Dispositions and Interferences

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ABSTRACT. The Simple Counterfactual Analysis (SCA) was once considered the most promising analysis of disposition ascriptions. According to SCA, disposition ascriptions are to be analyzed in terms of counterfactual conditionals. In the last few decades, however, SCA has become the target of a battery of counterexamples. In all counterexamples, something seems to be interfering with a certain object's having or not having a certain disposition thus making the truth-values of the disposition ascription and its associated counterfactual come apart. Intuitively, however, it would seem that, if all interferences were absent, the disposition ascription and its associated conditional would have the same truth-value. Although this idea may seem obvious, it is far from obvious how to define the notion of 'interference' in a clear and non-circular manner. In fact, it is has become widely assumed that it is not possible to do so. In this paper, I will argue that this assumption is wrong. I will develop an analysis of disposition ascriptions, the Interference-Free Counterfactual Analysis (IFCA), which relies on a clear and non-circular definition of the notion of interference and which avoids the standard counterexamples to SCA while vindicating the intuition that disposition ascriptions and counterfactual conditionals are intimately related.

1. Introduction

We routinely ascribe dispositions to objects. We may say, for example, that the teacup is fragile, that the coach is short-tempered, or that silicon is a semiconductor. A philosophical account of disposition ascriptions would seem to include at least three components: first, a criterion for distinguishing dispositional predicates from non-dispositional ones; second, an analysis of covert disposition ascriptions (such as the ones in my initial examples) into overtly dispositional terms (along the lines of '*o* is disposed to *M* when *S*'); third, an analysis of overt disposition ascriptions in non-dispositional terms. In this paper, I will be concerned exclusively with this third component. Moreover, for the sake of simplicity, I will focus only on overt ascriptions of "sure-fire", "single-track" dispositions and I will call 'disposition ascriptions' both positive disposition ascriptions (e.g. '*o* is disposed to *M* when *S*') and negative disposition ascriptions (e.g. '*o* is *not* disposed to *M* when *S*'), so that, in what follows, 'dispo-

sition' will mean 'sure-fire, single-track disposition' and 'disposition ascription' will mean 'overt (positive or negative) ascription of a sure-fire, single-track disposition'.

Once upon a time, the *Simple Counterfactual Analysis* (SCA) used to be considered the most promising analysis of disposition ascriptions. According to SCA, disposition ascriptions are to be analyzed in terms of counterfactual conditionals in accordance with the following schema:

(SCA): *o* is disposed to *M* when *S* iff, if it were that *S*, then *o* would *M*.

To the casual observer SCA may seem so obvious as not to be even worth spelling out. However, in the last few decades, SCA has been the target of a battery of counterexamples,[1] and, although a number of valiant attempts to defend it have been made,[2] there seems to be a growing suspicion that SCA cannot be salvaged.[3] In this paper, I will try to dispel this suspicion by developing and defending an analysis of disposition ascriptions, the *Interference-Free Counterfactual Analysis* (IFCA), which vindicates the intuitions that underlie SCA while avoiding the standard counterexamples to it.[4] In §2, I will briefly rehash the standard counterexamples to SCA. In §§3–5, I will outline the proposed analysis of disposition ascriptions for intrinsic dispositions (intIFCA) and define its central notion—i.e. that of interference. In §6, I will illustrate how intIFCA avoids the standard counterexamples. In §§7–10, I will discuss some seemingly problematic cases. Finally, in §11, I will offer an analysis of extrinsic disposition ascriptions (extIFCA) to complement intIFCA.

2.   *The Standard Counterexamples*

The standard counterexamples to SCA are usually grouped into four categories, which are often labeled 'finks', 'masks', 'antidotes', and 'mimicks'. Since I do not find this fourfold classification particularly illuminating, I will not spend too much time trying to give an abstract characterization of each category or explain the differences among them. Instead I will limit myself to introducing one representative exemplar for each category of counterexample.

> *Fink.* This live copper wire is disposed to conduct electricity when touched by a conductor, but, since a circuit breaker is installed on the same circuit, if a conductor were to touch the wire, the circuit breaker would open the circuit and the wire would not conduct electricity.

> *Mask.* This porcelain vase is disposed to break when dropped. The vase, however, has been wrapped in bubble wrap so carefully that, if the vase were to be dropped, it would not break.

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[1] See, e.g., (Johnston 1992) (Martin 1994), and (Bird 1998).

[2] See (Lewis 1997), (Malzkorn 2000), (Gundersen 2002), (Choi 2008), and (Steinberg 2010) to name just a few. Although the general consensus seems to be that none of these strategies is entirely satisfactory (see n.3 below), it is beyond the scope of this paper to assess their merits and demerits.

[3] This suspicion is more or less explicitly expressed by, e.g., (Heil 2003), (Fara 2005), (Bird 2008), (Manley and Wasserman 2008), and (Martin 2008).

[4] I should note here that, in trying to vindicate SCA, I am *not* also trying to vindicate the disgraced counterfactual account of dispositionality (CAD), which is widely regarded as having been refuted by Hugh Mellor (1974). According to CAD, a predicate is dispositional if and only if its ascription entails a counterfactual. Even if it may have seemed natural for someone who accepts SCA to also accept CAD and vice versa, the two accounts are independent and do not stand or fall together.

