

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 salinity⁶

¹ Charles Martin, *The Mind in Nature* (Oxford: Oxford University Press, 2008)

² John Heil & Charles Martin, ‘The Ontological Turn’, *Midwest Studies in Philosophy* (1999), pp. 34-60, and Charles Martin & John Heil, ‘Rules and Powers’, *Nous* (1998), pp. 283-312

³ Stephen Mumford & Rani Anjum, *Getting Causes from Powers* (Oxford: Oxford University Press, 2011)

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

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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.⁷ Perhaps for a particular manifestation 10, or even 10²⁰ 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.⁸

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’⁹, then we might naturally conclude, with Martin, that the ‘so-called background conditions are every bit as operative as the identified dispositional entity’.¹⁰ **MM** accepts and accounts for **EC** by holding that one

⁷ See especially Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, Chapter 2, and Charles Martin, *Mind in Nature*, Chapter 5.

⁸ See for instance my article ‘The Truthmaking Argument Against Dispositionalism’, *Ratio* (2014), doi:10.1111/rati.12071, and also Antony Eagle, ‘Causal Structuralism, Dispositional Actualism, and Counterfactual Conditionals’, in T. Handfield (ed.), *Dispositions and Causes* (Oxford: Oxford University Press, 2009), pp. 65-99, Trenton Merricks, *Truth and Ontology* (Oxford: Oxford University Press, 2007), and John Heil, *From an Ontological Point of View* (Oxford: Clarendon Press, 2003).

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*.¹¹ 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 water¹²

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'.¹³

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'.¹⁴ 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

¹¹ See George Molnar, *Powers: A Study In Metaphysics* (Oxford: Oxford University Press, 2003), and Stephen Mumford & Rani Anjum, *Getting Causes From Powers*. The term 'pleiotropy', as Molnar (2003, p.194) notes, is borrowed from developmental genetics.

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*.¹⁵ 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'.¹⁶ 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'.¹⁷ 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'.¹⁸

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.¹⁹ 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.²⁰ 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

¹⁵ I should mention that 'pure pleiotropy' is not a novel invention of **MM**, but has been floating around the literature for some time now. For instance, Alexander Bird, *Nature's Metaphysics: Laws and Properties* (Oxford: Oxford University Press, 2007), Neil Williams, 'Putting Powers Back on Multi-Track', *Philosophia* 39: 3 (2011), pp. 581-595, and Barbara Vetter, 'Multi-Track Dispositions', *The Philosophical Quarterly* (2013), pp.330-352, promote a theory akin to it by endorsing 'multi-track' dispositions, while Brian Ellis, *Scientific Essentialism* (Cambridge: Cambridge University Press, 2001) conceives of a single causal property as grounding a wide set of 'behavioral dispositions', and Jonathan Jacobs, 'Powerful Qualities', *The Monist* (2011), pp.81-102, refers to it as the 'blue print' view about dispositions.

¹⁶ Charles Martin, *Mind in Nature*, p.89

¹⁷ Charles Martin, *Mind in Nature*, p.183

¹⁸ Charles Martin, *Mind in Nature*, p.52

¹⁹ Cf. Nancy Cartwright & John Pemberton, 'Aristotelian Powers: Without Them, What Would Modern Science Do?', in John Greco & Ruth Groff (eds.), *Powers and Capacities in Philosophy: The New Aristotelianism* (New York: Routledge, 2013), pp.93-112, at pp.108-110, who also gesture towards the epistemological problems with what they call a 'causal profile account of powers' that **MM** makes use of.

²⁰ Charles Martin, *Mind in Nature*, p.52

which can account for *all* of the dispositional causation in which that particular participates?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?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 multi-faceted 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 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 Molnar²³, its fullest expression is found, paradoxically enough, in Mumford & Anjum.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

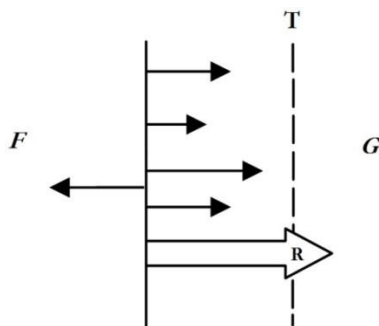
²¹ I have recently discovered that E.J. Lowe, 'On the Individuation of Powers', in Anna Marmodoro (ed.), *The Metaphysics of Powers – Their Grounding and Their Manifestations* (New York: Routledge, 2010), pp.8-26, brought up this very point in his defence of 'single-track' powers.

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.

²³ George Molnar, *Powers: A Study in Metaphysics*

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.²⁵ 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.²⁶ 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*.²⁷ 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’.²⁸ 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

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’.

²⁶ Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, pp.24-25

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

²⁸ George Molnar, *Powers*, p.195

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

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 McKittrick, '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

³² Stephen Mumford & Rani Anjum, *Getting Causes From Powers*, p.42

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’.³⁴ 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.³⁵

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.³⁶ 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’.³⁷

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.

³⁸ For good reviews of these, see Luke Glynn, ‘Review of *Getting Causes From Powers*’, *Mind* (2012), pp.1099-1106, and Anjan Chakravartty, ‘Review of *Getting Causes From Powers*’, *British Journal for the Philosophy of Science* (2013), pp.895-899.