IS DISPOSITIONAL CAUSATION JUST MUTUAL MANIFESTATION?

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Abstract

Dispositional properties are often referred to as ‘causal powers’, but what does dispositional causation amount to? Any viable theory must account for two fundamental aspects of the metaphysics of causation – the causal complexity and context sensitivity of causal interactions. The theory of mutual manifestations attempts to do so by locating the complexity and context sensitivity within the nature of dispositions themselves. But is this theory an acceptable first step towards a viable theory of dispositional causation? This paper argues that the reconceptualization that the theory entails comes at too high a price, and is an unnecessary step in the wrong direction: these two central aspects concerning the metaphysics of causation can and should be accounted for in a dispositional account of causation without it.

The discussion concerning the ontological nature of dispositions – or ‘causal powers’ – has become ubiquitous in modern metaphysics. Dispositional properties have been utilized to explain all manner of different things, but most recently, and I think, most importantly – modality and causation. It is the last of these that this paper will focus on, for it is qua a conceptual tool towards establishing a theory of causation based on dispositions that the theory of mutual manifestations (MM) was proposed. MM was first proposed explicitly by C.B. Martin1 and John Heil2, and it has more recently been defended by Stephen Mumford and Rani Anjum3 – all of these authors attempt to utilize MM as a means of developing a dispositional theory of causation.

MM can be encapsulated in a slogan: ‘Many Dispositions, One Manifestation’. More specifically, the theory says that there is no such thing as a manifestation of a single dispositional property.4 For every manifestation event, there are at least two dispositional properties involved. And, furthermore, the manifestation is brought about by both of the dispositions – not merely one or the other. Hence, both dispositions are called ‘manifestation partners’, as the responsibility ‘comes from both sides of the partnership in their mutual manifestation’.5 An example that both Martin and Mumford & Anjum offer concerns the classic case of salt’s solubility. Thus Martin:

Water has the directedness of a dispositionality as solvent for salt...for the mutual manifestation of coming into a solution of salinity. And salt has a directedness and dispositionality as soluble in water...for that same mutual manifestation of coming into a solution of salinity.6

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4 Or, at the very least, most manifestations are not the result of single dispositional properties.
5 Charles Martin, Mind in Nature, p.60
6 Charles Martin, Mind in Nature, p.88
Now the above example is really only a toy case for, according to MM, there simply is no upper limit on how many dispositions might come together to produce a single manifestation – indeed, proponents of MM admit that the usual case will involve a great multitude of dispositions producing a single manifestation. Perhaps for a particular manifestation 10, or even $10^{20}$ dispositions are required to “partner up”.

Needless to say, conceiving of dispositional properties as having manifestations only in tandem with some other dispositional property (or complex of properties) is undoubtedly a shift in our concept of the nature of dispositions – in particular, it is in stark contrast to our usual stimulus-response model, where a single disposition is responsible for its own particular manifestation – solubility for salt, solvent-ability for water, for instance. Why then ought we believe it?

1. Motivating the Theory of Mutual Manifestations: Accounting for Causal Complexity

As far as I can tell, there are two somewhat interrelated motivations for accepting MM, both of which are grounded on desiderata which arise from philosophical reflection concerning the intricacies of causal interactions. Having an account of such interactions which can satisfy these two desiderata is something that any adequate theory of causation – dispositional or otherwise – must do. The general motivation for accepting MM then is simple: it provides one with just such an account.

The first motivation concerns causal complexity, and it is the endorsement of the equal contribution of causal factors (hereafter, EC): all causal factors that contribute to the production of an effect/event are equally responsible for its production. Rather innocently, the motivation is founded on the idea that the everyday, run of the mill dynamic events with which we are all familiar are not caused by a single causal factor, but rather a conglomeration of such factors. So, for instance, the event that is the lighting of the match requires not just that the match be struck, but also that it have an appropriately low moisture content, that sufficient oxygen is present, etc. That dispositional properties require such a wide variety of “enabling” conditions is now hardly contested, and it has recently functioned as the basis for a strong argument against those properties’ cherished truthmaking role: because those other causal factors must always be taken into account, dispositions alone cannot necessitate the truth of their associated counterfactuals.

