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On What Powers Cannot Do

ABSTRACT

Dispositionalism is the view that the world is, ultimately, just a world of objects and their irreducible dispositions, and that such dispositions are, ultimately, the sole explanatory ground for the occurrence of events. This view is motivated, partly, by arguing that it affords, while non-necessitarian views of laws of nature do not afford, an adequate account of our intuitions about which regularities are non-accidental. I, however, argue that dispositionalism cannot adequately account for our intuitions about which regularities are non-accidental. Further, I argue that, intuitions aside, if we suppose that our world contains objects along with their irreducible dispositions, we must suppose, on pain of logical incoherence, that it contains laws of nature that are incompatible with a dispositionalist ontology. Indeed, if we suppose a world of objects and irreducible dispositions, we will have to suppose that the most prominent views of laws of nature currently on offer are all inadequate.

I. Introduction

Dispositionalism has been growing in popularity of late.¹ It consists primarily in two theses, a purely ontological thesis and a thesis about what explains events. With respect to ontology, the dispositionalist view is that the world is ultimately just something like a

¹ Proponents of this view include, among many others, R. Harré and E. H. Madden (1975), J. Fetzer (1977), N. Cartwright (1989), S. Mumford (1998) and G. Molnar (2003).

conglomerate of objects and their dispositions.² Accordingly, some of the dispositions of objects must be supposed to be irreducible to categorical properties, that is to say to properties that are wholly manifest whenever they are instantiated.³ Moreover, change is said ultimately to consist in the manifestation of these dispositions in response to appropriate prompting. With respect to explanation, the dispositionalist view is that dispositions alone are the ultimate ontological units that explain the occurrence of events. Thus, according to the dispositionalist, explanations for the occurrence of events are ultimately causal explanations. Events are ultimately to be explained by observing that they are the manifestations or effects of certain dispositions.

We can get a better perspective on what dispositionalism involves if, following Mumford, we contrast it with the *laws view* (1998, 219). With respect to ontology, the laws view holds that the world is comprised of events that ultimately only have categorical properties. Accordingly, dispositions are supposedly reducible to categorical properties. With respect to explanation, the laws view tells us that, insofar as the occurrence of an event can be explained, it can be explained by deducing the statement that it occurs from laws of nature and statements to the effect that certain other events occur. Thus, on the laws view, laws of nature are the ultimate explanatory ground for the occurrence of events. By contrast, the dispositionalist must, given the claim that dispositions are the ultimate explanatory ground for the occurrence of events, hold either

² Some dispositionalists would also postulate processes along with their dispositions. Nothing will turn on this here.

³ Dispositionalism does not, however, preclude supposing that there are irreducible categorical properties. For example, the dispositionalist could suppose that the intrinsic natures of objects are comprised solely of dispositional properties but that extrinsic properties such as spatial and temporal location are irreducible categorical properties.

that talk of laws of nature is explicable in terms of talk about the dispositions of objects, or that such talk should be eschewed altogether.

A prominent version of the laws view is the *regularity view of laws*. On this view, laws of nature are not expressions of real necessity. They are merely descriptions of regularities. In its simplest form, the regularity view essentially identifies laws with all descriptions of regularities. In a more sophisticated form, often referred to as the Ramsey-Lewis conception of laws, laws are identified with those descriptions of regularities that feature in the most economical true axiomatization of all particular facts.⁴ Now, sometimes dispositionalism is motivated partly by arguing that it is able, while regularity views are unable, to account adequately for our commonsense intuitions about which regularities are non-accidental.⁵ Intuitions deem some descriptions of regularities to be merely accidental truths, and distinguish these from others that supposedly are, or result from, laws of nature. Thus, if one is to be true to commonsense and to suppose that laws are descriptions of regularities, one must suppose constraints on which regularities count as laws. For example, one can go the way of the Ramsey-Lewis view and suppose that only descriptions of regularities that feature in some ideal true theory are laws. Nevertheless, it is arguable that so long as these additional constraints make no appeal to real necessity, it will always be possible to find cases in which they classify descriptions of regularities as laws while commonsense classifies them as accidental truths.

