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DISPOSITIONALITY: BEYOND THE BICONDITIONALS

David Manley

Suppose dispositions bear a distinctive connection to counterfactual facts, perhaps one that could be enshrined in a variation on the well-worn schema ‘Necessarily, x is disposed to ϕ in ψ iff x would ϕ in ψ ’. Could we exploit this connection to provide an account of *what it is* to be a disposition? This paper is about four views of dispositionality that attempt to do so.

1. Introduction

There is an intuitive distinction between properties like *fragility* and *irascibility* on the one hand, and properties like *being spherical* and *having three parts* on the other. It is this distinction that the term ‘disposition’ is intended to mark. But it is very hard to say what exactly the distinction amounts to—a fact that has recently led a number of philosophers to take it as primitive or give up on it altogether.¹

To rehearse some background, consider the natural idea that there is a special connection between *counterfactual facts* and the properties we think of as dispositional. For instance, an object’s disposition to ignite at 200°C seems to be closely connected to facts about what it would do at 200°C. Here it is traditional to focus on *entailment*: the idea is that dispositional claims entail—and perhaps are entailed by—certain counterfactual facts. But it is notoriously difficult to provide a general characterization of which counterfactual facts are entailed by which dispositions. This problem has received a good deal of attention over the last few decades and I will not attempt to solve it here.

Instead, I am interested in whether—supposing that this kind of mutual entailment holds—it would suffice to provide an account of dispositionality that can preserve the intuitive distinction between dispositions and categorical properties. I will argue that we must appeal to a connection between dispositions and counterfactual facts that is more intimate than necessitation.

¹Cross [2005] recommends taking it as primitive. Others argue that *all* properties are dispositional [Mellor 1974, 1982; Shoemaker 1980; Martin and Heil 1999]. Still others deny that, strictly speaking, any properties count as ‘dispositional’, because the term properly applies only to predicates: see Mellor [2000], Lowe [2006], and, at certain points, Mumford [1998: 75–6, 205].

2. The Biconditionals

There have been a number of attempts to analyse dispositions in terms of conditionals. (My use of ‘analysis’ is intended to be neutral about whether the project is reductive, either ontologically or conceptually.) Some of these proposals are aimed at specific dispositions, like this example from Quine: ‘To say that *a* is fragile at *t* is to say that if *a* were struck smartly at *t*, *a* would break at *t*’ [1960: 222–3]. Others are more ambitious, offering schematic biconditionals such as these, which are presumably intended to hold of necessity:

x is disposed to ϕ in ψ iff

(S1) ... *x* would ϕ in ψ .²

(S2) ... *x* has some intrinsic property *B* partly in virtue of which, were it to retain *B*, it would ϕ in ψ .³

(S3) ... certain ‘ideal’ ψ -cases are such that *x* would ϕ in them.⁴

(S4) ... for a suitable proportion of ψ -cases, *x* would ϕ in them.⁵

Most now agree that S1 can be falsified in both directions,⁶ and no doubt the other proposals face their own challenges.⁷ But in what follows I will be assuming only that there is a type of counterfactual fact, such that for every disposition *d*, having *d* will be modally equivalent to a fact of that type.

This is a somewhat weaker assumption than the claim that, using a schema like S1–S4, it is possible in English to provide an analysis for every disposition. In particular, note that these schemas have no direct application to predicates like ‘fragile’ and ‘irascible’, which do not explicitly mention stimulus or manifestation conditions. One might hope that these can ultimately be analysed into predicates of the form ‘is disposed to ϕ in conditions ψ ’, but perhaps they will resist analysis. For example, perhaps we recognize the stimulus conditions for fragility when we see them, but cannot

²The idea that dispositional ascriptions entail subjunctive conditionals predates the robustly modal approach to the semantics of such conditionals that is common today: see Ryle [1949], Goodman [1954: 34], and Quine [1960: 222–3].

³See Lewis [1997], though I suppress some details of his account. Note that these proposals can be combined: for example, S2 would arguably handle ‘masks’ better if it were combined with S4 to read: ‘... iff *x* has an intrinsic property in virtue of which, in a suitable proportion of ψ -cases, *x* would ϕ ’.

⁴See Mumford [1998: 89–91]. Ideal circumstances are not supposed to include finks and masks, but neither are they simply ‘circumstances that guarantee ϕ ing’, because every object would ϕ in such circumstances. Instead, perhaps we simply have a pretheoretical notion of what ‘ideal circumstances’ are for a given dispositional ascription, even if we cannot fully articulate what they are. On this point see Prior [1985: 48–9], Mellor [2000: 263], and Cross [2005: 235].

