

## STATIC AND DYNAMIC DISPOSITIONS

**ABSTRACT.** When it comes to scientific explanation, our parsimonious tendencies mean that we focus almost exclusively on those dispositions whose manifestations result in some sort of change – changes in properties, locations, velocities and so on. Following this tendency, our notion of causation is one that is inherently dynamic, as if the maintenance of the status quo were merely a given. Contrary to this position, I argue that a complete concept of causation must also account for dispositions whose manifestations involve no changes at all, and that a causal theory that fails to include these ‘static’ dispositions alongside the dynamic ones renders static occurrences miraculous.

Sometimes things happen: birds sing, cars crash, fireworks explode, and so on. Likewise, sometimes very little or nothing happens: everything, or very nearly everything, stays exactly as it was and nothing moves or makes a sound. Clearly, it is occurrences of the first kind that we tend to notice the most. It is not at all surprising that a loud explosion of colourful light against a dark backdrop of night sky – as happens when fireworks go off – should impress itself upon the mind with more force and vigour than when a small table sits silent and motionless in the corner of the room. However, once epistemological considerations are put to one side, the two kinds of events have a lot more in common than we had originally noticed, or so I will argue. In fact, it seems that both kinds of occurrence warrant a similar causal explanation, and that our causal theories run the risk of being incomplete if they ignore examples of the second kind.

What I shall argue is that an object’s dispositions, or capacities, or powers, or whatever you prefer to call them, are not just for manifestations that involve changes, but are also for manifestations that involve no changes at all. That is so to say that amongst an object’s dispositions are those whose manifestations involve bringing about some different state of affairs than was previously the case, as well as others whose manifestations simply involve the maintenance of the status quo. Any theory of causality that fails to account for such humdrum manifestations is lacking in some important ontological sense, and is unlikely to be an adequate theory of causation.

In order to argue that this is the case, I want to introduce a distinction between what I shall call ‘static’ and ‘dynamic’ dispositions.<sup>1</sup> Dynamic dispositions are those dispositions whose manifestations result in some

kind of change within a world. This could be a change in a particular object's properties, a change in the arrangement of the objects in a world, or even a change in the number of objects in a world, but must involve bringing about a state of affairs that is clearly different from that which obtained prior to the manifestation of the disposition.<sup>2</sup> Static dispositions, on the other hand, will be those whose manifestation does not involve any change. The manifestations of this kind of disposition simply result in a maintenance of the status quo, and for this reason typically go unnoticed.

Now, to have introduced a distinction is not yet to have argued for it. And, in what follows, that is exactly what I intend to do. It is my hope that the defence of the distinction should make apparent the need to take seriously those dispositions whose manifestations are involved in 'merely' keeping things as they are, and that the existence of such dispositions will be recognised. In order to argue for the distinction I will begin with a short discussion of the dynamic dispositions, but for the most part I will assume that we are all familiar with dispositions of this type. Next I will go on to discuss the static dispositions – those whose nature is far less obvious, but which I will argue are nevertheless just as common, if not more so. The discussion will cover three different types of static dispositions, all of which are tied to manifestations that we tend to overlook. This includes: (1) those dispositions involved in an object's persistence, and maintaining the object's intrinsic properties; (2) those dispositions involved in maintaining an object's extrinsic properties; and (3) those dispositions involved in threshold situations.<sup>3</sup> Before turning to the static/dynamic distinction, I want to make some quick comments regarding the nature of dispositions.

'Disposition', as I shall use the term, means nothing more than a capacity, power, or propensity of an object to act in some particular way in some particular set of conditions. I shall assume throughout the paper that a form of dispositional realism is true – in other words that dispositional ascriptions capture genuine states of objects in virtue of the properties they possess, and are not just statements about past or possible behaviour.<sup>4</sup> That being said, I shall remain neutral concerning the kind of properties required as truthmakers for our dispositional ascriptions. My tendency is to think that properties themselves are at least partly dispositional in nature, and are capable of supporting numerous dispositional states of their bearers, but nothing hangs on this. My claims would be the same if I thought that dispositions could be explained in terms of non-dispositional properties and physical laws. Hence, for those who insist that dispositions be reduced to non-dispositional properties, I would ask that you keep in mind that the dispositional realism I defend here is weak enough to allow for such a view, though it is not my own.<sup>5</sup> Despite my preferences, with regards

to the present discussion, I consider a theory that posits a network of dispositional properties to be no better or worse than one that offers a set of relations or law-like entities to do the same work. All I ask is that for sake of simplicity we make use of Ockham's razor, and allow that there be *either* networks of dispositional properties *or* sets of laws. An ontology that postulates both kinds of entity is somewhat superfluous, and is in need of a little trimming.

That being said, I do want to offer a word of caution regarding my understanding of dispositionality. That is that dispositions as I understand them should not be confused with their manifestations. There is another use of disposition in the literature that ties dispositions to their manifestations essentially, effectively reducing dispositions to behaviours. This can either be in terms of present behaviour or tendencies for behaviour, where the tendency is ascribed to the object on the basis of past behaviours, and not because of any present state or property of the object.<sup>6</sup> On that view, to claim that an object has some disposition or other is to claim that it, or other objects like it, has produced some specific type of manifestation in the past, and that the object is such that it will tend to do so again. The concept of disposition discussed here is still closely connected to the concept of manifestation but, unlike the other kind, the dispositions I consider need never be manifested. I make the static/dynamic distinction according to the different types of manifestation a disposition *can* give rise to, but no assumptions are made as to whether or not it actually will. A disposition can, and will, continue to be a very real component of an object, even if the manifestation, which the disposition happens to be for, never obtains.<sup>7</sup> Of course, due to our perceptually constrained epistemic limitations, we only come to recognise the existence of particular dispositions through their manifestations. However, it would be a grave mistake to assume that the only dispositions an object has are the ones we have observed in manifestations, as if an object's capabilities were somehow a product of our perceptions of them.

