

Critical Notice of Stephen Mumford's *Dispositions*

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Stephen Mumford's *Dispositions*¹ is an interesting and thought-provoking addition to a recent surge of publications on the topic.² Dispositions have not been such a hot topic since the heyday of behaviourism. But as Mumford argues in his first chapter, the importance of dispositions to contemporary philosophy can hardly be underestimated. Dispositions are fundamental to causal role functionalism in the philosophy of mind, response-dependent truth conditional accounts of moral and other concepts,³ capacity accounts of concepts more generally,⁴ theories of belief, the compatibilist conception of free will, the philosophy of matter, probability (propensities) and more. So it is natural that conceptual and ontological issues about dispositions have come again to the fore. The only surprise is that it's taken so long.

Mumford discusses both the concept of the dispositional, and the ontology of dispositions. He advocates a functionalist construal of dispositional concepts, which are to be contrasted with categorical concepts. Much of his discussion of conceptual issues is devoted to making sense of the dispositional/categorical distinction. Satisfied that it has been adequately drawn, Mumford goes on to argue that although the contrast is conceptually real, it gets no purchase ontologically. He says (p. vi): "The dispositional and the categorical do not ascribe two different types of property that objects or kinds

¹ Oxford UP, 1998.

² Important recent works include a substantial portion of D. M. Armstrong, *A World of States of Affairs* (Cambridge UP, 1997); D. M. Armstrong, C. B. Martin, and U. T. Place, *Dispositions: A Debate* (London: Routledge, 1996); Alexander Bird, 'Dispositions and Antidotes', *Philosophical Quarterly*, 48 (1998), pp. 227-234; Nancy Cartwright, 'Where Do Laws of Nature Come From?', *Dialectica*, 51 (1997), pp. 65-78; B. Ellis and C. Lierse, 'Dispositional Essentialism', *Australasian Journal of Philosophy*, 72 (1994), pp. 27-45; Rom Harré, 'Is There a Basic Ontology for the Physical Sciences?', *Dialectica*, 51 (1997), pp. 17-34; David Lewis, 'Finkish Dispositions', *Philosophical Quarterly*, 47 (1997), pp. 143-58; C. B. Martin, 'Dispositions and Conditionals', *Philosophical Quarterly*, 44 (1994), pp. 1-8; also his 'On the Need for Properties: The Road to Pythagoreanism and Back', *Synthese*, 112 (1997), pp. 193-231; George Molnar, 'Are Dispositions Reducible?', *Philosophical Quarterly*, 49 (1999), pp. 1-17.

³ See e.g. Mark Johnston, 'Dispositional Theories of Value', *Proceedings of the Aristotelian Society*, Supplementary volume 63 (1989), pp. 139-74; Philip Pettit, 'Realism and Response-Dependence', *Mind*, 100 (1990), pp. 1-21.

⁴ See e.g. Christopher Peacocke, *A Study of Concepts*, (Cambridge, Mass.: MIT Press, 1992).

possess; rather, they are two different modes of denoting the very same properties of these things." Though Mumford assimilates the dispositional and the categorical in ontology, he denies that the assimilation is a matter of reduction. Neither the dispositional nor the categorical has ontological priority; the basic ontological element is (in C. B. Martin's words,⁵ whose view Mumford's most resembles) the unitary intrinsic property itself. The book is best understood as a defence of this variety of property monism.

I think there are some problems with Mumford's functionalist account of dispositional concepts. In particular, his conditional entailment criterion of the dispositional/categorical distinction is marred by a highly questionable appeal to "ideal conditions" for a disposition's manifestation. Also, the causal element of the account (which makes it functionalist) is not well motivated. In the end, though, the essence of Mumford's account of dispositional concepts is promising.

On the ontological side, I am in sympathy with the property monist view, but I think there are some serious questions to be raised about Mumford's version of it. Mumford propounds a bizarre view of universals, whereby two distinct universals may share instances. He is forced into this bizarre view because of a number of antecedent commitments, including the causal criterion of propertyhood and the construal of dispositions as real properties. The puzzling view of universals results from an unstable mixing of functional specification and functional state identity theory, two varieties of functionalism in the philosophy of mind. Also, Mumford's conception of the categorical forces him to accept an ontology of purely dispositional properties possessed by spatially located particulars. This metaphysical picture fails to dispel the mystery accompanying the pure-dispositionalist world view, and, I contend, is scarcely distinguishable from it. On the positive side, I recommend that Mumford modify his view so it closely resembles that of C. B. Martin. This would enable him to espouse a more comprehensible view of universals and a standard functionalism, and to reject pure dispositionalism.

I - Dispositions as properties - against Hume

⁵ 'On the Need for Properties', p. 216.

Dispositions are ascribed to (at least) objects, kinds, and persons.⁶ What is it that is being ascribed? *Prima facie*, it is a property that is ascribed: the replicas of the Crown Jewels are fragile, copper is malleable, Bob is funny. The Humean tradition, however, challenges this first appearance. Before he defends his views on dispositional properties, Mumford counters the Humean position that dispositions aren't properties at all. Much of the first three chapters is devoted to this preliminary goal. Mumford does not pretend to introduce much in the way of original argument here, but he does an admirable job of outlining the main points of contention.

Dispositions are causal dispositions: fragility, flammability, charge, and, if causal role functionalism is right, even having a dispositional belief. Hume, at least on one popular reading of him, thought that our notion of causation involves, in part, the expression of a habit that arises from our observation of the constant conjunction of events. (Exactly how Hume conceived of the connection between the notion of causation and the habit of association is a matter of controversy.⁷) Upon seeing the hammer swing towards the glass, we expect the glass to break because we've seen the same sort of thing happen in the past. Having this expectation, and attributing cause and effect once the expectation is met, do not involve wielding a representational concept of power or necessity. Over and above the expectation we merely subsume successive and contiguous events under regularities. This subsumption is the only properly cognitive, conceptual element in causal thought and talk, and it is reflected in Hume's "first definition" of cause:

An event precedent and contiguous to another, and where all the events resembling the former are plac'd in like relations of precedency and contiguity to those events, that resemble the latter.⁸

According to Hume, then, the attribution of a causal disposition does not amount to the attribution of a property, a "potency" intrinsic to the object.

⁶ Mumford also discusses (but places little importance upon) what he calls "abstract dispositions," such divisibility by 2. He thinks that it is a virtue of an account of dispositions that it can subsume such cases. I will not address abstract dispositions in this review.

⁷ See Jonathan Bennett, *Locke, Berkeley, Hume: Central Themes*, (Oxford UP, 1971), Ch. 12; Barry Stroud, *Hume*, (London: Routledge, 1977), Ch. 4; and Simon Blackburn, "Hume and Thick Connexions", *Philosophy and Phenomenological Research*, (1990) for various views.

⁸ I have replaced "object" with "event" in this quotation. *Treatise*, 1.III.14

Rather, in attributing a disposition one says something about future events falling under a regularity. “Power consists in the possibility or probability of any action, as discover’d by experience and the practice of the world.”⁹ When we talk of dispositions, we really talk of possible or probable manifestation-events that will occur when there are certain other triggering events. We don’t attribute properties to things; we engage in event soothsaying. Hume says the distinction between a disposition and its manifestation is illusory, by which he must mean that the thought of a disposition and the thought of its manifestation involve the same concepts. These concepts are not concepts of properties, but rather of events – manifestation events and triggering events. A statement that, on the surface, has a simple subject-predicate property attributing structure (e.g. the bridge is stable) must be analysed into a statement about events (if the bridge were crossed by something heavy, it would remain standing.)¹⁰

In Chapter 2, Mumford illustrates, through a couple of examples, some apparent shortcomings of the Humean view of dispositions (i.e. that dispositions are to be analysed in terms of events) and offers some initial support for what he calls the “realist” view (that dispositions are genuine properties.) He first wields the Martin-Armstrong truthmaker principle against the Humean. For a counterfactual statement to be true at time *t*, something must exist at *t* that makes it true. In particular, if it is true that the bridge is such that if it were crossed, it would remain standing, there must be something about the bridge that makes that true of it. A hypothetical difference, a difference in possible events, must be grounded in some actual difference, a difference, Mumford says, in an object’s properties. This will get nods from the realist, but is not likely to convince a modern Humean. David Lewis, for instance, acknowledges the need for truthmakers, though he is a Humean through and through. He finds the truthmakers for counterfactuals in similarities between the actual world and nearby possible worlds where the relevant occurrences are *not* counter to the

⁹ *Treatise*, 2.I.10.

¹⁰ Of course, on the view that any predicate corresponds to a property, the predicate “is such that if it were crossed, it would remain standing” would correspond to a dispositional property attributable to the bridge. But this property is nothing but a subjunctive conditional construction out of events. In this context, the Humean view could be rephrased as follows: dispositional properties, though they exist, are nothing but subjunctive conditional constructions out of events.

facts.¹¹ On the other hand, projectivist and quasi-realist Simon Blackburn regards the demand for truthmakers as realist rhetoric to which the anti-realist also has a right. Wearing another, ontologically serious hat, he rejects the demand for truthmakers as empty.¹²

Similarly unconvincing for the die-hard Humean are some arguments in Chapter 3 resting on the obvious truth that dispositions can persist unmanifested and even never manifested. Mumford claims that this leads us to a realist construal of dispositions as abiding properties. A Humean would just give a different gloss on such cases. The real problem arises in the nature of this gloss, and Mumford's primary attack on Humeanism occurs in Chapter 3 where he criticizes the conditional analysis of dispositions upon which the Humean relies.

The Humean analyses disposition statements into subjunctive conditionals; to ascribe a disposition is to say that if certain triggering events were to occur, then a certain manifestation event would occur. Though the example is due to break from overuse, consider fragility. The Humean would say "The replicas of the Crown Jewels are fragile" just means that were the replicas to be dropped or knocked, they would break. The analysis refers only to future possible events, not to dispositional properties. Mumford attacks this analysis along familiar lines, but he worries that the attack endangers a distinction he wants to maintain – that between the dispositional and the categorical.

The familiar line of attack on the Humean is due to C. B. Martin.¹³ Consider again the subjunctive conditional analysis:

(1) The museum's replicas of the Crown Jewels are fragile iff if they contacted a hard surface with a certain force, they would break.¹⁴

Now there are a number of conditions which might defeat this analysis. For instance, the replicas might be dropped, but rendered molten in flight by a jet of

¹¹ David Lewis, *On The Plurality of Worlds* (Oxford: Blackwell, 1986).

¹² Personal correspondence.

¹³ 'Dispositions and Conditionals.'

¹⁴ They could also be squeezed or subjected to a shearing force etc., but let's ignore these varieties of destruction for simplicity's sake.

hot gas so they would not break upon contacting the floor. However, they were certainly fragile as they sat on the table above the jet of hot gas.

The Humean might legitimately complain that the analysis in (1) is intended to apply at a particular time. So the replicas were indeed fragile before they were touched by the jet of hot gas, and the counterfactual was true. After they encountered the gas jet, the replicas lost their fragility, but at *that* time the counterfactual was false. So the analysis gets it right. Let us make the analysis reflect this reply:

(2) The museum's replicas of the Crown Jewels are fragile at t iff if they contacted a hard surface with a certain force at t , they would break at t .

