5-2010

The Ontology of Pure Dispositions

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by

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A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Doctor of Philosophy

Major: Philosophy

Under the Supervision of Professor Jennifer McKitrick

Lincoln, Nebraska

August, 2010

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University of Nebraska, 2010

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This dissertation defends and develops the thesis that some instances, or tokens, of dispositional properties are pure. A pure disposition has no causal basis in any further properties beyond the disposition. A causal basis typically consists of some set of properties underlying a disposition that enables the disposition to manifest when stimulated in the appropriate circumstances. For example, a vase is fragile because it is disposed to break when a hammer or other suitable object strikes it, where the causal basis for fragility is the underlying micro-structure of the vase. Moreover, micro-structural properties of the vase seem to anchor the continuous existence of the vase's fragility when the vase is not actually breaking. In contrast to the neo-Humean metaphysical assumption that any disposition requires a causal basis in further properties, as in the example of fragility, the Pure Dispositions Thesis denies this.

This dissertation achieves four goals. First, it defends the Pure Dispositions Thesis from notable objections: the Powers Regress Argument, the Insufficient Causal Basis Argument, the Argument from the Identity Thesis, and the Argument from Spatial Occupation. Second, it evaluates several theories of the continuous existence of pure dispositions, and argues that some pure dispositions are self-grounded via a minimally sufficient occurrence of their own power. Third, it presents two arguments that some pure dispositions are extrinsically grounded, the Argument from the Higgs Field and the Argument from Priority Monism, and deflects numerous objections to those arguments. Finally, it develops and defends an account of systems of pure dispositions, arguing that a pure dispositional system may generate higher-level categorical and

dispositional properties by way of an emergence mechanism involving the union of two pure dispositions.

AUTHOR'S ACKNOWLEDGEMENTS

Many people helped me improve the arguments and ideas in this dissertation. Portions of Chapters 2, 3, and 4 were presented over several meetings of the Philosophy Graduate Student Colloquium at the University of Nebraska. I would like to thank my fellow graduate students for their numerous comments and questions in those meetings, especially David Chavez, Luke Elwonger, Cullen Gatten, Tim Loughlin, Steve Swatrzer, and Adam Thompson.

Most of chapter 2 was presented to audiences at the 28th annual meeting of the Kansas Philosophical Society, the 37th annual meeting of the Society for Exact Philosophy, and the Metaphysics of Science Conference at the University of Melbourne (July, 2009). I thank those audiences for their abundant feedback, in particular Stathis Psillos and Alexander Bird for their comments and valuable discussion (not only on chapter 2, but other facets of this project too). Masaya Honda also provided valuable feedback on chapter 2.

Parts of chapter 3 were presented at the Central States Philosophical Association (October, 2009), and I thank that audience for their questions. Ronald Loeffler provided insightful commentary on my presentation. Most of chapter 3 was presented at a Philosophy Colloquium meeting at the University of Nebraska (December, 2009), and I am grateful to both the graduate students and faculty members in attendance for comments, especially Al Casullo, Mark Decker, Janice Dowell, David Henderson, Jennifer McKitrick, and Mark van Roojen. Aaron Bronfman discussed at length with me various ideas in chapter 3, which helped me clarify many concepts.

I presented an early version of chapter 4 as my doctoral candidacy advancement paper. I thank the advancement committee, consisting of Ed Becker, Reina Hayaki, Harry Ide, Jennifer

McKitrick and Joe Mendola, for the ensuing helpful discussion. I also thank John Gibbons for discussion of ideas in this chapter.

I could not have asked for a better dissertation adviser than Jennifer McKitrick. Over the last two years she met frequently with me and provided detailed, insightful comments on nearly every key argument and concept in this dissertation. She always perfectly balanced critique and encouragement.

I am extraordinarily grateful to my wife, Marcy, and my son, Isaac, for their understanding of my dedication to this project, and for being so wonderful.

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Chapter 1

INTRODUCTION TO PURE DISPOSITIONS

1.1. The Pure Dispositions Thesis

A hammer possesses the power to break a vase. This power depends on the hammer's property of hardness. But some powers do not so depend on any further properties to display their effects. That is, some powers are *pure* powers, or pure dispositional properties. Such is the central contention of this dissertation.

Powers, or dispositions, pervade the world. A helium atom is disposed to rise in Earth's atmosphere. A diamond's hardness disposes it to scratch all other minerals. A vase is fragile or disposed to break. An animal is disposed to seek shelter. However, dispositions need not manifest their effects – the helium atom may not rise, the diamond need not scratch anything, the vase may not break, the animal may not seek shelter – though they typically do manifest when something triggers the causal basis of the disposition. The causal basis consists of some set of properties underlying the disposition that enables it to manifest. So a vase is fragile because it is disposed to break when a hammer or other suitable object strikes it, where the causal basis for fragility consists of the underlying micro-structural properties of the vase. Moreover, the micro-structural properties seem to anchor the being or continued existence of the vase's fragility when the vase is not actually breaking.

In contrast to this intuitive example, the Pure Dispositions Thesis claims that some dispositions do not require causal bases in any categorical or dispositional properties. More precisely, the claim is this:

> **Pure Dispositions Thesis**: It is metaphysically possible that there exists some type of dispositional property of which any instance or token, F, does *not* have a distinct causal basis for its manifestation, where a causal basis consists of an instance of a property or property-complex that is causally relevant to F manifesting when the causal basis is activated by an appropriate stimulus.

I will elaborate in detail the notions of causal relevance, causal basis, stimulus, and manifestation below, but four preliminary notes are in order.

First, by 'metaphysically possible', I mean possibility stronger than mere logical possibility. There are, at least, possible worlds in which pure dispositions exist. Those worlds may include the actual world, as maintained by dispositional essentialists (e.g., Bird 2007, Ellis 2001, Mumford 2004), who claim that at least some fundamental properties of the world have dispositional essences.[1] While I do hold that some version of dispositional essentialism is true, my focus in this dissertation is to defend pure dispositions from objections to their metaphysical possibility, and examine claims important to understanding the nature of pure dispositions. Second, I indicate that F does not have a *distinct* causal basis. Although it has no causal basis in other properties of any sort, either dispositional or categorical, it is its own causal basis (McKitrick 2003b)[2]. Third, the Pure Dispositions Thesis contrasts with two influential theories of dispositions.

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[1] Bird (2007: 44-5, 204) labels any view 'dispositional essentialism' if it holds that at least *some* properties have dispositional essences, and I will assume that understanding of dispositional essentialism in this dissertation. Note that Bird (2007: 45) further argues for 'dispositional monism', that *all* fundamental properties have dispositional essences. By contrast, Ellis (2001: 127) holds that fundamental spatiotemporal relations and structures are categorical, while the properties of all fundamental particles and fields are essentially dispositional. It is not part of my project to adjudicate which particular view under the general rubric of 'dispositional essentialism' is truer to the spirit of the view; it is sufficient for my purposes that all dispositional essentialist views require the Pure Dispositions Thesis. Examples of opposing theories include the view of Armstrong (2004, 1997), that all of the fundamental properties are categorical (only gaining dispositional natures due to the laws of nature influencing them), and the neo-Humean view, as held by Lewis (1986a), that all of the fundamental properties are categorical.

[2] McKitrick (2003b) uses the term 'bare disposition' instead of 'pure disposition'.

One theory is that any disposition necessarily requires a distinct, categorical causal basis, as Prior, Pargetter, and Jackson (1982) claim; pure dispositions do not have distinct causal bases. Another theory is the identity thesis (Heil 2003),[3] which claims that any property is simultaneously dispositional and categorical; pure dispositions are not identical to categorical properties.[4] The fourth and final preliminary note is that so far as the Pure Dispositions Thesis says, there may be non-fundamental pure dispositions. While dispositional essentialism generally requires that some fundamental properties are purely dispositional, the Pure Dispositions Thesis is neutral on whether such properties are fundamental or non-fundamental.

One way of understanding the Pure Dispositions Thesis, likening dispositions to functions, is that a pure disposition is a physical function that does not depend on any underlying structure of the object that possesses it in order to yield its typical output or manifestation. That is, the underlying structure, if there even is any, is not causally relevant to the functionality of the pure disposition.

Purported actual examples of pure dispositions include the mass, charge, and spin of electrons, since these particles appear to have no further properties underlying these dispositions.[5] Perhaps what we know of electrons yields good evidence for the Pure Dispositions Thesis. Since physicists are ontologically careful, obeying Occam's razor, they generally posit no more than necessary to explain natural phenomena. One might therefore argue that since physicists do not find it necessary to posit that electrons have

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[3] Martin (2008), who influenced Heil's conception of dispositions, also maintains the view that properties are both dispositional and categorical at the same time. Mumford (1998) argues for the Identity Thesis, but now (Mumford 2004) does not accept it.