In sections II and III of the present paper, however, I argue that dispositionalism too cannot adequately account for our intuitions about which regularities are non-

⁴ See P. F. Ramsey (1978) and D. Lewis (1983).

⁵ See, for example, Mumford (1998, 217 & 222-3).

accidental. Thus, if positions such as dispositionalism and the laws view ought to offer an adequate account of our intuitions about non-accidental regularities, dispositionalism is in as much trouble as regularity views. Nevertheless, in section IV, I suggest that even if dispositionalism is in trouble here, the trouble need not be with its ontological component. Dispositionalists typically move directly from the ontological claim that the world is a world of objects and their irreducible dispositions to the claim that dispositions alone are the ultimate explanatory ground for the occurrence of events. One could, however, accept the dispositionalist ontology while rejecting the supposition that dispositions alone are the ultimate explanatory ground for the occurrence of events. Moreover, once explanatory resources beyond those afforded by dispositions are available, an adequate account of the distinction between accidental and non-accidental regularities may well be forthcoming. This is not to say that the dispositionalist ontology is acceptable. In section V, I reject it. I argue that the view that the world is merely something like a conglomerate of objects and their irreducible dispositions is logically incoherent. I go on, in section VI, to point out that the only way to avoid logical incoherence, while nevertheless maintaining that dispositions are irreducible, is to suppose some laws of nature that are incompatible both with the dispositionalist ontology and with what currently are the most prominent views of laws of nature.

Let me make two more points by way of introduction. First, while I argue that dispositionalism does not adequately account for the intuitive distinction between accidental and non-accidental regularities, I do not address the issue of whether dispositionalism, or indeed the laws view, ought to offer such an account. I take it that my argument will nevertheless be of interest to dispositionalists, partly because it brings

out the implications of their position and partly because they do tend to accept that dispositionalism ought to offer an adequate account of the distinction in question. Second, I do not, in this paper, consider whether dispositions are irreducible. I argue only that if one supposes that dispositions are irreducible, one must suppose that there are laws of nature that are incompatible with a dispositionalist ontology. Whether this does or does not undermine the view that dispositions are irreducible will depend, among other things, on whether there is a viable conception of laws of nature that, although incompatible with a dispositionalist ontology, allows that dispositions are irreducible.

II. Mumford on Dispositions and Stability

In this section, I argue that some of our intuitions about non-accidental regularities are incompatible with the dispositionalist package, and I criticise Mumford's attempt (1998) to reconcile the two. In the next section, I consider and reject two additional attempts to reconcile our intuitions about non-accidental regularities with dispositionalism.

Consider the following questions raised by N. Everitt (1991): why should objects have the same dispositions at different times, and why should different objects of the same kind have the same dispositions? If we adhere to our intuitions, it is not adequate to respond to these questions by saying that this is just how objects happen to be. Intuitively, it is no accident that an object has the same dispositions at different times. And, intuitively, it is not merely an accident that different objects of a single kind possess the same dispositions. It seems, however, that the dispositionalist must accept that these are accidents.

Before considering how dispositionalists might respond to Everitt's questions let me clarify why our intuitions are not compatible with the response that the regularities that his questions are about are accidental. One way of seeing this is by noting that the regularities in question are instances of principles of conservation and that, intuitively, these principles are, if true, not accidentally true. Consider the regularity involved in an object's having the same dispositions at different times. Such a regularity is precisely that object's conforming to certain conservation principles. For instance, an electron's retaining its charge over time, and hence its retaining certain dispositions over time, is precisely its exhibiting a certain conservation principle, and thus its participating in what, intuitively, is not an accidental regularity. Consider also the regularity involved in different objects of a given kind sharing the same dispositions. If it is no accident that different objects of that kind only participate in processes in which certain quantities are conserved, it is no accident that they share dispositions.⁶ Think, for example, of processes in which new electrons are created, say of electron-positron creation by photons. Intuitively, the principle of the conservation of charge that is instantiated in such processes is not an accidental truth. Thus, intuitively, it is no accident that the created electrons have the same charge, and hence some of the same dispositions, as other electrons.