Of course "at t " is a little rough; the replicas take time to break. But perhaps (2) accomplishes its task well enough.

This is where Martin's finkishness cases come in.¹⁵ Martin imagines cases where the "triggering conditions" of some disposition also cause the loss of that very disposition. His example is of an "electrofink," which defeats the following analysis of the disposition to be electrically live:

(3) The wire is live iff were the wire touched by a conductor, current would flow from the wire to the conductor.

The electrofink is constructed so as to ensure that, whenever the wire is touched by a conductor, the current in the wire stops. So the wire is live *unless* it is touched by a conductor. If the wire were to be touched by a conductor, current would not flow from the wire to the conductor, so the counterfactual is false, even though the wire is live. The truth of the counterfactual, then, is not necessary for the correctness of the disposition ascription. (The fink can also work in reverse, so that the wire is dead unless touched by a conductor. So the truth of the counterfactual isn't sufficient for the correctness of the disposition ascription either.) The fink acts at the same time as the stimulus, so a temporal

¹⁵ 'Dispositions and Conditionals.'

specification as in (2) is no help here.¹⁶ Applying finkishness to our replicas: suppose they were hooked up to some mechanism that made them instantly melt upon contacting any hard surface. Though they are fragile, (2) would be false.

Along with David Lewis¹⁷, Mumford takes the possibility of finkishness to refute the simple subjunctive conditional analysis of disposition statements. It seems our understanding of dispositions cannot be straightforwardly reduced to an understanding of conditionally occurring events. How on earth *are* we to understand dispositions then? Well, we could refine the conditional analysis, or try some other tack. Mumford does a bit of both.

II - Characterizing the dispositional/categorical contrast

Consider the predicates “is orange”, “is black”, “is red” and “is light grey.” Consider also the predicates “is white”, “is green”, “is blue” and “is dark grey.” Now suppose I told you that each predicate in the first group falls under the determinable “is gleb”, while each in the second group falls under the determinable “is strack.” Suppose I asked you: does “is medium grey” fall under “is gleb” or under “is strack”? What about “is purple”? You wouldn’t have any idea what to say, because the exemplars I’ve given you do not allow you to grasp any contrast between “is gleb” and “is strack.” And there would be a way I could fill out the list of predicates that fall under each determinable so that you *still* couldn’t discover the contrast between “is gleb” and “is strack.” You would likely conclude that “is gleb” and “is strack” don’t pick out genuine determinables, and you would doubt that they expressed (in some sense) concepts in good standing. They are mere collections of random predicates that characterize object surfaces visually. (“Is gleb” and “is strack” seem not to be *projectible*.)

But suppose I were to give you the following two lists: “is orange”, “is red”, “is green”, and “is blue.” Then: “is black”, “is dark grey”, “is light grey”, and “is white.” One immediately suspects that these two groups fall under concepts that express genuine determinables, namely chromatic and achromatic.

¹⁶ For more on matters of timing, see Lewis, ‘Finkish Dispositions’, pp. 145-7, who agrees that fiddling with timing won’t save the simple counterfactual analysis.

¹⁷ ‘Finkish Dispositions.’

The predicates picking out these two determinables seem to draw a genuine contrast, and thus appear to express projectible concepts, concepts in good standing (in some sense).

We are considering the supposed concept of a determinable, expressed by the predicate “is disposed to X”, for which we have been unable to provide an analysis. Under this determinable fall such predicates as “is live”, “is fragile”, “has negative charge”, etc. One might worry that “is disposed to X” is like “is gleb,” i.e. not projectible and thus of questionable utility in describing how things are. If we could find a contrast between dispositions and something else, by analogy with the chromatic-achromatic distinction, we could be more confident that the concept of a disposition is in good standing. Note that we could be satisfied that we had characterized a genuine contrast without having found an *analysis* of the relevant determinable. We didn’t need to analyse “is chromatic” and “is achromatic” in order to be sure we had a genuine contrast. Presumably in the chromatic/achromatic case there are some general principles somehow embodied¹⁸ in our perceptual mechanisms that provide a (non-conceptual?) foundation for the distinction. These principles may be unavailable to us, except through scientific investigation into object surfaces, and perhaps our perceptual mechanisms. Perhaps dispositional concepts have a similar perceptual foundation; Mumford does not consider this possibility.¹⁹ Rather, he tries to find a contrast at the conceptual level, and assumes that the relevant principle is available to us.

So Mumford opts to reveal the nature of dispositional concepts by contrasting them with another type of concept. Traditionally, dispositions are contrasted sometimes with the occurrent, sometimes with the categorical. The contrast with occurrence comes from the conditional analysis into possible events: there are presently occurring events, and there are the possible events

¹⁸ “Embodied” should be taken in a very minimal sense; it may be possible for the general principles to be embodied in our perceptual mechanisms without their being computationally realized, in the rules and representations sense.

¹⁹ Perhaps he should - when we perceive pressure on our skin, we are plausibly perceiving dispositions. Evan Fales has suggested this route in Ch.1 of his *Causation and Universals*, (London: Routledge, 1990), and David Armstrong approves in Ch. 14 of *A World of States of Affairs*. (They suggest it as a perceptual origin for the concept of a singular causal relation rather than a disposition, but pressure is plausibly dispositional.) There is also the venerable source of inner sense; perhaps we perceive our own intentions, which might be construed as dispositional.

that disposition ascriptions make reference to. But we have seen that Mumford rejects the Humean conditional analysis in favour of the “realist” view that dispositions are to be understood as abiding properties. So he thinks that in order to clarify the concept of dispositionality, it must be contrasted not with occurrence (applicable to events), but with categoricity (applicable to properties).

Despite the failure of the straightforward conditional analysis, dispositions are clearly somehow linked with counterfactuals. If we are told something is fragile, we expect it to break if struck. Categorical properties - Mumford uses determinate shapes and structures as his examples - are not, at least not to the same extent, “full of threats and promises” (in Nelson Goodman’s phrase.²⁰) Thus a suggestion: though they are not equivalent, perhaps dispositional ascriptions *entail* conditional statements, while categorical ascriptions do not. If this were true, we would still lack an analysis of dispositional predicates, but we could be more certain that they were concepts in good standing, since they could be contrasted with another type of concept that is in good standing.

Mumford defends a conditional-entailment criterion of the dispositional.²¹ There are two ways one might object. Disposition ascriptions might fail to entail conditionals, or categorical ascriptions might entail conditionals just as much as disposition ascriptions do. The first objection is the finkishness objection. Hugh Mellor has an objection of the second sort.

Mellor assumes that the correct ascription of a dispositional property to a particular entails that the particular satisfies some conditional. We have seen that the finkishness case gives the lie to this assumption. However, let us accept it for the sake of argument; after all, Mumford intends to reply to the finkishness objection. Mellor complains that conditional entailment fails to distinguish dispositional properties from categorical ones, because categorical properties equally entail conditionals. For example, he says that something’s being triangular entails that if its corners are counted correctly (where “correctly”

²⁰ *Fact, Fiction and Forecast*, 4th ed. (Cambridge, Mass.: Harvard University Press, 1983) p. 40.

²¹ He presents his defense of the conditional-entailment criterion as underwritten by his functionalist theory of dispositions. Though this theory becomes relevant later, its added causal element is irrelevant to Mellor's challenge and finkishness. I will therefore discuss these independently of Mumford's functionalism.

refers to the method, not the result), the answer must be three. Though it entails a conditional, triangularity is certainly a categorical property.

Mumford's response is that there is no *conceptual* entailment of a conditional in the case of categorical ascriptions, though there may be some kind of *a posteriori*, natural entailment. The laws of nature are contingent, and the result of a particular counting method depends upon the laws of nature. A counting method that works perfectly well to count the corners of a triangle for the set of laws L_1 might systematically deceive if the laws were set L_2 . Somewhat less plausibly, I suppose he would say that were the laws of nature different, square pegs might fit into round holes.

Thus categorical property ascriptions, Mumford claims, do not have as part of their meaning the entailment of particular conditionals. There are possible worlds, having different laws of nature, where the same categorical property naturally necessitates the truth of different conditionals. By contrast, there *is* a conceptual connection between dispositional property ascriptions and particular conditionals. No matter what the laws of nature are, a dispositional property D always necessitates the truth of the same conditionals.

But which conditionals? Not straightforward ones, as the finkishness problem demonstrates. When the electro-fink (or melto-fink) is operative, the wire may be live (the replicas may be fragile), but the relevant conditional is false. Mumford offers a reformed conditional (replacing an earlier attempt²²).

The finkishness problem is due to the possible presence of interfering background conditions. If only we could specify the conditions that ensure the truth of the conditional, and do so without begging any questions! One possibility would be to formulate the conditional explicitly excluding any interfering finks:

(4) The wire is live iff were the wire touched by a conductor, and no electrofink is present, current would flow from the wire to the conductor.

²² 'Conditionals, Functional Essences and Martin on Dispositions', *Philosophical Quarterly*, 46 (1996).

But what is an electrofink? Well, it might be a machine with a particular structure. This could be specified without using dispositional terms. But specifying this one machine would not be enough; one needs to rule out all machines with the same causal role, or there would be no entailment. Some other machine with a different structure, but the same causal role, could defeat the conditional. But all of these possible machines cannot be specified without using dispositional terminology (in italics): e.g. "and nothing is present that *tends to make* the wire *dead* in the presence of a conductor," or "nothing is present that *would prevent* current from flowing in the presence of a conductor."²³

If the conditional entailment criterion of the dispositional were meant to be an *analysis* (and thence a reduction), the presence of dispositional terms on the right hand side would confound it. But since it isn't intended as an analysis, merely as a way to distinguish dispositional and categorical concepts, is it permissible to have dispositional terms on the right hand side? No, it is not. "X is triangular" entails perfectly well that if X were struck, and nothing prevented it from breaking, it would break. The revised, fink-excluding conditional is vacuous, and so is not suited for drawing the dispositional/categorical distinction.

It might be objected that the revised entailed conditional is meant to read: "If X were struck, and nothing *external* to X prevented it from breaking, it would break." Since dispositions are intrinsic (in the sense that exact duplicates share all their dispositions),²⁴ then if the conditions external to X are right, X is guaranteed to break. In the case of a true categorical ascription, it may often be some intrinsic property of X that prevents breaking (think of a triangular cloud.) Something's being triangular does not guarantee that it will break in some (external) circumstances. So the entailment seems unproblematic in the case of a dispositional ascription, and at best highly problematic in the case of a categorical ascription; indeed, this strategy may differentiate them. Don't get your hopes up, though. It is actually quite similar to Mumford's suggestion, and I think it may be subjected to the same criticisms.

²³ See Martin, 'Dispositions and Conditionals', pp. 5-6; Lewis pp. 157-8.

²⁴ See again Martin, 'Dispositions and Conditionals', and Lewis.

Mumford's strategy in dealing with the difficult problem of finding an entailed conditional is to appeal to ideal manifesting conditions. A disposition ascription entails a "conditional conditional" of the following form:

- (5) If the conditions are ideal, then if the replicas are knocked or dropped (stimulus event) then they break (manifestation event.)