[4] Sections 2.6 through 2.10 will further explain the Identity Thesis and present arguments against it.

[5] Section 4.1 argues that such properties are indeed dispositions, and so if they indeed have no causal basis in further properties – which is the crucial question – then they do count as pure dispositions.

categorical properties, we should conclude that they do not have any categorical properties. That is, an electron consists entirely of its dispositional properties. Thus, mass and other properties of electrons are pure dispositions. In a similar vein to the Argument from Physics just roughly formulated, Molnar (2003) and Mumford (2006) argue for the reality of pure dispositions.[6]

However, from a few purported empirical science examples we should not straightforwardly conclude that pure dispositions exist. Science should inform, but not direct, metaphysical argumentation. There will always be a metaphysical step needed in any argument for the reality of pure dispositions. First, we need to know if pure dispositions are even metaphysically possible in order to know whether such examples could be actual pure dispositions.[7]

This dissertation defends and develops the Pure Dispositions Thesis. Although the Pure Dispositions Thesis concerns the possibility of only a single instance of a pure disposition, such properties may form the groundwork of reality as dispositional essentialism maintain. Thus, we should not underestimate the metaphysical importance of the possibility of pure dispositions. Given that pure dispositions lie at the heart of dispositional essentialism and are intriguing in their own right, the Pure Dispositions Thesis requires careful examination.

As a brief preview of this dissertation, chapter 2 defends the Pure Dispositions Thesis from several noteworthy objections, after which I assume the metaphysical

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[6] I sometimes employ mass as an example. This should not be taken as an endorsement that it is a pure disposition, rather it used for illustrative purposes, as I also sometimes use fragility.

[7] Psillos (2006: 151-4) notes the incompleteness of the empirical evidence in favor of pure powers, concluding that the best thing to do is to withhold judgment in that area. So, he instead bases his critique of pure powers on metaphysical grounds, i.e., the Powers Regress Argument and the Insufficient Causal Basis Argument. I will assess these arguments in chapter 2. Williams (forthcoming) critiques the argument from science, and various instantiations of it, for the reality of pure dispositions.

possibility of pure dispositions while advancing various theses concerning the nature of their existence. Chapter 3 first argues that although pure dispositions have no causal basis they may be ontologically grounded in other properties, then evaluates various theories of the grounding of pure dispositions, and finally argues that at least some pure dispositions are self-grounded. Chapter 4 presents two arguments for extrinsic pure dispositions, and defends each argument from several objections. Chapter 5 proposes and defends an account of systems of pure dispositions, and shows how such a system may generate higher-level categorical and dispositional properties.

Given this brief preview of the dissertation, here is the plan for the rest of the introductory chapter. Section 1.2[8] explains the metaphysical importance of dispositions and pure dispositions. Section 1.3 defines key concepts, including those already briefly introduced. Section 1.4 presents a roadmap that explains the purpose of each chapter in greater detail than the brief preview in the preceding paragraph. Finally, section 1.5 summarizes the overall theory of pure dispositions I advance in the dissertation.

1.2. The Importance of Dispositions and Pure Dispositions

Historically, dispositions have occupied a significant role in metaphysics, although they have been variously characterized as 'potentialities', 'causal powers', or simply 'powers'. Aristotle (*Metaphysics*, Book Θ) distinguished between *dunamis* (power or potentiality) and *energeia* (actuality). He understood *dunamis* in two senses: the power of a substance to produce a change in something else and the potentiality of a substance to change states.[9] Contemporary investigation of dispositions is concerned with both senses of

[8] In referring to sections throughout this dissertation, the first number refers to a chapter, the second to a section, and the third to a subsection; e.g., '5.3.1' refers to chapter 3, section 3, subsection 1.

[9] Cohen (2008) characterizes the second sense of Aristotelian *dunamis* as a substance's potential "to be in a different and more completed state." Supposing this is the correct interpretation, then in comparing

Aristotelian *dunamis*: e.g., a vase's disposition to flatten bread dough which is a disposition to change something else (*dunamis* in the sense of power); and a vase's disposition to shatter which is a disposition to be in different state (*dunamis* in the sense of potential).

Locke discussed the causal powers of objects within the framework of the distinction between primary and secondary qualities. Dispositions are strongly analogous to what Locke (1690: Book II, Chapter VIII[10]) categorized as the powers of objects. Locke's discussion of powers mainly concerns secondary qualities, or capacities of objects to cause colors, smells, sounds, tastes, and tactile sensation in perceivers. These secondary qualities depend on primary qualities (figure, extension, mobility, etc.) for their existence.[11] Pure dispositions are akin to secondary qualities whose existence does not depend on primary qualities. However, as stated, some purported pure dispositions such as mass are of the nature of what Locke would characterize as primary qualities.

Aristotle and Locke provide just two of many examples in the long philosophical pedigree investigating dispositions. But attention to dispositions has intensified in contemporary analytic philosophy: dispositional accounts of beliefs in philosophy of mind (e.g., Ryle 1963, Schwitzgebel 2002), dispositional theories of value in metaethics (e.g., Lewis 1989), and the role of causal powers, especially as related to laws of nature, in the philosophy of science (e.g., Ellis 2001, Harré and Madden 1975).

Aristotelian potentiality to dispositionality, it is important to notice that the 'more completed state' of a disposition is the *disposition's* manifesting what it is a disposition for, not necessarily the object that possesses the disposition arriving at a more completed state. For example, when fragility manifests as shattering, fragility reaches a more completed state (i.e., a manifested state), but this is not obviously a case of the vase reaching a more completed state.

[10] See especially Book II, Chapter VIII, Sections 8, 9, 10, 23, and 24 of *An Essay Concerning Human Understanding*, for Locke's analysis of primary and secondary qualities, and powers.

[11] However, Locke (1690: Book II, Chapter VIII, Section 8) appears to suggest that primary qualities are powers too, since characterizes qualities in general as having powers. Heil (2003: 80, 199) argues that Lockean primary qualities are, indeed, powers. For example, sphericity is a power to roll (Heil 2003: 199).

Recent examinations of the ontology of dispositions abound, with many philosophers critiquing or defending the coherence of *systems* of pure dispositions: for example, Armstrong (2004) and Heil (2003) critique such systems, while Bird (2007) and Mumford (2004) defend them. Importantly, such views assume that even a *single* instance of pure disposition is possible. Is this assumption true? I suggest that serious philosophical attention be paid to the nature and possibility of pure dispositions before examining systems of pure dispositions, hence the focus of this dissertation on the Pure Dispositions Thesis.

The possibility of pure dispositions constitutes an important issue for a number of reasons. First, the mere metaphysical possibility of pure dispositions shatters neo-Humean assumptions that require causal bases for all dispositions, a prima facie intuitively plausible idea. Second, examining pure dispositions potentially affects one's stance on other important ontological issues, such as the distinction between categorical and dispositional properties, the ontological grounding of dispositions, and the relationships between pure dispositions and other properties they might generate or realize. Third, if pure dispositions form the ground floor of reality (per dispositional essentialism) and their power makes things happen in the world, then the world is inherently powerful in contrast to requiring that laws of nature activate inert categorical properties. Once we secure reasons to allow pure dispositions in, and see the metaphysical work they can do (e.g., see Mumford 2004), we have taken a significant step on the road to dispositional essentialism. Fourth, pure dispositions invoke the idea of prime matter possessing pure potentiality; so, the idea of pure dispositions represents an old idea in new clothes. Finally, the existence of pure dispositions raises intriguing

possibilities in areas beyond basic ontology. For example, if beliefs are best characterized as dispositional properties (Ryle 1963: 114, Schwitzgebel 2002), then it is at least possible that beliefs are pure dispositions. Given the connections between pure dispositions and other issues, the Pure Dispositions Thesis is worth rigorous pursuit.

1.3. Core Concepts & Assumptions

In this section I formulate some key definitions employed in the dissertation, as well as assumptions that will hold throughout, especially regarding dispositional properties, categorical properties, the directedness of dispositions, and the causal profiles of dispositions. Additional concepts pertinent to particular arguments are explained in the relevant chapters. (Note that I generally use the variable 'D' to refer to an instance or token of any disposition, and the variable 'F' to refer to a token of any *pure* disposition. I also specify this where it may otherwise be unclear. Additionally, the set of all Fs is a subset of the set of all Ds. Most of what I contend about the set of Ds also applies to the set of Fs; when this is not the case, I will specify this if it is not clear from context.)