Mumford's response to Everitt's questions consists primarily in advocating *dispositional essentialism* about fundamental objects, that is to say about objects that have no internal structure or are not known to have an internal structure. Dispositional essentialism about fundamental objects is the view that the dispositions of fundamental objects are essential to their being the kinds of objects they are. On this view, for

⁶ By 'processes' I merely mean 'sequences of events.'

example, an electron is not supposed to have an internal structure and thus, supposedly, would not be an electron unless it had the dispositions to behaviour it actually has. If this is correct, all fundamental objects of a given kind must have, and so will have, the same dispositions to behaviour irrespective of time and place. Moreover, when it comes to objects that do have internal structure, say when it comes to macroscopic objects, the stability of their dispositions over time is to be explained in terms of the stability of the dispositions of their constituents. The same explanation supposedly accounts for the fact that certain non-fundamental objects of the same kind share some of the same dispositions (1998, 233-5).

I assume that if Mumford's strategy shows that dispositional essentialism about fundamental objects yields an explanation for the regularities we are concerned with, it yields the desired result that these regularities are not accidental.⁷ The question, then, is whether dispositional essentialism can adequately explain present and future regularities in objects' dispositions. Everitt, it seems, does not object to the idea that it can (1991, 208). I, however, am inclined to do so. Mumford and Everitt only ask why sameness in object *kind* across time should imply sameness in dispositions. However, the worry about regularities in objects' dispositions over time ought to include worries about why there is sameness in kinds across time. It ought to include worries about why fundamental objects of this or that kind do not evolve into somewhat different kinds of object over time, and hence into objects with somewhat different dispositions. For example, it ought to include a worry about why electrons do not evolve into objects that are merely very similar in kind, and hence in dispositions, to electrons. Mumford's essentialism cannot explain such

⁷ I do not, however, here claim that only regularities that have explanations are non-accidental.

regularities. It implies that fundamental objects such as electrons will retain the same dispositions *only* so long as the kinds they instantiate do not change.

Why should the worry about regularities in objects' dispositions over time include worries about sameness in kinds across time? Because, in those cases in which we do find stability in the dispositions of fundamental objects over time – i.e. in those cases in which conservation laws imply the stability of such objects' dispositions over time – a change in the kinds the objects belong to, along with the resulting change in dispositions, would also involve the violation of conservation principles. After all, for example, when the charge of a system containing a single fundamental object is conserved, it is not merely conserved so long as the object happens to remain an electron or the kind of object it is. Thus, the intuition that certain conservation principles are not accidental truths involves the intuition that sameness in what kind a fundamental object is over time is not an accident.

Similarly, Mumford's response does not adequately address the worry about why there are regularities in the dispositions of different objects. Mumford construes this worry as a worry about why different objects of the same kind share the same dispositions. However, in light of our intuitions about conservation principles, it ought to include worries about why there are only certain kinds of fundamental object – namely only those that participate in conservative processes – and thus only certain dispositions. It ought, for example, to include a worry about why there are not an infinite variety of fundamental objects that are similar to electrons in kind and hence in dispositions, but that participate in processes that violate conservation principles.

One might try to modify Mumford's response by suggesting that the dispositions of fundamental objects are essential to the very existence of such objects, and not merely to their being the kinds of objects they are. On this suggestion, an object's existence would necessitate its possessing the dispositions it possesses, and hence its being the kind of object it is. Thus, it might be thought, the mere continued existence of a fundamental object would explain why it remains the kind of object it is. So too, it might be thought, the very existence of the fundamental objects that do exist would explain why there are only the kinds of fundamental objects there are.