> *Antidote.* This potassium cyanide pill is disposed to kill when ingested. However, if Mithrida-
> tes were to ingest the pill, he would not die because he has previously ingested some hy-
> droxycobalamin, which is an antidote to potassium cyanide.
>
> *Mimick.* This sturdy golden chalice is not disposed to break when touched. However, a sor-
> cerer has cast a spell on it that would cause the chalice to break into pieces if anything were
> to touch it.

The first three scenarios, *Fink*, *Mask*, and *Antidote*, are counterexamples to the "if" side of SCA. In each of them, the *analysandum*—i.e. the disposition ascription—would seem to be true, but the *analysans*—i.e. the associated counterfactual—seems to come out false (the wire in *Fink* is live but would not conduct electricity if touched by a conductor, the vase in *Mask* is fragile but would not break if struck, and the pill in *Antidote* is poisonous but would not kill if ingested). The last scenario, *Mimick*, on the other hand, constitutes a counterexample to the "only if" side of SCA. In it, the *analysandum* would seem to be false but its associated counterfactual would seem to come out true (the chalice is not fragile but, nevertheless, it would break if it were to be touched).

As far as I can see, the distinction between the counterexamples that target the "if" side of SCA on one side and those that target the "only if" side of SCA on the other is far more significant than the customary classification into finks, masks, antidotes, and mimicks. As I will argue, all standard counterexamples to the "if" side of SCA (including those that are usually classified as finks, masks, and antidotes) rely on what I will call 'destructive interfer-ences' and can be dealt with in one fell swoop. It is only counterexamples to the "only if" side of SCA, which rely on what I will call 'constructive interferences', that require a some-what different treatment. In the next few sections, I will substantiate my claims by defining the notions of destructive and constructive interferences (in §5) and showing how they can be used to defuse the standard counterexamples (in §6). Before doing so, however, in the next two sections, I will introduce and outline my general proposal.

3.   *The Interference-Free Counterfactual Analysis*

The basic idea behind the IFCA, which I will develop and defend in the rest of this paper, is rather obvious—in all standard counterexamples to SCA, something interferes with what an object is (or is not) disposed to do and, as a result, the truth-values of the disposition ascrip-tion and of its associated counterfactual come apart; if all interferences were to be removed, however, the disposition ascription and its associated conditional would have the same truth-value, as predicted by SCA.

The basic idea is not particularly original either. After all, IFCA would seem to be just one of the many attempts to avoid the standard counterexamples to SCA by prefixing the associ-ated counterfactual with a qualifying clause (e.g.: '*ceteris paribus*', 'in normal/ideal circum-stances', etc.). In the case of IFCA, the qualifying clause would be something along the lines of 'in the absence of any interferences'.

If the basic idea is rather obvious (and not particularly original), however, what is far from obvious is how to implement it successfully. In fact, it has become widely assumed that it is not possible to do so.[5] On the one hand, specifying all possible interferences one by one would seem to be impossible (for any given object, there would seem to be infinitely many possible ways to interfere with what it is (or what it is not) disposed to do); on the other

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[5] See n.3.

hand, simply prefixing the associated counterfactual with the generic qualifying clause 'in the absence of any interferences' might not seem to be an adequate solution, for, unless the notion of 'interference' can defined clearly and without circularity, such clause would seem to be open to charges of vacuity.[6]

Supporters of qualified counterfactual accounts have usually tried to address this sort of challenge by arguing that the content of qualifying clauses need not be explicitly specifiable for those clauses not to be vacuous.[7] Unfortunately, however, this approach does not seem to entirely dispel the suspicion of vacuity. In this paper, I will take (and more ambitious) tack—I will argue that, contrary to prevailing wisdom, it is in fact possible to meet the challenge and give a clear and non-circular definition of the notion of interference. In the next section (§4), I will introduce my proposal in its bare bones and then, in the following section (§5), I will flesh it out by defining the two central notions it employs—i.e. those of constructive and destructive interferences. If my arguments are sound, the indefinability of qualifying clauses turns out to be a philosophical myth and qualified counterfactual accounts of disposition ascriptions can be definitively cleared of the charge of vacuity.

4.   *Intrinsic Disposition Ascriptions*

According to the *Interference-Free Counterfactual Analysis of intrinsic disposition ascriptions* (intIFCA), intrinsic disposition ascriptions are to be analyzed as follows:

(intIFCA): *o* is intrinsically disposed to *M* when *S* iff:

   (1) :
       (1.1) it is nomically possible that *S*,[8]
       (1.2) if it were that *S*, then *o* would *M*,
          and
       (1.3) nothing interferes with *o*'s *not* being intrinsically disposed to *M* when *S*,
      or
   (2) something interferes with *o*'s being intrinsically disposed to *M* when *S*.

Let me call a *destructive interference* anything that interferes with an object's being intrinsically disposed to *M* when *S* and a *constructive interference* anything that interferes with an object's *not* being intrinsically disposed to *M* when *S*. According to intIFCA, an (intrinsic) disposition ascription can still be true of an object even if its associated counterfactual is false as long as something is destructively interfering with the object's having the disposition in question and it can still be false even if its associated counterfactual is true insofar as something is constructively interfering with the object's not having the disposition in question.