Here is a brief summary of the presuppositions elaborated below. I assume that objects exist and bear property tokens or instances, at least some of which are disposition tokens.[12] I also assume (and will provide reasons for this) that there is an ontological distinction between the grounding properties and the properties that constitute the causal basis of a disposition. Moreover, dispositions, including pure dispositions, are best characterized as properties directed toward their manifestations, and they manifest when appropriately triggered in the right circumstances; by contrast, categorical properties are

[12] I am only concerned, in this dissertation, with instances (or, tokens) of dispositional properties. Note that I intend for my arguments to assume no specific theory of properties, such as that properties are best conceived as universals or tropes, although I do favor some version of trope theory.

not so directed. Finally, dispositions have causal profiles consisting of their multiple powers to manifest in many ways; that is, a token disposition possesses many powers.

1.3.1. Dispositional Properties

Dispositions manifest in specific ways under specified conditions; they are 'for' a manifestation event, to use the terminology of Martin (2008). The manifestation is an event which a disposition undergoes – it is the effect of the disposition's being triggered. The disposition's causal basis must be appropriately stimulated or triggered by another property, specifically another disposition, and the object that possesses the disposition must be in suitable environmental conditions. Thus, under different conditions and with different stimuli, a disposition will display different manifestations. This implies that dispositions have multiple tracks of powers, or are 'multi-track', a notion I will elaborate in section 1.3.5.[13]

A disposition's causal basis is a property or set of properties (i.e., a property-complex) of an object that is causally relevant to the disposition manifesting. For example, Lewis (1997) conceives of the causal basis of a disposition in this way. The disposition manifests because the disposition's causal basis is stimulated. In this sense, 'causal basis' may refer *either* to the underlying properties causally relevant to F's manifestation, *or* it may refer to F itself. In the former case, 'causal basis' refers to the intrinsic categorical (or, perhaps, dispositional) property or property-complex necessary for D's manifestation (though not sufficient since a stimulus is also needed), on theories that hold that properties underlying F do the real causal work (e.g., Lewis 1997, Prior 1985). In the latter case, by contrast, F may be its own causal basis, i.e., F may be the only property that is causally relevant to its manifestation, as McKitrick (2003b) argues.

[13] The idea of multi-track dispositions comes from Ryle (1963: 114).

In both cases, it seems plausible that the causal basis of F is both: (i) that property or property-complex which gives F its very being or existence when F is not manifesting, and (ii) that property or property-complex that, in the relevant circumstances, leads to the manifestation of F. Thus, whether F is in a state of manifesting or not, the being of F remains grounded in its causal basis. I will challenge this equivalence of the causal basis and the grounds of D in section 1.3.4.

What makes the causal basis causally relevant to the manifestation? The causal basis of D plays a necessary causal role in the manifestation of D; the causal basis must be triggered in order for D to manifest its power. The stimulus of a given disposition token may vary from manifestation to manifestation (D can be stimulated in multiple ways, e.g., fragility can be triggered by a hammer or by singing); but the underlying property that is D's causal basis, e.g., the micro-structure of a vase that bears the disposition fragility, plays a necessary role in the manifestation of D. A common view is that a disposition's causal basis just is the same thing as the ontological grounds of the disposition, the property or set of properties responsible for the continuous existence of a disposition through periods of non-manifestation.

To exemplify the core notions introduced here, take a vase, V, which bears the disposition, D, to break if struck by a hammer, where the breaking is the manifestation of D, an event involving the disposition displaying what it is for. D is manifested because D's causal basis, some micro-structural property of V, is triggered; and, the micro-structural property grounds D's being even when not manifesting. Suppose the hammer's property of hardness (a disposition to resist impression) stimulates D, triggering D via D's causal basis. V must be in appropriate manifestation conditions for D to manifest

when stimulated; if V were well-protected by some sort of packaging material, D would not manifest though V were struck. In that case, V's fragility would be masked (Johnston 1992). The appropriate manifestation conditions include the relevant laws of nature. If V travels through an anomalous region of spacetime where the laws of a nature suddenly change, then V will not break when dropped (perhaps because the anomalous laws dictate that any two objects that move within a millimeter of each other can go no farther).

I mentioned above that the causal basis of a disposition is often viewed as the grounds for the very being of the disposition as well. However, I argue in section 1.3.4 that there is an ontological distinction between the causal basis and grounds of a disposition.[14] By 'grounds' I mean a property or property-complex G upon which another property, P, ontologically depends for its continuous existence; in other words, P's being depends on G's being. The intuitive idea is that the grounding properties are those that, if eliminated, would result in the immediate elimination of P as well; e.g., an instance of a color depends on the object with that color having the property of shape.

The distinction between grounds and casual basis has the following important consequence: a disposition may indeed be pure in that it has no distinct causal basis for its manifestation (though it is its own causal basis), yet it may be ontologically grounded in some other properties that do not constitute a causal basis. This distinction opens up the possibility of various grounding theories of pure dispositions, which will be explored in chapter 3. One of these grounding options is that a pure disposition may be extrinsically grounded, or grounded in properties not possessed intrinsically by the object that bears the pure disposition; this is the major thesis of chapter 4.

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[14] Handfield (2008: 298) distinguishes between the supervenience base of a disposition and the causal basis for the manifestation of a disposition, akin to my distinction between grounds and causal basis.

So far I assumed that dispositions necessarily are borne by objects, and this has a descriptive usefulness, as when we say 'this object has a disposition to break'. But this assumption might not be true, for disposition tokens might not required instantiation in objects, given that any property token might 'float free', apart from objects, as Schaffer (2003a) argues. Additionally, when I do speak of objects in this dissertation, I do not intend a specific ontological conception of objects, unless otherwise noted. I simply mean by 'object' an entity that bears or instantiates properties. Thus, I try to keep all of my arguments neutral regarding, for example, the bundle theory versus the substratum view of objects. When these theories are relevant, this will be duly noted.

1.3.2. Categorical Properties

Categorical properties, such as shape or extension, do not have manifestation conditions, and cannot be stimulated to bring about some further event. They are already, continuously manifesting their full nature. A categorical property like shape of an apple is supposed to be static, possessing a quality of "just-there-ness" (Armstrong 2004: 141). This dissertation does not enter into analysis of the necessary and sufficient conditions for a property being a disposition as compared to a categorical property. Rather, I assume that dispositions exist and that there is an ontological distinction between dispositions and categorical properties.[15]

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[15] Here, it is useful to adopt the marks of dispositionality employed by McKitrick (2003a: 157), which are prevalent throughout the literature on dispositions, as McKitrick (2003a: 156-7) notes. The marks of dispositionality, where D is a disposition, are: (i) D has a characteristic manifestation when appropriately stimulated; (ii) D requires triggering or activation in the appropriate circumstances; (iii) a counterfactual statement typically holds true of the object, X, bearing D; (iv) an overtly dispositional locution holds true of X. For example: (i) a vase will typically break when dropped on a hard floor, (ii) the fragility of the vase requires triggering by a hammer or some other stimulus; (iii) it is ceteris paribus true that 'if the vase were hit by a hammer, then it will break', and (iv) the statement that a vase has 'the disposition to break when struck by a hammer' is true. These marks or indicators are not definitive; they are simply marks of dispositionality, or useful ways of identifying dispositions. The point in offering them is to contrast dispositions with categorical properties, for which these marks do not seem to hold.

This raises the question of the relation between the dispositions and the categorical properties of a given object. The traditional view, as stated in section 1.1, is that categorical properties are causal bases for dispositions: a disposition is a property that necessarily depends on a categorical property for the disposition's manifestation. The Pure Dispositions Thesis questions that view, suggesting that no categorical properties and no additional dispositional properties (dispositions besides F itself) play a role in the manifestation of some dispositions.

1.3.3. The Directedness of Dispositions

The characterizations above rely on intuitive differences between categorical and dispositional properties. But is there a definitive difference between them? The traditional attempts to delineate the difference involve conditional analyses of dispositions of the form. A simple conditional analysis of dispositions, 'an object, X, is disposed to manifest, M, in conditions, C, *iff* X would M if X were in C', appears to be simply false given well-noted counterexamples involving finkish dispositions (Martin 1994) and antidotes (Bird 1998). Lewis (1997) provides a reformed conditional analysis, but Bird (2007: 31-6) shows this to be in need of repair too. Still, the usefulness of characterizing dispositions with conditionals is clear enough.

But, conditional analyses of dispositions arguably do not fully address the ontological nature of dispositionality. Suppose it is true that some conditional analysis of dispositions is correct. Does this reveal the real nature of dispositionality? There seems to be a question remaining about the essence of dispositionality. In lieu of conditional analyses, Place (1996) and Molnar (2003: 60-81) argue that dispositions possess physical intentionality, akin to psychological or mental intentionality. The central component of

intentionality is that an intentional state or property is *directed* toward some other possibly inexistent state or property. Directedness is a characterization that competes with the conditional analysis for understanding the fundamental nature of a disposition. The following principle captures the main idea:

> **Directedness:** A disposition is a property directed towards a range of characteristic possible manifestations.

