

The Irreducibility of Dispositionality

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Abstract

The thesis that the modality of nature is irreducibly dispositional or tendential in character is associated with ancient and medieval philosophy but has returned to contemporary metaphysics. Causes dispose towards their effects in a way that is less than necessary but more than purely contingent. This theory of dispositional modality can be distinguished from the contingent necessity view, the latter which seems to be the considered view of some others who use the language of tendencies. The argument for treating such cases as conditional necessity does not look compelling *prima facie*, however, and a recent challenge to this conclusion is addressed. One argument for accepting the dispositional modality is that it can be experienced. Another is its explanatory power, which is then outlined in relation to metaphysics, action theory, ethics, epistemology and logic. The powers view, if it embraces the dispositional modality, is potentially as powerful explanatorily as Lewis's plurality of worlds, though without the disadvantage that those worlds are epistemically inaccessible.

PART ONE: THE DISPOSITIONAL MODALITY

1. The central claim

A thesis associated more with ancient and medieval philosophy than modern is that the modality of nature is irreducibly dispositional or tendential in character. Causes tend – but no more than tend – towards their effects. In many cases they succeed in producing them, when the disposition is manifested. They never necessari-

tate their effects but nor does nature consist of a mosaic of unconnected objects, as Hume argued (Hume 1739 and Lewis 1986a: ix).

This idea of there being an irreducible dispositional modality in nature was associated with Aristotle and Aquinas but has been revived in recent contemporary metaphysics (see Mumford and Anjum 2011a, 2011b). The core idea is that the modality of causation is the dispositional modality, connecting a causal power with its manifestation, where the dispositional modality is neither pure necessity nor pure contingency but something in between. This modality is *sui generis* and can come in various strengths. A disposition or power can tend towards an effect with a greater or lesser degree. While it admits a range of magnitudes, however, it would cease being the dispositional modality if it was so strong that it reached necessity. And where we have complete contingency, then we should say there is no tendency or disposition there at all.

A gene may dispose towards the development of a certain phenotype, for instance, or the dropping of a glass dispose towards its breaking. For it to be a real disposition, the connection between the dropping and the breaking – or between the gene and the phenotypic trait – has to be more than the complete contingency that Hume described. Where we have a disposition, there is a connection in the world that is more than ‘loose and separate’. This disposes or tends towards an outcome of a distinct type, of all those outcomes that might be logically possible. Hence, when the glass is dropped, it ‘might’ in some purely logical sense evaporate, explode, turn into a pig, grow wings and fly. But there is no natural disposition towards any of these things. Rather, the glass is disposed to break.

But the glass is not bound to break, as some anti-Humeans would suggest (Ellis 2001, Bird 2007). Clearly, some dropped glasses don’t break and some genes fail to manifest their associated phenotype. Things can go wrong in nature or get in the way. There can be interferers or preventers for any natural process. Hume (1739: 161) himself suggested that his opponents believed in necessities in nature but they needn’t do so. It is not as if a straight choice is to be made between Humean contingency and strict necessity. The dispositional modality is a third option and, as we have developed the account elsewhere (2011a, ch. 8), the one true worldly modality for describing an active, empowered nature.

This may sound good in theory, but why should anyone believe that this is the one true modality? There are two main reasons. The first is an argument from acquaintance. It is claimed (Mumford and Anjum 2011a: ch. 9) that we have direct experiential knowledge of the dispositional modality through being causally engaged with the world. We are causal agents and patients, and contrary to Hume's flawed volitional account of agency, we acquire knowledge of causation and its dispositional modality when we act and are acted upon. We will not repeat the details of the argument here but instead will concentrate on the second, less direct argument.

The second reason to accept the reality of this dispositional modality is its explanatory power, which we largely present in Part Two. This is a similar argument to Lewis's for the existence of a plurality of other concrete worlds (Lewis, 1986b). The argument is from their explanatory power. Lewis alleges that if we posit such concrete worlds then so many problems of philosophy are explained: causation, laws, counterfactuals, properties, and so on. Now that may be so. Positing such worlds might produce an explanation of all those things. But that still would not convince us to accept such an account if there are other ways of explaining such phenomena at least as well. Lewis's explanation is a unifying one, of course, but perhaps there is another explanation that is just as powerful and is also unified. This, we claim, is the case for the metaphysics of powers and its accompanying dispositional modality.