Now, the problem, of course, is that, as it stands, intIFCA is patently circular, for the very notion that needs to be analyzed (i.e. that of being intrinsically disposed to *M* when *S*) occurs in the *analysans*. In order to avoid charges of circularity, therefore, intIFCA needs to be sup-

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[6] Willard van Orman Quine, for one, wrote 'An infirmity of the dispositional idiom […] is its dependence on a vague proviso of *caeteris paribus*' (Quine 1973: 12; cited in (Molnar 2003: 88)).

[7] See, e.g., the aforementioned (Steinberg 2010).

[8] Although this clause is not required to deal with the standard counterexamples to SCA, I think it is needed to avoid other potential counterexamples. In particular, it ensures that the associated counterfactual (intIFCA(1.2)) is not a counternomic. For those who believe laws of nature to be contingent, this reflects the common assumption that an object's dispositions are the ones it has under the actual laws of nature. For those who (like me) take laws of nature to be necessary, this is to ensure that the associated counterfactual is not a counterpossible and, hence, merely vacuously true.

plemented with a definition of the notions of destructive interference and constructive interference that do not themselves employ notions that are either explicitly or implicitly dispositional. It is to this task that I turn to in the next section.

Before doing so, however, let me emphasize that intIFCA only provides us with an analysis of ascriptions of *intrinsic* dispositions—i.e. dispositions that cannot be acquired or lost without undergoing some intrinsic change[9]—(hence the 'int' in 'intIFCA'). This is because the distinction between *extrinsic* dispositions and cases of mimicking is too fine a distinction to draw at this level of analysis. It is only in §11 below that, with an adequate analysis of intrinsic disposition ascriptions in hand, I will be able to offer an analysis of extrinsic disposition ascriptions to complement intIFCA. Until then, I will focus exclusively on intrinsic dispositions and, unless otherwise stated, by 'disposition' I will mean 'intrinsic disposition'.

5.   *Destructive and Constructive Interferences*

In this section, I will provide the definitions of the notions of destructive interference and constructive interference. Since these definitions are somewhat convoluted, however, I will first introduce both notions informally. Let me start with the notion of *destructive interference*. Something destructively interferes with o's being intrinsically disposed to M when S if and only if it participates in at least one of possibly many actual but nomically contingent states of affairs such that, even if only one of these states of affairs were to obtain, o would not M if it were the case that S, but, if none of those states of affairs obtained (and o and its parts did not acquire any intrinsic property[10] in the process), then, if it were the case that S, o would M. So, for example, the bubble wrap in *Mask* destructively interferes with the vase's being intrinsically disposed to break when dropped because the bubble wrap participates in an actual but nomically contingent state of affairs (i.e. *the bubble wrap's being wrapped around the vase*) such that, insofar as that state of affairs obtains, the vase would not break if dropped but, if that state of affairs did not to obtain (and the vase and its parts did not acquire any intrinsic properties as a result), then the vase would break if it were to be dropped.[11]

Let me now turn to the notion of *constructive interference*. Something constructively interferes with an object's *not* being intrinsically disposed to M when S if and only if it participates in at least one of possible many actual but nomically contingent states of affairs such that, even if only one of those states of affairs obtains, then, if it were the case that S, o would M, but, if none of those states of affairs obtained (and o and its parts did not lose any intrinsic property in the process), then, if it were the case that S, o would not M. So, for example, the sorcerer in *Mimick* constructively interferes with the chalice's not being intrinsically disposed to break when touched because it participates in an actual but nomically contingent state of affairs (i.e. *the sorcerer's having cast a spell on the chalice*) such that, whenever that state of affairs obtains, the chalice would break if it were to be touched but, if that state of affairs did not

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[9] The disposition a key has to unlock a certain lock, for example, is an intrinsic disposition of that key, for the key cannot acquire it or lose it without undergoing any intrinsic change (e.g. by becoming bent). The key's disposition to open a certain door, on the other hand, is extrinsic, for the key can lose it without undergoing any intrinsic change (e.g. the key can lose it if the door lock gets replaced).

[10] Although the notion of intrinsic property is notoriously difficult to define (see, e.g., (Lewis 1983), (Humberstone 1999)), here I will assume that, as Stephen Yablo once put it, 'you know what an intrinsic property is: it's a property that a thing has (or lacks) regardless of what may be going on outside of itself' (1999: 479).

[11] Note that here I will not distinguish between something interfering with a disposition and something interfering with its manifestation. In the terminology used here, to interfere with the manifestation of a disposition is just one way to interfere with that disposition.

obtain (and the chalice and its proper parts did not lose any intrinsic property), the chalice would not break if it were to be touched.

Now for the more formal definitions. The predicates 'x (destructively) interferes with o's being intrinsically disposed to M when S' and 'x (constructively) interferes with o's *not* being intrinsically disposed to M when S' are defined as follows:

(DI): x (destructively) interferes with o's being intrinsically disposed to M when S iff:
   (1) I_1 and … and $I_k(x)$ and … and I_n (where 'x' occurs free at least once in 'I_1 and … and $I_k(x)$ and … and I_n'),
   (2)   it is nomically possible that not-(I_1 and … and $I_k(x)$ and … and I_n),
   (3)   it is not the case that, if it were the case that S, then o would M,
   (4)   for each I_j ($1{\leq}j{\leq}n$), even if it were the case that not-(I_1 and … and $I_{(j-1)}$ and $I_{(j+1)}$ and … and I_n), it would still not be the case that, if it were that S, then o would M,
   (5)   if it were the case that not-(I_1 and … and $I_k(x)$ and … and I_n), then:
      (5.1) it would be the case that, if it were that S, then o would M, *and*
      (5.2) it would not be the case that, if it were that not-S, then o would M,
   (6)   it is not the case that, if it were the case that not-(I_1 and … and $I_k(x)$ and … and I_n), then some (proper or improper) part of o, $o*$, would acquire some (sparse, natural) intrinsic property, (where by 'property', throughout this paper, I will mean exclusively 'sparse, natural property', so that, for example, neither '*not being made of gold*' nor '*being 3 meters long or such that 2+2=4*' denote a property),