So, for example, for object *x* to possess mass, supposing mass is a disposition, is for *x* to be directed towards massive manifestations: *x* will exhibit massiveness at spacetime location l_1 in circumstances C (in other words, *x* is directed at massive displays). Or, for object *x* to possess fragility is for *x* to be directed towards fragile manifestations, e.g., breaking or shattering.[16]

I will assume that the correct conception of dispositions, and thus of pure dispositions, involves directedness. Although I do not give a complete defense of the directedness of dispositions, my critique of one objection to pure dispositions (in sections 2.2 and 2.3) helps preserve the idea that directedness correctly characterizes dispositionality. Given that I refer to the directedness of dispositions on several occasions, I will explain the relevant background to this claim and elaborate in some detail the nature of the directedness of dispositions.

As stated above, the directedness of dispositions is analogous to how beliefs are directed towards their possibly inexistent objects. Molnar (2003: 63-66) thinks that the intentionality of mental states closely parallels the intentionality of dispositions, and that directedness towards a possibility inexistent object is the most important factor in this

[16] The principle of Directedness is an ontological claim about dispositions. Semantically, it implies that in asking for an analysis of the meaning of dispositionality, we are essentially asking for an analysis of directionality. What it means to be a disposition is to be a property that is directed.

analogy. On Molnar's view, psychological intentionality is strongly analogous to physical intentionality. In the case of psychological intentionality, beliefs (and thoughts more generally) are directed towards an object of belief, where the object may be a physical object in the external world or another thought of some sort. In the case of physical intentionality, the object of the disposition is the manifestation event it points toward. Although these are different senses of 'object', the parallel with psychological intentionality is made stronger because in both physical and psychological intentionality, the object may be inexistent.[17]

One might not claim that psychological intentionality just *is* physical intentionality, while allowing that they are analogous (as Molnar allows). Additionally, one might not agree that all of the marks of psychological intentionality have clear parallels with dispositions, while still accepting one or more of the marks to some degree. Bird (2007: 126), for example, allows that "at most" dispositions are directed towards their inexistent manifestations. Still, the notion of directedness is admittedly somewhat vague. In what remains of this section, I attempt to clarify the notion of directedness.

The directedness feature of intentionality is often characterized in terms of X being oriented towards Y, or pointing towards Y. This is consistently cited as the most important mark or characteristic to evaluate when attending to psychological/physical

[17] Traditionally, debate over physical intentionality turns on a set of five criteria, including directedness, by which dispositions and beliefs (or, thoughts generally) are compared: For an intentional state *x*, and the state or object *y* which *x* is about or concerns: first, *x* is directed toward *y*; second, though *y* may not exist, *x* is still directed toward *y*; third, *y* may be ontologically indeterminate or vague; fourth, within an intensional (with an 's') context, there is referential opacity concerning *x* (i.e., lack of truth-preservation between co-referring phrases); fifth, the truth or falsity of an embedded declarative sentence, ascribing *x* to someone or something, does not turn on whether one denies or asserts that ascription. (The last two criteria are linguistic phenomena. Place (1996) argues that the intensional (with an 's') criteria are not relevant to physical intentionality, while Molnar (2003) defends them.) Employing these criteria, Martin and Pfeifer (1986) argue that intentionality is the mark of the dispositional, not the mental, and thus we need a different conception of intentionality that marks off the mental from the dispositional. Place (1996) and Molnar (2003: 60-81) argue that we should just outright accept intentionality as the mark of the dispositional, while Mumford (1999) and Bird (2007: 114-26) critique this claim.

intentionality parallels. Mumford (1999) points out that a falling rock can be directed toward a road, but this clearly involves no intentionality. This kind of example, involving *spatial* directedness or the directedness of a vector (Bird 2007: 120) is not an objection to directedness, but indicates a need to further examine what is meant by 'directed' in the context of intentionality. In response to Mumford, Place (1999) indicates that there is an intuitive sense of what we mean by 'directed'. But what might 'directedness' refer to?

Mumford (1999: 217) advocates a functionalist theory of dispositions, claiming that his functional theory of dispositions "explains the appearance of directedness, but does so without the remotest danger of animism," thus preserving intentionality as the mark of the mental. Mumford proposes such a theory to *replace* the directionality understanding of dispositions proposed by Place (1996). The functionalist theory says that dispositions are a sub-set of the set of functions, and forwards two main claims (Mumford 1999: 223): first, what makes a property or state D of an object a disposition is that it is a conceptual truth that D causally mediates from stimulus events to manifestation events, and second, what makes a disposition D the type of disposition it is consists in the specific stimulus and manifestation events to which it bear the causal mediation relation. In other words, a disposition is a *function from stimulus to manifestation* (my characterization). A disposition is an actual property that is functionally linked from a variety of stimuli to possible manifestations. Unlike the functional theory of dispositions proposed by Prior (1985), which claims dispositions are inert, the kind of functionalism suggested by Mumford allows that dispositions are causally relevant to their manifestations. I am suggesting Mumford's functionalist theory,

contrary to his motivations against directedness, as an approach to understanding the directedness of dispositions.

I suggest that functionality, like dispositionality, possesses directedness, and furthermore that dispositions are a sub-class of functions. X might be directed toward Y in the sense that X possesses a function, or plays a role, in a system that yields a certain outcome. This is the directedness of functions: If X possesses a function, then given appropriate inputs (stimulus, force, etc.) acting upon X, the appropriate output (event, manifestation, etc.) Y will occur. In this sense, X has directedness toward the output because it possesses a function for Y or 'toward' Y. I propose that this sense of directedness best captures the sense of directedness intended in the physical intentionality debate.

Mumford (1999: 224) thinks that "At no point in the functionalist account do we have to appeal to properties being directed, having aims or striving towards their preferred realizations. Purely physical objects make no choices and the functionalist theory requires none." Being directed and having aims in the agential sense are different things, and agency is one feature of some mental states, not a definitive mark of intentionality. Intentionality (and directionality) may be required for agency, but not vice versa. As I have suggested, functions seem to have the very directedness Place and others attribute to dispositions. They are states directed toward an outcome (a manifestation). A physical function possesses directedness towards an output. So, although Mumford wants the functional account to replace the directedness account of dispositions, he inadvertently proposes a theory that assumes the directedness of dispositions.

Mumford (1999: 222) contends that the functional approach explains everything Place (1996) wants from the physical intentionality thesis, specifically in regards to the notion of directedness: why certain types of events are more connected with a particular disposition, why this connection is conceptually necessary, why the meanings of disposition terms are subject to conditional analyses, and why dispositions can be possessed though their associated conditionals are false. However, it seems that we also want to explain why dispositions seem to point toward an inexistent entity (a manifestation); this is the idea that prompts the directedness thesis. Every functional state, like a dispositional state, is a state that is directed towards a possible manifestation, or outcome. In functional terms, we might say that a physical function is directed towards a certain outcome; e.g., the function of gravity is to yield gravitational outcomes like accelerations. The outcome may not exist or does not yet exist, similar to dispositional manifestations. Thus, it seems that for every functional analysis we can give an explanatorily equivalent dispositional analysis.[18]

Given these considerations, I suggest that dispositions are best understood as directed entities, unlike categorical properties. That is, the best characterization of dispositions, and thus of pure dispositions, posits directedness as an essential feature. Thus, combing the ideas of pure dispositions and directedness, we arrive at this characterization: a pure disposition is a disposition that does not have a distinct causal basis, so it is pure directedness towards a possible manifestation. This is further examined in sections 2.3 and 2.12.

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[18] It is important to note that in claiming that the functionalist theory can explain directedness, this does not commit us to functionalism about the mind. Full-blown functionalism in philosophy of mind is that *all there is* to mental states is their functional role. We only need accept that mental states, like dispositions, are subject to a functionalist understanding, not that a functionalist is a completely sufficient account of mind.

1.3.4. The Ontological Grounding of Dispositions

As foreshadowed in section 1.3.1, the grounds and causal basis of a disposition are not necessarily identical, as is typically assumed.[19] In this section I will elaborate the notion of an ontological grounding property (or, ground), argue that it is not always the case that the causal basis just is the grounds of a disposition, and develop two types of grounding, intrinsic and extrinsic (as a result, I will also develop working definitions of 'intrinsic' and 'extrinsic'). The concepts elaborated in this section are critical to the arguments in chapters 3 and 4. Although the definitions advanced here pertain to all properties, I am concerned with their importance to dispositional properties, and in particular pure dispositions. The most important claim here is that a pure disposition, F, may be grounded by some property, G, which is distinct from F; yet, it is not the case that G constitutes a causal basis for F.