Each and every disposition is such that it will 'lie in wait' for the appropriate conditions for its manifestation; conditions which include the appropriate reciprocal disposition partners as well as the appropriate spatio-temporal arrangement of those partners. But regardless of whether or not those conditions are ever met, the disposition will nevertheless be present and waiting. In fact, the disposition will lie forever in wait, as real as anything else, even if the conditions for its manifestations are such that they *have never* and *will never* obtain. For instance, consider a lock that has never been opened, the original key for which has been lost. Now, further imagine that the lock is cast down a well, and years later the well is covered

and the lock becomes buried under miles of dirt. Even though that lock will never be opened, it is still true of the lock that a key – of the correct shape and hardness, and turned with the appropriate force – will open the lock. The lock's disposition for opening continues to be present, even if the conditions for its manifestation are not. In fact, the dispositional base of the lock is so deep that it is capable of the mutual manifestation of opening not just with *actual* objects (such as the key that was lost) but also for *possible* objects as well (there are infinitely many 'keys' which, if made in the right shape and hardness, would open the lock if turned with the appropriate force), in numerous arrangements, possible or actual.<sup>8</sup> Of course, a good many of the lock's dispositions will also be for manifestations in which the lock does not open, as failing to open for the wrong key is just as much a manifestation of the lock's dispositions as opening is, even if it is not the manifestation with which we are typically concerned.

# 1. SYNAMIC DISPOSITIONS

With this background in place, we are now ready to consider the first half of our distinction: the dynamic dispositions. As I say above, dynamic dispositions are those whose manifestations involve some sort of change in a world. This could be a change in an object's properties, a change in the arrangement of the objects in the world, or even the creation or annihilation of objects, but in all cases a full description of the world before and after the manifestation of the disposition cannot differ only in that they are temporally distinct – some kind of substantive change must have taken place.

For the most part, dispositions of this type are the ones we are most familiar with. It is dynamic dispositions that lead to warning labels, child safety caps on bottles, protective wrapping, and so on. For instance, try taking a quick nip of cyanide. Most likely, the cyanide's disposition to poison you when swallowed, along with your reciprocal disposition for being poisoned when having swallowed the cyanide, will result in the mutual manifestation of your poisoning, and your untimely death. This is clearly a case where the manifestation of the disposition brings about a change in the world. But changes need not be quite this obvious – most dynamic dispositions will result in manifestations that are far more subtle, and typically far less fatal.

Consider a piece of litmus paper, and imagine what would happen if we dipped it into a small test tube containing a weakly acidic solution. The paper should, assuming it possesses the appropriate disposition, undergo a change in colour from white to red. The manifestation of the dynamic

disposition in this case has resulted in a change in the object's properties. The once white paper is now red. Hence, before the experiment took place the litmus paper had the dynamic disposition to change its colour from white to red in the presence of an acidic solution, and the acidic solution had the reciprocal dynamic disposition for turning the litmus paper from white to red.

An example of a dynamic disposition whose manifestation involves a rearrangement of the objects in a world would be the gravitational force exhibited by those celestial bodies that are sufficiently large or dense. Our very own planet is such that it possesses the dynamic disposition to attract smaller bodies, made evident by the meteors that periodically bombard its surface. These collisions are the end result of a prolonged mutual manifestation of the Earth's gravitational field (a dynamic disposition for the attraction of smaller bodies) and the meteors' reciprocal dispositions for attraction. Because of the Earth's gravitational disposition, smaller celestial bodies will be drawn towards the planet's surface when they enter that gravitational field. The result of the attraction is a new arrangement of the objects in the universe.

Finally, the ability to add or remove objects to or from the universe can be found in the reciprocal dispositions of two smallish lumps of clay to combine to form one larger lump of clay. This union would result in a new state of affairs which could equally well be described as either creating a new large lump of clay or annihilating two smaller lumps of clay.<sup>9</sup> According to a certain way of counting, after the reciprocal dispositions are manifested there are no longer two objects present, only one. Each of the lumps is such that it is dynamically disposed for the mutual manifestation of cohesion with the other lump of clay, to form a larger conjoined whole.

I have described a number of dispositions which I characterise as dynamic, and which, as I said, we are typically quite familiar with. Because we have a more or less reasonable sense of what our environment is like, we tend to notice when it changes. If these changes happen often enough, or are drastic enough (the potentially fatal disposition of cyanide is not something that requires repeated manifestation to make itself apparent), then we are likely to become aware of many of the dynamic dispositions possessed by the objects around us. In fact, an argument could easily be made to the effect that our very survival depends on it. Moreover, it is probably some type of survival cum evolutionary story that explains why it is that dynamic dispositions are so familiar to us, whereas static ones go virtually unnoticed. It might go a little like this:

We are finite beings with vast mental capabilities but extremely limited energy, mental or otherwise. Therefore, a kind of economy demands that

for our survival we limit our expenditure of mental energies, one easy way being to restrict our perceptions of the world around us; or, from another perspective, that those pre-humans who used less energy, mental or otherwise, were able to make better use of their resources and were better set for survival. It seems only natural that within such perceptual economising the last things to go (or first things to arise) would be those types of perceptions that are most obviously connected to facts about our survival. If our present species has been selected for on the basis of ability to survive, then it strikes me that the pre-human who noticed such things as “the large moving yellow sharp toothy thing that eats other moving things is coming this way” is far more likely to have enjoyed a lengthy life and gone onto to propagate numerous progeny than those pre-humans who failed to notice the predator and instead noticed things like “that tree stump is brownish and looks the same each and every time I come here”. Eventually, the only pre-humans that managed to go the distance were those who could limit the use of their mental resources such that the vast majority of their perceptions had to do with getting resources (red berries good), and avoiding untimely deaths (green mushrooms bad, very bad). Consequently, dynamic dispositions, either for aiding well being or producing ill fate, are the ones whose actions tended to impress themselves upon the pre-human mind, such that nowadays dispositions go unnoticed unless they bring about changes important to our survival. Hence, if we are likely to become aware of a disposition, it is far more likely to be one for change rather than not, and even then it will tend to be limited to changes that have the greatest impact upon our lives.