(CI) x (constructively) interferes with o's not being intrinsically disposed to M when S iff:
   (1) I_1 and … and $I_k(x)$ and … and I_n,
   (2)   it is nomically possible that not-(I_1 and … and $I_k(x)$ and … and I_n),
   (3)   if it were the case that S, o would M,
   (4)   for each I_j ($1{\leq}j{\leq}n$), even if it were case that not-(I_1 and … and $I_{(j-1)}$ and $I_{(j+1)}$ and … and I_n), it would still be the case that, if it were that S, then o would M,
   (5)   if it were the case that not-(I_1 and … and $I_k(x)$ and … and I_n), then it would not be the case that, if it were that S, then o would M, *and*
   (6)   it is not the case that, if it were the case that not-(I_1 and … and $I_k(x)$ and … and I_n), then some (proper or improper) part of o, $o*$, would lose some intrinsic property,

I will now offer a brief, informal explanation of each clause of DI and CI and, where appropriate, of the rationale for it. DI(1) and CI(1) require that interferences are states of affairs that actually obtain. DI(1) and CI(1) allow for there to be only one interference as well as multiple ones.

DI(2) and CI(2) require that interferences are nomically contingent states of affairs. These clauses are meant to ensure that all interferences can be removed without breaking any laws of nature. These clauses are meant to avoid that, for example, this copper wire turns out to be an electrical insulator whose disposition not to conduct electricity is interfered with by the fact that (as a matter of nomic necessity) electrons repel each other. For those who, like me, believe laws of nature to be necessary, these conditions are also meant to exclude that the counterfactuals in DI(5)and CI(5) are counternomics and, as such, vacuously true (thus avoiding that, for example, my bike turns out to be disposed to turn into a unicorn when travelling faster than light).

DI(3) and CI(3) require that the associated counterfactuals are, respectively, actually false and actually true. Unless multiple interferences obtain, then, under some widely held assumptions about the semantics of counterfactuals,[12] these conditions are made redundant by DI(4) and CI(4).

DI(4) and CI(4) are there to ensure that each interference is individually sufficient for the associated counterfactuals to be, respectively, false and true. Otherwise, insofar as, for example, the vase in *Mask* is wrapped in bubble wrap, anything would seem to destructively interfere with its disposition to break when dropped, for, as it is easy to verify, *the Eiffel Tower's being 1,063 ft tall*, *Socrates' being snubnosed* or what-have-you meet all other conditions for being destructive interferences.

DI(5) and CI(5) demand that, if none of the interferences obtained, the associated counterfactuals would be, respectively, true and false, as predicted by SCA. DI(5) also requires that, if all interferences were absent, the consequent of the associated counterfactual would not be true even if its antecedent were false. This is supposed to guarantee that the stimulus condition plays a role in bringing about the manifestation of the disposition. If this wasn't the case, *this chair's not being hit with a sledgehammer*, for example, would turn out to interfere with an alleged disposition the chair would have to break when looked at.

Finally, DI(6) is meant to ensure that the object does not acquire any dispositions it does not actually have by virtue of acquiring some intrinsic property that would act as the causal bases for those dispositions and CI(6) that the object does not lose any dispositions it actually has by virtue of losing some intrinsic property that would act as the causal basis for those dispositions. *This wire's not being made of rice flour*, for example, does not interfere destructively with its disposition to taste good in a stir-fry nor does *its being made of copper* constructively interfere with its *not* being disposed to conduct electricity, for, needless to say, the wire is neither disposed to taste good in a stir-fry nor not disposed to conduct electricity.

Now, since DI and CI provide us with a clear and non-circular definition of the notions of destructive and constructive interferences, it should be clear that intIFCA is immune to charges of vacuity. In the next section, I will explain why it is fit for the job by explaining how it avoids the standard counterexamples to SCA.

6.   *The Standard Counterexamples Defused*

Consider first the counterexamples to the "if" side of SCA—such as finks, masks, and antidotes. In these counterexamples, the *analysandum* (i.e. the disposition ascription) was true, but the *analysans* (i.e. the associated counterfactual) came out false. On intIFCA, however, these scenarios pose no challenge, for, even if the associated counterfactual is false, the *analysans* still comes out true. This is because finks, masks, antidotes, and the likes are destructive interferences and, therefore, even if the first disjunct of the *analysans* is false (because the associated counterfactual (intIFCA(1.2)) is false), the *analysans* is still true because its second disjunct (intIFCA(2)—i.e. 'Something destructively interferes with *o*'s being disposed to *M* when *S*') is true.

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[12] The assumption in question is what is sometimes called 'strong centering'—i.e. the assumption that no possible world is as close to the actual world as the actual world itself.

Let me illustrate this by focusing on *Fink*. According to (DI), the circuit breaker in *Fink* (destructively) interferes with the wire's being intrinsically disposed to conduct electricity when touched by a conductor,[13] as all of the following conditions hold.