The modified version of Mumford's response would only allow an explanation of why, *given* that only certain fundamental objects exist, only certain kinds of fundamental objects exist. However, the worries about why there are only certain kinds of fundamental objects include worries about why the fundamental objects that exist do so rather than certain other fundamental objects. Specifically, they include worries about why there only exist objects that participate in conservative processes rather than at least some objects that do not do so. After all, to return to the example of a physical system that is comprised of a single fundamental object, when the charge of such a system is conserved, it is not merely conserved so long as the object that makes it up happens to continue to exist rather than to evolve into a numerically different object.

III. Dispositionalism, the World and its History

Mumford fails to reconcile dispositionalism with our intuitions about the stability in kinds of objects, and hence dispositions. There are, however, other ways in which dispositionalists might attempt such a reconciliation. To begin with, some apparent

dispositionalists have argued that their position does allow an explanation of why the world contains only the kinds it contains. J. Bigelow, Ellis and C. Lierse have argued that the world, by which they mean the universe, is one of a kind and that, as such, it possesses certain essential properties (1992). Thus, they suppose that just as an electron would not be an electron unless it was disposed to behave as electrons do, the world would not be the kind of world it is unless it obeyed a number of laws, including the law of the conservation of energy. This, they think, allows an explanation of why the world contains only the kinds of object it contains, along with the dispositions that these kinds possess.

It is not clear how to understand the position advocated by Bigelow, Ellis and Lierse. Perhaps, as Ellis thinks is likely, it is equivalent to the thesis that all entities that exist or might exist in the world belong to certain kinds, and obey certain laws in virtue of doing so (2001, 248-9). This suggests that the world's being one of a kind is supposed to supervene on the fact that the entities that make up the world have certain intrinsic properties and belong to certain kinds.⁸ But if these entities are supposed to conform to a dispositionalist ontology, no progress is made in dealing with worries such as those raised by Everitt. Alternatively, the thesis that the world is one of a kind might be thought to involve the view that there are properties of the world as a whole, properties such as being a world that obeys the law of the conservation of energy, that do not supervene upon the fact that the entities that make it up have certain intrinsic properties and belong to certain kinds. If so, we would be owed an explanation of how one of the world's supposed global properties constrains which kinds of objects it could contain. And, as A.

⁸ In distinguishing between the entities that make up the world and the world, I do not assume that the world is not an entity. I assume only that the world is not one of the entities that make up the world.

Chalmers observes, if properties such as being a world that obeys the law of the conservation of energy are not reducible to the dispositions of objects within the world, then dispositionalism has to be abandoned (1999, 14). Conceived of as irreducible to the dispositions of objects within the world, properties that consist in the world's being subject to certain laws of nature seem just to be constituted by the obtaining of certain explanatorily fundamental laws of nature, that is to say laws of nature the explanatory force of which does not rest on that of dispositions.⁹

The notion that the world is one of a kind, then, does not enable dispositionalism to offer an adequate account of our intuitions about the regularity in objects' dispositions. The only strategy remaining to the dispositionalist is 'historical'. Shoemaker claims that given an object along with its dispositions, only a certain range of future states of that object can eventuate (1984, 253). This might suggest that a dispositionalist form of explanation allows an explanation of how all the dispositions and events at some time arise out of those at a previous time. If the universe's causal history is infinite, this will mean that there is an explanation for the regularity of the dispositions of any finite set of objects, and thus an account for our intuition that the regularity in question is no accident. If the universe's causal history is finite, there will be some initial distribution of objects' dispositions that cannot be explained, but an explanation of the regularity of objects' dispositions at all later times, and hence an account of our intuitions about these, will be available.

⁹ This conclusion could be avoided if the property of being a world that obeys the law of the conservation of energy was an irreducible dispositional property of the world as a whole. But the property in question cannot be a dispositional property since, as we will see in the remainder of this section, dispositions cannot, as a matter of principle, explain what conservation laws explain.

It is some way from admitting that the dispositions of objects can adequately explain their manifestations to admitting that they can adequately explain how one state of the world gives rise to the next. In order to do so, one would, to begin with, have to show how in fact the dispositions of objects explain the persistence of objects along with their dispositions. Shoemaker does claim that it is typically built into the nature of a property that an object that possesses it will continue to do so in the absence of external influences (1984, 254). However, he does not, so far as I know, develop or substantiate this claim.

