

# Armstrong and the Modal Inversion of Dispositions

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## Abstract

D. M. Armstrong has objected that the Dispositionalist theory of laws and properties is modally inverted, for it entails that properties are constituted by relations to non-actual possibilia. I contend that, if this objection succeeds against Dispositionalism, then Armstrong's nomic necessitation relation is *also* modally inverted. This shows that at least one of Armstrong's reasons for preferring a nomic necessitation theory is specious.

Among anti-Humean accounts of natural laws, properties, and causal powers, there are two particularly prominent schools of thought. The Dretske–Tooley–Armstrong school argues that laws are contingent relations between universals.<sup>1</sup> The Dispositionalist (or Dispositional Essentialist) school holds that properties have natures which necessitate their particular causal powers and dispositional features.<sup>2</sup> As such, the laws of nature are necessary – at least

A previous, unpublished version of this paper has been cited under the title, “Armstrong, Meinong, and Dispositionalism”.

1. D. M. Armstrong, *What is a Law of Nature?* (Cambridge UP, 1983), and *A World of States of Affairs* (Cambridge UP, 1997); F. I. Dretske, “Laws of Nature”, *Philosophy of Science*, 44 (1977), pp. 248–68; M. Tooley, “The Nature of Laws”, *Canadian Journal of Philosophy*, 7 (1977), pp. 667–98, and *Causation: A Realist Approach* (Oxford: Clarendon, 1987).
2. See, for example, B. Ellis, *Scientific Essentialism* (Cambridge UP, 2001); G. Molnar, *Powers* (Oxford UP, 2003); S. Shoemaker, “Causality and Properties” repr. in his *Identity, Cause, and Mind* (Cambridge UP, 1984), pp. 206–33.

in the sense that if a property exists, the laws regarding that property must obtain.

The principal contention of this paper is that an argument which has been proposed by D. M. Armstrong as a crucial objection to Dispositionalism – the so-called “Meinong objection” – cuts just as deeply against Armstrong’s own theory. As such, both nomic necessitation theorists and Disposalists must answer the charge raised by this objection.

## I The “Meinong” Objection to Dispositionalism

The Meinong objection pertains to the possibility of dispositions which go unmanifested.

Consider, then, the critical case where the disposition is not manifested. *The object still has within itself, essentially, a reference to the manifestation that did not occur.* It points to a thing that does not exist. . .

[H]ow can a state of affairs of a particular’s having a property enfold within itself a relation (of any sort) to a further first-order state of affairs, the manifestation, which very often does not exist? We have here a Meinongian metaphysics, in which actual things are in some way related to non-existent things.<sup>3</sup>

The Meinong objection, then, is more serious than the charge that one’s ontology includes non-actual possibilities. It is, rather, the objection that *actual* properties are constituted – at least in part – by relations to non-actual possibilities. How the world *actually is* is constituted by how the world might have been. Whether or not one thinks that non-actual things exist, this appears to employ the wrong order of explanation. So the objection is not really about Meinongianism, it is about the manner in which modal facts are explained. Henceforth I shall call a property “modally inverted” if it is partly constituted by relations to non-actual things – thus bypassing the issue of Meinongianism.

Neither Armstrong nor myself are certain that a modally inverted ontology is incoherent or otherwise untenable.<sup>4</sup> *Prima facie*, however, such theories are

3. Armstrong, *A World of States of Affairs*. Hereafter, all references to this work will be made in-text, and abbreviated to *World*.
4. Richard Holton, “Dispositions All The Way Round”, *Analysis*, 59 (1999), pp. 9–14, has recently defended the coherence of this variety of modal inversion.

relatively implausible, and Armstrong thinks that modal inversion is a powerful reason to reject Dispositionalism in favour of his own theory.

I take it that the argument for the conclusion that Dispositionalists are committed to modally inverted properties can be reconstructed as follows:

- (1) Necessarily, for all  $x$ , if  $x$  has a dispositional property  $P$ , then if  $x$  were exposed to stimulus  $S$  then it would manifest response  $R$ .

Therefore,

- (2) A dispositional property is (at least partly) constituted by a relation to a possible stimulus condition and a consequent response.
- (3) The possible stimulus condition and consequent response may not be actual.