If we acknowledge that there are many causally relevant factors at play in any particular manifestation event, is there any principled, non-ad hoc justification for privileging one’s causal contribution over another’s? According to EC, the answer is no: there just is no fact of the matter concerning which of those factors are merely “background conditions” (the ceteris which must be in place) and which is an efficient cause (that oomph-bringing factor that brings about the event). If the distinction that we normally make between ‘condition’ and ‘cause’ is, as Mumford & Anjum put it, ‘primarily an epistemic one, rather than a matter for the ontology of causation’, then we might naturally conclude, with Martin, that the ‘so-called background conditions are every bit as operative as the identified dispositional entity’. MM accepts and accounts for EC by holding that one

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9 Stephen Mumford & Rani Anjum, Getting Causes From Powers, p. 32

10 Charles Martin, Mind in Nature, p.50
manifestation can be produced by many dispositions: the manifestation event of the lighting of the match, for instance, is not due to the causal contribution associated with a single dispositional property – that of the match – but to a plurality of dispositions in the same causal context, each equally required for the joint manifestation of that event.

The second motivation for accepting MM is grounded in the acknowledgement of the sensitivity of causal factors to their immediate causal context (hereafter, SC): a single causal factor can contribute to the production of various distinct effects/events as a result of it being in distinct causal contexts. With respect to dispositional causation, SC trades on the seemingly empirically verified fact that the effect of a single disposition can radically differ as a function of it operating within various distinct causal contexts – this phenomenon has been called dispositional pleiotropy. Martin’s example of pleiotropy is helpful here: Water thrown on burning wood and water (identically the same) thrown on oil burning on water has strikingly different mutual manifestations because of the difference between the reciprocal disposition partners in the burning wood and the oil burning on water.

What are we to make of situations like these? If one accepts MM, one can do away with the old, orthodox conception that there is a one-to-one correspondence between stimulus-conditions and manifestation events – for manifestations, on MM, are the results of a multiplicity of dispositions partnering together. And if one has abandoned that one-to-one correspondence, then it seems conceptually open to MM to allow that a particular disposition mutually manifests not only with some particular grouping of other dispositions, but that many distinct partnerings are permissible. And within the various partnerings that a particular disposition participates in, that disposition becomes responsible (along with its various partners) for bringing about a distinct manifestation event – thus ‘[p]owers can…have different partners for the production of different mutual manifestations’.

So not only does MM endorse ‘Many Dispositions, One Manifestation’, but it is also endorses ‘One Disposition, Many Manifestations’. Given that a single disposition may have multiple manifestation partners on MM, the theory seems to be able to account for dispositional pleiotropy. Thus Martin: ‘In one case the [water] helps extinguish the fire while in the other it exacerbates the fire. Thus one disposition manifests itself in two radically different ways given different reciprocal partners.’ So, MM can account for SC.

2. Dispositional Pleiotropy on MM: Two Problems

The aim of this paper is to show that MM’s method of accounting for the two central aspects of dispositional causation that function as its raison d’être is conceptually unattractive, and all else being equal, ought to be rejected. The dialectic is in two parts: I first show that the reconceptualisation that MM requires in order to account for those aspects makes an ontological mess of our conception of dispositional properties, and then claim that another, competing theory can account for them in a much tidier fashion. Importantly, I do not mean to offer even an implicit endorsement of that rival

12 Charles Martin, Mind in Nature, p. 90
13 Stephen Mumford & Rani Anjum, Getting Causes From Powers, p.35
14 Charles Martin, Mind in Nature, p.90
theory—it is used here only as a rhetorical foil to help lay bare the shortcomings of MM’s methodology. But before I get to that alternate view, I want to pick out a few problems with the way in which MM claims to account for those aspects of an account of causation. Consider first with the latter of them—MM’s account of dispositional pleiotropy.