Nevertheless, let us assume that the persistence of objects along with their properties is explicable in terms of disposition manifestations. Dispositions would still not explain why persisting objects do not, without cause, acquire new dispositions. Insofar as dispositions explain what does not occur, they do so through events that do occur. For instance, my hand's not penetrating the wall when pressed against it is explained by the wall's disposition to resist applied pressure along with the wall's actual resistance. However, the fact that an object does not acquire dispositions by their simply popping into existence does not involve the occurrence of any events, and so does not involve events that are disposition manifestations.¹⁰ Thus, dispositionalists must suppose that it is merely an accident that objects do not, without being caused to do so, acquire new dispositions. Moreover, once again, our intuitions about the stability of an object's dispositions over time remain unaccounted for. The dispositionalist would not, for example, have an explanation of why electrons do not, without cause, evolve into objects with similar but not identical dispositions.

¹⁰ The suggestion that dispositions might simply come into existence without cause is made by T. Handfield (2001).

Nor can the above historical strategy explain why there are only the fundamental kinds of object there are, and thus why there are only objects that participate in certain conservative processes. Partly, this is because of its already discussed failure to explain why any given object doesn't acquire new dispositions over time. This is also so because, for the same reason that dispositionalism cannot explain why objects do not inexplicably acquire new dispositions, it cannot explain why new fundamental objects belonging to an endless variety of new kinds do not, at random points in time and without cause, simply pop into existence.

Thus dispositionalism is in the same position as regularity versions of the laws view. It cannot offer an adequate account of our intuitions about non-accidental regularities. Specifically, it cannot offer an adequate account of our intuitions about regularities in objects' dispositions.

I am, of course, not merely claiming that dispositionalism implies that some matters of fact are contingent. The demand that a position account for our intuitions about non-accidental regularities, including those involving conservation, is compatible with the supposition of contingent matters of fact. Indeed, it also seems to be compatible with the supposition that the account of our intuitions about non-accidental regularities is itself to be given in terms of contingent facts. For example, while the Ramsey-Lewis conception of laws is a version of the regularity view and thus supposes that laws are contingent, it arguably offers an adequate account of the intuition that conservation principles are not accidental truths. It is plausible to suppose that conservation principles feature in the most economical true axiomatization of all particular facts and thus that they are, on the Ramsey-Lewis view, laws.

IV. Humean Manouvers

Dispositionalism is not compatible with our intuitions about regularities in objects' dispositions. It implies that it is a mere accident that there are the fundamental kinds of object there are. Yet, intuitively, this is no mere accident. How, then, should the dispositionalist respond to the incompatibility of her position with our intuitions about which regularities are accidental?

One response would be to reject appeals to intuitions about non-accidental regularities in evaluating dispositionalism. I will not examine the viability of this response here. An alternative response accepts that dispositionalism needs to be modified, but aims to do so without modifying the dispositionalist ontology. Dispositionalism's ontological component, recall, is the claim that the world is, ultimately just a conglomerate of objects and their dispositions. Dispositionalism's second component is the claim that, ultimately, dispositions alone are the explanatory ground for the occurrence of events. Now, one could maintain the dispositionalist ontology while rejecting the claim that, insofar as events are to be explained, such explanation ultimately involves an appeal to their being the manifestations of dispositions.

Assume that the world is ultimately merely a conglomerate of objects with irreducible dispositions. If we assume, in addition, that all explanations for the occurrence of events are ultimately explanations in terms of disposition manifestations, then a universal principle will explain the occurrence of events only insofar as the regularity that the principle describes results from or is grounded in dispositions, e.g. if

the principle describes the circumstances in which a disposition manifests itself along with the resulting disposition manifestation. However, an alternative would be to suppose, with proponents of regularity views of laws, that some universal principles explain the occurrence of events even though they are contingent and do not describe regularities that are grounded in dispositions. Such principles would then be supposed to describe the contingent arrangement of objects and their irreducible dispositions. For example, borrowing from the Ramsey-Lewis view of laws, one could suppose that any universal principle that features in the most economical true axiomatization of all particular facts is a law and so also affords explanations for events, even where the principle in question does not describe a regularity that is grounded in dispositions. On this supposition, conservation principles would, as already stated, probably count as non-accidental. Moreover, such principles could be appealed to in order to explain why, for example, new kinds of object that violate conservation laws do not pop into existence. At the same time, while it would be supposed that there are irreducible dispositions, there would be no claim to the effect that conservation laws describe regularities that are grounded in dispositions.