How are the "ideal conditions" determined? Mumford says they're determined by the *context* of the ascription; they are not part of the meaning of the disposition term. If they were part of its meaning, we would be back in the situation of trying to specify, *per impossibile*, an infinite list of possible defeating conditions. Note that Mumford's "conditional conditional" (5) is equivalent to:

- (6) If the conditions are ideal *and* the stimulus event occurs, then the manifestation event occurs.

So adding *specific* ideal conditions as part of the meaning of a disposition ascription can be seen as merely further specifying the antecedent stimulus event. Any such further specification, if finite, fails to get the required entailment for familiar reasons. There is always the possibility of defeating conditions (finkish or not) that haven't been specified. Mumford wants to keep the conditions non-specific - simply as "ideal conditions" - to keep the conditional flexible enough so there aren't any "defeating conditions." That is why he chooses to make them context dependent, and discovered *a posteriori*.²⁵

Remember that Mumford's "conditional conditional" is supposedly entailed by a disposition ascription, but not a categorical ascription. According to Mumford, when one makes a disposition ascription, one is saying that in ideal conditions, if a particular antecedent is realized, a particular manifestation follows.²⁶ "Ideal conditions" get fleshed out as "ordinary conditions for the

²⁵ Alexander Bird ('Dispositions and Antidotes', pp. 233-4) makes a similar suggestion.

²⁶ p. 89. Mumford actually says "usually follows," but I can only make sense of the "usually" as a repeat of the appeal to ordinary conditions. That is, the "usually" just means that if the manifestation does not follow, the conditions weren't ordinary. (Mumford's further discussion in section 4.9 strongly encourages this interpretation.)

present context." Just "ordinary conditions" won't do, because in a scientific context, the ideal conditions for manifestation of a disposition might be far from ordinary, e.g. at the centre of a star. Disposition ascriptions are used when, in the context of the ascription, it is reasonable to expect the manifestation when the antecedent is realized. If the manifestation does not occur, one wants an explanation for why it didn't. This practice is evidence that there is a tacit appeal to ideal or ordinary conditions in disposition ascriptions.

Suppose, however, that we counted the corners of a triangle according to a reliable method, and the result failed to be three. We would require an explanation, would we not? So perhaps categorical ascriptions entail Mumford's watered-down conditional as well as disposition ascriptions. On at least one reading of the conditional, this entailment certainly would obtain. Mumford allows that the laws of nature are contingent. What if they get included in the ordinary conditions clause? Then "the gem is triangular" would entail "if the gem's corners were correctly counted and the conditions were ordinary for the present context (including the actual laws of nature obtaining), then the result would be three."²⁷ Remember his response to Mellor's original objection was that categorical ascriptions don't entail conditionals because the laws of nature are contingent. That won't work here, if the relevant laws of nature get included in the ideal conditions clause.²⁸

Suppose, then, that the relevant laws of nature don't get included in the ideal conditions clause. Then even a disposition ascription may fail to entail Mumford's conditional. There will be possible worlds in which all the "ordinary conditions for this context" obtain, but where the manifestation doesn't. And if the laws of nature in this counterfactual situation aren't *too* different from the actual ones (e.g. there is just a difference in the amount of force required to break the replicas), the disposition ascription will be true. The only explanation for the

²⁷ On a construal of "P entails Q" as "It is impossible for P to be true and Q false." I suppose relevance logics might provide Mumford with a way out of this problem. Out of the frying pan...

²⁸ On p. 156, Mumford seems to imply that the laws of nature *are* included in the ordinary conditions clause. He gives essentially the same story in 'Ellis and Lierse on Dispositional Essentialism', *Australasian Journal of Philosophy*, 73:4 (1995): "...when we, in the actual world, speak of the dispositions of fragility and non-fragility we refer to the dispositions of fragility and non-fragility in the actual world, *which will be shared by all possible worlds which share the laws of the actual world*" (italics mine). He endorses this portion of the paper on p. 237 of *Dispositions*.

failure of the disposition to manifest itself will appeal to the different laws of nature. So in order to get the entailment, the relevant laws of nature must be included in the ideal conditions clause... but we just saw that won't do either.

There are other problems, too. For instance, it seems problematic that the ideal conditions for the manifestation of a disposition are discovered *a posteriori*. How would an investigation into ideal conditions go? Here is a caricature: We start off with the concept of a property that mediates between stimulus event A and manifestation event B. We find, in the world, successive events A and B that are mediated by something to which we ascribe the disposition. We then investigate what conditions obtain in the preponderance of cases where A really does lead to B in a context we judge to be common to all cases. These conditions are then considered to be "ordinary for the present context."

What would we think if we found out that, as a matter of fact, ordinarily the conditions required for the mediation between A and B were finkish, or at least highly unusual? Suppose that all the substances we take to be poisonous are in fact highly beneficial, except when ingested along with a cofactor that renders them toxic. This cofactor happens to be present, unbeknownst to us, in our drinking water. Ordinary conditions presumably include that we drink water, and ordinarily the water contains the cofactor. So on Mumford's account, these substances count as poisonous, where the ordinary conditions for the manifestation of this disposition turn out to include the ingestion of the cofactor. It seems to me that, on the contrary, if we *knew* about the cofactor, we would not call these substances poisonous, or we would be at least uncertain whether to call them poisonous. So there must be built into the concept of a poison that the ordinary conditions for its manifestation do not include such cofactors. But similar scenarios could be cooked up to persuade us that any of the "ordinary conditions" were part of the concept. This takes us back to the original problematic full specification of the antecedent event, where any finite list will fall prey to finkishness or other background condition defeaters.

Another problem involves the possibility of internal "masking" of dispositions, or internal finkishness. Mumford must intend the ideal conditions to be external to the object that has the disposition. If the ideal conditions could be internal, the conditional would be (almost) vacuous, since it would be true of

any object that could, while retaining its identity, undergo internal changes so as to acquire the disposition. It would be tenuous indeed to maintain that no true categorical ascription entails a conditional whose ideal conditions clause ranges over conditions internal as well as external to the object. That would require that no categorical property guarantees that an object possessing the property could acquire, via some series of modifications internal to it, some particular disposition. Who knows if *that's* true.

But if Mumford requires all ideal conditions to be external to the object that has the disposition, an internal blocker of the disposition will also block his proposed conditional entailment. For example, a neuron might be disposed to fire upon the application of glutamate, but this disposition may be masked by a channel blocker. Since the blocker is internal to the neuron, it mustn't be excluded by the ideal conditions clause. So even when the conditions are ideal, the neuron will fail to fire upon application of glutamate. (The success of this objection will depend upon whether there are such things as "masked dispositions," a matter of some controversy.²⁹ Some would maintain that the neuron just lacks the disposition to fire upon glutamate being applied.)

The essence of Mumford's account of the dispositional/categorical distinction

For these reasons, I think Mumford's appeal to ideal conditions fails to provide him with a conditional the entailment of which can distinguish between dispositional and categorical property ascriptions. However, I do think he has the resources available to provide a better candidate. It seems to me that the essence of Mumford's dispositional/categorical distinction has nothing to do with ideal manifestation conditions. He often points out that the stimulus event and the manifestation event are not known *a priori* for a categorical property, but they are for a dispositional property. By conceptual necessity, all properties must be causally efficacious (this is the "causal criterion of propertyhood" Mumford accepts, as do I). But only a dispositional property's "causal role" is

²⁹ See Simon Blackburn, 'Circles, Finks, Smells and Biconditionals', *Philosophical Perspectives*, 7(1993), pp. 259-279; Lewis, 'Finkish Dispositions'; Martin, 'On the need for properties,'; Molnar, 'Are Dispositions Reducible?'

known *a priori*. I think this is all Mumford needs to draw the dispositional/categorical distinction, given his assumptions.

Mumford claims that if the laws of nature were to change, the extension of categorical concepts would remain the same, but the extension of dispositional concepts need not.³⁰ The Pyramids would still be pyramidal, but salt might no longer be soluble. The Pyramids might have none of their former causal powers, and still remain pyramidal. So being pyramidal can have no conceptual connection with a set or even a disjunction of sets of causal powers. On the other hand, Mumford claims, disposition ascriptions would track the same stimulus and manifestation events (characterized categorically). Soluble things would still be those that tended to dissipate in water; perhaps steel would become soluble. So there is a conceptual connection between stimulus and manifestation events for disposition ascriptions, but not for categorical ascriptions.

So far so good. But Mumford seems to think that the very same determinant that a particular concept is dispositional rather than categorical must also provide individuation conditions for that dispositional concept. So, for instance, Mumford thinks that "fragile" has as part of its meaning "in ordinary conditions for this context, if x were struck, x would break." The ordinary conditions clause distinguishes "fragile" from, for instance, "quite durable."

But we have seen there are problems with the "ordinary conditions" component. Can we discard this component while remaining faithful to Mumford's intuition about the distinction between the dispositional and the categorical? I think we can, and Mumford himself points the way. He says, "What is known *a priori* with a disposition term, because it is part of the meaning, is the causal role that is being ascribed when an ascription of that term is true." In other words, a disposition ascription entails that *in some circumstances or other* a *particular* type of manifestation event will ensue following a *particular* type of stimulus event. Or, more accurately: A true disposition ascription to any object in any possible world entails that it is nomologically possible relative to that

³⁰ Indeed, on the standard view, a change in laws necessitates the identity of categorical properties through the change. A law connects or links categorical properties according to the basic schema $\forall F\forall G (Fx \rightarrow Gx)$. For a law of nature to change (other than in its constants and exponents), it must connect different categorical properties, a change which presupposes the identity through the change of the connected categoricals.

world for a particular type of manifestation event to follow a particular type of stimulus event. For short: It is nomologically possible that if the stimulus event occurs then the manifestation event occurs - call this "the modal conditional." (We could maybe even leave off the specification of the stimulus event - cf. p. 88: "The minimal claim of a disposition ascription is that a particular *can* do something [in particular].")

So, for example, "X is fragile" entails that it is nomologically possible for X to break upon being struck. Not so for a categorical concept. Though "X is triangular" may entail that it is nomologically possible for *some* event to occur (in accordance with the causal criterion of propertyhood), no *particular* type of event is entailed.³¹

Though we distinguish "fragile" from "indestructable" with this device, we do not distinguish "fragile" from "quite durable." But this is a failing only if we expect what distinguishes dispositional concepts from categorical concepts also to individuate dispositional concepts. I see no need to insist on this additional requirement. Once we have the dispositional/categorical distinction, we may further distinguish between dispositional concepts by specifying their manifesting conditions. And this need not be done by using conditional entailments, a strategy that fails due to Martin's finkishness counterexamples.