Our scientific development has had a similar effect on our tendency to ignore static events. One of the central aims of the sciences is to capture as much as can be explained in as few axioms as possible – thereby ‘taming’ an otherwise unruly set of observational data. And part of this process has involved taking the status quo as given. At best, the way things are prior to interaction has warranted a single overarching axiom. Simply put, science seeks to explain change. This is not to claim that scientists deem stasis unworthy of explanation; it just so happens that existence, persistence, and the like, are not the kind of phenomena with which scientific investigation has been concerned. For the scientist, what is paramount is how things respond to one another and what kind of reactions they produce in their various combinations; for the most part, stasis gets overlooked. Hence, when we consider the tremendous role that scientific reasoning has had on our intellectual development, particularly in the last hundred years or so, it is no wonder that the static has been left behind.

However, when it comes to ontological explanation, the metaphysician must aim for a more democratic treatment of the phenomena. Complete ontological explanations require taking nothing as simply given: in this case that means taking all events, and their putative causes, on par. The metaphysician must take into consideration every kind of event – not just those that benefit us most, or are most important to our survival – and look for the account that best explains them all. Now, it need not follow from this that all the phenomena will be captured under the same theory, but that is certainly the aim. Like the scientist, the metaphysician wants to explain as much as she can with as little theory as is feasible. Nor need it follow from taking static and dynamic events on par that our treatment of the latter will be inadequate for the former. In fact, I think the static cases warrant precisely the same kind of explanation we give for the dynamic ones. With that in mind, let me do what I can to convince you that static dispositions are present and at work in the world at least as much as their dynamic counterparts. The first kind of static disposition I shall consider is those dispositions of objects whose presence is required in the explanation of persistence.

## 2. STATIC DISPOSITIONS FOR INTERNAL STABILITY

Let me start my case for the existence of static dispositions by way of contrast with a similar, but dynamic, disposition. First of all, some objects are simply not fit for survival. For whatever reason, some objects are disposed in such a way that virtually any environment will bring about their annihilation. Other objects, very similar to this first group, might also be very unfit for survival, but might require some reciprocal disposition partner for their ‘kamikaze’ manifestations. For instance, such objects as bombs, fireworks, or grenades might fall into this ‘assisted suicide’ group of objects. When these objects are on their own, their dispositions for annihilation lie in wait, but in a wide range of circumstances, with a wide range of reciprocal partners, their dispositions can be manifested.

Dispositions of this nature are quite common; common enough that we have names for them, like explosive or combustible. The more extreme cases, those of objects whose annihilation does not require any kind of external catalyst, are far less familiar – in fact, our world may be such that there are no objects like this, not for long anyway! Nevertheless, we can make sense of what it would be like to have this kind of disposition. For those having more trouble with the idea, think of a process like decay, whereby an object slowly deteriorates, but speed the process up until it is only short moments between the object’s coming into, and then going out

of, existence. However fuzzy a concept this may be, I am confident that we have some idea what this type of dynamic disposition is like.

But now consider the inverse of the ‘annihilating’ type of dynamic disposition. Just as objects can have dispositions that make them cease to be, there are the complementary dispositions *that ensure their continuity*. Objects, for the most, part do not disappear in puffs of smoke. They just sort of sit there and endure the passage of time, looking generally no worse for wear. Unless we want to risk endorsing a ‘gappy’ causal theory that can account for certain types of events but not others, then I think we are compelled to say something about this kind of situation. And, as far as I can tell, the best solution looks like some kind of static disposition: in particular, one that has to do with a propensity for continued existence.<sup>10</sup>

With the introduction of static dispositions, we can begin to explain an object’s annihilation or continued existence by appeal to a continuum of dispositions. At one extreme are those objects with dynamic dispositions for their immediate annihilation. As soon as one such object comes to be, it is disposed so that every possible situation causes it to immediately go out of being. Moving along the continuum we get to those objects that are disposed for their own annihilation, but within a more restricted set of conditions and reciprocal partners. Further along still, we get those objects disposed for decay, the manifestation of which sees them annihilated, but at an extremely sluggish pace. Once we move a little further along the continuum, however, we enter the static end of the spectrum – objects that are disposed for survival, but only weakly. These objects might be considered existentially ‘frail’, but in the right conditions will continue to exist. Travelling further and further down the line brings us to those objects whose dispositions for survival get stronger and stronger, until we get to those for which annihilation is an impossibility. At this far end of the spectrum, objects would be so strongly disposed for survival that no circumstance could arise in which the disposition to persist would fail to be manifested.<sup>11</sup>