(1) The circuit breaker is installed on the circuit.
(2) It is nomically possible for the circuit breaker not to be installed.
(3) It is not the case that, if the wire were to be touched by a conductor, it would not conduct electricity.
(4) [This condition is redundant in this case because only one interference obtains.]
(5) If the circuit breaker was not installed, then:
     (5.1) if the wire were to be touched by a conductor, it would conduct electricity, *and*
     (5.2) it would not be the case that, if the wire were not to be touched by a conductor, then it would conduct electricity.
(6) If the circuit breaker was not installed, neither the wire nor any of its proper parts would acquire any intrinsic property.

If, instead of only one circuit breaker, there were multiple circuit breakers installed on the circuit, then each of them would count as a destructive interference according to DI. Let me illustrate this with the case in which two circuit breakers (call them 'CB#1' and 'CB#2') are installed on the circuit. It is easy to see that all of the following conditions would hold.

(1) Both CB#1 and CB#2 are installed.
(2) It is nomically possible that neither CB#1 nor CB#2 is installed.
(3) It is not the case that, if the wire were to be touched by a conductor, then it would conduct electricity.
(4) :
     (4.1) Even if CB#1 were not installed, it would still not be the case that, if the wire were to be touched by a conductor, it would conduct electricity (this is, obviously, because CB#2 would still be installed) *and*,
     (4.2) even if CB#2 were not installed, it would still not be the case that, if the wire were to be touched by a conductor, then it would conduct electricity (because CB#1 would still be installed).
(5) If neither CB#1 nor CB#2 were installed, then:
     (5.1) if the wire were to be touched by a conductor, it would conduct electricity, and
     (5.2) it would not be the case that, if the wire were not to be touched by a conductor, then it would conduct electricity, and
(6) If neither CB#1 nor CB#2 were installed, then neither the wire nor any of its proper parts would acquire any intrinsic property.

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[13] Here I am following a short but venerable philosophical tradition in assuming that being live is an intrinsic disposition of the wire (see, e.g., (Lewis 1997)). However, I should note that this assumption seems to be mistaken. Unlike the wire's being a good conductor, its being live would not seem to be an intrinsic disposition of the wire. A wire is live only if it is (directly or indirectly) connected to the two terminals of a voltage source (such as a battery or a socket) and, therefore, can lose that disposition without undergoing any intrinsic change.

Since what I have said about *Fink* applies, *mutatis mutandis*, to *Mask* and *Antidote* (as well as to all other cases of finks, masks, and antidotes), I leave it to the reader to verify that the bubble-wrap in *Mask* and the antidote in *Antidote* would also be classified as destructive interferences by DI.

I will now turn to counterexamples to the "only if" side of SCA. In these counterexamples, the *analysandum* (i.e. the disposition ascription) is false and the *analysans* (i.e. the associated counterfactual) true. On intIFCA, however, even if the associated counterfactual is true, the *analysans* is still false because cases of mimicking are cases in which constructive interferences are at work and, therefore, both disjuncts of the *analysans* are false (for neither intIFCA(1.3) (i.e. 'Nothing destructively interferes with *o*'s not being disposed to *M* when *S*') nor intIFCA(2) are satisfied).

Consider, for example *Mimick*. According to CI, the sorcerer (constructively) interferes with the chalice's *not* being disposed to break when touched because all of the following conditions obtain.

(1)   The sorcerer has cast a spell on the chalice.
(2)   It is nomically possible for the sorcerer not to have cast a spell on the chalice.
(3)   If the chalice were to be touched, it would break.
(4)   [This condition is redundant in this case because only one interference obtains.]
(5)   If the sorcerer had not cast a spell on the chalice, then it would not be the case that, if the chalice were to be touched, it would break.
(6)   If the sorcerer had not cast a spell on the chalice, then neither the chalice nor any of its proper parts would have lost any of its intrinsic properties.

intIFCA seems thus able to avoid the standard counterexamples to SCA. However, there are other cases that may still appear to be problematic for intIFCA. In the following sections, I will discuss how intIFCA handles them.

7.   *Possible Interferences*

One possible worry with intIFCA is that it focuses only on actual interferences as opposed to possible ones. But what if, once all actual interferences were removed, some other possible but non-actual interferences were to emerge as a result? In particular, one may be worried of a possible counterexample to intIFCA that fits the following pattern:

i.   *o* is intrinsically disposed to *M* when *S*.
ii.   not-*J*,
iii.   if it were that not-$(I_1$ and … and $I_n)$, it would be that *J*.
iv.   if it were that *J* (and not-$(I_1$ and … and $I_n)$), it would not be the case that, if it were that *S*, *o* would *M*.

Do any genuine counterexamples fit this pattern? At first, it is tempting to think so. Consider, for example, the following variation on *Fink*.

> *Possible Fink*. This electric wire is live. However, Mr. Safe has installed a circuit breaker (call it 'CB#1') onto the circuit, so, if the wire were to be touched by a conductor, the circuit breaker would open the circuit and the wire would not conduct electricity. If, for any reason, the circuit breaker were to break or become disconnected from the circuit, however, Mr. Safe would immediately install a new (functional) circuit breaker (call it CB#2) on the cir-

cuit, so that, once again, if the wire were to be touched by a conductor, the circuit would open and the wire would not conduct electricity.