⁵See Manley and Wasserman [2007, 2008]. The range of ψ -cases includes those in all worlds compatible with the laws; what counts as a suitable proportion will depend both on the specific predicate involved and the context of assertion.

⁶See Johnston [1992], Martin [1994], and Lewis [1997]. For challenges to the general consensus about S1 see Gundersen [2002], Bonevac, Dever, and Sosa [2006], and Choi [2008].

⁷For concerns about S2, S3, and S4 see Manley and Wasserman [2008: 63–73, 77–82]. For further discussion about S4, see Bonevac, Dever, and Sosa [forthcoming], Choi [forthcoming], and Manley and Wasserman [forthcoming].

articulate what they all have in common beyond their being the stimulus conditions for fragility.⁸

Fortunately, at least two of the projects that have motivated schemas like S1–S4 do not require us to be in a position to provide an analysis of every disposition. To wit:⁹

(a) The project I am primarily interested in is that of illuminating the difference between dispositions and other properties. But it might be that we can state this connection quite generally. For example, one might propose that a property *p* is a disposition just in case the following condition holds: there is *some* stimulus *φ* and *some* manifestation *ψ* such that necessarily: *x* has *p* iff for a suitable proportion of *ψ*-cases, *x* would *φ* in them. This general claim would not be threatened by our inability to articulate the stimulus conditions of, say, irascibility.

(b) Another project is that of offering a metaphysical reduction, preferably one that explains the necessary connection between dispositions and counterfactual facts. Here there are a number of options beyond the claim that dispositional facts supervene on the global distribution of categorical and counterfactual truths. One might hold that dispositional facts are metaphysically less fundamental than the facts on which they supervene. Or, as we will see, one might hold that dispositional facts are simply identical to counterfactual facts of a certain kind. But, again, these general theses do not require that there is an accessible procedure for replacing every dispositional claim in English with a counterfactual one.

3. Four Views of Dispositionalism

Suppose, then, that there is a kind of counterfactual fact such that for any disposition *d*, *x* has *d* is equivalent to a fact of that type. Setting aside the issue of whether any of the schemas we have considered correctly specifies the relevant type of counterfactual fact, could we exploit this connection to distinguish dispositions from other properties? And if so, how?

Here are four broad strategies for doing so.

(i) According to the simplest, which I will call *consequentialism*, the entailments just discussed are sufficient to distinguish dispositions from

⁸More likely, breaking in any circumstance at all can be a manifestation of fragility, and so fragility is just the disposition to break. (Likewise, irascibility is just the disposition to get angry.) Situations like *being struck* come to mind only because they are the most salient cases in which fragile things manifest this disposition. If this is right, it poses a problem for schemas like S1–S3 because it is unclear what should be put in the antecedent of the relevant conditional. However, S4 is designed to avoid this problem: we can treat every circumstance as a stimulus condition for fragility.

⁹In his [1997: 151], Lewis abjures the responsibility to say what dispositions are or to distinguish dispositions from non-dispositions. Instead, ‘The question we want to answer is “What is it to have such and such a disposition (as it might be, the disposition to break if struck)”’ Individual answers to questions of this form may be available even if we are not in a position to answer others—in fact Lewis sets himself the task of offering a schema that answers such questions only for dispositions that can be expressed using a predicate of the form ‘is disposed to give response *r* to stimulus *s*’. Presumably, if this is to serve his more reductive metaphysical aspirations, the idea is that ultimately all dispositional claims could in principle be expressed this way.

other properties. See Goodman [1954: 34–5], Mellor [1982: 96], and Prior [1982].

(ii) Another view appeals to the *apriority* of the relevant entailments. Call this view *apriorism*. See Mumford [1998: 79, 183, 215].

(iii) A third strategy, *functionalism*, goes beyond entailments and makes a claim about what dispositions *are*. Roughly, a disposition is the second-order property of having some other property that would be partly responsible for the relevant counterfactual manifestations. See Prior, Pargetter, and Jackson [1982] and Prior [1985].¹⁰

(iv) Finally, *modalism* identifies dispositions with purely modal properties: to have a disposition just is to be such that the relevant sort of counterfactual fact holds.¹¹

To illustrate, here is an instance of each strategy using (S1) to specify the relevant type of counterfactual fact.