Therefore,

- (4) A dispositional property may be constituted by a relation to non-actual possibilities.

Thus stated, this argument is open to a number of objections. In particular, the first premiss is clearly false, given the failure of the simple conditional analysis of dispositions.<sup>5</sup> A dry piece of paper may be flammable, so it has the particular disposition to burn if lit with a match. I am standing nearby with a bucket of water, however. If the paper is lit with a match, I shall (very quickly) wet the paper, removing the disposition. Thus the conditional: 'If it were lit with a match, it would burn' is false. Nonetheless it still has the dispositional property.<sup>6</sup>

Perhaps that defect can be repaired, however. Suppose that an analysis like David Lewis's can succeed for dispositional properties.<sup>7</sup> Lewis's analysis is still in terms of counterfactuals, but has a great deal more sophistication than the simple analysis given in (1). For our purposes, we need not note the details of Lewis's treatment, but may proceed with the following:

5. C. B. Martin, "Dispositions and Conditionals", *The Philosophical Quarterly*, 44 (1994), pp. 1–8.
6. Depending upon how quickly I spring into action, my bucket-activities may constitute either a 'fink', a process that makes the object lose the causal base of the disposition before it can manifest; or an 'antidote', a process which does not remove the basis of the disposition, but which interferes with the causal process between stimulus and manifestation. See A. Bird, "Dispositions and Antidotes", *The Philosophical Quarterly*, 48 (1998), pp. 227–34.
7. D. Lewis, "Finkish Dispositions", *The Philosophical Quarterly*, 47 (1997), pp. 143–58.

- (1') For all  $x$ , necessarily, if  $x$  has a dispositional property  $P$ , then the counterfactual sentence, 'If it were that  $A$  then it would be that  $C$ ' would be true of  $x$ .

Where 'A' and 'C' make some reference to the stimulus and response conditions,  $S$  and  $R$ , but with further qualification. A simplified example of a Lewis-style conditional might be: "If the paper were lit at  $t$  and retained the intrinsic base of its flammability until  $t'$ , its being lit and its having the intrinsic base property would jointly cause it to burn".

Suppose that (1') is true. Then why should we think that this warrants an inference to (2)? One could reason as follows:

If (2) is not true, then why does "If it were that  $A$ , then it would be that  $C$ " hold necessarily of  $P$ -things? Suppose  $P$  is not a relation to a possible stimulus and consequent response: now it seems entirely opaque why the counterfactual is necessarily true. The necessity is 'brute' or *in re*. That should be avoided.

This reasoning is not entirely implausible. For the sake of the argument, I shall proceed as though it is sound, and invoke a further premiss to make the argument fully explicit. Call a property or relation  $P$  *counterfactual-entailing* if and only if:

If  $P$  exists then, necessarily, if it were that  $A$  then it would (non-vacuously) be that  $C$ ; where  $A$  and  $C$  denote distinct states of affairs, and  $A$  involves instantiation of  $P$ .

Given (1'), dispositional properties are clearly counterfactual-entailing. The required premiss is then:

- (M) If a property  $P$  is counterfactual-entailing, then it is (at least partly) constituted by a relation to states of affairs which may not exist.

With this further assumption, the argument proceeds happily to (2), and the modal inversion objection as a whole succeeds.

A word on what Armstrong means by speaking of properties as having constituents (*World*, §§3.7, 8.2): A structural property, such as *being a methane molecule* is said to have constituent properties (*is hydrogen* and *is carbon*) and a constituent relation (*are bonded*). The mode of composition is non-mereological, much like the composition of states of affairs. (For instance, *is methane* and *is butane* have identical constituents, but are nonetheless distinct. This could not happen with mereological fusions.) What is especially important about the constitution of properties is the following modal connection:

*Necessarily, if the constituted property is instantiated, so too are its constituents.* This last feature of property constitution makes it apt to *explain* various modal features of the world. And presumably this is what underlies the appeal of a principle like (M); it explains the a modal connection in terms of constitution.