V. *On the impossibility of the dispositionalist ontology*

I have suggested that appeals to our intuitions about which regularities are non-accidental fail to undermine the dispositionalist ontology. Nevertheless, this ontology will not do. In this section, I outline an argument that does not rely on intuitions about which regularities are non-accidental. It concludes that if we suppose that there are irreducible dispositions, the dispositionalist ontology needs supplementation. We will need, at least, to suppose

that there are some laws of nature that are necessary and that are not made true by objects, their dispositions and the regularities that objects exhibit.¹¹

Consider a disposition, *G*, which if possessed in the appropriate circumstances, *B*, necessitates that all objects with the property *F* will persist indefinitely. Consider also a disposition, *H*, which if possessed in the appropriate circumstances, *D*, necessitates that all objects with the property *F* will be annihilated immediately. Given only a dispositionalist ontology, there is nothing to rule out the possibility of dispositions such as *G* and *H*. There is, according to such an ontology, no law of nature in virtue of which some non-existent dispositions are possible and others are not. Indeed, not only is it implied that *G* and *H* are possible, it is implied that they could be possessed simultaneously by objects in a world that contains objects with *F*. There is, given the dispositionalist ontology, no law that would disallow this. It follows that, if circumstances *B* and *D* were to occur in this world at some time, *t*, it would be necessitated that objects with *F* would both persist indefinitely and be annihilated immediately. But, then, objects with *F* would both persist indefinitely and be annihilated immediately. In short, if we assume the dispositionalist ontology, a contradiction follows.

I have assumed that, given dispositionalism, there is no law of nature in virtue of which some non-existent dispositions are possible and others are not. So too, I have assumed that there is no law of nature that excludes the possible coexistence of *G* and *H*. These assumptions follow from the dispositionalist ontology. According to the dispositionalist, the world consists, ultimately, just in something like a conglomerate of objects and their dispositions. Thus, all necessity must supposedly be grounded in objects

¹¹ Chalmers also offers an argument against the ontological component of dispositionalism (1999). I suspect, however, that Chalmers' argument only succeeds in undermining the explanatory component of dispositionalism.

and their dispositions. Existing objects and their dispositions, however, can at best only necessitate facts involving how existing objects themselves will or could be, and so necessitate nothing about facts involving merely non-existent objects, dispositions and indeed worlds. In particular, they do not necessitate the non-existence of, and so do allow the possibility of, facts involving merely non-existent dispositions, objects and worlds.¹²

How, then, might the proponent of a dispositionalist ontology respond to my argument? It might be objected that all that is required in order to ensure that *G* and *H* are not instantiated in the circumstances I have described is a law of logic rather than a law of nature. Surely, it might be suggested, if the supposition that these dispositions can be instantiated together in certain circumstances leads to a contradiction, then this supposition is excluded on logical grounds alone. Not so. In order to see why, we need to consider whether there is some fact that logically excludes the existence of objects with *F* at a time when some object, *a*, has *G*, some other object, *b*, has *H*, and circumstances *B* and *D* obtain.

G and *H* are, it seems, logically possible. So too, given our descriptions of *G* and *H*, *a*'s possessing *G* and *b*'s possessing *H* are logically independent facts. Thus, the mere supposition that objects that possess *G* and *H* coexist does not generate a logical contradiction. There is, then, no logical problem with the supposition that, prior to *t*, *a* possesses *G* and *b* possesses *H*.