It is obvious that my recommendation of the modal conditional for characterizing the dispositional/categorical distinction dodges most of the objections I laid on Mumford's doorstep, since most of these objections were specific to the ideal conditions clause. But what about the problem with masked dispositions? It isn't obvious that my suggestion solves this one. In the first place, it seems that the nomologically possible conditions must be restricted to conditions external to the object in question, for reasons similar to why Mumford requires this restriction (see above). Will the presence of a mask block the

³¹ Mumford seems to lean closer towards this pared-down account in his 'Intentionality and the Physical: A New Theory of Disposition Ascription', *Philosophical Quarterly*, 49 (1999), pp. 215-225. Although he also says there (p. 224) that ideal conditions "can be specified non-trivially in the form of a Ramsey sentence." I confess I do not know what he could have in mind here. A Ramsey sentence is nothing but an existentially quantified conjunction of conditionals, and Mumford believes "the possible interfering background conditions cannot be excluded in a finite list that is appended to the conditional," (p. 88 of *Dispositions*.) A Ramsey sentence would be equivalent to just such an appended list.

entailment from “The neuron is disposed to fire upon the application of glutamate,” to “It is nomologically possible that if glutamate is applied the neuron will fire”?

Obviously not. If there are no nomologically possible external conditions *at all* that will remove the blocker, we would most certainly withhold the disposition ascription. So the entailment will always hold. (Though if there were conditions purely internal to the neuron that were responsible for periodic removal of the blocker, we would attribute to the neuron a *propensity*, a probabilistic disposition, for it to fire upon the application of glutamate. We must distinguish between a propensity and a disposition.) We have a choice: we can attribute to the neuron 1) a blocked disposition to fire, or 2) a disposition to acquire a disposition to fire. The stimulus for the first is the application of glutamate, just like for a non-blocked neuron. The stimulus for the second is the one corresponding to the disposition to lose the block (e.g. the application of magnesium ions.) The difference is whether one is prepared to ascribe a disposition to fire, a disposition whose manifestation requires another disposition to be manifested, namely the disposition to lose the block; or merely a disposition to acquire that disposition. This will be determined by a number of interest-relative factors. It will depend upon whether you are treating the object as simple or complex. It will depend upon how easily and quickly the block can be removed. Most importantly, it will depend upon what you want to count as the stimulus (this is the antecedent of the conditional part of the modal conditional) and what you want to count as the manifesting conditions. According to the modal conditional account, this is what determines which disposition concept you are wielding. And, as has often been pointed out,³² the distinction between stimulus and manifesting conditions is interest-relative. It corresponds to no ontological difference. So my suggestion, unlike Mumford’s, allows for masking, though it does not require that some of our actual dispositional concepts (fragility, disposition to fire) allow for masking. (Though it seems to me that we ought to make this allowance in some cases.) It even

³² See Martin’s entries in ‘Dispositions: A Debate’, and John Stuart Mill, *A System of Logic* (London: Longmans, Green & Co., 1843/1925), III:V,4.

helps explain the disagreement over the phenomenon by exhibiting its interest relativity.

This new, modal conditional entailment criterion of the dispositional is all very nice, but in the end, perhaps someone like Mellor would view it as merely *ad hoc* conceptual legislation. Is it really an *a posteriori* matter, dependent upon the laws of nature, that when the corners of a triangle are correctly counted, the answer is three, or that round pegs fit into round holes? (Perhaps these are bits of *a priori* geometrical reasoning, and not causal or dispositional at all - I'm not sure.) Someone like Mellor, who contests the distinction, may contend that "the gem is triangular" does entail "it is nomologically possible that if the gem's corners are correctly counted, the result will be three." If the laws of nature changed such that when we counted the gem's corners, we arrived at an answer of four, and the gem appeared to us to have four corners (how else could we arrive at this answer?), etc. etc. for all the gem's former seemingly triangularity related dispositions, could it really be the case that, nevertheless, the gem still fell under the concept of triangularity? I, for one, would at least hesitate to maintain this as a possibility. Mumford says at one point that he would be willing to take as dispositional some predicates that at first glance seem categorical, but I doubt he would go so far as to reconstrue "triangularity" as a dispositional concept. Perhaps we have arrived at an intuitional stand-off?

I think someone who supported what I'm calling the essence of Mumford's position on the dispositional/categorical distinction might be able to resolve the standoff in her favour by using different examples of categorical properties. When philosophers give examples of categorical properties, the overwhelming majority choose shape or structure. In particular, all of Mumford's examples of categorical properties fall into one of those two classes. But these are just the sorts of properties that Mellor and others can find plausible conditional entailments for. As C. B. Martin often says, just ask the cabinet maker about the dispositions something has in virtue of its shape! There is a better prototype for categoricity, that differentiates it more clearly from dispositionality according to the conditional entailment criterion.

III - An ontological interlude on categoricity

I shall use the term "qualitative property" to designate the better prototype for categoricity.³³ There are two principal models for qualitative properties. First there are the introspectible monadic properties of phenomenal individuals, or *qualia* in C. I. Lewis's original sense.³⁴ Second, there are colours in the manifest image. Russell, Lockwood, Chalmers, Martin, and Unger take qualia as their principal model for qualitative properties.³⁵ I shall take colours as my principal model, since I am persuaded by Harman³⁶ that when we "introspect", we do not find qualities of our experiences, but rather qualities our experiences represent external objects as having. But if you prefer Russell's view, that will do just as well for my purposes here. Just modify the following remarks accordingly.

Colours are presented to us as non-relational, non-dispositional properties. As Russell puts it, we are "acquainted" with them:

...the particular shade of colour that I am seeing ... may have many things to be said about it.... But such statements, though they make me know truths about the colour, do not make me know the colour itself better than I did before: so far as concerns knowledge of the colour itself, as opposed to knowledge of truths about it, I know the colour perfectly and completely when I see it and no further knowledge of it itself is even theoretically possible.³⁷

We have seen that it is contentious whether we can imagine a triangular ruby retaining its triangularity while changing all of its causal powers. But it seems much less contentious that we could imagine the ruby retaining its red colour while changing all of its causal powers.³⁸ It may very well be that if the laws of

³³ See Martin's entries in 'Dispositions: A Debate', 'On the need for properties', and John Heil *The Philosophy of Mind*, (London: Routledge, 1998), Ch. 6.

³⁴ C. I. Lewis, *Mind and the World Order*, (New York: Scribners, 1929); William G. Lycan, *Consciousness*, (Cambridge, Mass.: MIT Press, 1987), Ch. 8.

³⁵ Bertrand Russell, *The Analysis of Matter*, (London: Routledge, 1927); Michael Lockwood, *Mind, Brain, and the Quantum*, (Oxford: Blackwell, 1989); David Chalmers, *The Conscious Mind* (Oxford: Oxford University Press, 1996); Martin, 'On the need for properties'; Peter Unger, 'The Mystery of the Physical and the Matter of Qualities', *Philosophical Perspectives* (forthcoming).

³⁶ Gilbert Harman, 'The intrinsic quality of experience', *Philosophical Perspectives*, (4, 1990).

³⁷ *The Problems of Philosophy* (Oxford UP, 1912) p. 47.

³⁸ Perhaps we cannot imagine the gem retaining its red hue while acquiring a colour saturation of zero. If saturation is properly construed as dispositional (I'm not sure about this), it is perhaps an example of a causal power that can vary in only a limited way if the gem is to remain red. So there would then be a conceptual connection between redness and saturation, a supposedly categorical property and a disposition. This may seem to cast doubt on redness's credentials as categorical. I disagree; there may be a conceptual connection between saturation and being

nature were to change completely, we would no longer see the ruby as red. Indeed, if the scientific account of colour is to be accepted, it would no longer *be* red, since on the scientific account, being red is a matter of having one of a set of horribly complex dispositional properties. But that's in the scientific image. It doesn't matter for the present point; the scientific account of colour is a *surprise* to the folk (at least the unreflective, naïve realist folk!) The point is that we can perfectly well imagine an object retaining its colour while changing all of its causal powers (even its powers to affect us).³⁹ That is, operating from within the *manifest* image, 'red' is a categorical concept according to the essence of Mumford's account of the dispositional/categorical distinction. There is no particular event whose nomological possibility is entailed given that an object is red. I think that Mellor, who worries that the gem's being triangular may entail that if the gem's corners are correctly counted, the answer would be three, would be hard-pressed to find a similar conditional entailment implicating a dispositional nature to colour, as we commonly conceive of it.

More radically, I contend that shape and structure are not just poor examples of categorical properties, they aren't categorical properties at all! Let me explain. There are two notions of structure, one of which is partially dispositional. There is a sense in which the two molecules in Fig. 1 have the same structure, and a sense in which they do not. They have the same structure₁ because they have the same shape. But they don't have the same structure₂ because they don't have the same types of component atoms at corresponding positions in their structure₁. What is the difference between the structure₂ of formamide and the structure₂ of ethene? The occupants of their structural nodes have different dispositions (and perhaps the bonds also have different dispositions, e.g. rigidity). It doesn't matter if these dispositions eventually get explained by more fundamental categorical properties (though I doubt this is so, as does Mumford); according to the conception of structure that we are considering, formamide and ethene would have different structures₂ even if the

coloured, and thereby between saturation and redness. But it is the same connection that saturation has with greenness, or blueness etc. This suggests that, contra Hume, our colour concepts are complex. The property that should then take as categorical should be hue, not colour *per se*.

atoms at the nodes were simple unstructured entities. So the concept of structure₂ is not a purely categorical concept.

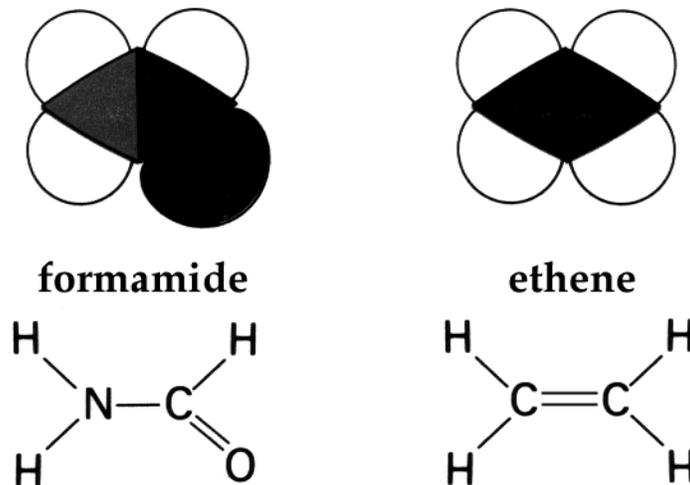


Figure 1

What about structure₁? Recall the causal criterion of propertyhood that Mumford and I accept - a property must confer causal powers on its possessor. I would maintain that shape and structure₁ do not confer any causal powers. And it's not that they fail to confer any *particular* causal powers due to their being categorical properties (cf. the essence of Mumford's account above). Rather, *they fail to confer any causal powers at all*. Shape confers a spatial arrangement upon a substance; structure₁ confers a spatial configuration upon things. The shape independent causal powers of this substance, and the structure independent causal powers of these things, *exhaust* the causal powers of the shaped or structured thing. One appeals to shape to explain how the causal powers of the continuous parts of a thing interact with each other and with other things. One appeals to structure₁ to explain how the causal powers of the objects at the nodes of the structure₁ interact with each other and with other things. The structure of a molecule does not *add* any causal powers to the component atoms, it merely forms part of the manifesting conditions for some causal powers of the atoms.