At this point, someone might be tempted to argue that a ‘propensity for continued existence’ can do nothing to help explain persistence, because dispositions play no part in genuine explanations. A disposition to persist is nothing more than a dormative virtue (a *virtus dormitiva*), and therefore subject to Molière’s mockery. Two things can be said in response to this objection. First of all, the dispositional realism I defend here is a weak version: it permits reductions of dispositions to non-dispositional properties. Hence, seen this way, the disposition is just a placeholder for a more detailed, and perhaps more satisfying, non-dispositional explanation. However, I do not favour such reductions, but nevertheless think that the



dispositional story can be just as satisfying. The satisfaction comes, in part, from treating dispositions as holding in virtue of dispositional properties of the persisting objects; the rest of the story involves removing a bias towards explanations that include natural laws. If one treats properties as dispositional, then the manifestations of the dispositions they support are no longer simply a given, as they can either manifest or not, depending on what prior states of affairs happen to obtain. This means that when they do manifest, one can explain that manifestation on the basis of the properties of the object in question. And here is where issue of bias comes in. On the non-dispositional story, the manifestations that obtain do so in virtue of the properties of the object, plus the required laws of nature. For the dispositionalist, the laws of nature are contained within the properties themselves, so all one need refer to in an explanation are the relevant properties. The dispositional and the non-dispositional explanations differ in terms of their *ontological commitments*, not what they deem necessary for an adequate explanation. Hence, the claim that dispositions play no part in genuine explanations comes from a bias towards certain ontological commitments, and not because dispositions cannot have explanatory force.<sup>12</sup>

Even amongst those who accept the explanatory power of dispositions, it might nevertheless be objected that continued existence is something altogether too strong, or too serious, or too fundamental, to be merely the manifestation of some disposition. Due to limited space, I cannot give this objection the full response it deserves, but let me just say that dispositions for persistence constitute one way of relating and propagating distinct object-stages, a necessary ingredient in any theory of object persistence.<sup>13</sup> But just in case explaining an object's continued existence via static dispositions seems problematic, I think there are other ways to defend the idea that there are static dispositions, the manifestations of which do nothing more than keep an object the way it is.

In much the same way as existence seems to require a continuum of dispositions, running from those objects strongly dynamically disposed for annihilation to those strongly statically disposed for continued existence, the same might be said of shape, or hardness, or any of what have historically been called an object's 'primary qualities'. For purposes of brevity, we need only consider one of these primary properties. My assumption is that the same could be said of the others, but if that is not the case it would not pose any serious problems for my view – even the existence of one static disposition is enough for the distinction.

Considering shape then, it seems that the same kind of continuum holds. At one extreme we have objects whose dispositions are such that under no conditions can they maintain their shape. At the other extreme

we find objects so strongly statically disposed for the maintenance of their particular shape that there are no circumstances under which that shape could be lost. This is not to say that shape is a disposition; it might be, but that is not my point here. What I am claiming is that as well as having some 'shape' property, an object will also have some disposition for the maintenance of that shape. Those disposed to lose their shapes, or those disposed to have permanently fluctuating shapes, reside at the dynamic end of the spectrum. At the static end we find those objects so disposed as to keep their shape.<sup>14</sup> The difference is that which we find between say, a child's balloon and a bowling ball. A child's balloon is most likely dynamically disposed, such that with numerous reciprocal partners, in numerous situations, it will manifest a change in its shape. Poke a balloon with your finger and the entire shape of the balloon will change. Bowling balls on the other hand are much more resistant to change. For a good many reciprocal partners and a wide range of circumstances, a bowling ball will manifest its static disposition to keep its current shape. This, as I see it, is one of the virtues of a bowling ball, and given what it is designed for it only stands to reason that a bowling ball would be disposed to keep its shape in a large number of situations. A bowling ball that could not keep its shape would be utterly useless!

Hence, just like existence, properties seem to admit of degrees to which an object can continue to exhibit them. Without an explanation for how it is that objects can maintain their shapes, their doing so begins to look like a miracle or an accident, neither of which has any place in a mature causal theory. These are real events and, just like their dynamic counterparts, they require explanations. My suggestion is that these are cases that show the presence of static dispositions for those particular partners in those situations. And though apparently inconsequential to our epistemic awareness of dispositions, these dispositions have an important ontological role to fill.

### 3. STATIC DISPOSITIONS FOR EXTERNAL STABILITY

As well as the abilities of objects to hold onto their current intrinsic properties, objects display a wide variety of stability when it comes to their relations. Again, I take this to be the result of certain static dispositions, and not merely a gap in the causal network or an irreducible fact about existence.

Consider a world that contains just two electrons. By limiting the example in this way, it should be easier for us to get a really good sense of what dispositions the objects possess. Now, I have argued above that

amongst each of the electron's dispositions will be infinitely many dispositions whose manifestations involve the participation of certain reciprocal partners – partners we have not included in the world. Hence, even though these dispositions are just as real as the others, we can stipulate that no other objects will ever enter this world and so, for simplicity, we shall simply ignore the dispositions that are associated with them. The dispositions are still there, they simply will not be of any interest to us for the time being. Now, amongst the dispositions we do care about are all the objects' static or dynamic dispositions for internal stability or change, and all of the objects' dispositions that involve causal interaction with the other objects in the world – in other words, the other electron. Allowing for some possible overlap between these two sets of dispositions, this should account for all the dispositions possessed by our two electrons. Given that we have already looked at the internal case, we shall focus our attention on those dispositions the electrons have that pertain to one another.

First of all, let us say that the two electrons are exactly similar, so that any disposition that one has is mirrored in the other. This is not just to say that the dispositions they have for mutual manifestations with each other will be reciprocal, but also that both electrons have exactly similar dispositions. Now, imagine that our two electrons are fairly limited when it comes to their reciprocal dispositions. In fact, the only (dynamic) reciprocal disposition they have is to repel each other if they should come within one metre of each other. If at any time the two electrons should come within a metre of one another, their reciprocal dispositions will result in the mutual manifestation of repulsion.<sup>15</sup>

But what should we say about the rest of the time? If we want to be serious about our causal story, then the description we have given so far is not enough. We know what will happen if the two electrons should happen to find themselves a metre or less apart, but unless our causal network is full of gaps, we need to input into our electrons 'instructions' for what manifestations they should exhibit when *not* within a metre of one another. It is not enough merely to say that they will not repel one another – that is nothing more than a recognition that the conditions for one of their mutual manifestations has failed to obtain. If we assume that the two electrons are currently one thousand metres apart, then some other dispositions, for some other manifestation, must be at work. These are the static dispositions.