Property *p* is a disposition just in case for some ϕ and ψ , necessarily

(I) ... *x* has *p* iff *x* would ϕ in ψ .

(II) ... it is *a priori* that: *x* has *p* iff *x* would ϕ in ψ .

(III) ... *p* just is the second-order property of having some other property that would be partly responsible for one's ϕ -ing in ψ .

(IV) ... *p* just is the property of being such that one would ϕ in ψ .

One can, of course, construct other variants of each view by implementing other proposed schemas such as S2–S4.¹²

Which of these general strategies should we prefer? Those interested in a reductive metaphysical project will have an initial inclination towards functionalism and modalism, since they *explain* the necessary connection that is merely posited by the others. But I will set that virtue aside for the moment. In §4, I argue that ‘Mellor’s Problem’ is a significant concern for consequentialism. In §5, I consider and reject some variations of apriorism

¹⁰See also a related view in Johnston [1992: 234]. While Lewis offers something like (S2) as a biconditional linking dispositions and counterfactuals, he is officially neutral on whether dispositions *are* second-order properties. However, he does write, ‘If forced to choose, I would side with Prior’ (151–2)—that is, with functionalism [Lewis 1997: 157]. I consider a view that identifies a given disposition with the property of *having some property in virtue of which* ... to be a kind of functionalism rather than a kind of modalism, even though that is what we would get if IV were stated in terms of S2.

¹¹This is one way of generalizing on Quine’s claim: ‘To say that *a* is fragile at *t* is to say that if *a* were struck smartly at *t*, *a* would break at *t*’ [1960: 222–3]. But no doubt Quine would be unhappy with the property-identity claim as well as with the modal semantics for subjunctive conditionals that I am taking for granted. I will not speculate about what exactly Quine’s ‘To say that ... is to say that ...’ locution amounts to.

¹²Avoiding redundancy, the most natural way to combine (S2) with functionalism would be: *p* is a disposition just in case *p* is the property of having some intrinsic property *B* in virtue of which, were one to retain *B*, one would ϕ in ψ .

aimed at avoiding this problem. And in §6, I argue for modalism over functionalism.

4. Mellor's Problem and its Limits

In his [1974] and [1982], D. H. Mellor set out to refute the 'myth that there are non-dispositional properties of things—i.e. properties that support no subjunctive conditionals' [1982: 96]. Mellor famously argued that even *x*'s being *triangular* entails that if *x*'s corners were counted correctly, *x* would be found to have three corners. But, he argued, if triangularity is dispositional, then so is every property. In response, Elizabeth Prior imagines cases in which the laws are such that counting an object's corners *changes* the number of corners it has [Prior 1982: n. 2]. But surely Mellor could hedge the antecedent of the conditional with '... in a situation with such-and-such laws', or 'and *x* were not to undergo deformation'. (In offering the initial biconditionals, some philosophers intend to be holding the laws fixed anyway.)¹³ And there are plenty of other examples that appear to make Mellor's point. Trivially, for example, *x*'s being triangular also entails that if *x* were red, *x* would be coloured.

Entailing subjunctive conditional facts, it seems, is just too easy. But attempts to 'analyse' dispositional claims in terms of conditionals, from Goodman to Lewis and beyond, actually posit a relationship of *mutual entailment*. Thus every dispositional ascription is supposed to entail a conditional sentence like those specified by (S1)–(S4), as well as *vice versa*. And according to consequentialism, it is this kind of mutual entailment that sets dispositions apart. Are there variants of Mellor's Problem involving entailments in *both* directions?

How about this?: 'Necessarily, all and only things with three corners are such that, if their corners were correctly counted (without undergoing deformation/being in a scenario with such-and-such laws), they would be found to have three corners.' That some such biconditional holds seems as plausible as any alleged mutual entailment between a dispositional ascription and a subjunctive conditional. (And the claim is equally plausible if it is put in terms of S2–S4.) In any case, one can again generate some fairly trivial examples: necessarily, *x* has the property of *being Socrates* iff, if *x* were a member of any singleton set, *x* would be a member of singleton-Socrates. But surely this is not sufficient to make *being Socrates* a dispositional property.¹⁴

¹³If the laws are contingent, as Prior is assuming, the issue hinges on whether we take dispositions that are intuitively intrinsic (like fragility) to be in fact intrinsic *full stop* or only intrinsic *modulo* the laws. See Lewis [1997: 147–8]. For suppose having fragility is equivalent with some counterfactual claim *S* that does not constrain the laws. Then, it seems, an object might satisfy *S* at the actual world, while a duplicate fails to satisfy it at a distant world where the laws are very different. If such an object is no longer fragile, then at best fragility is only intrinsic *modulo* the laws. Given this, one might try the following strategy to avoid Mellor's Problem: only dispositions, one might claim, are equivalent to counterfactuals that do not constrain the laws. However, I doubt that even this will be successful: the addition of '... and *x* were not to undergo deformation' seems to do the trick as well. Could we stipulate away that kind of addendum? It is hard to see how, especially since one popular way to avoid finkish cases for ordinary dispositions—that is, cases where the relevant disposition is lost—is to specify a similar property-retention clause (see S2).