³⁹ This account of colour concepts is of course controversial. There are some who advocate a dispositional account of our manifest image concept of colour.

Similarly for the conformation of a protein and the structure of a car's engine. Since shape and structure do not add any causal powers, they are not properties in the strict sense required by the causal criterion of propertyhood.

Here's a more rigorous argument for the same conclusion. First I'll consider whether a spatial relation between two objects adds any causal powers to the objects, then I'll apply that case to structures and shapes. The causal criterion of propertyhood requires that an instance of a genuine property endow the object having the property with causal powers that are not among the causal powers the object possesses in virtue of all the other properties it has. So for a spatial relation to be a property by this criterion, it must endow one or both of the objects entering into the relation with causal powers they don't have otherwise.

Now consider two charged particles. The force they exert on each other is given by Coulomb's law⁴⁰:

$$\frac{Cq_1q_2}{r^2}$$

where C is a constant (which we will ignore for the sake of simplicity), q_n is the charge on particle n, and r is the distance between the two particles. Suppose r contributes causal powers, i.e. dispositions to one or both particles. That would mean, for instance, that particle one, when it comes to be at $r=1$ away from particle two, acquires a new disposition. Leaving our units unspecified, this disposition is the disposition to accelerate at a rate of 1 per unit of particle one's mass (force = acceleration per unit mass). If the particles are of the same type, particle two acquires the disposition to accelerate at a rate of 1 per unit of particle two's mass. Of course, as soon as these dispositions are manifested and the distance between the two particles changes, they each acquire new dispositions. And we must repeat these considerations for every particle within each particle's light cone - each particle will have an indefinitely large number of dispositions to accelerate in an indefinitely large number of different directions. And any time any one of the particles moves, all of the other particles in that particle's light

⁴⁰ Note that this law is importantly unlike Newton's laws in that it has not been falsified by modern physics (David Halliday, and Robert Resnick, *Fundamentals of Physics* 3rd ed. (New York: John Wiley & Sons, 1988), p. 537.

cone acquire new dispositions. That's a lot of dispositions - but perhaps we can live with that.

But we may not be able to live with the following consequence. It is essential to a property's being dispositional that it can be possessed at time t though it is not being manifested at time t . That seems fine on the above scenario; suppose the two particles are being held in place. They each have a disposition to accelerate away from the other, though they are not at present manifesting this disposition. But of course, they must be held in place by other particles. We would like to construe this holding in place as active, i.e. as involving the manifestation of other powers/dispositions. But according to our hypothesis that spatial relations confer causal powers, it seems that we can't. Consider a stable system of charged particles, one in which, as we would say, all the forces "cancel out." According to the above reasoning, which established that our two particles held in place are failing to manifest dispositions to accelerate with respect to each other, all of the particles in the stable system *can be manifesting no (charge) dispositions at all* with respect to each other. We might ask: what's holding them in place, then? Nothing? Even when they smack into a wall?

The same argument can be used with respect to any other forces that depend upon spatial relations (e.g. gravitational force.) Our understanding of forces requires that dispositions can be manifested though no displacement occurs. Our supposition that spatial relations confer causal powers on their relata confounds this requirement. We may avoid this unpalatable consequence by individuating dispositions a little less finely. Instead of saying that each particle acquires new dispositions every time it moves, we may attribute to each particle, at any time t , a unitary disposition according to its charge. Suppose its charge is 1 unit. It will then have the disposition to accelerate at:

$$\frac{Cq_2}{r^2}$$

per unit mass, where q_2 and r are *variables*. (Alternatively, one could attribute to the particle at any time t the infinite set of fine-grained dispositions you'd get by filling in values for the variables). But then the spatial relations the particle enters into will fail to change the particles' powers, i.e. fail endow the particle

with any causal powers it doesn't have otherwise. So by the causal criterion of propertyhood, they don't count as properties at all. Spatial relations feature only as conditions on the manifestation of the power described in the above equation.

This is just the position that I advocated before getting into the Coulomb's law example. It is really just an affirmation of the view that dispositions are not relational, but intrinsic, in the sense that exact duplicates share all their dispositions (unless they are subject to different laws of nature due to being in different nomologically possible worlds). Amongst the manifesting conditions of any disposition are 1) intrinsic properties⁴¹ and 2) external relations between the objects possessing the operative intrinsic properties. Call the first "reciprocal partners" (adapting a term of Martin's) and the second "relational requirements." An event, i.e. the manifestation of a disposition, involves objects coming into appropriate external relations, allowing some dispositions endowed by the intrinsic properties of the objects to manifest. The relations themselves do not endow any dispositions upon the objects involved. Taking external relations to be in the same ontological category as properties is just a mistake, one committed by many philosophers, as Armstrong has pointed out.⁴²

In the case of shape and structure, spatial relations are taken to be internal to an object. But if what I have said above about spatial relations is true, the causal powers of the thing with structure will be reducible to the causal powers of the nodes of the structure⁴³ - since the spatial relations between the nodes add no causal powers to the nodes. And there's nothing else that could give the object new causal powers, short of emergence. (Similarly, the causal powers of a shaped thing will be reducible to the causal powers of its [infinitesimal?] parts, since the spatial relations between the [infinitesimal?] parts of the shaped thing add no causal powers to the parts. Given what we know about physics, however, it is likely that shape is fundamentally structure, i.e. particles spatially

⁴¹ In some cases there may be no reciprocal partners, e.g. if the irreducible propensity view of atomic decay is correct.

⁴² *A World of States of Affairs*, p.4.

⁴³ C. B. Martin expresses substantially the same thought in 'On the need for properties' when he says (p. 198): "...the constituents in *all* of their interrelatednesses and interactivities *and* their dispositions for these with one another *and* with whatever may be external, in all of their varying degrees of stability, do fully constitute and together *are* the whole (admitting some additions and subtractions and alterations of properties and configuration suitable for being that kind of whole.)"

related.) So when we say that an object has certain causal powers because of its structure, we are really just privileging certain causal powers of the structure's nodes *since their relational requirements are met*. But structure does *not* contribute causal powers to an object like charge does, or like some fundamental property analogue to colour might. Shape and size⁴⁴ are relational requirements, and not reciprocal partners. They contribute no causal powers, and are only manifesting conditions for causal powers.

End of digression. But the digression will be important for my final evaluation of Mumford's ontology. Though he repudiates a pure dispositionalism, if what I say about shape and structure is right, he is actually *committed* to pure dispositionalism.

IV - Mumford's functionalism: the causal element

There is an important causal element in Mumford's full-dress account of disposition concepts. Up to now I haven't paid any attention to this causal aspect because it isn't essential to the discussion of conditionals and the dispositional/categorical distinction. But it is essential to a discussion of the ontology of dispositions, and Mumford gives it centre stage, so now I'll look at it. This will complete my discussion of Mumford's account of disposition concepts. I'll then move on to his ontology.

Mumford thinks that adding a causal element onto a conditional criterion of dispositionality gets him closer to being able to provide analyses of dispositional terms. The only thing that prevents his account from being an analysis, Mumford says, is the ineliminable mention of ideal conditions. Of course, I found some problems with the ideal conditions clause, and recommended that Mumford remove it while still preserving the essence of his account. But this essence does not even come close to an analysis; it remains a mere characterization of the dispositional-categorical distinction, the elucidation of which seemed to be Mumford's main goal. Perhaps we can view the addition of a causal element to his account of dispositional concepts as an attempt to

⁴⁴ Or substitute some relativity friendly invariants.

capture an important feature of them over and above their special connection with conditionals, whether or not we're in "analysis" territory.

Here is a reason for thinking that the addition of a causal element will capture something important about disposition ascriptions.⁴⁵ Suppose "it is nomologically possible that, if the jewels were struck, they would break" is true. We would probably suppose that this was because the jewels had a disposition to break when struck; indeed, perhaps they are fragile, which would entail the above modal conditional. (Here I am just making use of the essence of Mumford's account.) But we cannot conclude this, because the jewels may not be disposed to break when struck, but only be disposed to break if some other stimulus is applied to them. For instance, suppose the swinging of a hammer (as opposed to the striking) leads, by some causal chain or other, to the temperature dropping suddenly and drastically. This sudden drop in temperature might cause the jewels to break even though they are not disposed to break when struck. But it will still be true that "it is nomologically possible that, if the jewels were struck, they would break." The hammer swings, the jewels are struck, and they break. In order to even come close to an entailment from the modal conditional to the presence of the dispositions, we need to add a clause requiring that the disposition, which is intrinsic to the object in question, must somehow bring about the manifestation in conjunction with the stimulus.⁴⁶ Mumford construes this "bringing about" as causation, and chooses to make dispositions causes.⁴⁷

Mumford's proposal is that we understand dispositions causally or functionally (in the non-teleological sense). A disposition is a property that plays a certain causal role, a property that causes a certain effect in a certain circumstance. It has this functional role by conceptual necessity. If we have

⁴⁵ I'm a little fuzzy on what Mumford's *exact* reasons are for adding the causal element.

⁴⁶ We can't insist that the striking be able to immediately cause the breaking in order for the jewels to be disposed to break when struck, because that would rule out dispositions where there must be a causal chain between the stimulus event and the manifestation event. *Certain* causal chains may be ruled out, depending upon the particular dispositional concept (A. D. Smith's wayward causal chains - see 'Dispositional Properties', *Mind* 86 (1977), pp. 439-45). For example, a styrofoam cup is not fragile just because the hater of styrofoam is inclined to rip it up when it is struck (Lewis, 'Finkish Dispositions', p. 153). But I see here no reason to rule out causal chains in general - even if it isn't fragile, the styrofoam cup may still be disposed to break when struck. Or, at least, a spark plug is disposed to fire when the engine's key is turned!

correctly deciphered the essence of Mumford's dispositional/categorical distinction, we could put it this way: A true disposition ascription to X ("the replicas are fragile") entails that it is nomologically possible for some intrinsic property of X (the disposition) to cause a certain effect (the replicas' breaking) given an antecedent condition (striking the replicas). This coheres well with the final statement of his functionalism in Chapter 9:

- 1) What it is that makes a property or state *d* of an object *x* a dispositional property or state is that it is a conceptual truth that *d* causally mediates from stimulus events... to manifestation events.
- 2) What it is that makes a disposition *d* the type of disposition it is is the specific stimulus and manifestation events to which it bears the relation of causal mediation.

Note that Mumford is talking about the causal role of a property rather than an event. Suppose we are characterizing an *event* according to its causal role, say an event of being in pain. Events of that kind are caused by occurrences of bodily damage, and they cause events of, say, wincing. We might also indirectly characterize a *property* by describing the causal role of some particular events, namely events of that property's coming to be instantiated. We would say instantiations of the property of being in pain (or just "pain" for short) are caused by occurrences of bodily damage, and such instantiations cause events of wincing.

Mumford thinks that dispositions, which are properties, play "causal roles". But he doesn't characterize the disposition of fragility like this: instantiations of fragility are typically caused by strikings, and these instantiations typically cause breakings. Instantiations of fragility are certainly not caused by strikings; barring a reverse-fink, the disposition is there before any striking occurs. The striking is the triggering event of the disposition, not its cause as the use of "causal role" with reference to events would suggest. On the other hand, Mumford does insist that the disposition (instance) actually causes its manifestation. But this, of course, is not event causation, but property

⁴⁷ See Lewis p. 156 for more reasons for adding a causal element, and further sophistication of it.

causation, as in “The deep brown of her eyes caused me to swoon,” or perhaps fact causation, as in “Her eyes’ being deep brown caused me to swoon.”