Below I give an example, employing possible-worlds semantics and derived from an argument by Michael Smith and Daniel Stoljar, intended to show the appeal of (M).<sup>8</sup> For those unconvinced about the merits of the above account of property-constitution, however, they can expect little comfort from the example. They can take it as merely illustrative of the sort of considerations which motivate Armstrong and others who might endorse the Meinong objection.

Consider a very simple world,  $W_1$ , where one object,  $a$ , possesses a pure dispositional property,  $P$ . If objects which are  $P$  instantiate stimulus property  $S$ , then they instantiate response property  $R$ . In this world, the one object which is  $P$  is neither  $S$  nor  $R$ .

$W_1$ :  $a$  is  $P$ ,  
 $a$  is not exposed to stimulus  $S$ , and  
 $a$  does not manifest response  $R$ .

Two similar worlds are as follows:

$W_2$ :  $a$  is  $P$ ,  
 $a$  is exposed to  $S$ , and  
 $a$  does not manifest  $R$ .

$W_3$ :  $a$  is  $P$ ,  
 $a$  is exposed to  $S$ , and  
 $a$  manifests  $R$ .

Given the dispositional nature of  $P$ , it is true of  $W_1$  that:

If  $a$  were  $S$ , it would also be  $R$ .

On possible-worlds semantics, this counterfactual is true iff  $W_3$  is more similar to  $W_1$  than  $W_2$  is similar to  $W_1$ . But why should we think this is so? There are two respects in which  $W_3$  differs from  $W_1$ , while there is only one respect in which  $W_2$  and  $W_1$  differ.

Since  $P$  is essentially dispositional, this pattern of transworld similarity will always be instantiated when  $P$  is instantiated.  $P$  necessitates the existence of

8. M. Smith and D. Stoljar, "Global Response-Dependence and Noumenal Realism", *The Monist*, 81 (1998), pp. 85–111, at §3.

an external similarity relation to worlds of the  $W_3$  type. Rather than leaving that necessitation entirely mysterious, Armstrong presumably infers that it obtains in virtue of the structure of the properties:  $P$  is partly constituted by the similarity relation.

If that inference is correct then  $P$  is modally inverted, because it is partly constituted by relations to non-actual states of affairs. And it appears the same will hold of any other counterfactual-entailing property. It is for this sort of reason that (M) appears true.

There is an objection to the above example worth noting. It misconstrues the Dispositionalist position somewhat to say that  $W_3$  is closer than  $W_2$  to  $W_1$ . The Dispositionalist denies that  $W_2$  exists at all. It is a *necessary* truth, thinks the Dispositionalist, that  $P$ -things  $R$  when  $S$ , so there are no worlds where  $a$  is  $P$  yet fails to  $R$  when  $S$ . So of course  $W_3$  is the closest world to  $W_1$ . The alternative is not a world at all.

This may show that the objection is poorly expressed when it is made in terms of similarity relations, but it hardly does anything to relieve the charge of modal inversion. It merely shows that, whatever a dispositional property is, it has direct and non-trivial consequences for the contents of *other worlds*. Having a disposition, then, is not just a matter of how this world is, it is a matter of how other possible worlds are.

The reader may remain unconvinced of the success of the argument. Armstrong, however, clearly does endorse it – or something very much like it. The question, then, is whether his own account is immune to the charge.

## 2 Tu quoque, Armstrong

Armstrong's preference is for an account of dispositions in terms of laws of nature, which he proposes are relations of nomic necessitation between universals (*World*, §5.6). The universals themselves are *categorical*, because they are not essentially such as to confer the causal powers they do in fact confer. While mass is *actually* nomically related to acceleration, for instance, this need not have been the case. So inertial mass need not have conferred the power to resist acceleration.

What does the Armstrongian account say, then, about cases of unmanifested dispositions? A grain of salt has the disposition to dissolve if it possesses a property  $F$ , where that property is nomically related to being wet ( $G$ ), and dissolving ( $H$ ) in such a way that wet  $F$ -things dissolve. The relation in which these properties stand is the nomic necessitation relation,  $N$ . The sim-

plest Armstrongian hypothesis, then, is that  $N$  is a two-place relation, and the salt is soluble because the salt is  $F$ , and:

$$N((F \ \& \ G), H)$$

(Henceforth I will ignore the complications that the relata may be conjunctive, and that  $N$  may be of higher adicity than two.)