¹⁴This example is not a problem if one's form of consequentialism employs a causal version of (S2): *x* does not seem to have any property that would be *causally* responsible for its being a member of singleton-Socrates.

There is also a kind of symmetry that can intuitively arise between some dispositions and their categorical ‘triggers’, as discussed by Troy Cross [2005].¹⁵ To fix ideas, imagine a toy universe with some fundamental particles, and suppose for *reductio* that some objects have categorical property C, and others have the disposition to attract nearby objects that are C. Call this disposition ‘D’. Imagine further that this is a fail-safe disposition: the laws require that all and only D objects attract C objects. If this is possible, let conditions ψ involve the laws as just described. Then we get: ‘Necessarily, x has D iff: if x were near a C-object in conditions ψ , x would attract it.’ But we also get, ‘Necessarily, x has C iff: if x were spatially related to a D-object in conditions ψ , x would be attracted by it.’

Objection: Isn’t C in this example intuitively both categorical and dispositional? C is stipulated to be categorical, but at the same time the laws make C-objects disposed to induce a response in D-objects. Doesn’t this in turn make C *intuitively* dispositional, rather than just dispositional-according-to-consequentialism?¹⁶ Answer: There is, I think, a use of the term ‘dispositional’ that would make any categorical basis of a disposition count as ‘dispositional’ simply for being such a basis—and in this sense everyone should agree that (at least) some categorical properties are dispositional. But it does not follow that there is no way to distinguish between properties that are categorical (some of which may also be dispositional in this loose sense) on the one hand, and properties that are *merely* dispositional on the other (such as fragility, as well as any property that can be expressed in the canonical form ‘the disposition to ϕ in ψ ’).¹⁷ In short, unless we are antecedently committed to consequentialism, being dispositional in this loose sense does not obviously suffice for being *a disposition*.

Admittedly, Mellor’s Problem shows that no such distinction is saved by consequentialism itself. But we should not over-react to this result.¹⁸ Cross [2005: 330] himself abandons hope for a non-circular account of the distinction between dispositions and categorical properties, and recommends taking it as primitive. Others are willing to simply jettison the intuitive distinction I have in mind. Some are happy to conclude that *all* properties of things are equally dispositional [Mellor 1974, 1982; Shoemaker 1980], or equally both dispositional and categorical [Martin and Heil 1999; Heil 2005]. Still others deny that the categories of ‘dispositional’ and ‘categorical’ properly apply to properties at all, but rather to predicates; see Mellor [2000], Lowe [2006], and, to some extent, Mumford [1998: 75–6, 205].

But these are somewhat desperate measures. The intuitive distinction between properties like triangularity and properties like fragility is, it seems

¹⁵Note that Cross focusses on entailments in one direction, rather than on biconditionals.

¹⁶Thanks to an anonymous referee for pressing me to clarify this issue.

¹⁷Take a shape S which is such that necessarily anything that has S in conditions ψ (which specify some laws) is disposed to attract D-objects. We can call S ‘dispositional’ in this loose sense, but the intuitive distinction I have in mind still seems to hold between S and the disposition to attract D-objects in ψ . One way of spelling out that intuition is to say that, intuitively, S itself cannot be expressed using the canonical form for dispositional predicates—it is not simply the disposition to ϕ in ψ , for any ϕ and ψ .

¹⁸Usually the problem is stated in terms of the entailment of subjunctive conditionals by categorical properties, rather than their mutual entailment. But the proposed analyses are usually biconditional in form.

to me, precisely what the term ‘disposition’ was introduced to track. And it is this distinction that we appeal to when we try to inculcate someone into the use of the term. Since consequentialism is just one attempt to make good on that distinction, surely our attachment to consequentialism should be weaker than our attachment to the original intuitive distinction that gave rise to the expression in the first place. After all, consequentialism itself has little or no direct intuitive pull—in contrast with the intuition that triangularity is not a disposition. Thus it seems entirely backwards to assume, as Mellor does, that a property is dispositional just in case it entails (or is equivalent to) a subjunctive conditional, and then go on to conclude that all properties are dispositional [1982: 96].