It is quite contentious to maintain that dispositions can be causes, though it seems that Mumford's functionalist account of dispositional concepts depends upon a successful defense of this claim. He undertakes such a defense in Chapter 6, but the reader is left disappointed. The key objection of *virtus dormitiva* is rebutted by *relying* on his functionalist account of disposition ascriptions. And his arguments to the effect that dispositions are explanatory of the occurrence of events is beside the point. I'll take up this second criticism first.

Sometimes, dispositions purport to play an explanatory role. Why did the glass break when it was dropped? Because it was fragile. Are this and its kin genuine explanations? Some (e.g. Quine) would have it that dispositional explanations are mere place-holders for genuine, mechanistic explanations that make no mention of dispositions. Much of Mumford's sixth chapter is devoted to demonstrating that dispositions *can* figure in causal explanations. Assuming success in this project, does it support Mumford's claim that dispositions can be causes?

I don't think so. On either the ontic or non-Humean epistemic views of explanation, a proof that dispositions are explanatory fails to establish that dispositions are causes. The only view of explanation that would help Mumford out is the Humean epistemic view of explanation, but it is unavailable to him due to his other commitments. So in attempting to establish that dispositions are causes, Mumford ultimately begs the question.

Here is how I diagnose the problem. There are two broad types of views of explanation, the epistemic and the ontic.⁴⁸ Ontic views of explanation⁴⁹ require that a “why did this happen” question be answered with reference to singular causal relations. Whether a prior event explains a subsequent event will depend not only upon whether there is a regularity (exceptionless or statistical) of the second following the first, but also upon whether the first *caused* the second. So on the ontic view, whether or not dispositional explanations are good

⁴⁸ See the introduction to David-Hillel Ruben (ed.) *Explanation* (Oxford: Oxford University Press, 1993.)

explanations will depend upon a resolution of the prior question of whether dispositions can be causes, which Mumford must therefore address independently. To argue that dispositional explanations are good explanations without arguing that dispositions can be causes is to beg the question. Given the ontic view of explanation, Mumford's arguments to the effect that dispositions can figure in explanations are useless, since he does not offer independent reasons to think dispositions are causes. One can rebut his claim that dispositional explanations are good ones with even the weakest argument against dispositions being causes. And the *virtus dormitiva* objection, which Mumford does not rebut successfully, is not weak (see later). So Mumford fails to shoulder the burden of proof.

What if we adopt, not an ontic, but an epistemic view of explanation? Epistemic views, like Hempel and Oppenheim's deductive-nomological model, tie explanation closely to prediction and regularity. To explain the occurrence of an event E, for example, is to cite a regularity that events of type A follow events of type B, and then to exhibit that E is an event of type B, and that it was preceded by an event of type A. There are two possibilities here. First, our explainer might be a Humean. As such, she doesn't believe in any special *in re* singular causal necessitation, or thinks it is incoherent. She thinks the ontology of singular causation amounts to nothing more than sequences of events being instances of regularities. For the Humean, then, explanation and causation merge into one. On this view it would seem that a successful demonstration that dispositions were explanatory would indeed establish that dispositions were causes. But of course Mumford rejects the Humean regularity view of causation (and any Humean reading the book will already be sailing alongside in a dinghy, haven't gotten off the boat in the first chapter.) So following a Humean epistemic account of explanation, Mumford's arguments to the effect that dispositions are explanatory are of no use to him, plus they'll fall on deaf ears.

Alternatively, our epistemic explainer might not be a Humean. But if so, explanation will fail to track causation since, unlike on the ontic view, A need not cause B in order to explain B. Incidentally, the Humean may also deny that

⁴⁹ See Wesley Salmon, *Scientific Explanation and the Causal Structure of the World* (Princeton, NJ:

explanation tracks causation; Hempel does. His example of the gas laws will serve us here. The pressure of a gas might be used to explain its temperature according to the law $PV=nRT$, but, he says, there is no *causal* relationship between these two quantities. So were he to adopt a non-Humean epistemic view of explanation, Mumford's arguments to the effect that dispositions are explanatory would fail to establish that dispositions are causes since explanatory relevance is not sufficient for being a cause.

Mumford makes his commitment to a distinction between causation and causal explanation explicit (on p. 143). So he cannot, by his own lights, argue that dispositions are causes by arguing that dispositions are explanatory. He answers only one objection to dispositions being causes without saying "but they are explanatory": the *virtus dormitiva* objection. So Mumford's defense of the causal element in his account of dispositions all comes down to this objection, and as I mentioned earlier in this section, we are left disappointed.

The objector says dispositions can't be causes because dispositions terms are just definite descriptions of the form: "the cause of x such that x is...." When Molière's natural philosopher answers the question, "Why does opium make one sleep?" with "It has a dormitive virtue," he is not describing a property of the opium that is the cause of sleep, he is just uselessly reiterating the fact that opium causes sleep. There really is no such property as "dormitivity"; it is a dummy property serving in a pseudo-explanation.

In answer, Mumford emphasizes the distinction between causation and explanation. Mumford replies that by the logic of the objector, the cause of G isn't the cause of G (pp. 139-143). Since "dormitivity" means in part "the cause of sleep", dormitivity citing answers to the question "Why did the sleeping pill cause Gwendolyn to sleep?" are trivial and thus mere pseudo-explanations. But that does not mean dormitivity isn't a cause of sleep. "A trivial truth is still a truth, [but] a trivial explanation is not an explanation."(p. 141) Well, OK, but we are left having to take Mumford's functional account of dispositions for granted - a key premise in his reply is that "dormitivity" means in part "the cause of sleep." I started this section looking for a defence of Mumford's functionalist

construal of dispositions. If you disagree with his account because you doubt that dispositions can be causes, Mumford doesn't really have an answer for you.

Well, that's not quite true. He does have a kind of answer, a rather holistic one. He might ask you to consider his view *in toto*, and weigh its benefits and disadvantages against other theories. The ontology that he proposes, a variety of property monism, provides him with the resources to make good sense of the claim that dispositions can be causes. He says that we have dispositional and categorical ways of picking out properties, but the properties themselves are *not* divided into these two classes. So if you think that categorical properties can be causes, but balk at dispositional properties as causes, Mumford can reply: but they are the same properties! With this issue in mind, let us move on to the ontology of dispositions.

V - Property monism

At one point in the presentation of his functionalist account of dispositions, Mumford switches from talking of “dispositional properties” to “properties characterized dispositionally.” This sets the stage for his ontological position that the very same property may be characterized either dispositionally or categorically. When one characterizes a property dispositionally, one says something specific about its causal role. When one characterizes a property categorically, one does not say anything specific about its causal role, though according to the causal criterion of propertyhood (which Mumford accepts), it must play some causal role or other.

He also puts his monist position in terms of truthmakers. Take “D” to represent a dispositional predicate, and “C” a categorical predicate. Suppose both D_a and C_a are true. He proposes that if C is the categorical “base” or “ground” for D, then the very same property of a (or rather, a's having that property) makes both D_a and C_a true.

In the second part of the book, Mumford defends this monist ontology against the property dualist, who thinks there are both categorical and dispositional properties, with neither being reducible to the other. He also defends it against the varieties of property monist who think either that all

properties are or may be reduced to the purely dispositional, or that all properties are or may be reduced to the purely categorical.

Chapter 5 introduces this debate in the guise of a discussion of the "bases" of dispositions. As Mumford portrays them, the property dualist and the categorical monist typically believe something like this: every disposition has a categorical base, which somehow "explains" the disposition. The categorical monist thinks that the disposition is reducible to, or can be eliminated in favour of, its categorical base. (Armstrong ought to count as a categorical monist too, although he now takes dispositions to be reducible to categorical bases *plus laws of nature*, and not just categorical bases as he formerly held.⁵⁰ Mumford only considers Armstrong's older view.) The dualist thinks a disposition and its categorical base are distinct, and posits a causal, supervenience, or some other non-identity relation between a dispositional and a categorical property.

The typical property dualist's position may be summarized by Prior, Pargetter, and Jackson's "Three Theses About Dispositions"⁵¹:

- 1) each disposition has a causal base
- 2) each disposition is distinct from its causal base
- 3) dispositions are causally impotent.

A disposition is causally impotent because it is a second-order property. It is the property of having a first-order (categorical) property that plays a certain causal role.

The typical categorical monist rejects (2) and (3), replacing them with:

- 2') each disposition is reducible to (or can be eliminated in favour of) its causal base.

The eliminativist accepts (3), whereas the reductionist replaces it with:

- 3') dispositions are causally potent,

⁵⁰ See Armstrong's contributions to *Dispositions: A Debate*, and *A World of States of Affairs*.

since the disposition is causally potent if the categorical base to which it is reduced is. Mumford accepts (1). And like the reductionist categorical monist, he accepts (3'). But he rejects (2') and replaces it with:

2'') each disposition is identical to its causal base

This does not seem very different from the categorical monist's position on the face of it. (Isn't property reduction really just identity?) But Mumford denies that he is a categorical monist. What can he possibly mean?

The idea is that real properties are neither truly dispositional nor truly categorical. Perhaps they are both, perhaps neither. But the property picked out by a dispositional term, and the property picked out by its corresponding categorical base term are identical. (Note this requires a sense-reference distinction for predicates, and Mumford cites Armstrong in defense of such a distinction.) There is no reduction, in either direction.

Mumford's argument for his position is very simple:

- (1) Disposition d = the occupant of causal role R (by the functionalist account)
- (2) Categorical base c = the occupant of causal role R (determined by doing some science)

Therefore,

- (3) $d=c$.

His monist position is clarified, and some problems become evident, when Mumford tries to rebut some objections to this simple argument.

The most obvious objection is a multiple realizability argument analogous to such arguments in the philosophy of mind. The very same disposition type, the argument goes, can have different types of bases. Such variably realized disposition types can't be identical to any base type. Mumford takes variable realization to be plausible in the case of dispositions like solubility and fragility. But if a disposition type d can have various possible types of categorical bases, c_1 , c_2 , and c_3 , how can d be identical with any of them, as Mumford wishes to

⁵¹ American Philosophical Quarterly, 19(3) July 1982 pp. 251-7.

maintain? If d is identical with its categorical base, then it follows that $d=c_1$, and also that $d=c_2$, from which follows $c_1=c_2$, *contra* hypothesis.

Mumford's response is to replicate a common move in the philosophy of mind, from a thesis of type-identity to a thesis of token-identity. He proposes that each *instance* of a disposition is identical to an *instance* of a categorical base; a's having that property instance is what makes both Da and Ca true. In conjunction with his belief that there are both dispositional and categorical universals, I believe that this move renders Mumford's position incoherent. I think he would be better off accepting that all universals are *both* dispositional and categorical, and that both dispositional and categorical *predicates* apply to their instances. I will devote this section to the flaws in Mumford's position and the corresponding benefits to my alternative suggestion.