Think of it this way. An object's full set of dispositions is like an infinite set of commands or instructions for what actions the object must carry out under those conditions. This is a fully inter-related system, such that for every disposition an object X has (to do such-and-such with object Y in arrangement A), object Y carries the complementary, or 'reciprocal'

dispositions for the mutual manifestation. And the set of instructions is not just for interaction with every other object Y, but also for every object Y *in every* arrangement A. Hence, there will be an infinite number of reciprocal dispositions that any two objects will share according to all the possible environments and arrangements which could obtain.<sup>16</sup>

Let us return to our two electrons. In order to have a complete causal system for the world we have described, we need to include instructions not only for when the two objects are within one metre of one another, but also when they are not. The failure to do so is equivalent to a blank region in the electron's list of instructions; it is a failure to account for all possible situations.<sup>17</sup> Quite simply, without static dispositions the electrons have incomplete sets of instructions. Consider an analogy: we can imagine a situation in which a golf pro gives a set of instructions to someone golfing for their first time, explaining which clubs to use for a particular hole. The golf pro tells the neophyte golfer: "at the tee box use the 1-wood, on the fairway use a 7-iron, and on the green use the putter". To this the golf pro adds that the pitching wedge can be used if the ball is near the green but not quite on it, or if the ball ends up in the rough. Then, while playing the hole, the student finds her ball has fallen into a sand trap. Which club should she use? If the golf pro fails to tell her which club to use if her ball falls in the sand, then the golf pro has not really done her job. The instructions she has given are incomplete, as is the lesson as a whole; the instructions the golf pro has provided are not sufficient for covering all eventualities that could arise when the student attempts to play the hole.

When it comes to examples involving golf lessons we can image getting an incomplete set of instructions. But do we really believe that the causal 'instructions' that govern the nature of causal interaction in the universe could be incomplete in this way? I for one do not, and I would have a very hard time making sense of someone who disagreed. There might be nothing incoherent about denying that the causal system is fully determined, but a few random elements are not elements without instruction – they are merely elements with limited instruction. Assuming I am correct that the causal network cannot include entirely 'instructionless' regions, then it must be that case that the electrons of our example have instructions for what to do when not within a metre of one another. If carrying out these instructions requires no changes, then they will be static dispositions. These static dispositions, then, will have something to do with the way the two electrons relate to one another, which basically allows for them to 'carry on as usual'. In some sense, it is the extrinsic static dispositions that keep a world in order, and give us the basis for determining which objects have actually moved.

At this point some readers might happily admit that the universe should come complete with a full set of instructions, but still doubt that anything like static dispositions are needed to fill up the gaps. Instead, they might prefer to think that the stability is just the result of a kind of ‘default setting’ for the universe, such that if no action is put in, or no disposition is manifested, then everything just remains the same. On this view, existence and stability are just part of the default setting, and change only occurs as a result of the dynamic dispositions, which would of course be the only kind of disposition.

On the face of it, this ‘default’ view looks like a viable alternative to the static disposition view I am offering. However, closer inspection shows that this purported alternative is nothing more than the static disposition view under the physical law description. It is expressed as if it is somehow prior to any other causal structure that might be at work within the world, as if it were more fundamental as a ‘background’ condition, or a precondition on the very construction of a world. However, without an explicit statement that things within a world will generally stay the same when not under the influence of other laws, we have no reason to think that they will stay the same. Once that is understood, it is clear that this ‘default’ setting is nothing more or less than an overarching physical law – and could just as well have been described in dispositional terms. As I said at the beginning of the paper, when considering causal issues my preference is to use dispositional talk, but nothing substantive hangs on that preference. In terms of the arguments presented here, what is expressed in dispositional terms might just as well have been given in law-like terms. There is, of course, a serious difference in the ontological commitments of each, but for the most part this is a difference in name but not in kind. Had my particular preference been for laws, then everything said here regarding static dispositions would have been couched in terms of laws, one of which might have been a general law that ensures the stability of the universe when not undergoing change, which is all the ‘default setting’ is. So though it may look like an alternative, a default setting is really just more of the same view I am defending here.

#### 4. THRESHOLDS AND STATIC DISPOSITIONS

The final kind of static dispositions I want to consider are those that involve what are often called ‘threshold’ conditions. A threshold is some point or magnitude separating conditions that are adequate for bringing about some effect, from those that are not. For instance, we can imagine a light bulb that will light up only if it receives an adequate amount of electricity, say

50 watts. What this means is that if the light bulb receives anywhere from 0 to 49 watts it will not light up, but it will light up if it receives 50 watts or more. Fifty watts then is the threshold point for the bulb's lighting – it marks the minimum wattage of electricity required to light the bulb, and separates the conditions in which the bulb will light from those in which it will not.

Quite clearly, the bulb and the electricity have dispositions that are reciprocal disposition partners. The bulb is (dynamically) disposed for lighting in the presence of the appropriate amount of electricity, and the electricity is reciprocally disposed for the lighting of the bulb under the correct conditions. Now, when it comes to the issue of manifestation, I take the threshold point to indicate the change in dispositions from static to dynamic. On those occasions when the bulb lights, it is clear that the reciprocal dispositions at work are dynamic. Their manifestation results in a change from a non-lighted to a lighted state of affairs. For any wattage greater than 49 watts, the electricity comes in and the result is the lighting of the bulb. The particular disposition base in this situation is deep enough that, for any further increase in the wattage, we will get an exactly similar manifestation of the bulb's lighting. In other words, the threshold marks the change in the kind of manifestation. From 50 watts and above, each unit increase will mark a change in the conditions, and therefore will produce a new, but exactly similar, manifestation of the bulb's disposition to light.