Now, at first *Possible Fink* may appear to be a counterexample that meets all of the above conditions and, in particular, that *CB#2's being installed on the circuit* is our non-actual destructive interference, *J*, while *CB#1's being installed on the circuit* is the only actual destructive interference. A little reflection, however, shows that this is not the case. As it can be easily verified, in *Possible Fink*, there is another actual destructive interference at work—namely, Mr. Safe himself—for all of the following conditions apply.

(1) CB#1 is installed and Mr. Safe is disposed to install a new circuit breaker when CB#1 fails.[14]

(2) It is nomically possible for CB#1 not to be installed and for Mr. Safe not to be disposed to install a new circuit breaker.

(3) It is not the case that, if the wire were to be touched by a conductor, then it would conduct electricity.

(4) :
(4.1) Even if CB#1 was not installed, it would still not be the case that, if the wire were to be touched by a conductor, then it would conduct electricity, *and*,
(4.2) even if Mr. Safe was not disposed to install a new circuit breaker, it would still not be the case that, if the wire were to be touched by a conductor, then it would conduct electricity.

(5) If it were not the case that CB#1 is installed and Mr. Safe is disposed to install a new circuit breaker, then:
(5.1) if the wire were to be touched by a conductor, it would conduct electricity, and
(5.2) it would not be the case that, if the wire were not to be touched by a conductor, then it would conduct electricity, *and*

(6) If CB#1 was not installed and Mr. Safe was not disposed to install a new circuit breaker, neither the wire nor any of its proper parts would acquire any intrinsic property.

In general, in addition to conditions (i)–(iv), a counterexample based on possible interferences would have to satisfy a further condition:

v. There is no x such that:
    v.a. $K(x)$,
    v.b. it is nomically possible that not-$K(x)$,
    v.c. if it were that not-$(K(x)$ and I_1 and … and $I_n)$, it would not be the case that J.

Any alleged counterexample that does not satisfy (v) would be defused by the fact that whatever would be responsible for bringing about the *possible* interference (i.e. *K*) would itself be classified as an *actual* interference by DI.

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[14] Let me note that appealing to Mr. Safe's disposition to install a new circuit breaker does not lead to circularity here because we are not trying to determine what, if anything, interferes with *that* disposition but, rather, what interferes with the wire's disposition to conduct electricity when touched by a conductor.

As far as I can see, there are no clear counterexamples to intIFCA that satisfy conditions (i)-(v), for the only cases in which (i)-(v) would be obviously jointly satisfied are cases in which it is not (logically, metaphysically, or nomically) possible that not-(I_1 and I_2 and … and I_n and J), so that, if it were the case that not-(I_1 and I_2 and … and I_n), it would have to be the case that J. In other words, the obtaining of the non-actual interference would have to be a *direct* result of the non-obtaining of the actual interferences not an *indirect* one as in *Possible Fink*. Personally, I cannot think of any clear counterexample to intIFCA that satisfy (i)-(v) and, while it might be just due to lack of imagination on my part, I suspect there is none. However, even if there were any clear counterexamples of this kind, they would seem to involve cases in which an object has a disposition that is necessarily interfered with and these may be dealt with as I suggest in the next section, where I discuss necessary interferences.

8. Necessary Interferences

Consider now the following scenario:

> *Necessary Mask.* God (who is a necessary and omnipotent being) necessarily loves this extremely fragile vase so much that, if something were to strike the vase, God would miraculously prevent the vase from breaking.[15]

The first problem that scenarios such as *Necessary Mask* may seem to pose is that DI(2) (which requires the removal of the interference to be nomically possible) may not seem to be satisfied by *God's loving the vase*, for, according to the story, it is necessary that God loves the vase and therefore it would seem that, *a fortiori*, it is nomically necessary that God does so. This problem, I think, can be solved by adopting a weak reading of DI(2) (and CI(2)), according to which all DI(2) (and CI(2)) require(s) is that no laws of nature are broken in the process of removing the interference (which in this case is God's love for the vase). On this weak reading, DI(2) would read 'for all p, if it is a law of nature that p, then it is not the case that, if it were that not-(I_1 and … and I_n), then it would not be the case that p'. It seems plausible to claim that God would not break any law of nature by not loving the vase (as, presumably, it is not a consequence of the laws of nature that God loves the vase, as, I imagine, God's inclinations would not fall under their jurisdiction). On this weaker reading of DI(2), God's love for the vase would therefore satisfy DI(2).

Necessary Mask however may seem to raise a second problem, which is both subtler and more serious. Since God loves the vase necessarily, all counterfactuals whose antecedents involve God's not loving the vase (including the two counterfactuals embedded in DI(5)) are counterpossibles and, as such, they are vacuously true. At first, this may not seem to be a problem—after all, one may think that all that matters is that DI(5) comes true even if only vacuously so. The problem, however, is that, if all it took to satisfy DI(5) were trivially true counterfactuals, then the vase could be ascribed all sorts of dispositions that, in fact, it does not have. As it can be easily verified, God's love of the vase would also seem to destructively interfere with, for example, the disposition the vase would seem to have to turn into a butterfly when dropped.