Of course, it might be argued that the best we can do is to offer an equally powerful metaphysics to that of Lewis. It then might be a stalemate, with nothing to choose between these two rival metaphysics. But this would be where the first argument for powers could be brought back into the reckoning. There is no adequate modal epistemology, for Lewis's theory. As worlds are spatiotemporally and thus causally discontinuous from each other, we have no way of knowing – for instance, perceiving – what is the case in other worlds: nor indeed any independent experiential evidence for their existence. The argument for them is purely in their explanatory power. But in the case of causal powers and their dispositional modality, we have argued that these are also known directly through experience. This combination, of explanatory power

and empirical evidence in their favour, makes for a persuasive case.

While Part Two will illustrate some of the explanatory potential of the account, we feel we also have to do a bit more work to outline the theory of the dispositional modality and why we should accept it. This occupies the remainder of Part One. We will first consider some of the historical sources. Certainly this view has been attributed to others but we will see that they did not all have a clear irreducible modality of tendency in mind. We will show how the dispositional modality differs significantly from a conditional necessity account, which might resemble it superficially. We will then answer one recent objection to the dispositional modality account as this gives a good flavour of the issues under debate.

2. Historical precedents and conditional necessity

There are some alleged precursors to the dispositional modality. The view that the world contains tendencies that dispose, and no more than dispose, towards their manifestations is arguably to be found in Aristotle, Aquinas, Geach, Harré and Madden, Bhaskar and Cartwright. We will not be offering a comprehensive historical survey here, which deserves a dedicated study elsewhere. But we will mention one recent strand of thinking that has come into analytic philosophy via Geach's interpretation of Aquinas. We will show how this has been understood in a way that is possibly not entirely consistent with a claim of dispositional modality. Indeed, we will argue that there is a rival conditional necessity view that is different from dispositional modality.

The contemporary source is Geach's chapter on Aquinas's philosophy of nature where the Thomistic account attributes tendencies towards certain outcomes that fall short of necessity (Geach 1961: 101f). An example is given to illustrate the tendency view. A heater is switched on in a room which tends towards its heating but doesn't necessitate it. Indeed, at the same time an air conditioner is also turned on that counteracts the effect of the heater. Thus, the power of the heater is being exercised and is tending towards an effect but one that is not being realised. The same can be said from the point of view of the air conditioning sys-

tem. It is tending towards the cooling of the room but its effect also cannot be realised. We have, thus, a simple case of mutual interference between two oppositely disposed powers. From this Geach concludes, rightly in our view, that powers cannot necessitate their effects, even when they are in the right conditions for their exercise. And, as we argued elsewhere (Mumford and Anjum 2011a: ch. 3), if powers do not necessitate their effects in cases where they are prevented from doing so, then they did not necessitate their effects even in the cases where they succeeded in producing them because there was always the possibility of prevention and interference, even if it did not happen as a matter of fact. Instead, then, we should think of those powers as tending, and no more than tending, towards their effects.

Whether Geach is right to attribute this view to Aquinas is moot. Geach gives no textual evidence at all to support his interpretation and this is work that ought now to be done. In particular, there are two ways of understanding these cases: as dispositional modality or as conditional necessity, two views we will distinguish shortly. Whether Geach's attribution was correct or well-documented, we nevertheless think that as a philosophy of nature it has much to recommend it. And it should also be said that it has proven influential.

Harré and Madden (1975: 98-100) argue for a tendency account, for instance, and follow Geach in attributing the view to Aquinas but cite no more evidence than Geach does. They say that they prefer the term 'power' over 'tendency' because they see the latter as suggesting passivity. There is a reason to have some scepticism that Harré and Madden were firmly wedded to a genuinely tendential view of nature, consistent with the dispositional modality, because they subtitle their book *A Theory of Natural Necessity*. The idea that powers irreducibly tend towards their manifestations says, on the contrary, that dispositional modality is neither complete contingency nor necessity. Dispositionality is not reducible to either. It is dispositionality that is the primary modality of nature, on this view.

This distinction between a commitment to a genuine dispositional modality and what can be called a conditional necessity view can be brought out into the open if we consider the more detailed statements in Bhaskar (1975). Bhaskar speaks of tendencies as con-

stituting the generative mechanisms of causal laws, where those tendencies can act transfactually, underlying and generating the occurring events. However, it is not obvious that tendency constitutes an irreducible dispositional modality in this view. A first clue is that, like Harré and Madden, Bhaskar uses the explicit language of *natural necessity* to contrast his view of science with Hume's (see e.g. Bhaskar 1975: 14 & ch. 3.3). And this does not seem to be a mere slip or unintended implication but much of what Bhaskar says there indicates a necessity view of nature or at least conditional necessity.