It is of the nature of  $N$  that for any two universals,  $\phi$  and  $\chi$ , ' $N(\phi, \chi)$ ' entails 'All  $\phi$ s are  $\chi$ s'. The entailment does not go the other way, however.<sup>9</sup> That is, if all the  $\phi$ s are  $\chi$ s, that does not entail that it is a *law* that all  $\phi$ s are  $\chi$ s. It could be a mere coincidence.

Armstrong has attempted further to elucidate the nature of  $N$  (see *World*, §15.2), but those details are irrelevant to the *tu quoque*. The argument requires only one assumption:  $N$  is *essentially* such that, if it relates two universals, a regularity of coinstantiation will obtain with respect to those universals. This entails:

$$(5) \quad \Box \forall \phi \forall \chi (N(\phi, \chi) \rightarrow \forall x (\phi x \rightarrow \chi x)).$$

This is, I believe, a natural assumption to make about  $N$ , given much of what Armstrong has said about it. (I consider the consequences of denying the assumption in §3.3.)

Consider a world where there are a number of universals, including  $F$ ,  $G$ , and  $N$ . It is neither the case that  $N(F, G)$ , nor that all  $F$ s are  $G$ s. Given (5), it is a necessary truth that:

$$\text{Had it been that } N(F, G), \text{ it would have been that } \forall x (Fx \rightarrow Gx).$$

Therefore  $N$  is counterfactual-entailing. By (M), therefore,  $N$  is constituted by a relation to states of affairs which may or may not exist. In other words,  $N$  is *modally inverted*.

There is another way of arguing for the same conclusion, analogous to the Smith–Stoljar argument above. Consider three worlds:

$$W_4: N(F, G), a \text{ is not } F, a \text{ is not } G.$$

$$W_5: N(F, G), a \text{ is } F, a \text{ is not } G.$$

$$W_6: N(F, G), a \text{ is } F, a \text{ is } G.$$

9. Armstrong, *What is a Law of Nature?*, p. 85. All subsequent references to this work will be abbreviated to *Law*, and made in-text.

Here, Armstrong must be committed to the impossibility of  $W_5$ . But if we suspend judgment on that matter for a moment, and ask which world is closer to  $W_4$ , then it looks like  $W_5$  ought to be the closer of the two. If  $N(F, G)$  is not the relation of universal coinstantiation, then the impossibility of  $W_5$  remains unexplained, and the claim that  $W_6$  is closer to  $W_4$  than  $W_5$  looks every bit as suspect as the analogous claim made by Dispositionalists.

In fact, it is no longer clear that Armstrong has the same right as other Categoricalists to the title.<sup>10</sup> While many of the universals he posits are categorical, he arguably employs one *über*-disposition, the  $N$ -relation, to do the very same metaphysical work as the Dispositionalists' more numerous modally inverted properties. And given the  $N$ -relation is supposed to ground the very same observed powers as Dispositionalists aim to account for, it must make just as many modal references as they do. The site of the wound may be more compact, but the degree of injury is the same.

Admittedly, it is only in a very extended sense that we can apply our natural language terms 'dispositional' and 'categorical' to a second-order relation such as  $N$ . However, the instantiation of  $N$  by a pair of universals does *bring about* a distinct state of affairs: a regularity. And it is the essential nature of  $N$  to bring about such regularities. The  $N$  relation is akin to a disposition to make first-order properties dispositional. If this does not suffice to convince you that the apparent category mistake of calling  $N$  a dispositional universal is warranted, then my weaker conclusion will suffice:  $N$  may not be a power or disposition, but it is essentially such as to bring about non-actual states of affairs under non-actual but possible conditions. As such, it is just as modally inverted as a first-order disposition or power.