Grounding is a matter of what depends on what for its being or continuous existence. Thus, the first definition is that, for any disposition, D:

> **Grounds of D** $=_{df}$ that property or property-complex, G, upon which D ontologically depends for its continuous existence (or, being).[20]

So, 'D is grounded' means that D ontologically depends upon some other property or property-complex, either of the object bearing D (e.g., fragility is grounded in constituent atoms of a vase), or the object bearing F *and* some other property or property-complex beyond the object bearing D (e.g., object *a*'s property of being taller than object *b* is

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[19] For example, Mumford (2006: 479) and Molnar (2003: 131) implicitly assume that the grounds of a disposition, D, is equivalent to the causal basis of D.

[20] The notion of dependence I mean to capture is that, for two token entities *x* and *y*, *x* depends on *y* "not in a merely causal sense, but in a deeper, ontological sense," as Lowe (1998: 136-7) states. As such, *x*'s existence requires *y*'s simultaneous existence. While the notion of grounding I'm employing involves the notion of ontological dependence, they are not equivalent in my discussion. For one thing, the conception of grounding I'm employing is a relation between properties, while ontological dependence may be a relation between various types of entities (substances, properties, etc.) as Lowe (1998: 136-53) discusses.

grounded in properties of both *a* and *b*). 'D is ungrounded' means that D's being does not depend on any other property or property-complex distinct from D itself; in this case, D is *self*-grounded, such that it is ontologically sufficient for its own being. Self-grounding is critical to the argument of chapter 3, and so I will develop that notion in detail there.

After introducing some helpful terminology related to grounding, I will further elaborate the notion of grounding itself. Schaffer (2009a) presents a set of definitions pertaining to the grounding notion, which will be useful to adopt in explicating arguments below, especially chapters 3 and 4. Here are the first two of his definitions:

***x* is fundamental** $=_{df}$ nothing grounds *x*

***x* is derivative** $=_{df}$ something grounds *x*

Schaffer claims that fundamental entities are prior, primary, independent, grounding entities; derivative entities are posterior, secondary, dependent, grounded entities. So, fundamental entities have *primary being* while derivative entities have *derivative being* (my characterization); derivative entities are thus non-fundamental. Note that my concern is with the cases of grounding in which the grounding or grounded entities are properties.

Furthermore, Schaffer (2009a) thinks that the notion of grounding captures the mereological distinction between an integrated whole (that which exhibits a genuine unity) and a mere aggregate (a random assemblage of parts). Thus:

***x* is an integrated whole** $=_{df}$ *x* grounds all of its proper parts

***x* is a mere aggregate** $=_{df}$ all of *x*'s proper parts ground *x*

These notions will be important in the Argument from Priority Monism in section 4.5. On the first definition, *x* is ontologically prior and grounds its derivative parts or derivative objects, which have being in their own right. Putting this in terms of properties, some

property or property-complex of *x* grounds its parts, and thus grounds properties of its parts. On the second definition, the parts (properties of them) have ontological priority and ground the whole (and properties of the whole).

Schaffer (2009a) also notes the following relations. First, entities *x* and *y* may each be *partial grounds* of entity *z*; i.e., *z* can be grounded in multiple entities. Second, grounding is a *transitive* relation, such that an entity can be grounded in an entity that has a deeper ground; so, *z* can be grounded in *y*, and *y* may also then be grounded in *x*. Note that partial grounding and transitivity of grounding are compatible: *z* can be grounded in *y* which is grounded in *x*, and this implies that *z* is partially grounded in both *y* and *x*, since *z* depends on both *y* and *z* for its being.[21]

What about the notion of grounding itself? For purposes of this dissertation, grounding is a relation between properties. The grounding relation is a synchronic, non-causal relation between a disposition, D, and some other property or property-complex, G. The intuitive idea is that the grounding properties are those that, if eliminated, would result in the immediate (simultaneous) elimination of D as well. It must be simultaneous otherwise an animal's property of being alive, for example, would be grounded in properties of oxygen, which appears to be a causal, not a grounding, relation. D can have partial grounds in multiple, distinct properties, some of which may not be intrinsic properties of the object that bears D; e.g., D might be grounded partially in properties of its object-bearer, *x*, and also be grounded partially in properties of some object in *x*'s environment, or property of *x*'s environment. (This is the case with relational properties, such as tallness). These different ways of grounding will be addressed below.

[21] Schaffer (2009a) also says that the notion of grounding is irreflexive and asymmetric, in addition to being transitive.

To exemplify the notion of grounding, take a color, R, of an object *x*. R is grounded in the property of *x* having some shape or extension. Yet the shape of *x* does not cause *x* to have R. For instance, a tennis ball's shape grounds its property of being yellow, but does not *cause* yellow R. R is partially grounded in the shape of *x*, and also (probably) in some other properties of *x* such as its light-reflecting properties.

The supervenience relation may be thought to be the same relation as that of grounding. Assume a standard conception of supervenience, following Davidson (1970: 124): (i) no two things are alike in all B respects but differ in some A respect, and (ii) nothing alters in an A respect without altering in some B respect, hence A properties supervene on B properties. Supervenience may suggest that one property is the ontological grounds of another, but this is not an accurate implication of supervenience. For, two otherwise unrelated properties may share a supervenient relationship; e.g., mental properties may supervene on physical properties because an all-powerful entity always ensures that mental properties co-vary with physical properties, but in this case mental properties are not grounded in physical properties. Moreover, to refer to the example in the previous paragraph, yellow does not necessarily supervene on the shape of the tennis ball; the tennis ball can change shape while retaining the same color.

Before arguing that grounds and causal basis can come apart, it remains to establish working definitions of 'intrinsic' and 'extrinsic' and the various notions of grounding they suggest.

My proposed characterization of the intrinsic/extrinsic distinction takes the following intuition offered by Molnar (2003: 39) as fundamentally correct: "the deepest intuition concerning 'intrinsic' is that the intrinsic properties are those the having of

which by an object in no way depends on what other objects exist."[22] Molnar's remark captures a plausible sense of intrinsicness, and implies the following notion of extrinsicness: an object having D not solely by virtue of itself has that property extrinsically, i.e., the object depends on some other object in order to have D. Thus, I will use the following definitions. For a disposition instance D (i.e., an object having D):

> **D is intrinsic** $=_{df}$ object *a*'s possessing D is ontologically independent of any properties either of another object *b* or of *a*'s environment *e*.
>
> **D is extrinsic** $=_{df}$ object *a*'s possessing D ontologically depends on some property or property-complex of another object *b* or of *a*'s environment *e*.

A bit more succinctly, 'intrinsic' means that object *a* possesses D solely in virtue of itself, and 'extrinsic' means that object *a* does *not* possess D solely in virtue of itself. The definitions imply that *a*, *b*, and *e*, are distinct from each other. Objects *a* and *b* must be sufficiently distinct so as to really be two different objects, such that the one can *depend* on the other for the extrinsicness of D to obtain, or, not so depend for the intrinsicness of D to obtain. (One plausible sense of distinctness is spatiotemporal distinctness; this is discussed in section 4.6.)

Putting the intrinsic/extrinsic distinction and the notion of grounding together, if D is intrinsic *and* grounded, then D is intrinsically grounded; and, if D is extrinsic *and* grounded, then D is extrinsically grounded. If D is grounded at all, then whether D is intrinsically or extrinsically grounded turns on what D's grounding properties belong to. An intrinsically grounded property is ontologically grounded in some property or property-complex of the object bearing it; and an extrinsically grounded property is

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[22] Compare Michael Dunn's (1990: 178) characterization of intrinsicness: "Metaphysically, an intrinsic property of an object is a property that the object has by virtue of itself, depending on no other thing."

partially ontologically grounded in a property or property-complex of the environment *or* of some object(s) other than the object bearing the property in question. So I will use these definitions:

> **D is intrinsically grounded** $=_{df}$ D, an intrinsic property borne by object *a*, is ontologically dependent *solely* on some intrinsic property or property-complex of *a* that bears D.
>
> **D is extrinsically grounded** $=_{df}$ D, an extrinsic property borne by object *a*, is partially ontologically dependent on some other property or property-complex not possessed by *a*.

We can further distinguish a sub-kind of intrinsic grounding, *micro-grounding*: if object *a*'s having D ontologically depends on micro-constituents of *a* or properties of *a*'s micro-constituents, then D is intrinsically grounded. Micro-grounding is a species of intrinsic grounding since *a* bears D in virtue of itself. But is not equivalent to intrinsic grounding, since, for example, an object *x*'s being disposed to roll is intrinsically grounded in *x*'s sphericity, yet sphericity is not plausibly a *micro*-grounds of *x*'s disposition to roll.