Certainly, Bhaskar's tendencies may be exercised without being manifest in any outcome (1975: 14) but he also says that they nevertheless provide an ontological basis for 'necessity in nature' (1975: 14). Tendencies are potentialities that can be in play without being realised or manifest in an outcome and, crucially, 'It is the idea of continuing activity as distinct from that of enduring power that the concept of tendency is designed to capture.' (1975: 50) So it is not tendency as irreducible *sui generis* modality that it is the point: it is the idea of continuing activity, possibly without manifestation (which is what Bhaskar means by *transfactual*).

When we get explicit statements specifically on the modality that tendencies bring, Bhaskar consistently lapses back into talk of necessity and seems to mean it seriously. For example: 'there must be a reason why, once a tendency is set in motion, it is not fulfilled. ... Once a tendency is set in motion it is fulfilled unless it is prevented.' (Bhaskar 1975: 98) So if undisturbed, the generative mechanism would result in the tendency's manifestation.

Later, he adds: 'When such tendencies are realized the events describing the stimulus or releasing conditions for the exercise of the tendency and its realization may be said to be necessarily connected' (1975: 214), which is followed by a concrete example: 'If a thing is a stick of gelignite it must explode if certain conditions materialize. Since anything that did not explode in those circumstances would not be a stick of gelignite but some other substance.' (1975: 214)

This suggests that there are various natural necessities that are able to cut across each other but, where conditions are propitious, it is necessary that they exercise: and they so exercise even if they are 'unfulfilled' or unmanifested due to a countervailing ten-

dency also operating. The latter feature is certainly a part of the Mumford-Anjum account: in equilibrium cases, for instance. But the idea of the irreducible *sui generis* dispositional modality does not seem to be a feature of Bhaskar's account. He may of course be insensitive to the distinction we are trying to draw, or he may just be failing to express adequately and clearly his view, but many times he invokes necessity in the cases where the conditions are conducive to manifestation. His tendencies might not always be in the right conditions to have their effects: but where they are, those effects are necessitated.

It should be clear by now that we are not persuaded by this rival reading of the natural modality: the conditional necessity view. One very simple reason is the coherence of a notion of conditional necessity. The very idea of necessity seems to mean unconditional, as Mill (1843: III, v, 6) emphasised. Certainly as necessity is understood philosophically, then if A necessitates B, B should occur whenever A occurs. If switching on the heater necessitates the warming of the room, then it should do so whenever it is switched on. But we have seen that there are conditions in which it will not do so: when an air conditioner is also operating. So in what sense is there necessity here? And a second challenge to the coherence of the notion is that if we allow necessity to be conditional – something that operates when all the conditions are right – then every truth will turn out to be likewise necessary, destroying any distinction between contingent and necessary truths. One might think that a particular door being white is a contingent truth because it could have been otherwise. But no doubt there were conditions assembled that led to it being white. Would that count as conditional necessity, once those conditions came to be realised? What would then remain contingent?

There is a final reason we are sceptical about the conditional necessity view, which is that no sound argument is advanced in its favour. Bhaskar's argument contains a clear elision from it being necessary that kind-k members have tendency T to manifest m, as part of the essence of k-membership, to it being necessary that k's tendency T manifests m. We see this in Bhaskar where immediately before his gelignite example, quoted above, he says: 'a thing must tend to act the way it does if it is to be the kind of thing it is.' We have no quarrel with this claim, which is standard in dispositional

essentialism (Ellis and Lierse 1994). It says that it is a necessary condition of being a member of kind-k that something has tendency T. But one cannot at all infer from this, as Bhaskar does in the very next sentence (quoted above) that those kind members must of necessity manifest those tendencies (when conditions are right).

While Bhaskar may be confused between two options, Anna Marmodoro (forthcoming) explicitly recommends a conditional necessity view of causal powers and furthermore suggests that it was Aristotle's own view. It is arguable, however, that the original sources are ambiguous between a conditional necessity and dispositional modality interpretation. The sort of text in question is the following, for instance:

[a thing] has the potentiality in question when the passive object is present and is in a certain state; if not it will not be able to act. To add the qualification 'if nothing external prevents it' is not further necessary; for it has the potentiality . . . on certain conditions, among which will be the exclusion of external hindrances; for these are barred by some of the positive qualifications [for the potentiality in question]. (Aristotle, *Metaphysics* IX.5, 1048a15-20)

But this seems a form of words to which holders of both the conditional necessity and the dispositional modality views could consent. Marmodoro finds a notion of conditional or qualified necessity more plausible than do we, and endorses it accordingly. But whether it was Aristotle's view may be an open question. It seems quite plausible that he was not sensitive to the distinction between these two accounts that we contend is important. To be completely clear: on the conditional necessity view, when a power is in all 'the right conditions' for its manifestation, assuming such a notion can be spelled out non-trivially, then the effect is necessitated. It has to happen. On the theory of dispositional modality, in contrast, when a power is in all the right conditions for its manifestation, it still 'only' tends, and no more than tends, to produce its effect, where such tendencies can come in greater and lesser strengths.