A possible reaction to this counterexample would be to dismiss it as too far-fetched. One could simply claim that a scenario needs to be genuinely possible in order for it to constitute a genuine counterexample and that, in order for the situation described by *Necessary Mask* to count as a counterexample, we would have to be persuaded that it could possibly obtain and,

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[15] That is—it is necessary that, if the vase exists, God loves it.

since this would involve convincing us that there are good reason to believe not only that God exists and that She does so necessarily but also that She would bother turning vases into butterflies for no apparent reason other than making troubles for intIFCA, this would seem to be a difficult task indeed.

However, if a scenario needs not to be genuinely possible in order to constitute a counterexample[16] but only needs to be (*prima facie*) conceivable, then the burden of proof is not as heavy as the above reply assumes. So, for example, suppose that, necessarily, God does not exist and that, therefore, the scenario described by *Necessary Mask* cannot possibly obtain. The scenario described by *Necessary Mask*, however, would seem to be at least (*prima facie*) conceivable and this is all it takes for us to realize that, if it did obtain, it would cause trouble for intIFCA.

Note, however, that this concession cuts both ways. If *Necessary Mask* can count as a counterexample to intIFCA despite its not describing a genuinely possible scenario, it is because we are able to see that certain counterpossibles are *non-vacuously*[17] true (e.g. 'If the scenario described by *Necessary Mask* obtained, the vase would not break when struck despite its being very fragile'). If we are able to evaluate those counterpossibles, however, we would also seem to be able to evaluate counterpossibles such as 'If God did not love the vase, the vase would break if it were to be struck' and 'If God did not love the vase, the vase would not turn into a butterfly if it were to be dropped' as respectively (non-vacuously) true and false and this is all we need to defuse the kind of worry raised by necessary interferences.

9. Intrinsic Interferences

Consider now another case that might appear problematic (which I adapted from (Clarke 2008)).[18]

> *Intrinsic Fink.* The Great Antonio is able to lift very heavy objects. However, he has recently developed a rare (intrinsic) hypersensitivity to heavy objects, so that whenever his bare hands come into contact with a heavy object his muscles lose their tone and, as a result, Antonio cannot lift the object. Whenever he wears gloves, however, the Great Antonio is still able to lift heavy objects.

In *Intrinsic Fink*, the Great Antonio's hypersensitivity to heavy objects would seem to interfere with his ability to lift very heavy objects not destroy it. Antonio would still seem to have the ability to lift heavy objects when he is not touching one or when he is wearing gloves and, clearly, wearing gloves is not what makes Antonio strong—wearing gloves just masks his hypersensitivity. What is peculiar about this case is that the Great Antonio's ability to lift heavy objects seems to be interfered by one of Antonio's own intrinsic properties rather than by something extrinsic to Antonio and, no matter how unrealistic *Intrinsic Fink* may seem, we have no reason to assume there are no realistic scenarios in which an intrinsic property of an object destructively interferes with one of the object's dispositions. So, in this case, the destructive interference would seem to be *The Great Antonio's being hypersensitive to heavy objects*. This, however, would not seem to be a problem for intIFCA, for DI(6) only requires that the object does not *acquire* any intrinsic property as a result of the removal of de-

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[16] Or, at least, those described by counterexamples to a philosophical analysis of some ordinary concept.

[17] If vacuous truth were all it takes, then any impossible scenario would be a counterexample to anything.

[18] I would like to thank an anonymous referee for this journal for persuading me to take intrinsic interferences more seriously.

structive interferences; it does not require that the object doesn't *lose* some of its intrinsic properties (as CI(6) does). Now, since the Great Antonio would not seem to have to acquire any property if he were to lose his hypersensitivity to heavy objects (recall that in this paper, 'property' means 'sparse, natural property', so that, e.g., *not being hypersensitive to heavy objects* does not classify as an intrinsic property), intIFCA would therefore seem to be able to handle intrinsic interferences as well as it handles extrinsic ones.

10. Extrinsic Interferences

The last worry I would like to discuss is, I think, one of the most serious. The worry is that, on intIFCA, things would not seem to have many of the dispositions we ordinarily take them to have. Take, for example, this brand new, dry match. The match is such that, if it were to be struck, it would light and, ordinarily, we would take it to be disposed to light when struck. However, according to intIFCA, something—i.e. the presence of oxygen— would seem to be constructively interfering with the match *not* being intrinsically disposed to light when struck, for, if there was no oxygen, the match would not light when struck. So, what has gone wrong?

I think the correct answer is 'Nothing'. The verdict delivered by intIFCA in this case is correct because the match is not *intrinsically* disposed to light when struck. It is only *extrinsically* disposed to do so. Its disposition to light when struck is one that the match may acquire or lose without undergoing any intrinsic change (only in virtue of changes in its environment), which is the hallmark of an extrinsic disposition.[19]

As plausible as this reply may seem, however, it may not seem completely satisfactory until intIFCA is supplemented with an analysis of extrinsic disposition ascriptions. It is to this task that I turn to in the next section.