If we insist on using ‘disposition’ in such a way that it conforms with consequentialism, come what may, we risk setting up a mere term of art. (As in, ‘A “shmisposition” is any property the having of which is equivalent to a counterfactual fact.’) There is nothing wrong with terms of art, but it is not very illuminating to analyse them, and they can cause confusion when they happen to be homonymous with terms of ordinary language. So if there is no real division among properties even remotely corresponding to the one that the ordinary term ‘disposition’ appears designed to mark, it would be better to let the term go the way of ‘phlogiston’.

However, we have not been given much reason to think that there is no such real division. The fact that consequentialism fails to delineate it is a better reason to reject consequentialism than to reject the division. At this point we could, with Cross, simply take the division to be primitive—but even that would be an overly hasty capitulation. There are other accounts of dispositionalism to consider. To begin with, it seems to have escaped notice that functionalism and modalism avoid Mellor’s Problem altogether. Let us grant, for example, that being a spherical object *entails* that under circumstances C, one would exactly fill a spherical region without undergoing deformation—and *vice versa*. It does not follow from modalism that being a spherical object is a disposition, unless one is antecedently committed to the idea that all co-intensional properties are identical. Modalism tells us that to be a disposition is to be a property like *being such that one would exactly fill a spherical region*. But why think that *being spherical* is a property like this? Mellor’s examples do not require us to reject the natural view that the way objects *are* isn’t exhausted by facts about how they *might have been*, *would have been*, and so on. Neither do his examples undermine the intuition that it is at least partly *because* x is a spherical object that it has the relevant modal property, an explanatory asymmetry that would disappear if being a spherical object were identical with that property.

A similar point applies in the case of functionalism. While being spherical may entail being such that one would ϕ if ψ , we have been given no reason to *identify* it with a second-order property of the type specified by (III). In fact, it is implausible that being spherical is the second-order property of having some other property responsible for being such that one would exactly fill a spherical region. What would the other property be? Thus Mellor-style examples do not require the functionalist to categorize being spherical as a disposition.

At worst, Mellor's Problem causes *epistemological* trouble for the functionalist and the modalist. It opens up the possibility that there will be cases where we can identify an entailment between the ascription of some property *p* and a modal or second-order claim of the relevant type, but we are nevertheless uncertain about the dispositionality of *p*. But this kind of worry is hardly a decisive objection, especially since in a wide variety of cases we have no difficulty sorting properties into those that are dispositions and those that are not, despite the failure of consequentialism.¹⁹

5. Concepts and Apriority

What about apriorism? Some have argued that it helps with Mellor's Problem to insist that the mutual entailments are *a priori* only in the case of dispositions [Mumford 1998: 79, 183, 215]. But this is not obviously the case: some of the examples that caused trouble for consequentialism seem to involve entailments that are *a priori*, such as 'x is a spherical object just in case: if x were to remain intrinsically unchanged, x would exactly fill a spherical region'. Or consider our symmetrical case: if the relevant entailment for D is *a priori*, then a corresponding entailment for C will be *a priori* as well.

But perhaps there is an asymmetry here that can be exploited. Although both dispositions and categorical facts may entail counterfactual facts *a priori*, it might be argued that making the relevant inference (or at least, finding it compelling) is a *condition of concept mastery* only in the case of fragility. Compare the material conditionals: 'If x is a vixen, then x is a fox' and 'If x is a fox, then if x is female, x is a vixen'. Mastery of the concept of a vixen seems to require finding these claims *a priori* compelling. But mastery of the concept of a fox does not—indeed, one might have the latter concept without the former, and thus not find the relevant claims compelling.²⁰

Likewise, it could be argued, a child could master the concept of being spherical without having noticed that objects fill regions. But arguably things are different in the case of dispositions—mastery of the concept of fragility may require a connection to the concept of breaking. On this view, we could add to apriorism the condition that mastery of the concept associated with *p* requires knowing the relevant entailment—or at least, finding it *a priori* compelling.

If our goal were to distinguish between two kinds of *concepts*, an appeal to concept-mastery conditions might be more helpful than an appeal to the a

¹⁹How we do this is an interesting question that I will not take up here. And I do not mean to deny the existence of difficult cases, such as *having mass*.