In many places Mumford commits himself to the existence of dispositional universals as well as categorical universals. As a consequence of denying type identity Mumford must (and does) deny the identity of the universals d and c_1 , where an instance of c_1 is the categorical base for an instance of d . (Presumably, universal d is grounded by two different categorical universals, c_1 and c_2 , in virtue of two different instances of d , d_1 and d_2 , having c_1 and c_2 as categorical grounds or bases. The primary use of "ground" or "base" is the second one, i.e. its primary application is to instances.) *Prima facie*, his denial of the identity of d and c_1 must surely endanger his position that the *tokens* of d and c_1 - d_1 and c_1 - are identical.

A universal is strictly identical in its different instantiations. Armstrong calls this principle of "instantial invariance" a truism. It is part of the very notion of a universal: it is something that two things literally *have in common*.⁵² (This is how universals may be invoked to explain similarity. Two objects are similar in virtue of partial (numerical) identity, the identity of a universal.) I find it easier to think about the principle of instantial invariance and the numerical identity of a universal across its different instantiations in terms of the corresponding trope

⁵² See *A World of States of Affairs* p. 27, p. 85; *A Theory of Universals* (Cambridge UP, 1978) Ch. 19, sec. VII.

formulation.⁵³ The equivalent in trope theory of a multiply instantiated universal is a class of exactly resembling tropes, where the resemblance is not in a respect, but rather *tout court*. The trope theorist's formulation of the principle of instantial invariance is the truism that for two tropes to be members of the same class of exactly resembling tropes, they must be exactly resembling.

Now, according to Mumford's token-but-no-type-identity thesis, two instances of *d*, d1 and d2, are identical to instances of *different* categorical universals, *c*₁ and *c*₂. That is:

d1 = c1

d2 = c2

Speaking in trope terms, d1 and d2 are exactly resembling. But exact resemblance *tout court* is transitive, so c1 and c2 must be exactly resembling. But this is *contra hypothesis*, since c1 and c2 are instances of different universals, and are therefore (in trope terms) *not* exactly resembling. To suppose that c1 and c2 exactly resemble would be to countenance the existence of the disjunctive universal <*c*₁ or *c*₂>, something Armstrong is very much against, precisely because it violates instantial invariance.⁵⁴ Denying as he does the principle of instantial invariance, I do not understand Mumford's notion of a universal. (Mumford apparently misinterprets, and thus gives short shrift to a similar objection offered by Elizabeth Prior, pp. 159-60.)

Here is another way, in universals terms, to make the same point. On the non-Platonic, Aristotelian/Armstrongian view of universals, they do not exist over and above their instances. Further, universals are fully present in a single instance. That is, when two particulars instantiate the same universal, they don't somehow possess *parts* of the universal, they don't share it like we might share a chocolate bar. They share the universal, not its parts, for it doesn't have parts. Suppose, now, following Mumford's view, that two universals share an instance.

⁵³ Some can't make sense of similarity that isn't similarity in some respect; so much the worse for tropes, they say, universals are for me. Others can't make sense of the identity of a universal in its multiple instantiations; so much the worse for universals, they say, tropes are for me. Some can't make sense of either; so much the worse for properties, they say, classes of objects are for me. Myself, I don't think there is any contentful dispute between the trope theorist and the universals theorist. They are both describing, in their own way, *properties*, and the "mysteries" of primitive resemblance and multiple instantiation (really the same "mystery") are only mysterious if one makes the mistake of treating *properties* like *objects*.

⁵⁴ *A World of States of Affairs* p. 27.

Not: an object instantiates both universals, but: an object possesses an instance of a property that is an instance of two universals. Then both universals are fully present in that instance. How, then, can we distinguish the two universals? It seems they are one. We might try distinguishing them by noting that even though in this case the universals have an instance in common, there do exist particulars that instantiate one but not the other. But that would be to accept that universals have parts, *contra hypothesis*. The principle that universals are fully present in a single instance, and thus have no parts, is just the principle of instantial invariance seen from another angle.

Mumford also allows that a token of disposition d_1 may be identical to a token of the distinct disposition d_2 (p. 163). Suppose the token $\underline{d1} = \underline{c1}$. The categorical universal (or rather its instances) can play several different causal roles, e.g. the causal role of dissolving in water, and the causal role of tasting sweet on the tongue. So $\underline{c1}$, besides being an instance of d_1 (causes dissolving in water), is also an instance of d_2 (causes a sweet taste on the tongue), i.e. $\underline{c1} = \underline{d2}$. Therefore, $\underline{d1} = \underline{d2}$. Dispositional universals are individuated by their causal roles, but their instances are not. This is a bizarre view, to say the least. And again, it runs afoul of the principle of instantial invariance.

An easy way out of his problems with instantial invariance would be for Mumford to keep the formulation of his monism in terms of the application of predicates, but drop the incoherent token-identity thesis. He could say that the property instance referred to by the disposition predicate in “Da”, and the property instance referred to by the corresponding categorical term in “Ca” are identical. There is no mention here of two different universals, a dispositional universal and a categorical universal. He could hold that there was only one universal, maintaining that the dispositional/categorical distinction was not a distinction among universals but rather among predicates or concepts. Thus we have one property (universal or instance) and two ways of describing it. At one point in the elucidation of the token-identity thesis, Mumford seems to endorse just such a view:

... if every disposition property token is numerically identical to some categorical token, there is just one token of a particular with two ways of characterizing it.

He actually says that the property token is a token of two different universals, a dispositional universal and a categorical universal. What he should say is that the token is of a universal that is neither purely categorical nor purely dispositional.

Mumford's basic position is that the dispositional/categorical distinction is not ontological, but merely conceptual. And he includes universals as part of his ontology. Why, then, does he countenance distinct dispositional and categorical universals? Mumford has a number of desiderata and commitments that force him to accept his strange view of universals where the principle of instantial invariance is discarded.

A. Dispositions are real properties, as opposed to mere shadows cast by predicates.⁵⁵

He also accepts

B. Real, concrete properties must be causally relevant.

Since he takes the causal relevance of properties to be the same as those properties being potential causes, he must say:

C. Dispositions are causes.

(Perhaps the desideratum that dispositions be real properties also motivates him to countenance purely dispositional universals.)

There are two types of theories in the philosophy of mind that are called functionalism. The first is functional specifier theory, the second is functional state identity theory.⁵⁶ It turns out that Mumford's desiderata and commitments

⁵⁵ Since he allows abstract dispositions and abstract properties, this commitment should really be: Concrete dispositions are real concrete properties, as opposed to.... I'll ignore this addition since I'm ignoring abstract dispositions. Mumford himself puts very little emphasis on them.

⁵⁶ See Ned Block, 'What is Functionalism', in *Readings in the Philosophy of Psychology*, vol. 1 (Harvard UP, 1980) pp. 171-184.

A-C above make it impossible for him to accept either type of functionalism. And this is what explains his refuge in that strange view of universals.

Classic functional state identity theory has its source in Putnam.⁵⁷ Given a property reading, the functional state identity theorist thinks e.g. pain is a functional property. That is, pain is the property of having a property that plays a particular causal role.

Functional state identity theory has been adopted as a theory of dispositions by Prior, Pargetter and Jackson.⁵⁸ Various properties⁵⁹ C_1 to C_n of objects O_1 to O_n , can ground the same disposition, D , had by O_1 to O_n . When this is the case, C_1 to C_n play the same causal role R , i.e. some circumstances plus C_1 or C_2 or C_3 ... necessitates the manifestation event of, say, breakage. So O_1 to O_n have something in common: they each have a property that plays causal role R . Having disposition D is thus second order; it is the property of having a property that plays a certain causal role. For example, a glass vase and a quartz crystal are both fragile, which is to say that they each have a first order property that plays the causal role of fragility. Since these two first-order properties play the same causal role, the vase and the crystal have something in common, namely the property of having a property that typically causes breakage in certain circumstances.

On this view, it is the first order properties that are causally operative. They are the ones that get in on the singular necessitation relation. The second-order properties are causally inert. So if Mumford were to accept functional state identity theory, and say dispositions are second-order, functional properties, he could not maintain that dispositions are causes (as long as he accepts an *in re*, realist view of causation, which he does.) This is the rejection of (C) above, which would force him to reject (B), and then (A), as well as his functionalist account of dispositional concepts as given in the early chapters and chapter 9, due to the causal element of this account.

What about functional specification? Lewis and Armstrong are functional specifiers. Given a property reading, the simplest version of the functional

⁵⁷ 'Minds and Machines', in Sidney Hook (ed.) *Dimensions of Mind* (New York UP, 1960).

⁵⁸ 'Three Theses about Dispositions.'

⁵⁹ Which PPJ take to be categorical, but this is inessential to the view.

specification theory says that “John is in pain” is true iff John (or a subpersonal part of John) instantiates a property that occupies a particular causal role. “Pain” is a non-rigid designator that denotes the property that occupies that causal role. (In the philosophy of mind, “property” in the previous sentence is usually taken to refer to universal or class - this gives rise to special epicycles (see Lewis on Mad Pain and Martian Pain). Here I will use the more straightforward property instance reading.⁶⁰) In different cases, different property instances will occupy the role in question, so the referent of “pain” will differ from case to case.

The basic difference between the two views is that on the functional state identity theory, “pain” denotes a second-order functional property, whereas on the functional specification view, “pain” (flaccidly) denotes a first order causal role occupier, a property-instance. The functional specifier, unlike the functional state identity theorist, *can* say that pain is a cause, or causally relevant property. Would it not then be natural for Mumford to import this view into a functionalist theory of dispositions? “The replicas’ fragility,” then, would denote the property instance of the replicas that is causally efficacious for their breaking. The replicas’ fragility causes them to break.

The problem is that Mumford wants to accept, or at least leave open the possibility, that causal role occupying properties are always *categorical bases*. But if “the crown jewels’ fragility” designates a categorical base, why think there is some dispositional *property*, the jewels’ fragility, that is causally efficacious? Mumford is worried about someone taking the following position: It is the categorical property instance that does the causing. When we say “the crown jewels’ fragility” we are just using a dispositional term to describe a categorical property. We are specifying it via its functional role.

So the functional specifier view also leads to a denial of the existence of dispositions.⁶¹ What is Mumford to do then? I suggest that we view Mumford’s token-but-no-type-identity thesis, and the accompanying view of universals that

⁶⁰ Mumford ignores the property instance reading (see p. 207).

⁶¹ We might say there is a property, call it “being fragile”, that all fragile things have in common. Perhaps it is causally relevant? It can’t be - it’s nothing more than the functional state identity theorist’s functional property, which is second-order and therefore causally inefficacious. And if it is first-order, it is highly disjunctive, and therefore unsuited to be a cause. See David Lewis, ‘Reduction of Mind’, in S. Guttenplan (ed.) *A Companion to the Philosophy of Mind* (Oxford: Blackwell, 1994) pp. 412-431.

repudiates the principle of instantial invariance, as an attempt to embrace *both* functional specification theory and functional state identity theory. He needs dispositions to be first order so they can be causes/causally relevant, and thus real according to the causal criterion of propertyhood. He gets this from the functional specifier view, which says the disposition is the property-instance occupant of the relevant causal role. But he doesn't want it to turn out that this property instance is an instance of a categorical property, functionally specified; that would endanger the reality of dispositions. So he takes from the functional state identity theorist the view that the disposition is a property, *rigidly designated* now, that plays a certain causal role. This property is had by all things that have the disposition question, unlike its various categorical "realizers."