At *t*, we have the following facts:

¹² The fact that there are no laws that constrain which dispositions are possible allows me to specify the triggering conditions for *G* and *H* as I please. Thus, I am entitled to assume that *B* and *D* are circumstances that do not logically exclude each other. For the same reason, I am entitled to stipulate that I am concerned with dispositions that do indeed fulfil the descriptions I have given them, and thus that these descriptions are not merely reference fixers. If they were mere reference fixers, it might turn out that, say, *G* fails to fulfil my description of it in such a way that it, as it were, loses out to *H*. No contradiction would then follow in the scenario I have envisaged.

(1) At t , there are objects with F , circumstances B obtain and a has G .

(2) At t , there are objects with F , circumstances D obtain, and b has H .

(1) is such that it has, and must have, the property of necessitating that objects with F will persist indefinitely while (2) is such that it has, and must have, the property of necessitating that objects with F will be annihilated immediately. But there is no logical incompatibility here. All we have here are two distinct facts each with its own intrinsic property of necessitating some eventuality. Moreover, the only reason one might have for suspecting that (1) and (2) cannot, as a matter of logic, both obtain along with these intrinsic properties is that the effects of (1) and (2), i.e. the facts that they necessitate, are logically incompatible. But that the effects of certain facts are logically incompatible does not imply that the facts are, in themselves, logically incompatible.

The only putative facts that, in themselves, logically exclude each other in the envisaged scenario are the effects of (1) and (2), that is to say the existence and non-existence of objects with F after t . If, for example, objects with F still exist a moment after t , it follows that it is not the case that objects with F no longer exist after t , and hence that objects with F were not immediately annihilated. Moreover, given that objects with F were not immediately annihilated, it follows that (2) does not obtain. Thus, the logical incompatibility of the effects of (1) and (2) ensures that, if the effect of (1) obtains, (2) does not obtain. However, it is, at t , neither the case that objects with F exist after t , nor the case that they do not exist after t . In other words, it is, at t , not the case that

(1)'s effect exists, and it is, at t , not the case that (2)'s effect exists. Thus, there can be no question of either of these effects logically excluding anything from being the case at t .

When one fact logically excludes another, say when something's being red excludes its not being red, it is some existing fact that excludes another. But, in the scenario I have envisaged, there are, at t , no facts that might logically ensure either that it is not the case that there are objects with F , G is possessed by some object and circumstances B obtain, or that it is not the case that there are objects with F , H is possessed by some object and circumstances D obtain. This is so since, at t , it is not yet the case that there are objects with F after t , and it is not yet the case that there are no objects with F after t . If one of these facts comes into existence, it does so after t .

I have assumed that, when G and H are possessed by objects in circumstances B and D , it is neither a fact that objects with F no longer exist at some later time nor a fact that they still exist at some later time. In other words, I have assumed that, in the envisaged circumstances, the future does not exist. This implies, among other things, that while it is true, at t , that one fact has the property of necessitating that objects with F will exist after t and another fact has the property of necessitating that objects with F will not exist after t , it is neither true that objects with F will exist after t nor true that objects with F will not exist after t . Statements such as, "Objects with F will exist after t " are, if true, true at least in part in virtue of what exists after t , but, by hypothesis, there is, at t , nothing that exists after t .¹³

¹³ I assume, but will not now argue for, a *non-presentist* semantics for statements such as 'Objects with F will exist after t .' Thus, I assume that such statements are about, and so could only be made true by, facts that obtain after t . Nothing significant depends on this. To be sure, it might be thought that, on a presentist semantics, both 'Objects with F will exist after t ' and 'Objects with F will not exist after t ' would, in the scenario I have envisaged, be true at t , and would thus represent logically incompatible facts that exist at t . But, I would argue, if these statements are made true by facts that obtain at t , then they are made true by (1) and (2) and thus by facts that are not logically incompatible.