²⁰This type of approach is suggested by the following passage from Mumford [1998: 183]: 'The conditionals for disposition ascriptions follow by analytic necessity because it is part of the meaning of a disposition term that it is a property which causes a particular manifestation if certain conditions are realized.' However, Mumford distinguishes dispositional properties by wrongly denying that the relevant counterfactuals are *a priori* entailed by categorical ascriptions [ibid.: 79], so he does not fully exploit this notion of 'part of the meaning of a term'.

priority of certain entailments. But since we are trying to save a distinction between two kinds of properties, even the concept-mastery approach will not, in the end, give us what we want.

First, there may be all sorts of dispositions for which we have no concept, such as dispositions only had by particles that existed in much earlier stages of the universe. Here one might try to modalize the requirement somehow: perhaps any concept of those properties would have to be a dispositional concept, with the relevant constraints on concept mastery. But arguably a layman could master a highly deferential concept of some dispositional property invoked in theoretical physics without being compelled by the relevant entailments. (For example, supposing that the colour charge of a quark is a dispositional property, those sympathetic to the Putnam/Burge-inspired idea of 'semantic division of labour' will grant that ordinary folk can think and talk about that very property without a very rich cognitive representation of it.)²¹

Second, if concept mastery requires knowing the relevant entailments, how is it that philosophers have had such a hard time stating exactly what those entailments are? Suppose the proposal requires only 'being such that one would be *a priori* compelled by the entailment if one considered it'. Still it seems that a staunch opponent of every conditional analysis might reject every alleged entailment involving fragility that she considered, and yet this would not rob her of the concept of fragility; cf. the related point on concept mastery in Williamson [2003].

Third, even if it were successful, it is worth noting that the project of distinguishing dispositions by way of dispositional concepts would be far from satisfying as an account of dispositionality. For granting that there is a special kind of concept at issue, we might well wonder what metaphysical division among properties answers to this division among concepts. In a similar fashion, we would not be very happy with the following account of dispositionality: dispositions are those properties that can be expressed by predicates of the following form 'x is disposed to ϕ in ψ '. Even supposing this were true (so that, for example, properties like fragility and irascibility could be expressed in that form), we would still be faced with the question whether there is any metaphysical distinction underlying the semantic one. Perhaps the properties answering to dispositional terms have nothing more in common than do the properties expressed by English predicates beginning with vowels. Or perhaps it is in virtue of a 'natural joint' among properties that some answer to dispositional concepts and predicates and others do not. Either way, apriorism does not shed much light on the metaphysical distinction we seek.

²¹Here is a different tack: all and only dispositional properties *could* be expressed by dispositional concepts. But is it the case that no categorical property could be expressed by a dispositional concept? Suppose the term 'flamity' is introduced by way of the following stipulation: 'Flamity expresses whatever categorical property one must have to be such that, if one were to become concentric with a spherical region without becoming deformed, one would exactly fill it.' It might be argued that to master the stipulative concept, one must find the relevant subjunctive conditional *a priori* compelling.

6. Functionalism vs Modalism

So far, the two most promising strategies for illuminating this distinction appear to be functionalism and modalism. But is there any reason to prefer one over the other? One difference between the two views is that only modalism allows for the possibility of dispositions that are categorically ungrounded. In many cases, such as that of fragility, dispositions clearly seem to have causal bases.²² The interesting case is that of fundamental properties. Let me begin by sketching a scenario that appears to involve *baseless* dispositions, which would provide a counterexample to functionalism if they were possible.

Consider a toy universe, consisting of some fundamental particles with categorical property C, and others without C. Among the non-C particles, some are such that if they were near a C-particle, they would attract the C particle. Call this counterfactual property 'F'. Now here is the crucial thing: beyond this counterfactual difference, there is no *other* difference between those non-C particles which are F and those which are not. In fact, there might have been a universe with the same distribution of first-order categorical properties, but a different distribution of F-ness. In short, F-ness is a *primitive* counterfactual property.²³

Many, especially those of a neo-Humean bent, will be inclined to deny that this scenario is possible. But assume for a moment that it is. The question is: are F particles disposed to attract C particles? If the counterfactual facts about F particles are sufficiently robust—that is, if F particles are such that, for a sufficiently high proportion of nearby situations, they would attract C-particles—the answer seems clearly to be 'Yes'. And here modalism agrees—having F is sufficient for having the disposition to attract C particles. But functionalism denies that having even the most robust primitive counterfactual property of this sort would amount to having a disposition. After all, the F-particles do not have any other property that is responsible for their being such that they would attract C-