Call the type of dispositional pleiotropy at issue here—captured by the slogan ‘One Disposition, Many Manifestations’—pure pleiotropy. Notice that endorsing pure pleiotropy entails that a single dispositional property cannot be defined by a single manifestation, as MM ‘allows that [an] identical dispositional state with different reciprocal disposition partners can have different mutual manifestations’. But this means, as Martin notes, that ‘[t]he character of a dispositional state derives from the pattern and complex variety of alternative manifestations (under a range of kinds of manifesting conditions) to or for which it is directed’. On MM then, dispositions are individuated not by a single characteristic manifestation, but by an entire range of possible manifestations, each correlated with respect to unique partnering relations; indeed, if Martin is correct, that range encompasses an ‘infinity of alternative manifestations’.

Not only might these possible manifestations be infinite, but they will also be quite astonishingly complex—for according to MM, a single manifestation is the result of a multitude of dispositions causally “coming together”. So not only must a single disposition be defined by a great number of possible manifestations, those manifestations must themselves be quite complex—for they are inexorably linked with the manifestation partners with which they require to occur, and these relations are at best dyadic, but more than often (and perhaps always) polyadic. Clearly, spelling out the nature of a dispositional property gets rather complex rather quickly.

There are two problems here—one epistemological, and the other metaphysical. Consider the epistemological problem first: if dispositional properties are to be individuated according to an entire array of wholly distinct possible manifestations, how could we ever come to know when we have an instance of a particular dispositional property? For we can no longer pick out a disposition by means of knowing its characteristic manifestation conditions (nor its characteristic stimulus conditions, mind), because its “characteristic” manifestation is perhaps only its most frequent, or perhaps its most theoretically interesting manifestation. Given that, as Martin makes clear, the “depths” of the possible manifestations of a disposition are unfathomable, we might have a genuine epistemological worry that we could never come to really know the nature of even a single dispositional property—we could only come to know a few aspects of it, as it were. And, to make matters worse, we might wonder, on account of this epistemological hiddenness, what is to stop certain wild-eyed metaphysicians from claiming that each concrete particular has only one disposition.


16 Charles Martin, Mind in Nature, p.89
17 Charles Martin, Mind in Nature, p.183
18 Charles Martin, Mind in Nature, p.52
20 Charles Martin, Mind in Nature, p.52
which can account for all of the dispositional causation in which that particular participates?\textsuperscript{21} On what basis could we argue with them?

Perhaps the defender of pure pleiotropy will remain unimpressed with these epistemological concerns. Unfortunately, I think there is a larger metaphysical concern here: what is the underlying metaphysical explanation for why a myriad of qualitatively distinct manifestations can all come about from a single dispositional property? Now, if those manifestations were simply quantitatively distinct iterations of specific determinate values of one and the same determinable, this question would not be interesting or especially troubling: if we were to consider an object’s ‘flammability’, would we bat an eye when discovering that less fuel is followed by less fire? But according to pure pleiotropy, the types of manifestations that are available to any one dispositional property are largely qualitatively variable, and sometimes even seemingly exact opposites of one another – think of Martin’s example of water both extinguishing and exacerbating the flame. Given this type of variability, the question arises as to how exactly all of these manifestations are linked together, ontologically as features of one and the same property. In other words, why does a particular disposition have this seemingly wildly unrelated set of manifestations, and how are they related to one another, if at all?\textsuperscript{22} If we are to believe an account wherein such a disjointed set of manifestation-types all flow from the nature of a single property, we must be presented with an ontology of those properties from which such multifaceted features could be derived. For whatever reason, such an account has yet to be offered by the proponents of MM – and it is difficult to believe that one is forthcoming.

3. An Alternative View: The Vector Model of Dispositional Causation

I have yet to raise any objections to MM’s first motivating factor – namely, its ability to account for EC. However, I do not have any straightforward objections to MM’s particular method of accounting for that tenet. My objection to that method is, as it were, by way of comparison. I maintain that there is an alternative view of how many dispositions are causally relevant in the production of a single event – one that also accounts for the context sensitivity of dispositions’ causal contribution. I will propose that this alternative view is not only is free from the problems associated with pure pleiotropy outlined above, but it accounts for both of the motivating factors of MM in a unified fashion – something MM cannot do. Again, I do not wish to endorse this view per se, and so will not be offering any detailed defence of it – the point is that its ability to for those two central factors in a unified fashion (and without revisionary metaphysics) is a desirable trait, one that any acceptable forthcoming theory ought to have, all else being equal.

