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## *Dispositional essentialism and the necessity of laws*

ROBIN FINDLAY HENDRY AND DARRELL P. ROWBOTTOM

### *1. Dispositional essentialism vs. quidditism?*

It used to be assumed, by Humeans and non-Humeans alike, that laws of nature are contingent. Indeed allowing for contingency was widely taken to be a desideratum on the acceptability of any account of natural laws. However, nomic necessitarians argue that even if laws of nature are logically contingent (so that putative law statements cannot be analytic), they are metaphysically necessary. Their arguments are typically, though not always, founded on dispositional essentialism.<sup>1</sup> Dispositional essentialism about a property is the view that its essence is dispositional: the dispositions it confers are what make the property what it is (Bird 2007a: 44).

The argument for nomic necessitarianism is roughly as follows (see for instance Mumford 2004: 103–4). Suppose it is a law that all Fs are Gs (e.g. that all salt dissolves in water), but that the nomic status is contingent. On a non-Humean account of laws like Armstrong's, although *F*-ness necessitates *G*-ness, the relation of nomic necessitation between *F* and *G* does not hold with metaphysical necessity: there are possible worlds (governed by different laws) in which some Fs are not Gs, and others in which no Fs are Gs (see Armstrong 1983: Chapter 11).

But why should we think that what we have called Fs in these worlds are *genuinely* Fs? In order to be Fs they must be instances of the *very same* property that (nomically) necessitates *G*-ness under the laws of nature as

1 See Bird 2001, 2002 and 2007a: Chapter 8 for other arguments, which we will not address here. See also Shoemaker 1984.

they actually hold. But they cannot be, if part of what makes something an instance of *F*-ness (e.g. being salt) is its conferring *G*-ness (e.g. a disposition to dissolve in water). So Armstrong rejects the idea that the identity of a property is fixed by a dispositional essence. Instead he contends that it is fixed by a quiddity, which is something like a haecceity for a property.

However, the dispositional essentialists are suspicious of quiddities for the same kinds of reason that many philosophers hold haecceities suspect (Black 1999, Mumford 2004: 104, Bird 2007a: Chapter 5). Quidditism allows that the causal roles of two properties like charge and mass can be swapped, so that ‘mass’ in some other possible world behaves just like charge does in the actual world. But how can we make sense of the idea? Surely we should say instead that what has wrongly been called ‘mass’ in that world *is* just charge. Mumford, for instance, puts it as follows:

The telling question these cases [i.e. properties swapping their causal roles] produce is how, if the causal role of a property is altered, are we still talking of the same property? If something has the causal role of *F*, why are we not now talking of *F*? And if *F* now has the causal role that *G* had, why is *F* not *G*? The only available answer seems to be: if the property had a quiddity over and above its causal role. But this allows that *F* and *G* could swap their entire causal roles and yet still be the same properties they were. (2004: 104)

Mumford concludes that this ‘apparent absurdity’ is ‘highly damaging’ to positions, like Armstrong’s, that allow it. Leaving aside the details of these arguments, let us assume that quidditism is untenable, at least as an account of the identity conditions of properties that uncontroversially confer dispositions, because the identity of such properties cannot float free from their causal role. Does nomic necessitarianism follow? It does not, we argue: scepticism about the explanatory role allotted to quiddities, and the wholesale swapping of causal roles that they allow, is perfectly consistent with nomic contingency.

Previous discussions of these issues have acknowledged only two possible positions: quidditism and a dispositional essentialism that ties property identity so closely to causal or dispositional role as to imply nomic necessitarianism. This is why arguments against quidditism have been mistaken for arguments in favour of nomic necessitarianism. What are the alternatives? One is that some *categorical* property fixes the identity of a property, though pure qualities apart it’s not clear what the candidates would be. And in any case, unless *that* property’s identity is somehow unproblematic, either because it is a quiddity or a pure quality, vicious regress would seem to beckon. Our main concern is the dispositionalist side:<sup>2</sup> we think that the

2 Vicious regress also threatens dispositional monism, the view that *all* properties have dispositional essences. See Bird 2007b for an investigation and response.

inference from dispositional essentialism about a property (in the broadest sense) to the metaphysical necessity of laws involving it is invalid. Let *strict* dispositional essentialism be any view according to which a given property's dispositional character is precisely the same across all possible worlds. Clearly, any version of *strict* dispositional essentialism rules out worlds with different laws involving that property. *Permissive* dispositional essentialism is committed to a property's identity being tied to its dispositional profile or causal role, yet is compatible with moderate interworld variation in a property's dispositional profile.<sup>3</sup> Our exploration of these possibilities comes in §3, where we provide a model of dispositional essentialism about a property and the metaphysical contingency of the laws involving it. Before doing that, we will explain why we are sceptical about nomic necessitarianism.