Given that the bulb's dispositions are responsive to such minute changes in wattage (the small difference between 49 and 50 watts is enough to engender a drastically different effect), what is going on when the bulb fails to light up? On the standard story, when 0 to 49 watts of electricity is sent through the bulb, nothing happens. But, at 49 watts, just one more watt would have been enough for a causal event to take place. On the standard view, threshold points mark dramatic changes on the basis of minuscule changes in conditions, and claim that for *any* input less than the threshold, absolutely nothing takes place. This is more than just a change from dark to light; the threshold point marks a radical switch from a non-causal interaction to a causal one. I find this account quite unsatisfactory, and rather unbelievable. What strikes me as far more intuitive is that the electricity and the bulb are co-responsive at any level of input, but that certain wattages are connected with stasis, others with change. Allowing for a touch of anthropomorphism for the purposes of clarification, the standard view paints the interaction between the bulb and the electricity as one where if the electricity is less than 50 watts, the electricity flows through the bulb, but the two are 'unaware' of one another's presence. Then all of a sudden, at 50 watts and up, the bulb 'sees' the electricity

and lights up. Much more plausible is that the electricity and bulb interact for any wattage, but that once the wattage hits 50 watts the nature of that interaction changes. From 0 to 49 watts, the bulb and electricity are reciprocally disposed for manifestations that are for us perceptually identical (manifestations of continued non-lightedness), but are in fact different manifestations due to different static dispositions, each new wattage bringing about a new, but qualitatively identical, manifestation.<sup>18</sup> Once the current hits 50 watts the conditions are right to trigger the dynamic dispositions, and the bulb lights up. Without the presence of the static disposition, the threshold point looks rather like a magical point at which something can come from nothing. If instead there are various dispositions corresponding to the various wattages, then the threshold marks the change in the kind of manifestation, and not a magical boundary between a causal event and nothing.

This brings to an end my defence that there are dispositions whose manifestations do not involve any change. As I have said, I take the denial of such dispositions to entail a view I do not care to endorse: namely that the causal network of the universe has regions of indeterminacy or ‘causal sand traps’. Unless one is willing to endorse the view that periods of local or global stability in the universe are miracles – by which I mean they are occurrences outside the explanatory domain of our causal theories – then I think we need static dispositions (or their law-like cousins) to fill up the gaps. I will now turn to the consideration of a number of objections.

## 5. FURTHER OBJECTIONS AND REPLIES

The first objection I want to consider is that the whole issue of ‘non-change’ manifestations is just linguistic. For the most part, we characterise dispositions by way of strict or strong dispositional statements, and it seems that if a disposition can be captured by the conditional ‘if X is in arrangement A with object(s) Y, then X and Y will produce M’, then the only reason a static disposition looks appealing is because we can say that ‘if X is *not* in arrangement A with object(s) Y, then X and Y will *not* produce M’.

However, this line of objection is flawed. First of all, we may use strict or strong conditional statements in order to *talk* about dispositions, but this is by no means a reduction of the disposition.<sup>19</sup> Dispositions are intended to be real states of objects and are supported by genuine properties of those objects, therefore they are the truthmakers for certain conditional statements, but are not reducible to them. Hence, once we distance ourselves from the conditional analysis, the simple addition of ‘not’ to the

conditional is not enough to constitute anything of substantial importance. Nor is it the case that static dispositions are being postulated purely as truthmakers for these negated conditionals. Granted, if for every arrangement that X and Y can get into that is not A, they consequently produce some manifestation other than M, (because the dispositions in question are static), then the negated conditional ‘if X is not in arrangement A with object(s) Y, then X and Y will not produce M’ would be true, in virtue of the static dispositions. But even if there were no static dispositions, the negated conditional would still come out true, just as long as A was the *only* arrangement in which X and Y could produce M. Hence it is certainly not the case that the static dispositions have been postulated merely to serve that purpose.<sup>20</sup> Their role, as I have said, is to support a causal account for occurrences that do not involve change. On these occasions, rather than thinking that nothing is going on, or that the universe is at a casual stand-still, it makes much more sense to say that a causal interaction, and not just the lack of one, has taken place, the resultant manifestation of which just happens to be perceptually identical to the circumstances that had previously obtained.

Throughout the history of philosophy, ‘negative’ or ‘non-existent’ entities and states of affairs have been a kind of ontological bogeyman to be avoided at all costs – no one wants to include things that do not exist in a list of what does. But that is not what is going on here. Static dispositions are not a bunch of ‘nothings’ that do nothing, they are very much intended as ‘somethings’, and however uninteresting their manifestations might be, they are extremely important for causal completeness. Certainly the actions of static dispositions are not in the least bit sexy or exciting; in terms of our perceptions they are very boring indeed. Nevertheless, before, after, and even during the fireworks that dynamic dispositions give rise to, the static dispositions serve to hold everything in place. They are not negative entities, negative properties, or the negations of any more exciting dispositions, they are positive and real dispositions whose manifestations allow for the maintenance of the status quo. They are, in some sense, the causal glue of the universe.

The second objection I want to consider involves the problematic transition from the manifestation of static dispositions to dynamic ones. If every object has an infinite set of dispositions that dictate the object’s behaviour for every possible situation, then the great majority are going to be static. But if an object is manifesting static dispositions for internal and external stability, how can it possibly go from a static to a dynamic state?