The alternative view is the vector model of dispositional causation, and though its roots are found in Molnar\textsuperscript{23}, its fullest expression is found, paradoxically enough, in Mumford & Anjum.\textsuperscript{24} The vector model utilises a distinct representation of dispositional causation by plotting the actions of various dispositions (that is, their manifesting) along a quality space using vectors, identifying the

\textsuperscript{21}I have recently discovered that E.J. Lowe, ‘On the Individuation of Powers’, in Anna Marmodordo (ed.), The Metaphysics of Powers – Their Grounding and Their Manifestations (New York: Routledge, 2010), pp.8-26, brought up this very point in his defence of ‘single-track’ powers.

\textsuperscript{22}I find an appeal to primitiveness untenable here, especially because, as I will show in the following sections, there is an suitable, though wholly distinct explanation for the phenomena of dispositional pleiotropy.

\textsuperscript{23}George Molnar, Powers: A Study in Metaphysics

\textsuperscript{24}In fact, although the vector model of causation is perhaps the central philosophical contribution of Stephen Mumford & Rani Anjum, in Getting Causes From Powers, its tenets are rather frequently obscured by its attempts to successfully wed it to the theory of mutual manifestation, with which, as we will see, it is quite incompatible. In the spirit of charity however, let us just operate under the assumption that, from the rest of this paper forward, Mumford & Anjum reject the theory of mutual manifestation in favor of the vector model.
occurrence of causal effects just when those vectors are appropriately combined (utilizing additive and subtractive combination) such that their resultant passes a threshold point – see the figure below.

On the vector model, a quality space dichotomously represents events in a particular state of affairs – take the simple, one-dimensional case (represented above, where only one event is focused on) of the temperature of a particular room.

On one side of the quality space, there is a certain threshold which marks the event of the room being warm (G), and on the other, a threshold which marks the room being cold (F). The various dispositions of a number of entities within the room actively manifesting themselves are represented by the vectors within that quality space – each has a direction (towards one side of that space or the other – F or G) and an intensity, represented by their respective lengths. For instance, despite the fan being on subtracting from their effort by “pulling” in the opposite direction (toward F), the oppositely-directed “push” of the radiator being on, the windows being shut, and the candles being lit all additively contribute toward the resultant effect (R), which crosses the threshold (T) on one side of that quality space (G) being met, and thus the occurrence of the effect/event of the room being warm.

Although it has many interesting and important facets, the main tenet of the vector model pertinent to its contrast with MM is its insistence on a strict distinction between effects and manifestations. This distinction is spelled out, as Molnar has it, by the claim that “…a manifestation is typically a contribution to an effect, an effect is typically a combination of contributory manifestations.” Importantly, on the vector model, a coarse-grained effect is the resultant of the combination of a fine-grained multitude of manifestations of various dispositional properties. In other words, the individual vectors in the model represent the manifestations of individual dispositions, and the reaching of the threshold point represents the occurrence of an event, which is nothing more than the compositional sum of all of the manifestations involved.

Now here is the point: by the lights of the vector model, macro-scale, coarse-grained events – such as the “fire extinguishing the flame”, “the dissolution of salt in water”, or “the warming of a room” – are identified as effects, not manifestations. There are two important things to note here. Firstly, as in our previous example with respect to the fan, the workings of the individual dispositions’ manifestations in a particular causal set-up may not all contribute towards the occurrence of the same effect – in a great many (if not all) cases of causation, ‘an effect is typically produced by many

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25 Of course, multi-dimensional quality spaces could be considered; in the example below, the dispositional properties of the candles could be mapped to quality space which represents both the ‘lighting of a room’ and the ‘heating of a room’.


27 Nancy Cartwright & John Pemberton, ‘Aristotelian Powers’, p.109, endorse this dichotomy as well, in their discussion of dispositions composing nomological machines.

different factors working at once, some of them disposing towards the effect in question, and some of them disposing away.\(^{29}\) Secondly, those effects are not produced as some novel event – they are merely the emergent result of the composition of many distinct dispositions’ individual manifestations passing some certain point at which we would identify a significant effect as having occurred, as if ‘reaching a finishing line’\(^{30}\).