3. A challenge to the dispositional modality

But why would anyone accept the latter view? Is there something unstable about the position? Doesn't it violate the principle of sufficient reason? While we do not intend to re-present all the arguments for and against the dispositional modality here, we will instead address a recent criticism voiced by John Heil (in conversation) that teases out a number of the issues.

Heil suggests that without necessity, the link between a disposition and its manifestation becomes mysterious. In what sense can a power be 'for' its manifestation unless it necessitates it? We have argued that the possibility of an additive preventer undermines the case for this connection being one of necessity. If we have A and B, which usually produce C, but can fail to do so when accompanied by D, then A and B cannot necessitate C, even on the occasions where they do in fact produce C. Another way of stating the necessitarian claim is that A and B are sufficient for C. Yet how could they be if there are some occasions when they occur without C, due to the presence of D? We call this an argument from additive interference and (in our 2011a: ch. 3) we consider and reply to a number of objections to the argument. Heil's objection is new.

Heil's diagnosis is that where A and B usually produce C, but when accompanied by D do not, the partnership of {A, B, D} is actually a new mutual manifestation partnership that produces a different manifestation E, where $E \neq C$. And just as {A, B} necessitates C, so {A, B, D} necessitates E, Heil alleges.

Our first response is to note that this does not appear to be the necessitation we usually find in philosophy: in logic, for instance. There, if {A, B} necessitates C, so does {A, B, D} because it contains {A, B}. Thus {A, B} cannot necessitate C if {A, B, D} doesn't also produce it, which Heil admits it doesn't. Another way of looking at this is to say that necessity admits monotonic reasoning, where inferences are not open to revision in the light of additional premises. So whatever is going on between a disposition and its manifestation, it cannot be quite what most philosophers mean by necessity. Perhaps it is a natural or metaphysical force rather than strict necessity. But this is what we think is the dispositional modality. And we think that it's quite alright to explicate the way a disposition is 'for' a manifestation in this manner. Tending towards

the manifestation seems a perfectly good way of understanding the meaning of *being 'for'*. *Tending towards* doesn't seem wholly mysterious, especially if it's something in our experience.

There is, however, a possible way out for Heil, which has been suggested to us by Olivier Massin (again in conversation). This objection makes use of another view for which we have argued, namely the possibility of emergent powers. The powers of a whole are not always the mere sum of the powers of the parts. This is because, among other reasons, powers might compose in a non-linear way. In that case, one cannot simply assume that the powers of the set {A, B, D} is simply the addition of the powers of A, B, and D. Each new set of powers could be thought of as an emergent whole that is not reducible to the powers of the parts. If that is the case, then our argument from additive interference seems inapplicable. {A, B} might indeed necessitate C, so it is alleged, but {A, B, D} need not because it has to be treated as a wholly distinct unit from {A, B}, rather than something that contains it.

In the case of emergent powers, this is an implication that we grant can follow. However, we still do not accept that this allows Heil's claim to go through. All it amounts to is an assertion of the very thesis we deny. Heil might assume that {A, B} necessitates C and {A, B, D} necessitates E, but there is no argument for that conclusion. It merely appeals to any pre-existing necessitarian inclinations had by the listener. What we have done is offer a test of necessity that, we argue, is failed in cases of additive interference. The best that Heil can say, in a case where an added power constitutes a new whole, is that our proposed test of necessity cannot be taken. We cannot conclude from the inability to apply a test that it is thereby passed. It might mean that we have to find another test but until that point we should not concede Heil's counterargument.

To summarise the position: there is a strong *prima facie* argument from the possibility of additive interference that suggests that powers do not necessitate their effects. Heil has challenged this argument but at most this challenge could show that there might be some cases where the test cannot be applied, which does not prove the case in favour of necessity. This of course does not prove in favour of the dispositional modality either. As we said at the start, however, there are two separate positive arguments in its favour. One concerned our perceptual experience as causal agents

and patients (Mumford and Anjum 2011a: ch. 9), which is that we have direct experience that our actions tend in a certain direction but can be prevented: and likewise in the case of powers acting upon us. The second kind of argument was the explanatory work that can be done by the dispositional modality, and this is what will occupy us in Part Two.