A possible way out might be that manifestations are forever ‘renewed’. Imagine a table that sits in the corner of an empty apartment. It clearly



manifests a good many static dispositions, not just for its persistence and intrinsic properties, but for its relations as well. In order to allow for change, such as that which might occur if someone were to enter the room and knock the table over, it seems to make sense that before the change its stability is not one long manifestation, but a series of them, continually 'renewed' moment after moment, each perceptually identical to the last. As soon as some change starts to take place, brand new manifestations occur, each qualitatively identical to the last, right up until the point of contact, when a new series of reciprocal dispositions comes into play, and are manifested in the table's falling over. In this way we might take manifestations to come instantly one after another, much like the way a frozen image on a television screen is not just one image, but the result of thousands of identical images, one immediately after the last.<sup>21</sup>

If we consider the problem of transition at a higher level, that of worlds, then we are confronted with what looks like the impossibility of change. Imagine again the universe whose only inhabitants are two electrons, and their only dynamic dispositions are to repel one another if they come within one metre of one another, only this time we will stipulate that they are exactly one thousand metres apart, and entirely motionless. It seems that in such a world change is impossible, because each of the electrons will continue to manifest their static dispositions. With nothing to interrupt them, no dynamic dispositions can be manifested, and so no change can take place.

Though this looks like a problem, it really is not, but does point out an important feature of the dispositional view. It is correct to say that the electron world *will* never change, but that does not mean that it *cannot* change. All the dispositions required for change are still present, they simply will not be manifested because of the particular set up of the world. The world does not prove that the static view permits worlds in which change is impossible; quite the opposite in fact. The two-electron world will never change because *it has been constructed* such that it will never change. Because the two electrons are otherwise alone in the universe, setting them up as stationary simply ensures that no change will take place. But other than the fact that we decided to set it up that way, this need not have been the case. This result is purely a product of how we constructed the world. It only makes sense that if you put two objects in a world, place them a thousand metres apart, render them motionless, and strip them of any causal powers they could exercise at that distance, then they are going to stay the same. What this shows is that in order for there to be change in a universe, there must always be some dynamic disposition or dispositions that are manifesting. For instance, add to the two-electron

world a third electron, and set it on a collision course with one of the original two electrons. Changes will occur, after which changes will likely continue to occur. It is only when a universe is entirely in a 'static' state, with no dynamic dispositions for that state, that change will no longer take place. Hence, for any universe to continue to exhibit change, dynamic dispositions must be at work somewhere within the universe. The case is rather like a row of dominoes: if they are left standing and motionless no change will occur. But should just one domino happen to topple it will set in motion a whole chain of events. And in a universe like our own, which is just teeming with metaphorical dominoes, the chain of events will go on and on. Should it ever happen, however, that everything were to stop and no more dynamic dispositions were manifesting, it would take a miracle to get it going again.

## 6. CONCLUDING REMARKS

In closing I would just like to make a short remark regarding the status of dispositions. As I say a number of times in the paper, my preference tends towards an ontology that includes dispositional properties, but when it comes to choosing between networks of dispositional properties and systems of non-dispositional properties in conjunction with natural laws, there is very little to go on. The inclusion of static dispositions alone cannot hope to break that deadlock – but might start to nudge the dispositional account ahead if combined with the right theory of persistence. The true test of any ontology can only come when that ontology is complete; if a dispositional account (which included static dispositions), were to be combined with a theory of persistence that explained the ability of objects to persist by way of certain static dispositions, the product would be a very tidy and appealing ontology indeed. There would still remain the question of how it is that some dispositions give rise to non-mutual manifestations, when all others require reciprocal partners, but the answer likely lies in a kind of 'temporal trigger'. Perhaps the movement from one moment to the next could trigger a unilateral manifestation, or if spacetime is treated as an object itself, then static dispositions for persistence could turn out to be a mutual affair after all. In any case, a dispositional account stands as a worthy rival to a law-based account, and may even have a few tricks up its sleeve that its law-based competitor cannot match.

Regardless of which view is preferred, the need for static dispositions arises. There cannot be holes within the causal network for which no instructions whatsoever are present. Some instructions – however limited or probabilistic – are required so that the universe continues to function.

Causal sandtraps are simply not acceptable; static dispositions are required to fill them up.

#### ACKNOWLEDGEMENTS

My thanks to Peter Unger, David Armstrong, John Heil, Achille Varzi, John Collins, and two anonymous referees for their helpful comments on earlier drafts of this paper.

#### NOTES

<sup>1</sup> These dispositions are individuated according to the manifestations they give rise to. It is important to note that an object's dispositions – individuated according to the various manifestations the object is capable of producing – are not to be identified with the properties that support them. One and the same property, perhaps itself dispositional, can support many of an object's dispositions, and those dispositions can be both static and dynamic.

<sup>2</sup> This concept of change is intended for consideration at the level of worlds. Hence, if a disposition is such that its manifestation would result in the relocation of a particle light years away, it would still count as dynamic. On the other hand, the mere change in status of a disposition from non-manifested to manifested will not count as an appropriate change in this sense. One could argue that this transition from a potential manifestation state to an actual one would result in a change in the object's properties, but as no property is actually lost or gained by the object in this situation, I will not consider that to be a relevant change.

<sup>3</sup> It is possible that this list involves some overlap, or misses out on some cases that ought to be considered the result of static dispositions. Nevertheless, as long as there are some dispositions whose manifestations are not for change, that will be enough to make the distinction between static and dynamic.

<sup>4</sup> As I have defined it, 'dispositional realism' carries only a weak commitment to the existence of dispositions, so is compatible with both reductive accounts (such as those that explain dispositions in terms of categorical properties and natural laws) and non-reductive accounts. This is intended to rule out any theory of dispositions that either: (1) denies that an object is capable of anything it is not currently manifesting; or (2) denies that the having of a disposition is anything more than the holding of a certain conditional. See Elizabeth Prior's *Dispositions*, Chapters 2 and 3.

<sup>5</sup> Even for those who find abstract entities like dispositions or powers to be too abstract, and have similar misgivings about the reductive alternatives I present, I still think there is something to be said for the claim that effects need not involve changes, but it is far from clear to me exactly how that story should be told.

<sup>6</sup> For more on dispositions as tendencies based on past behaviours see Gilbert Ryle's *The Concept of Mind*.