## 2. *Counter-nomics*

Could water have had a different boiling point? Putnam's account of the reference of natural-kind terms, as it was first envisaged, was widely taken to allow that it could: being water can coherently be pulled apart, at least in thought, from having water's stereotypical properties, including its boiling point. In other possible worlds water's boiling might be governed by different laws. But pulling apart water's nature from its behaviour is not in fact coherent, if strict dispositional essentialism is the correct account of the properties that make something water. Here's why. Let's suppose, following Putnam, that what makes something water is its having a particular molecular structure, where a molecular structure is just atoms of given kinds (determined by their nuclear charges) being connected in a particular geometry by chemical bonds.<sup>4</sup> But if the properties that individuate this structure are essentially dispositional, and among the dispositions conferred by having water's particular structure is the disposition to boil at 100°C under normal conditions, it seems that water couldn't boil at anything other than 100°C (under normal conditions). Something that did would not be water, because it wouldn't have the properties that make something water. Strict dispositional essentialism about a property makes a nonsense of counter-nomic discourse involving suspension of laws involving that property.

But there are examples of counter-nomic discourse in science in which the identity of a substance is held fixed, while nomically determined behaviour is

3 Note that Mumford (2004) further argues that the thoroughgoing non-Humean ought to deny that laws exist, because they have no role to play in 'governing' events. Our disagreement with Mumford then concerns the possibility of (minor) variation in a property's causal role.

4 Or rather, connected in a geometry that is the centre of a vague-boundaried cluster of such geometries: see Hendry 2006 for details.

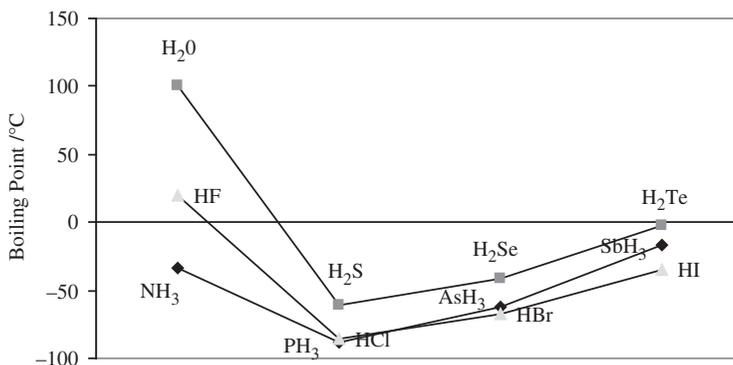


Figure 1. Boiling points of various hydrides.

allowed to vary. For example, chemistry textbooks describe the boiling points of ammonia, water and hydrogen fluoride (NH<sub>3</sub>, H<sub>2</sub>O and HF, respectively) as ‘abnormally high’ (Cotton and Wilkinson 1988: 91), ‘unexpectedly high’ (Gray 1994: 205) and ‘anomalously high’ (Greenwood and Earnshaw 1997: 53) in comparison to those of the hydrides of the other elements in their groups in the periodic table (see Figure 1).

Let us focus on water, which boils at a much higher temperature than the other hydrides in its group: hydrogen sulphide (H<sub>2</sub>S), hydrogen selenide (H<sub>2</sub>Se) and hydrogen telluride (H<sub>2</sub>Te). This is anomalous because the boiling points of H<sub>2</sub>S, H<sub>2</sub>Se and H<sub>2</sub>Te display a near linear relationship to their relative molecular mass. In short, water bucks a trend according to which it should be (or should be expected to be) a gas at room temperature. The anomalously high boiling point is explained in terms of hydrogen bonding: H<sub>2</sub>O molecules are polar, and interactions between them are stronger than those between less polar molecules (like H<sub>2</sub>S, H<sub>2</sub>Se and H<sub>2</sub>Te), which interact only via much weaker van der Waals forces. Hydrogen bonding has a marked effect on the properties of water, including its action as a solvent, its electrical properties like ionic mobility and conductance, its spectroscopic behaviour, and its structure in the solid and liquid phases (Greenwood and Earnshaw 1997: 53–61). The explanation of water’s anomalous behaviour, then, is that hydrogen bonding ‘modifies a great many physical and a few chemical properties’ (Pimentel and McClellan 1960: 6).