PART TWO: THE WORK THAT DISPOSITIONAL MODALITY CAN DO

We come, then, to the explanatory argument for the dispositional modality. We will show the work the dispositional modality can do in a wide range of areas of philosophy. And it is not just the powers that do the explanatory work in these cases, but specifically the tendential dispositional modality. Thus, if one understood powers in terms of necessity, as some anti-Humeans are inclined to do, then the explanations offered here will not be possible.

4. Metaphysics

The central case that motivated the original considerations in favour of the dispositional modality was that of *causation*. Given the kind of prevention and additive interference examples already cited, then the best explanation seems to be that causes tend towards their effects and often succeed in producing them. Since the effects could have been prevented, then they were not necessitated by their causes.

A feature that such a theory can explain is how general causal truths are less than universal. It is widely accepted, for instance, that smoking tobacco causes cancer and yet there can be some who smoke without getting cancer. On a strict Popperian view (Popper 1959) the existence of a long-standing smoker without cancer would constitute a falsification of the alleged causal connection. Yet it is remarkable how few would think so. A causal link between smoking and cancer is accepted to be perfectly consistent with there being exception cases. The best explanation of this, we suggest, is that the smoking of tobacco is a factor that tends towards cancer in some degree: a degree that produces a statistical correla-

tion of a measurable proportion of smokers who get cancer. Similarly, when we look at the causal role of genes in biology, there is ample empirical evidence (summarised in Mumford and Anjum 2011a: ch. 10) of a distinct tendency towards certain phenotypes but not ones that develop in every case in which the relevant gene is possessed.

A necessitarian about causation may well claim that both smokers and members of the genotype in question in reality divide into two classes and that all smokers of the right sub-kind get cancer and all with the right sub-genotype develop the related trait. But here there is some doubt that we can spell out the relevant sub-kind, such as ‘the right sub-kind of smoker’, in any non-trivial way that also secures the perfect correlation with cancer. We may have to make ever more refined divisions of sub-kinds until we have one that has only a few members (Russell 1913: 170). And what then would be left of the claim of necessity, with so few instances?

The tendential view thus takes us away from the need for regularities or constant conjunctions. This is appealing because it seems that they are won only through some artifice, rather than a phenomenon we regularly find in our natural encounters with causes. Constant conjunction is sometimes criticised by anti-Humeans for being insufficient for causation, for the reasons we have just given, but for the dispositionalist, it is not even a necessary condition. A necessitarian about powers will not agree with this conclusion, hence they have to join the Humeans in searching for constant conjunctions despite the *prima facie* data.

Within metaphysics, there are clear extensions of the dispositional modality to the related issues of *laws of nature* and *probabilities*. Understanding laws as general causal statements, we note that they often need a *ceteris paribus* qualification in order to claim truth. We then have a problem of how to understand such CP-clauses. Might such laws be still false, if they are meant to exclude a named factor? Or might they be rendered trivially true? Rather than those still problematic options, we follow Lipton (1999) in saying that the CP-clause should be read dispositionally. And if we then take that as an explicit commitment to a *sui generis* dispositional modality, then we have a non-trivial sense in which laws can be true. Being an F can dispose towards G, consistently with some-

thing being F and not-G because it is prevented from being so. The account is also a basis for a propensity interpretation of probability. Because of the *tending towards* of outcomes, some will be more probable than others with the strength of the disposition determining the truth of probability. This is not to say that the tendency is itself probabilistic, which is a matter that would require further discussion.

5. Action Theory

Minds are capable of forming intentional states, directed towards intentional objects, subject to the possibility of intentional inexistence. A naturalistic account of these abilities will almost certainly be in terms of the causal powers of agents, such as that attempted by Armstrong (1968: Pt. 2), for instance. If *intentionality* really is built on powers then we might expect some evidence of the dispositional modality at work. Indeed, this can be found.

Hoping for F would have no point if F were thought to be a matter of necessity. Such a thought might be dismissed as a failure of rationality. One must hope for something that is not necessary. But in hoping for F, an agent has a more than merely contingent relation to F. There are other things, G, and H, that are also less than necessary but they might not be the things for which the agent hopes. So there is an intimate relation the agent bears to F that they do not bear to other possibilities.

Similar things may be said of other intentional phenomena. One might intend to perform action Y, for example. Again, to do so is rationally an acknowledgment that Y is not a matter of necessity. But in intending to Y, Y becomes more than a mere possibility for that agent, among all the many others. The agent selects Y from the other possibilities in front of them and commits to its performance. Committing to a performance clearly cannot guarantee it is carried through, though, as there are obvious cases where our intentions go awry and we fail to perform those actions.