<sup>7</sup> For (much) more about the nature of dispositions, their purportedly categorical status, and their connections with manifestations, see C. B. Martin's 'On the Need for Properties: The Road to Pythagoreanism and Back', his contribution to *Dispositions: A Debate*, and with John Heil, 'The Ontological Turn'.

<sup>8</sup> A dispositional 'base' is the property (or properties) of the object in virtue of which a true disposition ascription applies. For this base to be considered 'deep', it must be in virtue of that property (or properties) that the object is capable of producing relevantly similar manifestations with a wide variety of reciprocal disposition partners. Hence, in the case of the lock, the disposition base for its unlocking is considered deep, because it will produce that same manifestation with numerous appropriately disposed keys. (This is assuming, as I think we should, that the same disposition base is responsible for all the potential 'unlockings' that the lock is capable of manifesting.) For more on 'dispositional depth', see C. B. Martin's 'On the Need for Properties: The Road to Pythagoreanism and Back', p. 208.

<sup>9</sup> I am sure there are readers whose mereological commitments are such that they will deny that what I have described is genuinely a 'creation' of a new lump of clay. They would likely argue that because the component parts of the 'new' object existed, the 'sum' or 'fusion' of those parts also existed, even prior to their union, and so nothing new was brought about (see David Lewis's *Parts of Classes*, pp. 72–81). I have no quarrel with the defenders of such a view, but even if they want to deny that melding two lumps of clay to make one constitutes the creation of a 'new' object, I am confident that they would nevertheless agree that some important change has taken place, be it compositional, cohesional, or even just topological. In any case, however the change is described, it will be change enough for my purposes.

<sup>10</sup> The idea of a propensity for continued existence came up in discussions with Peter Unger, and he comments on this possibility in Chapter 5 of his *All the Power in the World* (manuscript). Unlike most dispositions, those which explain persistence (whether part of a three or four-dimensional account) will be special in that their manifestations will not require reciprocal disposition partners.

<sup>11</sup> Just like those objects which are disposed for self-annihilation in all (or almost all) circumstances, I am doubtful whether our world has any objects disposed for survival in all (or almost all) circumstances.

<sup>12</sup> For more on the claim that dispositions can be explanatory, see Chapter 6 of Stephen Mumford's *Dispositions*, and Elliot Sober's 'Dispositions and Subjunctive Conditionals, or, Dormative Virtues are No Laughing Matter'.

<sup>13</sup> Any would-be objectors might also want to look at the accounts of 'immanent causation' found in David Armstrong's 'Identity Through Time', and *A World of States of Affairs*, as well as Sydney Shoemaker's 'Identity, Properties, and Causality'. Both authors argue that an account of genuine persistence requires that present object-stages are themselves the cause of subsequent object-stages, and that the very existence of the subsequent object-stages is the product of the powers of the present object-stages. I am indebted to David Armstrong for pointing out the similarity between my notion of static dispositions for continued existence, and his law-like version of immanent causation.

<sup>14</sup> I do not deny that the particular dispositions which an object has regarding its ability to maintain its shape will likely have something to do with the object's hardness as well, but I do not think this poses any problem for the view.

<sup>15</sup> For the sake of simplicity I have used the arbitrary distance of one metre; actual facts about electrons are bound to be different, but this is irrelevant to the argument I make.

<sup>16</sup> This situation might be likened to that of a computer program, where a highly specific set of instructions dictates what output the machine should produce for each input. For many of those inputs, the machine will have no output at all, and this should be considered the machine acting in compliance with the program. Of course, in the case of a computer,

the 'stay the same' output may not require a specific line of coding telling it to do nothing for that input – but this only because computers are constructed so that they 'stay the same' unless some other output is triggered. This is no different than the 'default setting' I discuss at the end of Section 3.

<sup>17</sup> It is not enough to reply that this region is merely 'indeterminate' – for indeterminate instructions are still instructions. It might be the case that all dispositions are probabilistic, but this would still require that each circumstance has a prescribed action, even if that action is one of some set. It might be the case that the exact manifestation is not determined, and so is indeterministic in this sense, but the circumstances cannot be one for which there is no instruction at all.

<sup>18</sup> Someone might object to this 'fine grained' division amongst the dispositions and manifestations on the grounds that 'watts' are a humanly developed scale for discriminating between different levels of electricity. It is surely just a historical accident that watts are the particular amounts they are, so to attach a change in disposition (intended to be realist) to a change in watts (a humanly constructed scale and not likely to be real) seriously undermines the status of the disposition. This is a problem, I admit, but I think there is a way out. Basically, the answer is to say that there are going to be different changes in the dispositions that relate to the changes in wattage, but they need not be one-to-one. All that really matters is that the manifestations be of one kind below the threshold, and of another at or above it.

<sup>19</sup> C. B. Martin argues in 'Dispositions and Conditionals' that the simple conditional analysis is neither necessary nor sufficient for capturing dispositions. David Lewis replies in 'Finkish Dispositions', but as Alexander Bird points out in 'Dispositions and Antidotes' the temporal factor Lewis introduces to rescue the simple conditional analysis fails to account for the possibility of antidotes.

<sup>20</sup> Of course, if there are readers who happen to think we need negative or totality facts to make certain negative statements come out true, then they will have an *additional* reason to believe in static dispositions – but that is not a reason I have cited.

<sup>21</sup> I am unsure just how committed I am to this picture of causation, but for now I can see no obvious reason to reject it. The problem that arises is one that parallels the problems faced by those philosophers who explain persistence by way of aggregates of 'object stages' or 'object slices'. Just as we might ask the four-dimensionalist how long a stage or slice lasts, we can ask of a manifestation how long it lasts. However, though the question is slightly unsettling, I do not think it is a problem that has no response, but I lack the space to go into that response here.

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