Finally, I need to distinguish two variations of extrinsic grounding, one based on the environment inhabited by an object bearing D and the other based on objects beyond the object bearing D. The two conceptions are intended as sufficiency conditions indicating satisfaction of the definition of extrinsic grounding above. The first variation is:

> **Extrinsic grounding [object]** $=_{df}$ D, of object *a*, is an extrinsic property of *a* and D's existence is grounded at least partially in some property or property-complex of another object *b* (or multiple objects *b*, *c*…).

For example, traditional relational properties meet this condition: object *a* has the property of being *taller than* object *b*; or, *a* has the property of being twenty feet from *b*. In each example, object *a* possesses D partially in virtue of intrinsic properties of *a* itself and partially in virtue of intrinsic properties of *b*. If one takes away object *b* (which has the property of being some height shorter than *a* in the first example, or the property of being at some spacetime location in the second example), then *a* no longer bears D (although *a* retains the intrinsic property of being taller than some *possible* object *b*, or being twenty feet from the spot an object *might be* located). D's very being is grounded not just in *a*, but also in *b* – so D is actual or has being because of something beyond the object bearing D.

The other important sense of extrinsic grounding of D involves the environment inhabited by the object bearing D:

> **Extrinsic grounding [environment]** $=_{df}$ D, of object *a*, is an extrinsic property of *a* and D's existence is grounded at least partially in some property or property-complex of the environment *e* inhabited by *a*.

McKitrick's (2003a) defense of extrinsic dispositions relies on the notion that being in a certain kind of environment can give an object a disposition it would not otherwise have, and her examples illustrate the above condition. For instance, *a*'s having the disposition of 'being vulnerable' ontologically depends on *a* being in an environment that makes it vulnerable, and *a*'s having the property of 'being visible' (meaning subject to being seen, not actually seen) depends on *a* being in an environment that makes it visible (McKitrick 2003a: 161). Note that it is true, in both examples, that *a* may be intrinsically disposed to gain the extrinsic disposition of being vulnerable or being visible; but being visible or

vulnerable are extrinsic dispositions. This example is addressed further below in defending the distinction between grounds and causal basis.

A final example of a disposition extrinsically grounded in its environment, discussed by McKitrick (2003a: 159-60), comes from Yablo (1999: 611): the disposition weight of an object *a*, which varies depending on the strength of the gravitational field inhabited by *a*. However, Bird (2007: 30) suggests that "In the case of weight, it is tempting to regard mass as the real and natural property," while also observing (Bird 2007: 125) that nobody has suggested that mass is not intrinsic. The arguments I present in chapter 4 suggest otherwise.

It seems possible that some disposition D, of object *a*, might be partially ontologically grounded in properties of some object *b*, or environment *e*, that does not bear D, yet neither *b* nor *e* are obviously causally relevant to the manifestation of D in some set of circumstances; so, it would be wrong to identify such grounds of D as the causal basis of D (as introduced in section 1.3.1). I will argue that the causal basis and grounds of a disposition may come apart in two kinds of cases, extrinsic and intrinsic.[23]

In the intrinsic case, it is possible for D to ontologically depend on and therefore be grounded in intrinsic properties of the object *x* that bears F, but that are *not* part of the causal basis of D. For example, D may be an emergent pure disposition, such that it is grounded in lower-level properties that constitute the grounds of D's emergence but do not constitute a causal basis for D's manifestations. The concept of emergence assumed here contrasts with reducibility. A reducible disposition is one that reduces to its causal

[23] However, there is a very broad sense in which the total ontological grounds of D are necessarily causally relevant in D's manifestation, in the sense in which an oak tree existing is causally relevant to its producing acorns. But this is not what is typically meant by 'causal basis' (it is usually meant as a property that is necessary for the triggering of a disposition).

basis; for example, fragility is reducible to a lower-level micro-structural property, which is its causal basis. If D is emergent, then D ontologically depends on the lower-level properties out of which it emerges, yet those properties may not be causally relevant to D's manifestations. This at least seems possible (and will be discussed further in chapter 5). Therefore, the grounds of D and causal basis of D are not necessarily identical. Therefore, there may be pure dispositions that are nonetheless ontologically grounded in some property or properties besides themselves.

In the extrinsic case, it is possible that D, of object *a*, is partially ontologically grounded in properties of some object *b* that does not bear D, yet no properties of *b* are part of the causal basis of D (where a causal basis is set of properties causally relevant to D's manifesting in appropriate circumstances). For example, take the extrinsic disposition *vulnerability* – i.e., capable of being damaged if attacked (this is an example of an extrinsic disposition discussed by McKitrick (2003a: 161)). For some object *x*, *x*'s being vulnerable depends on whether *x* is an environment that affords protection to *x*. When *x* is *not* in the protective environment, *x* is vulnerable. When *x* is in a protective environment, *x* is not vulnerable. Thus, vulnerability is an extrinsic disposition. But it is not obvious that *x* being located in a non-protective environment (and so being vulnerable) is part of the causal basis for the manifestation of *x*'s becoming damaged (where being damaged is the manifestation of vulnerability); rather it seems like it is solely some properties of *x* itself that constitutes the causal basis for *x*'s vulnerability, even though *x*'s having the disposition of vulnerability requires extrinsic (environmental) factors, i.e., the lack of appropriate protection. Thus, the grounds of vulnerability and the causal basis of vulnerability are distinct.

The most important conclusion I want to draw from the above considerations is that if a pure disposition, F, is its own causal basis that does not necessarily mean that F grounds itself. For, F may be extrinsically grounded. The possibility of a given pure disposition, F, being an extrinsic property and thus being extrinsically grounded [object or environment], opens up various grounding possibilities for F. I examine these possibilities in chapters 3 and 4.

1.3.5. Multi-track Dispositions and Causal Profiles

Henceforth I will assume that token dispositions, including token pure dispositions, possess various powers such that they can manifest in various ways. That is, dispositional properties have multiple powers or ways of manifesting. The underlying principle is this:

> **Multi-track**: A pure disposition token, F, may receive various stimuli, and thus may manifest in multiple ways.

Ryle (1963: 114) introduced multi-track dispositions, and others (Martin 2008, Mumford 2004) have also posited them in their theories of dispositions. To explain the principle above, by 'receive' I mean F may interact with a reciprocal disposition token. Since these dispositions partners may be various, there may be various kinds of manifestation. Part of what it means to be a disposition, and a pure disposition, is to require a stimulus for manifestation. So F's manifesting in a specific way (M1, or M2, or M3, etc.) depends on the kind of stimuli that triggers F's manifestation. For example, supposing fragility is a pure disposition, a vase's fragility can manifest when activated by the hardness of a hammer, or the high-pitched voice of a singer. Furthermore, these various stimuli may result in slightly different manifestation effects: cracking, shattering, chipping, etc.

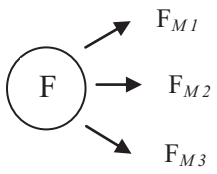
The multi-track conception of dispositions contrasts with the concept of a single-track disposition; supposing fragility is single-track, we would need to posit various fine-grained tokens of fragility within the same vase (fragility_1, fragility_2, etc.). Bird (2007: 23-24) argues that pure dispositions (or 'potencies' as he calls them), which constitute the entire class of properties at the fundamental level of reality on his view and form the basis of Dispositional Monism (the metaphysic Bird advances), are *not* multi-track dispositions. However, in lieu of multi-track dispositions, Bird posits a conjunction of dispositions for which a single multi-track disposition could be sufficient. On Multi-track, for example, it is possible that a fundamental entity e_1 with pure disposition mass m, when stimulated by a fundamental entity e_2 with force F_1, will display manifestation M_1, and when e_1 is stimulated by e_2 with force F_2, will display manifestation M_2, where the manifestations M_1 and M_2 are different accelerations. Such examples can be multiplied severally (for another instance, the same entity with pure disposition mass m may display different weights – weight is a function of mass plus gravity – in fields of different gravitational strength). On Multi-track, all the various manifestations associated with an object possessing a type of pure disposition can be accounted for by a single token of that pure disposition. Thus, Multi-track is plausible for pure dispositions.[24]

Due to F's capacity to manifest in various ways, I maintain that F has various powers: the power to manifest in way M1, the power to manifest in way M2, etc. Mumford (2004: 171) maintains a similar view, suggesting that a single instance of a pure disposition possesses a set of many powers. Figure 1 below illustrates the multi-

[24] These remarks do not take into account the details of Bird's discussion of multi-track dispositions. My intent here was not to attempt to refute Bird's argument, only to motivate the plausibility of multi-track fundamental dispositions.

track conception of dispositions, where F stands for a token pure disposition with various powers:

Figure 1: The multiple powers of a multi-track pure disposition



Powers of F, designated F_{M1}, etc., are possible manifestations F could have given different stimuli. In principle, F could have an infinite set of powers. Multi-track suggests that the *causal profile* of a pure disposition consists of multiple possible causal relations it may enter.[25] More precisely:

> **Causal Profile**: A pure disposition's causal profile consists of all of F's distinct, related powers to manifest in a multitude of ways, given a multitude of stimuli and circumstances.