These admittedly brief comments suggest contrastive explanations in which we consider water’s behaviour were hydrogen bonding absent, compare the counternomic behaviour with the actual behaviour, and implicate hydrogen bonding as the difference maker. Moreover, they are typical of a kind of explanation that is common in sciences that address complex situations: by considering the difference its absence would make, we can identify one factor among many acting in concert as the cause of some part of an

overall effect (in this case, water's boiling point).<sup>5</sup> If that factor is present as a matter of law, then the explanatory realist will see the situation as invoking counternomic situations. Note, however, that these counternomic situations are reassuringly close to the actual: no swapping of the causal profiles of properties is required.

The nomic necessitarian might not be impressed by an example like this, and we envisage two likely responses. One is that the explanations do not invoke counternomic situations, but that demands an alternative construal of how they work. The other is that the chemical explanations fail to involve coherent possibilities: Bird (2007a: Chapter 8), for example, argues that we have no reason to think that modal intuitions are generally reliable, and explains how laws might appear to be contingent when they are not. There is something right about such explanations, but their dialectical role is troubling. If they are meant to undermine *completely* the epistemic worth of modal intuitions concerning properties and their causal profiles, it is difficult to see how they would not also undermine the argument against quiddities: they would be an acid bath for modal considerations of any sort. Any discussion of the connection between property identity and causal role would end in a stalemate born of modal scepticism. But if the modal intuitions concerning quiddities and counternomic situations have some pull, however weak, a position that honours them will have an advantage over both quidditism and strict dispositional essentialism. To that possibility we now turn.

### 3. *Our model: dispositional contextualism*

According to the strict dispositional essentialist view of properties, the dispositions associated with any given property are fixed. So if possessing some property *P* involves manifesting *M* in response to a stimulus *S*, any object that possesses *P* *always* manifests *M* in response to *S*.<sup>6</sup> It is easy to see how the necessity of laws of nature follows from such an account, if no categorical properties exist. This feature is almost 'built in' because the universal

5 As Eddington (1988: 101–2) put it:

[T]he chief aim of the physicist in discussing a theoretical problem is . . . to see which of the numerous factors are particularly concerned in any effect and how they work together to give it. For this purpose a legitimate approximation is not just an unavoidable evil; it is a discernment that certain factors – certain complications of the problem – do not contribute appreciably to the result . . . This discernment is only a continuation of a task begun by the physicist before the mathematical premisses of the problem could even be stated; for in any natural problem the actual conditions are of extreme complexity and the first step is to select those which have an essential influence on the result . . .

See Rowbottom, forthcoming, for further discussion.

6 In the interest of brevity, we do not consider situations in which dispositions are propensities.

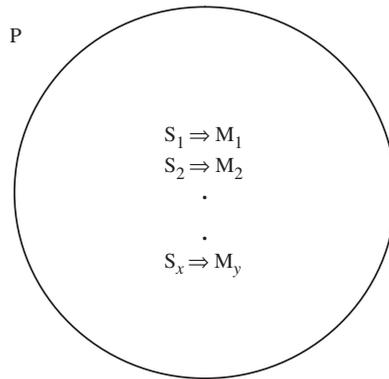


Figure 2. The standard dispositionalist view of a property.

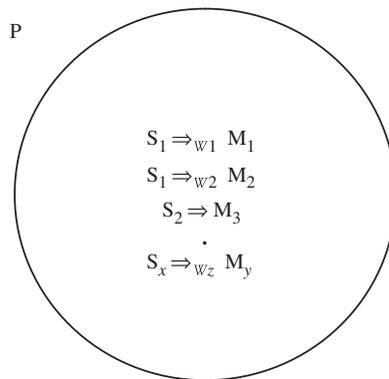


Figure 3. The dispositional contextualist view of a property.

quantification in ‘All entities possessing property  $P$  manifest  $M$  in response to  $S$ ’ has unrestricted scope.