²²As we have stated it, modalism is intended to apply even to non-basic dispositions like fragility. Suppose that the causal basis of the fragility of this glass is a kind of crystalline structure—surely the specification of this structure involves appealing to non-dispositional properties. For this reason—and also because, arguably, fragility can have different causal bases in different objects—neither modalism nor functionalism specifies fragility itself in terms of any particular causal basis. On both views, the crystalline structure of this glass may be causally responsible for its fragility—and in the case of functionalism it realizes the fragility of this glass—but what it is to be fragile is independent of any particular causal basis. (Thanks to an anonymous referee here.)

²³Primitive counterfactuals, when discussed, are often rejected. One exception is the view of Lange [2009], though it has been criticized precisely for its appeal to foundational subjunctive facts: see Woodward *et al.* [2011]. Another recent exception is Hawthorne [2005: 404], which recommends them to avoid problems arising from probabilistic laws for extant reductive treatments of counterfactuals facts. On Hawthorne's view, 'The closeness relation between worlds and the counterfactual operator on propositions form a family into which there is no entering reductive wedge.' Likewise, Michael McDermott appeals to primitive counterfactual facts in his treatment of the relationship between counterfactuals and indeterminism [McDermott 1999]; though others have criticized his account for precisely this feature: e.g. Hiddleston [2005: n. 2].

More commonly, primitive counterfactuals are taken to be problematic. For example, they are sometimes said to violate the intuitive idea that 'truth supervenes on being' [Lewis 2001: 614]. As a result, facts that rely on primitive counterfactuals are frequently felt to be somehow 'ungrounded'. Ted Sider [2004: 674] points out that a defender of primitive counterfactuals can accept a weaker thesis like 'Truths supervene on what categorical properties and relations are, or would have been, instantiated by objects had the distribution of categorical properties and relations been different.' This rules out other kinds of brute truths, but does not, in his estimation, capture the full intuitive force of the original idea behind the supervenience of truth on being.

particles. And according to functionalism, a disposition is a second-order property of the sort that must involve such an underlying causal base.

Of course, none of this is a refutation of functionalism if we have reason to reject the possibility of this scenario with its primitive counterfactual facts. And anyway, one might wonder, why would even a modalist accept the possibility of this scenario? After all, isn't modalism basically reductionist in spirit? Isn't the idea to reduce dispositions to counterfactuals, and in turn reduce those to something else—perhaps similarity relations that supervene on the categorical features of worlds? My answer to both of these questions is: it needn't be. Admittedly, a modalist identifies dispositions with a kind of counterfactual fact. And one benefit of this identification is parsimony—the modalist does not think that, aside from the categorical and modal properties a thing might have, there is a layer of *sui generis* dispositional properties as well. Instead, a thing's dispositional properties are simply *among* its purely modal properties. For this reason, modalism (like functionalism) explains—rather than simply posits—the necessary connection between dispositions and counterfactual facts. In this respect, modalism is reductive.

However, modalists need not go on to hold that counterfactual facts are themselves reducible, whether to neo-Humean similarity relations among worlds or even to the interaction of categorical properties with governing laws. A modalist can remain open to the possibility that—at least at the fundamental level—there are explanatorily basic counterfactual facts. And among these might be, say, the fact that a given object is disposed to attract C-particles. In fact, a modalist can go further and claim that *all* counterfactual facts hold in virtue of those special counterfactual properties of actual objects that we can identify with the fundamental dispositions.²⁴ (To put things in Lewisian lingo: the closeness facts among worlds are all explained by an elite group of counterfactual facts, namely the dispositional ones.)

Primitive counterfactuals, then, are compatible with modalism. But though they have occasionally been championed—for example, by Hawthorne [2005] and Lange [2009]—there are plenty of reasons one might want to reject them (see my n. 23). Some reasons are neo-Humean: one might hold that counterfactual differences between worlds are always grounded in the distribution of categorical properties. Other reasons for rejecting primitive counterfactuals are non-Humean: one might hold that

²⁴One might go even further and adopt the ancient thesis that *all modal facts* are grounded in the dispositions and powers of actual things. To sketch a view along the lines of those suggested by Martin and Heil [1999: 49–50], Pruss [2002], and Jacobs [2010], we might say that what makes a non-actual state of affairs possible is that, at one time, there were objects with the capacity to bring about that state of affairs. (There are problems, of course: for example, this kind of view cannot easily accommodate the intuition that everything might always have been different.) The *capacity to ϕ if ψ* can be understood as a kind of limiting disposition: it is the property of being such that, in at least one ψ -case, one would ϕ . So for the modalist, the project simply becomes that of showing how all of the world's modal properties hold in virtue of those modal facts that we can identify with dispositions.