We might think of this stage of the dialectic as a property dualist position that for every categorical property, there is, necessarily co-instantiated with it, a dispositional property. And both the categorical property instance and its accompanying dispositional property instance are causally efficacious and causally sufficient (given the other requisite circumstances) for their effects. But this position is clearly ludicrous: there is a serious problem of causal overdetermination, and an unexplained necessity. So what does Mumford do, at the end of this rational reconstruction? He identifies the two property instances! And then we have his actual view, where there are two universals (a dispositional property and a categorical property) that have an instance in common, namely the causally efficacious property instance that may be described either categorically or dispositionally. It may be described either way, because it is an instance of both a categorical universal and a (distinct) dispositional universal. But of course that lands him in a position where he must deny the truism of instantial invariance.

Note again how my suggestion would solve his problem. If he maintained that *neither* property instances nor the universals of which they are instances could be classified as purely dispositional or purely categorical, he would satisfy all his desiderata, meet his commitments, and not run afoul of the principle of instantial invariance. Dispositions would be first order, thus capable of being causes, taking the causal relation to be the singular relation of necessitation between a disposition and its actual manifestation. Being causes,

they would count as genuine properties according to the causal criterion. And further, the essence of Mumford's conceptual account of dispositions, including the causal component, would be vindicated. Why doesn't he take advantage of this view, with all its virtues? I suspect it may be because of how he thinks of the categorical, due to the examples that he and others dwell on. I will now briefly comment on this suspicion.

Recall the distinction between structure₁ and structure₂. Structure₁ was a purely geometrical concept, while structure₂ was a partly dispositional concept. I argued that structure₁ was causally inert, i.e. not causally operative. But, one might think, surely structure₁ is a perfectly real feature of an object. If you go in for universals, you might think: surely it is a perfectly good universal. This could even be underwritten by the causal criterion of propertyhood: structure₁ can be causally relevant through being a "relational requirement" for the manifestation of a disposition. This might be sufficient for it to count as a property. But structure₁ isn't dispositional because it's not causally operative like a disposition. So, Mumford may have thought, there must be *two* types of universals, the categorical (structure₁) and the dispositional. Though, as a matter of fact (p. 207), it turns out that dispositions have categorical bases.

But this last move rests on a subtle equivocation. If Mumford is construing categorical universals as structure₁ universals, they cannot serve as categorical bases. A categorical basis is supposed to be a sufficient cause (given the right external circumstances, i.e. the manifestation conditions) of the grounded disposition's manifestation - it is supposed to be causally *operative*. But structure₁ is not causally operative. Only structure₂ is suitable as a categorical base, and it is a mixed categorical/dispositional concept. It includes among its application conditions the dispositions of the nodes of the structure, or the stuff shaped (see above). Mumford need not be tempted to regard structure₁ as a universal, a causally relevant property at all.

I would recommend accepting Armstrong's advice, and treating external relations differently from properties. Properties (or qualities, if you prefer) would be conceived along the lines of the naïve view of colour, *but not as purely categorical*; ontologically, they are dispositional as well. (This is Martin's

position.) But if you liked, you could take structure₂ to be just the sort of dispositional *and* categorical universal that I am recommending Mumford accept.

VI - Mumford's pure dispositionalism

Which brings me to the last issue I wish to discuss. Mumford ends Chapter 2 by considering a problem for the Humean that is quite severe. But we shall see that it also arises for Mumford himself, in only a slightly different form. It is the problem of “filling in space,” as Simon Blackburn has put it.⁶² Mumford draws our attention to a difficulty I alluded to at the beginning: how does one characterize matter non-dispositionally? At first glance, extension seems a fine categorical property, but extension isn't sufficient to make matter, to fill space. You need solidity too. But solidity, i.e. impenetrability, is a dispositional notion, so the Humean is obliged to analyse it into events. But these events involve the motion of matter, and so we have not yet arrived at pure occurrence. The dispositional elements of the matter in motion must be analysed away in turn. This seems to generate a vicious regress, as the Humean needs dispositionality, “mere potentiality”, to bottom out in occurrence, or actuality. As Russell put it in *The Analysis of Matter*:

There are many possible ways of turning some things hitherto regarded as “real” into mere laws concerning the other things. Obviously there must be a limit to this process, or else all the things in the world will merely be each other's washing.

It seems the Humean must always have dirty underwear. Mumford thinks the realist about dispositions has a ready answer to this problem: the regress stops with properties, real dispositions, the instances of which are also categorical. The categoricity should stop the regress, it is the property version of what the Humean was looking for in occurrent events. But is Mumford's ontology of dispositions really able to stop the regress?

It turns out that it does not, and it is again because of his conception of the categorical. In a number of places, Mumford grants the possibility of

⁶² ‘Filling in space’, *Analysis* 50 (1990) pp. 62-65.

ungrounded dispositions. Indeed, he places a great deal of importance upon them (p. 168):

... such specifications of charge, spin, and half-life are all that we can say about these things; they are their only properties and, arguably, they are all dispositional properties. Why these particles have these dispositions is inexplicable: there is no categorical base or underlying mechanism that explains their behaviour, for they are supposed to be without structure. Arguably, such ungrounded dispositions will always have to be posited at the bottom of everything because unless something inexplicable is granted, then we will have an infinite regress of explanatory mechanisms. He goes on to say that instances of ungrounded dispositions are “cases where something is missing, rather than cases where something extra is possessed.” Presumably what is missing is the fact that the instance is an instance of a categorical universal. It is only an instance of a dispositional universal. As much fun as it is to be mysterious, and say it might be structure “all the way down,” I doubt if anyone has any idea what this really means. Mumford recognizes this, and it forces him to assert that there are ultimately ungrounded dispositions at the base of everything.

He notes with approval William G. Lycan’s multi-leveled “homunctional” model of explanation, where the structure/function distinction “goes relative.”⁶³ A nerve cell gets a purely functional description in the context of a neural network explanation; each neuron occupies a node of a structure₁, and together the structure₁ and the functional (or dispositional, though Lycan gives “functional” a teleological reading) nature of the nodes add up to produce a structural₂ explanation of the network. Going down a level, a neuron may then be treated as a structure₂, composed of a spatially organized (i.e. structured₁) group of organelles, membranes, and ion-pumps that are construed functionally or dispositionally. This may be continued until some fundamental level is reached, where there is no structure₁ left. At that point, we reach ungrounded dispositions (p. 229).

⁶³ Lycan p. 38.

Mumford (and Lycan) accept the existence of the higher level properties, e.g. “being a neuron,” as being real dispositional (or functional) properties. And, says Mumford, the instances of these properties have both a dispositional and a categorical nature. That seems fine, since they are structures₂. But aren’t instances of structures₂ literally composed of instances of structures₁ and instances of dispositions? In other words, aren’t structures₂ complex properties that have simpler properties and relations as their constituents? This would be a reductionist position, at least an ontological reduction⁶⁴ even if no translation is possible. Mumford says nothing to dissuade us from this intuitive conclusion. The problem is that, if the “homunctional” explanation can be repeated down to the bottom level, what we are left with is structure₁ and ungrounded dispositions. In other words, what we have are particulars that instantiate pure dispositions and enter into spatial relations. How is this different from the puzzling picture that Russell portrayed with his analogy of dirty laundry?

C. B. Martin puts the puzzle like this:

Dispositionalists believe that all that appears to be qualitatively intrinsic to things just reduces to capacities/dispositions for the formation of other capacities/dispositions for the formation of other capacities/dispositions for the formation of.... And, of course, the manifestations of any disposition can only be further dispositions for.... This image appears absurd even if one is a realist about capacities/dispositions. It is like a promissory note that may be actual enough but if it is for only another promissory note which is..., that is entirely too promissory.⁶⁵

The point is that in a purely dispositional world, the manifestation of any disposition amounts merely to the acquisition of further dispositions. There is a sense in which nothing ever seems to *happen* in such a world. (The phenomenalist might end the regress with perceptual occurrences, the operationalist with measurings. Though it is rarely made explicit, this is to re-introduce something non-dispositional.)

⁶⁴ On the notion of ontological reduction see Martin, ‘On the need for properties.’

⁶⁵ ‘On the need for properties’ p. 215.

The same point might be made in terms of causal laws. If there are causal laws that do not supervene on their instances⁶⁶, causal laws that are important elements of reality such that they help bring about effects, given their causes, then these laws will have to have something to lock onto. On this picture, laws explain the dispositions of an object. An object has different dispositions in virtue of different properties (the stone is disposed to sink in virtue of its density, but to attract iron filings in virtue of its magnetic dipole.) So different laws must apply to an object in virtue of different properties of that object. So the object must have some non-dispositional, or categorical intrinsic properties in virtue of which different laws apply. (Mumford rejects the laws picture in the final chapter of the book, in favour of ultimate dispositions “as the basic, unexplained units of explanation,” p. 229.)

So dispositions as actual, abiding properties are not enough to remove Russell’s puzzle, as Mumford hopes (pp. 33-34). And the ontology that Mumford ultimately offers differs not at all from the ontology of the pure dispositionalist, like Mellor or Shoemaker⁶⁷, despite the fact that Mumford explicitly repudiates such an ontology (p. 183).

But there is, just possibly, a way out of the puzzle. It is available to Mumford if he drops his structural construal of categoricity, adopting instead the non-structural view that I illustrated by means of the naïve view of colour. Since the nodes of the very bottom level of structure₂ are not structured, Mumford is forced to regard the intrinsic properties of these nodes as purely dispositional. I recommend viewing these fundamental properties as having non-structural categoricity. This is exactly what Martin recommends in “On the need for properties: the road to Pythagoreanism and back.” Indeed, if Mumford were also to accept my recommendation to regard universals as *both* categorical and dispositional, his view would then differ from Martin’s only in that he accepts

⁶⁶ By “supervenience” I mean the “nothing over and above” relation. A mereological whole supervenes on its parts in this sense. See Armstrong *A World of States of Affairs*, especially Ch. 2, for an admirable discussion of this useful construal of supervenience.

⁶⁷ D. H. Mellor, *Matters of Metaphysics* (Cambridge UP, 1991), Introduction; Sydney Shoemaker, ‘Causality and Properties’ in *Time and Cause*, Peter van Inwagen (ed.) (Dordrecht: D. Reidel, 1980).

universals, whereas Martin is a tropes theorist.⁶⁸ Which isn't a difference that makes much difference.⁶⁹

⁶⁸ Although it seems that Mumford has trope theorist leanings - see eg. p. 225: "The Dretske/Armstrong account urges a position of causal connection holding between universals. I suggest, instead, that the dispositions of things can be understood as particulars - states or instantiated properties - such that the real causal connections are connections between particulars rather than universals."

⁶⁹ See fn. 53.