There seems to be, then, a special connection that intentional beings hold to their 'objects'. Some say they are directed towards them. There are similarities between this notion of directedness and dispositionality. Both Place (1996) and Molnar (2003: ch. 3)

have explained the similarity by offering an intentional account of dispositions, claiming that intentionality is the mark of the dispositional. We see things the other way around. It is the dispositional modality of powers that explains intentionality, rather than vice versa, and intentionality thus inherits the modality of those powers. Wherever there are intentional states, we expect to find some connection with the agent that is less than necessary but more than purely contingent. One picks out some state of affairs, F, for instance, towards which one bears a more than purely contingent connection: it is what one hopes or wishes for, fears, intends, believes, perceives, and so on, but it is less than necessary that one does so. No doubt, there will be widely differing accounts of the various types of intentionality and their objects. It is possible – indeed desired – that one believes necessary truths, but clearly it is not necessary that one does so. The core position, however, is that any naturalised account of intentionality, built on causal powers, will exhibit its dispositional modality.

A consideration of action theory in the special subject of *philosophy of sport* also brings a useful application of the dispositional modality. In sports, we measure prowess, such as strength, stamina and skill. These are all causal powers, which we measure through their comparative manifestations: who can lift the heaviest weight, jump the highest, score the most goals, and so on. Each player or team seeks to manifest their sporting prowess to a level sufficient to beat their opponents.

The stronger team tends to win but need not always do so (Mumford and Anjum 2014b). The dispositional modality is absolutely vital to these sporting contests. We premise our participation and our spectatorship on such a tendential view. If the stronger team was bound to win, there would be no point playing or watching. Nothing their opponents did could alter the inevitable. Nor would the stronger team have any motivation to try hard. Greater causal power cannot guarantee success, though. But if the result were an entirely contingent matter, a pure chance, then sport would have no point either. Again, there would be no point training, preparing, striving and trying. And nor would a game of pure chance make for an interesting spectator experience. The obvious way to interpret sporting contests, therefore, is that each participant or team aims to manifest their sporting prowess to its

maximum extent, or enough to secure success, where the exercise of each prowess is a tendency towards victory. And perhaps there are some sporting liabilities, too, that are tendencies towards defeat, which the participants seeks not to manifest. These prowesses do not guarantee their outcomes but they have a purpose and role because they have a tendency towards them. The stronger teams tend to beat the weaker ones. They don't always, and thus sport retains some interest for spectators and is worth the effort for the participants. It thus appears that the whole of sport is premised on the dispositional modality being in play.

But to see this is also to approach one of the biggest pay-offs of all from the theory of dispositional modality. The account has the potential to offer a solution to the philosophical problem of *free will*. There have already been a number of attempts to carve out space for a libertarian solution based on the metaphysics of powers (O'Connor 2000, Steward 2012, Groff 2013: ch. 5, Lowe 2013, and Vihvelin 2013). Thus far, however, these accounts have not made use of the dispositional modality of powers.

The problem of free will can be articulated in terms of two principles. Both seem needed to get us free will yet it might look as if one of them can be gained only at the expense of the other:

The Principle of Alternate Possibilities (AP): we could have acted otherwise.

And:

The Principle of Ultimate Authorship (UA): we are the ultimate authors of our own actions and decisions.

It looks as if AP, alternate possibilities, can be gained only through rejecting determinism; that is, by allowing some indeterminism into the world. But if one does that, it seems as if UA, ultimate authorship, is undermined. One does not want to be in the grip of determinism's necessity but nor does one want to be the

slave of pure chance. Determinism threatens free will because it makes AP look impossible; but indeterminism also threatens free will because it makes UA look impossible.

However, in being empowered, we are causal agents whose actions will tend towards the production of certain outcomes. If we intend and achieve those outcomes, it is right that we have responsibility for them, even though it was possible that they could have been prevented. We retain ultimate authorship of what we do even though we cannot guarantee its successful performance. Why should we need to? Again, causes are rightly taken to be responsible for their effects even though they don't guarantee them. Producing them is enough. And the account works both ways. Similarly, the causes that act upon us, in respect of which we are patients, will only dispose towards having effects on us. We are capable of interfering with and preventing them, even though they will tend us in a certain direction to a greater or lesser degree. A commitment to the dispositional modality gives us libertarianism, therefore: free will as constituted by us having both AP and UA, secured as a pair through the dispositional modality.

6. Ethics

Much in the ethics of *responsibility* flows from this account of free will. If all was necessitated, it is hard to see how we can have genuine responsibility. The intuition is favour of incompatibilism between free will and determinism is thus largely right (Mumford and Anjum 2014a). But if all is purely contingent, including the connection between our intentions and our actions, and between our actions and their effects, then how can we have responsibility either? Needless to say, given the prior discussions concerning intentionality and free will, we propose to solve this dilemma in terms of the dispositional modality. It is neither the case that events are necessary nor purely contingent. We have responsibility for those outcomes we cause through our intentional actions.