It might, however, be argued that if the future is supposed to exist in the scenario I have envisaged, it will already be the case at t that, say, objects with F will persist. This would suffice logically to exclude the conjunction, at t , of circumstances D , an object with H and objects with F . Yet, given only the dispositionalist ontology, the future need not exist when circumstances B and D obtain. Indeed, there is, given this ontology, no law of nature that excludes the possibility that while the future does not exist at t , it comes into existence after t . As we have seen, the dispositionalist ontology cannot necessitate the non-existence of this or that world. Thus, I am entitled to consider a scenario in which there are objects with F , G and H are possessed by different objects, B and D obtain, and the future does not yet exist. The dispositionalist position entails that such a scenario is possible, and that, given such a scenario, the impossible will occur.¹⁴

What are needed, then, are one or more non-logical truths or laws of nature that cannot be made true by a dispositionalist ontology, and that imply the impossibility of eventualities such as those that necessitate the incompatible manifestations of G and H . What would such laws state? Most plausibly, to my mind, they would state that there are certain things that dispositions cannot do, and thus that there are certain constraints on what dispositions there could be. I will not, however, explore this issue here.

VI. *Modifying the Dispositionalist Ontology*

Dispositionalism is not compatible with our intuitions about which regularities are accidental. Specifically, dispositionalism is not compatible with the intuition that it is no

¹⁴ If successful, J. E. McTaggart's argument for the logical incoherence of the supposition of tensed facts (1908) implies that it is logically incoherent to suppose that future facts do not yet exist. Thus, if McTaggart's argument is successful, logic alone might seem to save the dispositionalist ontology from incoherence. I suspect, however, that the dispositionalist ontology implies that tensed facts are possible. I will not argue for this claim here.

accident that there are only certain kinds of fundamental objects. At the same time, it is not clear that this requires abandoning the dispositionalist ontology itself. Even if the dispositionalist accepts appeals to intuitions, her ontology may, perhaps, be kept. A dispositionalist ontology, adopted along with a modified version of the Ramsey-Lewis conception of laws, might allow an explanation of why there are only certain kinds of fundamental objects. Nevertheless, the dispositionalist ontology is unacceptable. I have argued that if we suppose that the world contains objects with irreducible dispositions, we must also suppose that there are laws of nature that are not compatible with a dispositionalist ontology. For brevity, let me call such laws non-dispositionalist laws. The previous section of this paper allows us to conclude that, if there are objects with irreducible dispositions, non-dispositionalist laws obtain and tell us something about which dispositions could coexist, perhaps by telling us something about which dispositions there could be.

Which non-dispositionalist conception of laws allows the supposition of objects with irreducible dispositions? Clearly, regularity views of laws will not do, even if they are modified in order to accommodate irreducible dispositions. For the laws that such a view will offer in supplementing those that irreducible dispositions yield will be contingent. Yet what the proponent of irreducible dispositions needs are additional laws that are necessary. In order to avoid logical contradiction, it must, at least, be necessary that certain dispositions do not coexist.

Alongside regularity views of laws, the most prominent non-dispositionalist view of laws of nature is the so-called Dretske-Armstrong-Tooley view. On this view, dispositional properties are reducible to existing categorical properties along with the

laws of nature. Moreover, laws of nature are not supposed to be general truths. Rather, they are supposed to be singular statements that describe nomological relations between universals, relations in virtue of which universal truths are supposed to hold.¹⁵ But even if we modify the Dretske-Armstrong-Tooley view so that it is compatible with the supposition of irreducible dispositions, it no more affords laws that are necessary than regularity views do. The Dretske-Armstrong-Tooley view has it that the nomological relations that hold between universals, and hence the laws of nature, are contingent.

I conclude that the main conceptions of laws of nature currently on offer cannot save the supposition of a dispositionalist ontology from incoherence, even if these conceptions are modified so as to allow that dispositions are irreducible. There are, of course, many additional conceptions of laws. Perhaps some of these allow, or can be modified so as to allow, both irreducible dispositions and some necessary, non-dispositionalist laws. Determining whether this is so, or developing a completely new conception of laws, is a challenge for those who would suppose irreducible dispositions.*

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¹⁵ See D. M. Armstrong (1983), F. Dretske (1977), and M. Tooley (1977).

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