However, we think that this standard view, as depicted in Figure 2, can be modified so that it allows for contingent laws of nature *without* positing any irreducible categorical properties (or *quiddities*). Our fundamental move is to suggest that having a property  $P$  may involve manifesting  $M$  in response to  $S$  in some contexts, but manifesting  $M_1$  in response to  $S$  in other contexts, where such contexts are possible worlds. Alternatively, we may explain the position by saying that to have a property is to have a single set of *actual and possible (but non-actual)* dispositions, rather than a set of actual dispositions only.<sup>7</sup> Figure 3 represents this view.

7 We say ‘possible (but non-actual)’ because actual implies possible in standard modal logics such as  $K$ .

In this figure, ‘ $\Rightarrow$ ’ denotes ‘causes’ (as in Figure 2) in an unrestricted sense, whereas ‘ $\Rightarrow_{w_i}$ ’ stands for ‘causes in world  $i$ ’. So any object possessing  $P$  manifests  $M_3$  in response to stimulus  $S_2$  (across all possible worlds), whereas objects possessing  $P$  manifest  $M_1$  in response to  $S_1$  in world one, but  $M_2$  in response to  $S_1$  in world two, and so forth. (In the remaining worlds, assuming that Figure 3 shows all the manifestations related to  $S_1$ , such a stimulus results in no manifestation.) So the *actual* dispositions associated with any given property may not be the only dispositions associated with that property.

The natural response of the advocate of strict dispositional essentialism would be to suggest that we are confusing different properties with one another. In order to illustrate this, let’s consider some (putative) property  $P^*$  with the following dispositional profile on our account: ( $S_1 \Rightarrow M_1$ ;  $S_2 \Rightarrow_{w_1} M_2$ ;  $S_2 \Rightarrow_{w_{2-\infty}} M_3$ ). (N.B. ‘ $\Rightarrow_{w_{2-\infty}}$ ’ is equivalent to ‘causes in every world except world 1’.) We may now depict the actual dispositions due to  $P^*$ , indexed by world, as follows.

Unlike the strict position, which requires that the dispositions be the same in the two worlds if the  $P^*$ s are to be transworld identical (or counterparts), permissive dispositionalism allows minor variations. What underwrites the transworld identity or counterparthood is similarity between the sets of dispositions.

Now the advocate of strict dispositional essentialism might insist that  $P^*_{w_1}$  should be understood as one property (e.g.  $P^*$ ) and that  $P^*_{w_{2-\infty}}$  should be understood as a distinct property (e.g.  $P^{**}$ ). However, the only way we can see to press this objection would be to show that all laws of nature are necessary. And that would beg the question if this claim were to be made on the basis of strict dispositional essentialism (as it is a result thereof provided that no categorical properties are invoked). As we have already explained, the virtue of our account is precisely that dispositional essentialism about  $P$  is shown to be compatible with contingent laws involving  $P$ . Nor have we implicitly understood (some) properties as quiddities, as might also be objected. We have not suggested that properties *take on* different dispositions in different worlds. Instead, we believe that properties *involve* possible (but non-actual) and actual dispositional profiles *which bear appropriate similarity relations to one another*. So according to our account, Figure 4 depicts the dispositional profiles of some property in different worlds if and only if ( $S_1 \Rightarrow M_1$ ;  $S_2 \Rightarrow M_2$ ) and ( $S_1 \Rightarrow M_1$ ;  $S_2 \Rightarrow M_3$ ) bear an appropriate similarity relation. For illustrative purposes, we therefore prefer to present  $P^*$ , depicting the similarity relation  $R$ , as shown in Figure 5.

We hold that such similarity relations are reflexive and symmetrical, but not transitive, because we take the complete dispositional profile of any given property to be vague. (As such, Figure 5 is an oversimplification which is useful for illustrative purposes only.) It is crucial that  $R$  be intransitive if the anti-quidditist considerations of § 1 are to be respected. Consider a string of small changes to some property  $F$ ’s dispositional profile whose

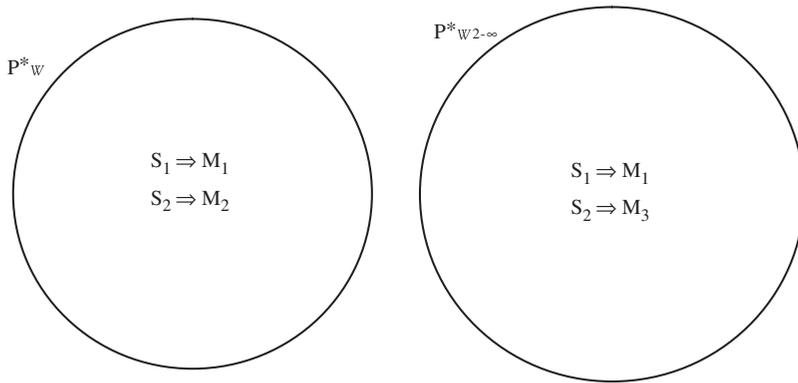


Figure 4. Property  $P^*$  in different worlds.