F enters causal relations with other dispositions, so it is other dispositions that serve as stimuli for the manifestation of a disposition. That is, a disposition F_1 will have various partner dispositions, F_2, F_3, such that F has the power to manifest in various ways in virtue of F_1's relation to F_2, F_3, etc. The causal role of each disposition is defined in terms of its possible relations to other dispositions. The causal profile of a disposition might arguably yield a principle of identity for dispositions, i.e., that each disposition is individuated by its causal profile. However, I contend that the additional criterion of

[25] Hawthorne (2001) uses the term 'causal profile' to refer to properties defined exclusively by their causal role in a system of properties. The term, as applied to a property, does not necessarily imply that the property is a pure disposition, since a disposition defined exclusively by a causal profile may have a causal basis in further dispositions.

spatiotemporal location is needed to yield an accurate principle of identity; I will argue for this principle in section 2.3, and its benefits are exemplified in sections 2.3 and 5.3.3.

Given Causal Profile and Multi-track, these questions arise: What is the relation between the various powers of disposition? And, what kinds of entities are the various powers of dispositions? I think the powers, F_{M1}, F_{M2}, etc., of F are best understood as properties of properties of F, essential for F being a token of the type of disposition it is. But this does not imply that they are really distinct, i.e., separable, from F or each other.

Duns Scotus inquired about the relationship between the various powers of the soul – its powers such as intellect, will, and imagination. He argued that these powers are *formally distinct*, but not logically or really distinct, from each other and from the soul itself.[26] These distinctions, and the analogy with the powers of the soul, may help in understanding the relationship between a disposition and its powers. The basic idea is that the powers of a token pure dispositional property, F, are *formally* distinct from F and from each other, but not *really* or *logically* distinct, and collectively constitute F. (The following application of Scotus' distinctions to multi-track dispositions is intended as helpful speculation, not a fully developed theory of the relation between dispositions and their powers.)

Scotus states that in the "same real thing there are always formally distinct realities (be they in the same real part or the same real whole)."[27] These "realities", or

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[26] Scotus introduces the formal distinction primarily to deal with questions concerning the nature of God—such as, if God is simple, then how can he possess various, diverse attributes, such as wisdom and mercy?—but he also applied it to being and its attributes, the soul and its powers, and the nature an individual shares with others of its species, as well as its unique individuality or haecceity (Alluntis and Wolter 1975: 507). This note is just to indicate the diversity of topics to which Scotus applied the formal distinction.

[27] Duns Scotus, *Ord*. II, d. 3, no. 187-8, Vat. 7, 483-4; qtd. in and trans. by Frank and Wolter (1995: 187).

"formalities," are the formally distinct entities in a thing (Grajewski 1944: 80). Here is my analysis of the formal distinction:

> **Formal Distinction**: In one thing, G, X and Y are formally distinct from each other and from G, i.e., are formalities occurring in G, *iff*: (i) X and Y are really identical to each other and G, and (ii) X and Y are virtually separate things in G.

Condition (i) distinguishes the formal from the real distinction, and condition (ii) distinguishes the formal from the logical distinction. Things are really distinct *iff* they are ontologically separable (e.g., as, in a water molecule, hydrogen and oxygen are separable from each other), and things are logically distinct *iff* they are distinguishable in thought alone (e.g., Superman is merely logically distinct from Clark Kent, because their being distinct depends essentially on one's perspective or awareness). The formal distinction, by contrast, occurs between "two or more" really identical formalities of a singular thing, G, so it involves a minimum of two formalities (Grajewski 1944: 93).

Concerning condition (i), Scotus thinks a *real identity* exists between X and Y, and G, *iff* they are really inseparable (Cross 1998: 8). He seems to mean that they are ontologically identical, the opposite of real distinctness, as Grajewski (1944: 74) notes. But within the class of really identical entities, some possess multiple *formalities* (X and Y), which are the objective correlates of the formal distinction (Alluntis and Wolter 1975: 506-7). Formally distinct entities do not just form union, as hydrogen and oxygen do, but are necessarily contained in one real thing.

Concerning condition (ii), sometimes Scotus makes a distinction between *virtually* distinct things and *formally* distinct things, and sometimes he interchanges the terms. Scotus thinks that formally distinct things *could be* taken to be separate things, but

in fact they are not. He says that we could call the formal distinction a *differentia virtualis* ("virtual difference"),

> because that which has such a distinction does not have in itself two things (*rem et rem*) but is only one thing (*res*) possessing virtually or eminently *as if* two realities, since to each reality, as it is in the thing, belongs that property which resides in such a reality, if it were a distinct thing. In this manner, one reality distinguishes and another does not distinguish, just as if this reality were one thing and that reality another.[28]

Condition (ii) establishes that X and Y are not "two things" but one: they are ontologically identical to themselves and to G. However, in unitively containing X and Y, G possesses them "virtually or eminently *as if*" X and Y were "two realities" or things. X and Y possess everything they need to be their own separate realties, but since they are contained unitively—as condition (i) holds—they are, despite appearances, not separate realities.

Scotus seems to mean that X and Y present themselves, from a metaphysical point-of-view (not just a mental or logical point-of-view), as if they were two really distinct things, though in fact they are really identical. In G there "belongs that property which resides in such a reality, *if it were* a distinct thing."[29]

The foregoing discussion is not presented as an argument that the powers of a token pure disposition, F, are formally distinct. Rather, it is presented as clarification of the relation between the various powers. Mumford (2004: 171) says that the various powers of a disposition form a unique set or cluster of powers in one property. This is

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[28] Duns Scotus *Ox*., I, d. 2, q. 7, n. 43, VIII, 603a; qtd. in and trans. by Grajewski (1944: 91).
[29] Duns Scotus *Ox*., I, d. 2, q. 7, n. 43, VIII, 603a; qtd. in and trans. by Grajewski (1944: 91, my italics).

consistent with the view advanced above, however the formal distinction offers a deeper understanding of the ontological status of the powers of F. F's multiple powers are formally distinct from each other and F. They are not separable, and so not really distinct, yet they are more than merely logically distinct, for they are realties of F. Together, F's powers constitute the causal profile of F.

1.4. Detailed Roadmap of Chapters 2-5

In this section I outline the overall course of the arguments in the remaining chapters, explaining the interconnections between key ideas. Section 1.5 then provides a brief summary of the core claims of the theory of pure dispositions I advance.

Chapter 2 defends the Pure Dispositions Thesis from a series of powerful objections: the Powers Regress Argument (Psillos 2006), the Insufficient Causal Basis Argument (Psillos 2006), the Argument from the Identity Thesis (Mumford 1998, Heil 2003), and the Argument from Spatial Occupation (Williams 2009). All of these objections aim to show that pure dispositions are metaphysically incoherent. I provide counter-arguments to each of these objections, thus preserving the Pure Dispositions Thesis. Elements of the counter-arguments point toward a modest theory of the being or continual existence of pure dispositions, and this theory is developed as part of Chapter 3.

Chapter 3 examines a motivating problem or question behind all of the objections countered in Chapter 2. This is the Problem of Being: What accounts for the continued existence of a pure disposition when it is not manifesting? Chapter 3 establishes criteria for evaluating the Problem of Being and then examines four theories of the being of pure dispositions: (i) that pure dispositions are grounded globally, i.e., in all properties (Handfield 2008); (ii) that pure dispositions are grounded in the world as a whole (an

implication of Schaffer 2010); (iii) that pure dispositions are grounded somehow by their object-bearers yet the object is not a causal basis (an implication of Lowe 2006); and finally, (iv) that pure dispositions are self-grounded entities (suggested by Mumford 2006 and Handfield 2008). It is argued that the self-grounding theory is the most viable of the four theories, but it is explained how the self-grounding of some pure dispositions is consistent with other pure dispositions being grounded somehow else (e.g., extrinsically). Furthermore, an explanation of how a pure disposition grounds itself is developed and defended. The core principle is that pure dispositions ground themselves through a minimally sufficient occurrence of their own power. In developing this idea, I explain what kind of manifestation this is, what the activating condition or stimulus might be, and why a minimally sufficient occurrence of a pure power does not imply that pure dispositions are categorical.