Thus, in many and important ways, the picture of dispositional causation that the vector model presents is very much distinct from that of MM. For, unlike MM, on the vector model, there is no novelty when it comes to the combination of many dispositions – there are just the individual manifestations of those dispositions, and the effect is simply a kind of resultant mosaic which is composed of the individual ‘push and pulls’ of these manifestations.\(^{31}\) As Mumford and Anjum put it, ‘...the resultant [the effect] and the components [the individual dispositions’ manifestations] are somehow the same things under different guises’.\(^{32}\) And because of this, there is no real sense in which that effect is the result of some kind of mutual partnership of the dispositions involved in its production – the only mutuality of those properties is that they are all individually contributing towards the resultant composition of that effect, and this is hardly the sense of ‘mutual’ that MM proposes – i.e. ‘Many Dispositions, One Manifestation’.

4. Accounting for Causal Complexities on the Vector Model

As I have said, the reason the vector model of dispositional causation trumps the theory of mutual manifestations is two-fold. The first is that it maintains the orthodox conception of dispositional properties being individuated by a single manifestation (or manifestation-type), and so does not have to deal with the epistemological and metaphysical problems (§2) arising from MM’s conception of pure pleiotropy. The second is that the vector model can not only account for and accommodate both of the factors that motivate the adoption of MM, but it also can do so in a unified fashion – let us see how.

Both EC and SC are motivating factors that centre around accounting for the complexity of dispositional causation. Can the vector model account for this causal complexity? Take EC first. Recall that the motivation claimed that while each causal event requires the obtaining of many quite distinct causal factors, there are no genuinely privileged factor, or factors – each causal factor is just as important as the next. As we have seen, MM accounts for this claim by positing that each of the factors – in this case causal powers, or dispositions – jointly causes a single causal event by means of their exhibiting a single, shared manifestation (which is the event). On the vector model however, the first half of that motivation is satisfied because, as Mumford & Anjum put it, ‘...whether, how and to what extent the effect occurs will be determined polygenically: by many factors working together’ – that is, many individual manifestations (represented by vectors) will be involved in the production of any one effect.\(^{33}\)

And the vector model likewise satisfies the second half of the motivation, for the non-privileging of any particular causal factor in the production of an effect is quite clear when one considers that a single effect is nothing more than a complex comprised of the many manifestations of

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29 Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, p.72 (emphasis added)
30 Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, p.72
31 As Jennifer McKitrick, ‘Manifestations as Effects’, in *The Metaphysics of Powers*, pp.73-83, at pp.81-83, points out, specifying precisely what the type or method of composition of these mosaics from manifestations is may require much more work. For a preliminary discussion, see Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, pp.27-30
33 Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, p.31
particular dispositions, and that effect occurs just when the sum of those manifestations “tips the scales” at the point at which we would wish to call their combinatory action a genuine causal event. With this in mind, Mumford & Anjum point out that, ‘…given such complexity, we can see how many different things have a right to be called a cause of the effect’. All of this entails that picking-out the causal factor – i.e. a particular dispositional manifestation – as the efficient cause of an effect then is only a pragmatic affair, for that causal factor may be the one that on this occasion that ‘takes the situation out of equilibrium’, but it by no means entails that all of the other dispositions’ manifestations are not equally contributing to the production of that effect.

What of SC? Recall that MM accounts for this by claiming that a single disposition may have multiple manifestation partners – I have called this the claim that dispositions exhibit pure pleiotropy. Now clearly the vector model cannot make use of pure pleiotropy – but it can utilize what we might call mixed pleiotropy. As I have said, the vector model holds (and in fact, must hold) that ‘[t]he same power must always make the same contribution’, because particular dispositions are individuated by their particular manifestations. However, as Molnar noticed, this is so in no way entails that a single disposition cannot ‘participate in the production of many different types of events’.