One may wonder if the above argument would also establish that  $F$  and  $G$  are modally inverted. If ' $F$  exists' strictly entails 'Had it been that  $N(F, G)$  then it would have been that all  $F$ s are  $G$ s' then is  $F$  not counterfactual-entailing, and by (M), modally inverted? I think this may be so, but it could be resisted, on at least two grounds. First, given that  $N$  is a contingent existent, then  $F$  could exist in a world where  $N$  does not exist, and the counterfactual would then (on Armstrong's theory of modality) be vacuous.  $F$  will only be counterfactual entailing, then, if  $N$  exists. ( $N$  is not similarly hostage to contingency because, in order for  $N$  to exist, it must be instantiated. There must therefore be at

10. Alexander Bird has independently put forward a similar argument. See "The Ultimate Argument Against Armstrong's Contingent Necessitation View of Laws", *Analysis* (forthcoming). See also "Potency and Modality", *Synthese*, (forthcoming).

least two first-order universals to instantiate it, and thereby give rise to a non-vacuous counterfactual.)

Secondly, one might question whether the state of affairs of  $F$  being related by  $N$  to  $G$  is in fact a state of affairs ‘involving’ the instantiation of  $F$  in the relevant sense.

The success or otherwise of these moves to block the allegation that first-order universals are modally inverted is irrelevant to the main argument of this paper. It is no obstacle to the success of my objection if it turns out that modal inversion is a form of contagion which, having affected  $N$ , thereby spreads to affect all other properties. One instance of modal inversion is more than enough.

### 3 Possible Replies

#### 3.1 Another necessitation relation

To explicate how the  $N$  relation has a power to bring about non-existent states of affairs, could one posit a yet higher-order relation of necessitation ( $N^2$ ?) instantiated by the state of affairs types  $N(\phi, \chi)$  and  $\forall x(\phi x \rightarrow \chi x)$ ?

Armstrong uses precisely this sort of technique to account for functional laws with uninstantiated values (*Law*, ch. 7). Suppose – as is very likely – no object ever instantiates the property of being  $10^{100}$  grams in rest mass. Nonetheless, we believe that the law  $F = ma$  applies to this very large mass just as much as it does to objects of only ten grams. Given Armstrong’s rejection of uninstantiated universals, he cannot claim that there is a law relating the large mass-property to properties of force or acceleration. For Armstrong, there is no such large mass-property to be involved in such a law. Instead, he relies upon a further property which all mass-properties share: *being a mass-property*. Armstrong claims that a law governing this higher-order property necessitates that if there were a mass-property of such magnitude, the appropriate lower-level law would be instantiated. In effect, the higher-order law says: ‘All mass-properties obey laws of type . . .’

This technique appears to succeed with respect to uninstantiated values of functional laws. But does it circumvent the objection? Certainly not. Any such attempt to use the same technique as was employed for first-order universals will immediately invite the same objection.  $N^2$  looks no less modally inverted than  $N$ .

### 3.2 Uninstantiated Laws

It has been suggested to me<sup>11</sup> that this problem could be addressed in a similar fashion to the so-called ‘problem of uninstantiated laws’ (*Law*, ch. 8; *World*, pp. 252–3). In certain cases we may have very good reason to believe that there is some law or other – currently unknown to us – governing ( $F \& G$ )-things, yet nothing ever instantiates both  $F$  and  $G$ .<sup>12</sup> Given Armstrong’s commitment to the non-existence of uninstantiated universals, he is forced to deny the existence of putative uninstantiated laws. He claims, however, that while he cannot affirm the truth of any counterfactual of the form:

(6) If anything were both  $F$  and  $G$ , then it would be that  $N((F \& G), H)$ ;

he *can* affirm the truth of:

(7) If anything were both  $F$  and  $G$ , then it would be the case that  $\exists \phi N((F \& G), \phi)$ .

And the truthmaker for (7) would be the pattern of laws which are in fact instantiated (*World*, p. 245).

The first thing to note about this problem is that it is not directly analogous to the problem raised in §2 because, although that problem can be expressed as that of providing a truthmaker for the counterfactual:

(8) If it were that  $N(F, G)$  then it would be the case that  $\forall x(Fx \rightarrow Gx)$ ;<sup>13</sup>

it could just as well be expressed as the problem of providing a truthmaker for (5). In other words, (8) is a necessary truth. The counterfactuals which arise in the problem of uninstantiated laws are not necessary.