On a wider ethical issue, however, the dispositional modality also offers something vital in the case of *normativity* generally. We argue that it invokes the dispositional modality and thus that all of

us who make normative claims are adept at invoking a tendential view (Anjum, Lie and Mumford 2013).

Hence, we ought to be truthful, some might say, but this does not necessitate that everyone, not even that anyone, is. Lies still occur. The norm does not determine the case, therefore. Indeed, one could say that a norm is redundant if its object is a matter of necessity. No one says that one ought to be subject to gravity. But the normative statement, that one ought to be truthful, says more than that truthfulness is just one possibility among many others. Normative statements instead identify a subset of all the possibilities as those an agent ought or ought not to perform. When one ought to do something, therefore, it is less than necessary but more than purely contingent that one does so. We can think of normativity as a selection function (Mumford and Anjum 2011a: 189). Of all the acts possible, this function selects a subset of them, saying that these are the ones towards which one should aim. Intentionality similarly employs some form of selection function. In the case of hope, a subset of all the future possibilities is selected as desired. In the case of belief, a subset of all the possible statements or propositions is selected to be believed, and so on.

Normativity and responsibility are not the only notions crucial to ethics in which the dispositional modality is involved. Others concern our agency, as already discussed. Normativity alone, however, if it depends upon the dispositional modality, is enough to show that this *sui generis* modality has valuable work to do in ethics. And given that we use normative notions with such frequency, seemingly with relative ease, it suggests that we all have a good sense of what this modality is.

7. Epistemology

If the world really is full of this dispositional modality, everywhere from causation to free will, ethics and sport, one might expect that our epistemological practices take it into account. When we act, for instance, we might be expected to do so in the knowledge that causes can sometimes fail to produce their desired effect. When we make predictions, they ought to be based on this modality, as should our inductive inferences.

There is enough evidence to believe that this is indeed the case. We do not offer a full theory of *prediction* here but are in a position to explain something crucial about it: an issue frequently overlooked or ignored. Even our best predictions are sometimes disappointed. Good predictions are on the whole reliable but we can never know for sure that they will come to be true, if the concern is with natural causal processes, which they all ought to be. Predictions are defeasible. We know this when we make them. An explanation of this is that we predict on the basis of what tends to be the case, given consideration of a number of factors. Occasionally our prediction is disappointed through involvement of some further factor that was not included in our modelling: in other words, an additive interferer. Hence, even in computer simulation, the basis for some of our best predictions, we have to include a finite number of factors. Effectively we create an artificial closed system within the model. The real world should be thought of instead as an open system in which new factors can enter, preventing some outcome that was previously expected.

Nevertheless, although we know that our predictions lack certainty, and are sometimes disappointed, if their truth were a matter of complete contingency, then they would have no use. If literally anything could happen at any time, with equal probability, then prediction would be a redundant activity. But we predict instead what tends to be the case, with more or less reliability: sometimes where those predictions come accompanied by the assessment of reliability, for instance, that there is an 80 percent chance of rain in the city tomorrow. Again, in making predictions, with the acceptance that they are defeasible, it suggests that we all have quite a good grasp of the dispositional modality: both how to invoke it and how to understand it.

This also feeds into our *inductive inferences* and suggests that the dispositionalist ought to rule that there is no problem of induction, as classically understood. Instead, we say that induction is thought only to be a problem on the unwarranted grounds that there are causal truths that can guarantee whenever A, then B. No natural process ever guarantees that so we should not be seeking a form of inductive inference that predicts B whenever A. Some time ago, Strawson (1952: ch. 9) suggested that we should not hope for

inductive inferences to deliver the same certainty as deductive inferences. Now we see why not. Causation itself does not work through necessity and our best inductive inferences are precisely as insecure as they ought to be. Thus, just as A and B cannot necessitate C, because they might be accompanied by the preventer D, so should we not seek any inductive inference from A and B to C with certainty. C will never be certain because A and B 'only' tend towards it. The only secure inferences like this would not properly be inductive, for instance that all men are mortal, which is a classificatory truth rather than an inductive one. Overall, where we have an entire uniformity of nature, for instance, that all electrons are negatively charged, then we should take it as *prima facie* evidence that something other than causation is involved, and that something other than induction is its source: for instance, that we have a truth of essence.