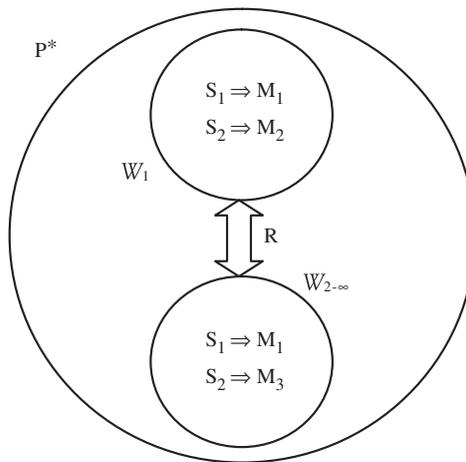


Figure 5.  $P^*$  depicted as similar possible dispositional profiles.

cumulative effect is to transform it into the dispositional profile actually exhibited by another property  $G$ . If each change is small enough for  $R$  to apply across it, then if  $R$  were transitive it would be possible for  $F$  to exhibit  $G$ 's dispositional profile. Causal-role swapping of two properties would be effected piecemeal, rather than wholesale as in §1.

It is easy to see how this position allows for moderate interworld variation in a property's dispositional profile. Starting from its actual dispositional profile, we delete or substitute a property's dispositions. In effect we consider, in each case, a different metaphysically possible world. We should add that we can agree with Bird (2007b: 533) that the 'identity of properties is dependent on...the pattern of manifestation relations', but we understand the dependence to include merely possible as well as actual patterns of

manifestation relations. More precisely, a property is dependent on a vague-boundaried cluster of such patterns, at the centre of which is the actual manifestation pattern. Moreover, we can readily adapt Bird's defence of strict dispositional essentialism against the regress problem (where properties are identified with whole structures) in defence of our laxer alternative. (See Bird 2007b.) Even if Bird's strategy for addressing the regress problem fails, our account is still no worse off than strict dispositional essentialism. In fact it remains preferable, we contend, owing to the possibility of admitting that some laws of nature are contingent.

This has been the briefest sketch of a position which, we think, offers the advantages of its rivals but without their chief defects, admittedly at the price of increased complexity.<sup>8</sup>

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## *The non-identity of the categorical and the dispositional*

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1. Consider a circle. It has both a radius and a circumference. There is obviously a real distinction between the properties *having a radius* and *having a circumference*. This is not because, when confining ourselves to circles,<sup>1</sup> *having a radius* can ever exist apart from *having a circumference*. A real distinction does not depend on that. Descartes thought that a real distinction between  $x$  and  $y$  meant that  $x$  could exist without  $y$  or vice versa, if only by the power of God. But Descartes was wrong. Separable existence is a sufficient but not necessary condition of there being a real distinction. The difference between a real and a conceptual distinction derives from medieval philosophy. Aquinas, for one, held that things can be really distinct even though not separable (the form and matter of a material substance or its essence and existence, for example).<sup>2</sup>

For a merely conceptual distinction between  $x$  and  $y$  to exist, it is necessary for the distinction to exist in thought only. There is only a conceptual distinction between an upward slope and a downward slope, or between a glass's being half empty and half full. Not only are the members of such pairs inseparable (whether by God or in any other way), but there is no real distinction between them. There is no numerical distinctness between the entities or qualities between which there is only a conceptual distinction. To this extent alone is Galen Strawson (2008) correct.<sup>3</sup> But when it comes to

1 We also speak of the radius of a polygon, but this is not the reason for speaking of a real distinction. I am speaking only of the radius of a circle and of the corresponding property *having a radius* as possessed only by circles.

2 For a useful brief discussion see Edwards 2002: 106.

3 All page numbers in parentheses, minus the year, refer to Strawson's original paper.