Moreover, any solution to the uninstantiated laws problem will presuppose that  $N$  relations have the power to bring about non-existent states of affairs under non-existent conditions. If we denied  $N$  this power then despite the truth of (7), it might *not* be the case that if it were that  $N((F \& G), \phi)$  that all ( $F$

11. The suggestion was made by Armstrong, in correspondence. I do not know if Armstrong has ever given the strategy his full endorsement.

12. The cases that give rise to these concerns are in large part due to Tooley, *Causation*, pp. 47–8.

13. Actually, the counterfactual may have to be more complicated to allow for the possibility of nomic interference in the necessitation. But if the antecedent is amended to read ‘If it were that  $N(F, G)$  and there were no other laws’, then the counterfactual should be straightforwardly true.

& G)-things would be  $\phi$ . The law would hold, but no regularity would ensue. That would be an utterly toothless law. The uninstantiated laws problem, then, is one to be solved *after* dealing with the current objection.

### 3.3 ‘The Third Way’: Deny the assumption

Thus far, I have attempted to show that Armstrong’s relation  $N$  must be a truthmaker for (5). There are two obvious ways in which this could be the case.  $N$  could be the relation of universal coinstantiation, but that would make Armstrong’s theory a variety of regularity theory, and that is an option he explicitly rejects (*Law*, p. 85). (Note that neither could it be the *conjunction* of coinstantiation and some other condition, as that would render it a ‘sophisticated’ regularity theory, which Armstrong also rejects.<sup>14</sup>)

The second option is my suggestion that  $N$  is a *power* to bring about regularities. But in other contexts, Armstrong has implicitly rejected that option too. He has insisted that there is a third way; that  $N$  is *categorical*, yet not a coinstantiation relation (*World*, p. 245).

Categorical universals, says Armstrong, have “a nature that is self-contained, distinct from the powers they bestow” (*World*, p. 69). In most contexts, it is clear that by this, Armstrong means that categorical properties only *contingently* bestow the powers they do.

In that case, if  $N$  is categorical, then it only contingently has the power to bring about (All  $F$ s are  $G$ s), under conditions  $N(F, G)$ . If this is the consequence of denying that  $N$  is a power, then (5) is *false*, and necessitation is not necessarily the relation of necessitation! (In other words, the assumption made in §2 is being denied.)

We may then ask, what is the truthmaker for (what is now) a contingent counterfactual like (8)? Trouble follows. It would be natural to suppose it is simply the fusion:  $(N + F + G)$ ; but if it is not necessarily the case that  $N$  has the power to bring about regularities, then (8) will not be entailed by a sentence asserting the existence of  $N$ ,  $F$ , and  $G$ . There must be something else *added* to the fusion of  $N$ ,  $F$ , and  $G$  in order to get a truthmaker for (8). But it is very hard to see what Armstrong could offer as a truthmaker. He cannot have the state of affairs  $N(F, G)$ , for (8) may be false even when that state of affairs exists. Nor can he have a higher-order law such as  $N^2$  for reasons already discussed.

14. *Law*, p. 86. See also Lewis, “New Work for a Theory of Universals”, *Australasian Journal of Philosophy*, 61 (1983), pp. 343–77, at 366.

Far preferable, then, to insist that  $(N + F + G)$  is the truthmaker for (8). If Armstrong continues to reject regularity accounts of  $N$ , then the *tu quoque* argument still applies. At least one of the three universals must be *essentially* such as to bring about non-existent states of affairs under non-existent conditions. And in that case, at least one of his universals must be modally inverted.

## 4 Conclusion

How should the news that the relation of necessitation is modally inverted be received? I take it that, for Humeans, this conclusion is just further grist to their mill. For those who reject Humean accounts of law, however, the proper moral is unclear. One response would be to grimly accept that modal inversion is a feature of the world. A second response would be to attack the argument given for the objection, and in particular, the premiss (M). A third, and more ambitious response, would be to grant that existing anti-Humean accounts fail, but to insist that some other anti-Humean account will escape the objection.

Whichever of these courses is pursued, however, it is ironic that Armstrong's objection, originally conceived to show the superiority of necessitation theories over Dispositionalism, has in fact united the opposing factions of anti-Humeanism under a common plight.<sup>15</sup>

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