In the parlance of the vector model, the claim is that a single vector – representing a particular disposition’s manifestation – can operate within a variety of distinct quality spaces, aiding in the combinatory push and pull of a host of other vectors towards a threshold, where an effect occurs. Of course, with respect to any vector-based representation of a particular event/effect, a single vector has a particular meaning only with respect to that particular quality space (towards one side or another, with a certain level of intensity, etc.) – but importantly, that constraint is not the same as the constraint that the property the vector represents in that quality space can only act, or be represented as acting in that very space. If, according to the vector model, ‘effects’ are nothing more than the result of the composition of various dispositional manifestations, then there is not any prima facie conceptual or metaphysical constraint on any particular manifestation to act within the context of the production of only a single, particular effect – and therefore no constraint on any manifestation being represented within any single, particular quality space.

Instead, every dispositional property is capable of causally contributing to the composition of various distinct groupings of dispositional properties and their manifestations: the manifestation of the ‘flammability’ of a collection of wood in a fireplace, for instance, is not constrained to being causally conducive to only one event – it may contribute (together with a host of other active dispositional properties) to the lighting of a room, or to the heating of a room, or to the dryness of the room, etc. That said, the type of pleiotropy that the vector model allows is quite unlike the type that MM endorses: it is “mixed”, in the sense that the single manifestation associated with a dispositional property can be used together with and in many different combinations of other dispositions’ manifestations to compose a variety of distinct effects. This mixed pleiotropy is, I think, all that is needed to account for SC – and given the problems associated with pure pleiotropy, I think it is clearly preferable.

34 Stephen Mumford & Rani Anjum, Getting Causes From Powers, p.31
35 Stephen Mumford & Rani Anjum, Getting Causes From Powers, pp.32-34, provide a few interesting examples about the timing of a particular dispositions’ manifestation often being the reason why we pragmatically designate a particular disposition as the efficient cause of an effect – namely because it is the “last factor” which, added to the others, causes the threshold for that particular effect to be met.
36 George Molnar, Powers, p.194
37 George Molnar, Powers, p.194
Lastly note that, as I have said, the vector model can account for both motivations concerning causal complexity in a unified fashion, due to its conception of events/effects as composed from a multitude of individual dispositions' manifestations. For from the vector model’s conceptualisation of events/effects as ‘mosaics’ wholly composed of a collection of dispositional manifestations, EC and SC are directly derivable: each ‘piece’ contributes equally to the formation of a mosaic – no one piece plays the composition role any more than any other – and, because mosaics are emergent in a certain respect, a single piece (in conjunction with many other distinct pieces) can contribute to the composition of many distinct mosaics. On MM’s conception of events/effects, you can easily derive EC, as two or more dispositions are required for any single manifestation, but note that deriving SC takes extra metaphysical machinery: even if multiple dispositions are required for a manifestation to occur, it does not follow that a single disposition is able to have multiple partners with which it is capable of producing manifestations; there could be, for instance, only one particular group of dispositions with which a single disposition is able to be partnered with for the production of a single manifestation.

In contrast, the vector model can account for both motivations in a unified fashion, as both principles flow naturally from its conception of events/effects: in virtue of not equivocating ‘manifestation’ and ‘event/effect’, and holding that the latter are in fact composed of the former, one can get both EC and SC. Not only is this something that MM cannot achieve, but it is something the vector model achieves without the utilisation of revisionary metaphysics, retaining the ‘One Disposition, One Manifestation’ paradigm. Taken together, these facts highlight the shortcomings of MM’s approach.

**Summing Up**

The two motivating assumptions concerning the complexity and context sensitivity of causal events that lead to the adoption of MM can be accounted for without that theory. Furthermore, given that if one accepts MM, one will have to face some serious problems concerning the nature of dispositional properties (§2), it ought to be abandoned in favour of a less revisionary picture. The vector model represents just such a theory – one that neatly accounts for both of the facts concerning the causal complexities of dispositional activity in a unified fashion, and which does not require an entirely novel, and I think, plausibly inoperable conception of dispositions. Even if that model fails to perfectly capture the phenomenon (for it too has its share of flaws38), its relative success in the aforementioned central areas ought to cast a strong shadow of doubt upon a theory like MM: dispositional causation – whatever it turns out to be – must be something other than simply mutual manifestation.

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