The view that modality is grounded in the dispositions and powers of actual things has its source in Aristotle and Boethius. I cannot do much to establish that claim here, but this remark from Boethius's commentary on Aristotle's *De Interpretatione* is telling: 'That is contingent which chance brings, or which comes from anyone's free choice and his own will, or which in virtue of a readiness of nature it is possible to bring into both parts (of contradictory opposition)' [Boethius, tr. Kretzmann 1998: II.190.3–5].

whenever different counterfactuals hold at pairs of worlds with the same distribution of categorical properties, this is only because there are different *laws* at work in those two worlds (cf. the discussion in Maudlin [2007: Ch.1]). And assuming that laws don't mention objects by name, it can't be the laws that explain the actual distribution of F-ness in our toy scenario.

In short, many theorists will deny the possibility of the alleged counterexample to functionalism. For them, is there a principled way to choose between functionalism and modalism? Here are two considerations that may be helpful.

(i) First, depending on one's wider view of counterfactuals and causation, there may be other cases where functionalism and modalism disagree about whether an object has a disposition.²⁵ For instance, suppose that there are two fundamental first-order categorical properties D and E such that, in all nomologically possible worlds, D-particles and E-particles at a distance approach each other (*ceteris paribus*). Now suppose further that there are plenty of other kinds of particles, and across nomological space D-particles behave this way with every other particle, while E-particles display no similar behaviour with non-D-particles. On some views, it may be that the attraction between D-particles and E-particles is due only to a law saying that D-particles attract *everything*. And one might then hold that there is no reasonable sense in which E-particles have a first-order property that is partially responsible for being such that they would approach D-particles under the right conditions. (This may be especially compelling if one takes laws as primitive, understands causation in terms of laws, and reads 'responsible' as 'causally responsible'.) On such a picture, functionalism will deny, but modalism will affirm, that E-particles are disposed to approach D-particles when at a distance from them. I expect intuitions to vary, but my own inclination is to side with the modalist here too.²⁶

(ii) For other theorists, it may turn out that (at least at the fundamental level) the second-order property that functionalism identifies with a given disposition will always be co-intensional with the counterfactual property that modalism identifies with that disposition. If we then insist on collapsing co-intensional properties, functionalism and modalism will turn out to be a distinction without a difference.²⁷ But suppose we do not. In that case, it seems to me, there may still be a consideration in favour of modalism that can be derived from the example involving primitive counterfactuals. After all, those who distinguish co-intensional properties are sometimes motivated by considering *per impossibile* scenarios where the properties come apart. For example, considering scenarios where Socrates exists but sets do not may suggest that what it is to be Socrates is something quite different from what it is to be a member of singleton-Socrates. And considering an

²⁵Thanks to Gordon Belot for discussion here.

²⁶Some report intuitions in the other direction when the question explicitly reifies the disposition, as in 'Do E-particles have the disposition to approach D-particles'? It could be that this question is more easily interpreted as asking for *the cause*.

²⁷Of course, this will bring back Mellor's Problem, because being spherical will be identified with 'being such that one would exactly fill a spherical region if one were undeformed in C'.

impossible scenario where there is a buck-toothed necessary being might lead one to distinguish *being buck-toothed* from *being buck-toothed and contingent*. If this kind of test is of any use in distinguishing co-intensional properties, our thought experiment about F-ness and primitive counterfactuals should indicate that dispositions are not second-order properties of the sort supplied by the functionalist.

7. Conclusion

I have set aside the question of whether in fact there is a mutual entailment between dispositions and counterfactual facts of the sort discussed in §2, and asked whether such a connection would provide an adequate account of what it is to be a disposition. Mellor's Problem shows that specifying the connection would not suffice by itself: there would probably also be mutual entailment of the relevant sort holding between categorical properties and counterfactual facts. Better to claim that the nature of dispositions is *exhausted* by the relevant connection: to be disposed to ϕ in ψ just is to be such that the relevant counterfactual fact holds. This would distinguish dispositions from categorical properties without precluding the idea that some dispositions are metaphysically fundamental, or even the idea that all (the other) counterfactual facts hold in virtue of the dispositions of actual things.

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