11. Extrinsic Disposition Ascriptions

In this section, I will offer an analysis of extrinsic disposition ascriptions, extIFCA, to complement intIFCA.[20] As I mentioned, the main problem is how to draw a principled distinction between genuine extrinsic dispositions and mere cases of mimicking. Consider, for example, two keys, Key and Key*. Key is so shaped that, if it were inserted in the lock on a certain door (let me call the lock 'Lock' and the door 'Door') and turned, it would cause the pins in Lock to rise in such a way that Lock would unlock and Door would be free to open. If Key* were inserted in Lock, on the other hand, its shape would not cause its pins to rise so as to unlock Lock. However, it just so happens that, if Key* were to be inserted in Lock, the Lock Fairy would magically cause the pins in Lock to rise so that Lock would unlock and Door would open. Now, the difference between Key and Key* would seem to be that, while Key is (extrinsically) disposed to open Door, Key* is not (its seeming disposition to open Door is, in fact, only a case of mimicking). The problem with intIFCA, however, is that it does not seem to be able to distinguish between these two cases, for, according to intIFCA,

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[19] Moreover, to think otherwise would amount to holding the implausible view that the match is intrinsically disposed to light when struck but its disposition to light when struck is masked in the absence of oxygen. Personally, I am inclined to think that the absence of something cannot mask a disposition, but my reasons for thinking so depend on issues in the metaphysics of causation that fall far beyond the scope of this paper.

[20] Since this is not the place to make a case for extrinsic dispositions (see (McKitrick 2003) for one), I will just assume that some dispositions are extrinsic. Those who do not believe that there are any extrinsic dispositions are free to reject this part of the account.

in both cases, something (i.e. Lock[21] in the case of Key, the Lock Fairy in the case of Key*) is constructively interfering with the key's not being intrinsically disposed to open Door. So, what, if anything, distinguishes these two cases? And, more in general, what distinguishes extrinsic dispositions from mere cases of mimicking?

The answer, I think, is that, unlike mimics, extrinsic dispositions are always underpinned by some intrinsic disposition of the object or of some of its proper parts. This conjecture gives rise to the following analysis of extrinsic disposition ascriptions:

(extIFCA) : *o* is extrinsically disposed to *M* when *S* iff:

(1) something interferes with *o*'s not being intrinsically disposed to *M* when *S*,
(2) some (proper or improper) part of *o*, *o**, is intrinsically disposed to *M** when *S** (for some *M** and *S**, which may or may not be identical with *M* or *S*),
(3) if it were that *S* but *o** did not *M**, then *o* would not *M*,[22] *and*
(4) if *o** was not intrinsically disposed to *M** when *S**, then it would not be the case that, if it were that *S*, then *o* would *M*.

extIFCA seems to deliver the right verdict in the case of Key and Key*. Although neither Key nor Key* are intrinsically disposed to open Door, Key is intrinsically disposed to open locks with Lock's design. If Key were to lose that disposition (e.g. by becoming bent), it would also lose its disposition to open Door. In the case of Key*, on the other hand, there is no intrinsic disposition of Key* (or of any of its proper parts) to underpin its apparent disposition to open Door and this is thus a mere case of mimicking.

extIFCA also seems to reach the right verdict in the other cases I have considered. For example, the one in *Mimick* would seem to be a case of mimicking because no intrinsic disposition of the chalice seems to underlie its supposed disposition to break when touched. (In fact, the chalice would seem to have an intrinsic[23] disposition *not* to break when touched.[24]) The match discussed in the previous section, on the other hand, would seem to have an extrinsic disposition to light when struck because the red phosphorus on its head is intrinsically disposed to turn into white phosphorus and heat up if struck on the side of a box—a disposition that the head of the match retains even when, due to the lack of oxygen, the match does not end up lighting up.

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[21] Lock would count as a constructive interference because, if, for instance, Lock were to be replaced with a different lock, Key would no longer open Door if inserted in its lock and turned.

[22] extIFCA(3) is meant to ensure that the underlying intrinsic disposition would contribute to the manifestation of the extrinsic disposition it underlies. This is needed to avoid counterexamples such as the following variation on *Mimick*. A sorcerer has cast a spell that makes all and only (intrinsically) fragile things turn into butterflies when struck. This porcelain teacup is fragile and, due to the spell, it would therefore turn into a butterfly if it were to be struck. If the teacup were not fragile, on the other hand, the spell would not apply to it (as the spell applies only to fragile things). However, this would not seem to make the teacup extrinsically disposed to turn into a butterfly when struck. Since the fragility of the teacup does not meet conditions extIFCA(3) (as, for example, even if the teacup fragility were to be masked, the teacup would still turn into a butterfly if struck), however, the teacup does not turn out to be extrinsically disposed to turn into a butterfly when struck on extIFCA, as its fragility would not be manifested in the process of turning into a butterfly.

[23] Although, its intrinsicness may be a matter of contention, I will not discuss this here.

[24] One may suspect that similar results may be obtained by focusing on intrinsic properties rather than intrinsic dispositions. Although I sympathize with this view, I think it would be subject to certain kind of counterexamples. For example, the sorcerer may have cast a spell on the chalice because the chalice is made of gold and the sorcerer hates all things that are made of gold. So, if the chalice were not made of gold, the sorcerer would not have cast a spell on it.

12. Conclusion

In this paper, I have developed and defended an analysis of disposition ascriptions that vindicates the intuition that there is a connection between disposition ascriptions and counterfactual conditionals while avoiding the counterexamples that plagued SCA. The basic idea is that, in all standard counterexamples to SCA, something interferes with the object's having or not having a certain disposition and that the associated counterfactual should only be evaluated after all interferences are (counterfactually) removed. Although this basic idea is rather obvious, conventional philosophical wisdom would have us believe that notions such as that of 'interference' cannot be defined in a clear and non-circular manner. In this paper, I have argued that this is just a philosophical myth.

Acknowledgements

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