With this understanding of nature, we are in a better position to make decisions for action, hence the dispositional modality contributes to *decision theory*. We make our decisions on the basis of our knowledge of the relevant dispositions in operation and how they combine, either in some linear or nonlinear fashion. We decide our actions on the basis that they tend towards production of a desired result, always with the awareness that an action can fail to deliver it. Where there is a failure, we either try again or correct the background conditions that have prevented the intended consequence, all showing complete mastery of the dispositional modality.

8. Logic

If one accepts the dispositional modality, there are a number of implications in relation to logic and language, but which all sit sensibly as solutions to some long-standing questions. For example, there are a variety of uses for *conditionals* one of which concerns what can be called an 'ordinary causal conditional' (Austin 1956: 209-10), or 'proper conditional' (Lowe 1995: 50). This would be where we invoke some kind of natural causal link between antecedent and consequent: so we will use the term natural conditional.

Contextualists accept that there are always circumstances in which a natural conditional is false, which raises again the issue of *ceteris paribus* qualifications. Nevertheless, although some conditions might render a natural conditional claim false, we are still able to use such conditionals because, we claim, of our grasp of the dispositional modality. Thus, the conditionals ‘if an iron bar is heated, it expands’, ‘if this match is struck, it lights’ and ‘if the news gets out, there will be panic’ can all be asserted in certain contexts in which they have truth. Nevertheless, any such conditional can also be false in some circumstance, which is usually accepted tacitly. The match won’t light when struck, if there is also a gale; and there won’t be panic when the news gets out, if accompanied by reassurances. Nevertheless, the assertion of a conditional is still useful as a linguistic tool because it is asserted while deploying the dispositional modality. We assent to some conditional such as ‘if this match is struck, it lights’ precisely because we know that striking matches is the way to get them to light. It cannot guarantee that result, certainly, but the antecedent conditions bear a more than completely contingent connection to the consequent conditions. Thus, we can invoke natural conditionals meaningfully while at the same time acknowledging the truth of contextualism. What we claim here need not be true of conditionals alone but is the basis for a dispositional understanding of language and *meaning* generally (Mumford and Anjum 2011c). All utterances will tend towards a core meaning but one that is variable and sensitive to context.

It follows from this that no conditional analysis of dispositions is possible, as many continue to believe (for example Gundersen 2002, Choi 2008). Natural conditionals of this kind are to be understood dispositionally and so cannot be the basis of an analysis of dispositionality. A conditional analysis of fragility, for instance, into ‘if dropped, then broken’ will be false in some context. We might try to build that context into the antecedent but there will always be some further possible context in which even that strengthened conditional could be false. Alternatively, we might try to capture all those conditions in a way that guarantees the truth of the consequent but it is hard to believe that this can be done non-trivially. The best account, as we have now suggested, is that this condition-

al be itself understood as invoking the dispositional modality. The dropping of fragile things tends to break them, where such tending is the *sui generis* modality of dispositionality. If the conditional has to appeal to this irreducible dispositional connection between antecedent and consequent, then in no way can it be used in an analysis of dispositions. On the contrary, it seems that a proper account of conditionals cannot be given without dispositions.

We might finally conclude that the realist about the dispositional is to be wholly unsympathetic to any purely extensional system of *logic*. Carnap (1936) and others attempted to reduce dispositions away using solely the resources of extensional and compositional logic: that is, logic that is restricted to the material conditional and other extensional connectives. This is a logic ideally suited to a Humean metaphysics in which all is loose and separate. But because it deals only with the truth of propositions – with no stronger-than-contingent connections – such logics cannot express the kind of connectedness in which the dispositionalists believe. The logic has to be rejected, therefore. Logic has a metaphysical basis, as does everything else, and this means, among other things, that the tool of logic cannot be used in adjudicating between rival Humean and anti-Humean metaphysics. Classic logic, and any system built upon it, will always favour Humeanism.

9. Conclusion: the new programme

It is a mark of a successful theory that it is able to unify and explain a range of different phenomena. The success of Lewis's Humean Supervenience programme is in large part due to this. We might argue that it is due only to this, given the entire lack of empirical evidence for the plurality of concrete other worlds, spatio-temporally disconnected from our own. The prospects of dispositionalism constituting an equally or even more powerful theory in due course are good, however, especially if all dispositionalists come to accept the special dispositional modality within the powers that be. And as we explained in Part One, we believe there is also empirical evidence that our world is one containing such powers.

This suggests that a pre-analytic idea of power and its sui generis modality – scholastic notions – could get us out of a number of the dead ends of contemporary philosophy. In Part Two, we have been able to provide only indications and much detailed argument would have to follow. But given that to grasp its explanatory power we need to understand how broad is the range of issues with which the dispositional modality can help, we think it has been important to offer this overview.

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