Chapter 4 examines the possibility of the extrinsic grounding of pure dispositions, suggested but tentatively dismissed in Chapter 3. It is frequently argued that the properties of simple fundamental particles are dispositional (not categorical) properties, and because such particles contain no micro-components, this implies that their dispositions are ungrounded – that is, there are no grounds for their 'being' beyond themselves. This argument assumes that dispositions, if grounded at all, are grounded intrinsically – that is, grounded by properties of the objects bearing the dispositions. For example, Mumford (2006: 479) contends that "The grounds of a dispositional property can be found only among the lower-level components or properties of that of which it is a property," where "lower-level" roughly means something intrinsic to the object in question. In contrast, I defend the possibility of extrinsically grounded fundamental pure

dispositions, such as mass. This is philosophically significant because no one has yet argued for the extrinsic grounding of such properties as mass, charge, and spin. The chapter forwards two arguments for the extrinsic grounding of at least some dispositions of fundamental particles, one partly empirical and one purely metaphysical, defends them from objections, and discusses important implications.

The connections between Chapters 3 and 4 call for some important qualifications relevant to the overall theory of pure dispositions I am advancing. While it is true that Chapter 3 argues that some pure dispositions are self-grounded, it remains possible that some pure dispositions may be extrinsically grounded. For example, fundamental dispositions may be pure self-grounded dispositions, while non-fundamental pure dispositions may be extrinsically grounded (and they are non-fundamental precisely because they have further grounds besides themselves, although these grounds do not constitute causal bases hence they remain pure dispositions). This is significant because many philosophers, e.g., Molnar (2003) and Mumford (2006), who accept pure dispositions, typically hold that pure dispositions are *necessarily* self-grounded properties (ungrounded in any further properties). More specifically, I hold that a pure dispositions, F, is either (i) its own causal basis and self-grounded, or (ii) its own causal basis and extrinsically grounded. F's grounding properties reflects the type, fundamental or non-fundamental, of pure disposition of which F is a token.

The cases in which we get this metaphysical split in which pure dispositions are grounded in different ways are those in which either some sort of extrinsic grounding holds, or in which pure dispositions emerge at higher-levels (and thus do not reduce to lower levels). Regarding the first case, supposing that Priority Monism (Schaffer 2010) is

true, dispositions of derivative objects may still be pure though grounded in properties of the World as a whole. However, dispositions of the World itself will also be pure, and since they are fundamental and do not depend on any further properties (intrinsic or extrinsic), they are self-grounded pure dispositions. (Note that the World as a whole must have at least one pure disposition, a disposition to generate or ground properties of the parts of the World.) Regarding the second case, it is possible pure dispositions emerge at higher-levels of reality, and that some properties of lower-levels constitute grounds for the higher-level pure dispositions while not constituting causal bases for them. These kinds of pure dispositions are made possible by way of the grounds/causal basis distinction addressed in section 1.3.4. Whereas dispositional essentialists generally hold that pure dispositions form the fundamental layer of properties, I am claiming that pure dispositions may exist at non-fundamental levels too.

Finally, Chapter 5 examines systems of pure dispositions. Chapter 2 through 4 concerned primarily the possibility and continuous existence of tokens of a single type of pure disposition. But the following question naturally arises: Can there be systems of pure dispositions? If so, how does such a system generate any other properties, supposing it forms the fundamental level, or some lower level, of a multi-level system of properties? In Chapter 5, first I provide an analysis of a pure dispositional system. Then, I defend the possibility of such a system of properties from three objections: the Act Exclusion Argument (Armstrong 2004), the Argument from Affectability (Heil 2003), and the Problem of Individuation (Hawthorne 2001). Finally, I show how a pure dispositional system may account for higher-level categorical and dispositional properties. I advance a theory of dispositional emergence based on the notion of property emergence advanced

by Humphreys (1997). The core of the theory involves the idea that two or more pure dispositions, working in a reciprocating fused state of existence, may generate higher-level emergent properties.

1.5. Summary of a Theory of Pure Dispositions

The chapters in this dissertation, to a large degree, stand alone; they are not to be necessarily construed as successive stages in one long argument. This is by design. However, the various critiques and arguments I advance do form an internally coherent package theory, as the roadmap above may indicate. But for further clarification, by way of concluding this introductory chapter, the overall theory of pure dispositions defended in this dissertation consists of nine core claims that I will state below. For any pure disposition token, F:

(1) F is directed towards its manifestation (Molnar 2003: 60-81). (I discussed this in section 1.3.3, and I further elaborate it in section 2.3.)

(2) F's directedness is not a property of F, but either an existence condition for F, or F's dispositionality just is F's directedness. (I argue for this in section 2.3.)

(3) F is multi-track, so it can manifest in multiple ways (Ryle 1963: 114); thus, F possesses many powers. (I discussed this concept in section 1.3.5, and I employ it mainly in sections 2.5 and 3.7.)

(4) F is its own causal basis (McKitrick 2003b). (I introduced this in section 1.1, and it is crucial assumption in section 2.4 and 2.5, and all of chapters 3 and 4.)

(5) The grounding properties of F may be distinct from the causal basis of F. (I argued for this in section 1.3.4, and it is employed as a standing assumption throughout chapters 3 and 4.)

(6) F may not be a fundamental property as dispositional essentialists assume, since F could have lower level grounds but still be pure; thus, some pure dispositions might exist at higher levels of reality. (The arguments of chapter 4 suggest this, and sections 5.2 and 5.4 further discuss this.)

(7) F is either (i) its own causal basis and self-grounded, or (ii) its own causal basis and extrinsically grounded, depending on the type (fundamental or non-fundamental) of pure disposition of which F is an instance. (This is implied by the collective arguments of sections 3.7 and chapter 4.)

(8) If F is self-grounded, such that F is an intrinsic property of the object that bears it and there are no further grounding properties besides F itself, then F maintains its own being via a minimally sufficient occurrence of its power. (This is discussed in sections 3.6 and 3.7.)

(9) Systems of pure dispositions may realize higher-order categorical and/or dispositional properties, via the mechanism of dispositional emergence. (This is the main claim of chapter 5.)

With the core elements of my theory of pure dispositions summarized, and key assumptions explained, the next chapter defends the possibility of a pure disposition from several objections.

Chapter 2

A DEFENSE OF PURE DISPOSITIONS

2.1. Introduction

The Pure Dispositions Thesis or something similar is endorsed by Bird (2007: 43-6), Mumford (2006: 471-80), Molnar (2003: 131-7), McKitrick (2003b), and Ellis (2001: 114, 2002: 74-5). But are pure dispositions possible? This chapter evaluates four recent, powerful objections to the Pure Dispositions Thesis, and argues that none of them show that pure dispositions are metaphysically impossible. The four objections include: the Powers Regress Argument (Psillos 2006), the Insufficient Causal Basis Argument (Psillos 2006), the Argument from the Identity Thesis (Heil 2003), and the Argument from Spatial Occupation, an implicit worry behind the other objections that is articulated explicitly by Williams (2009). These are not the only objections, but they are ones that have not been dealt with sufficiently.

I will examine each of the objections in turn, arguing that none of them falsifies the Pure Dispositions Thesis. Note that McKitrick (2003b) responds very effectively to another set of objections to pure dispositions which I will not deal with here. Building on elements of my critique, I will sketch an initial theory of the being or continual existence of pure dispositions. This theory will then be developed in Chapter 3.

2.2. The Powers Regress Argument

What do dispositions do when they are not manifested or manifesting?[30] One answer is that a disposition remains grounded in its causal basis. For example, for any given vase, V, the micro-structural properties of V arguably serve as the causal basis of V's fragility. The breaking of V in the appropriate circumstances is the manifestation of fragility, yet

[30] Psillos (2006: 137) asks this question.

V's fragility exists even when not manifested. The causal basis anchors the being of a disposition when it is not manifesting. So, the answer to the question at the beginning of this paragraph is that dispositions remain grounded in their causal bases when they are not manifesting (or manifested). But, the question then arises: what do *pure* dispositions do when they are not manifesting or manifested?

According to the Pure Dispositions Thesis, a pure disposition, F, has no causal basis so we cannot say that when it is not manifesting, it is anchored by its causal basis. More exactly, F neither has a causal basis in categorical properties (categorical properties by their very nature are continuously fully manifest or occurrent), nor a causal basis in further dispositions. Either way, F would not qualify as a pure disposition. According to Psillos (2006), this idea leads to a regress given two plausible assumptions about the nature of dispositions.

The first assumption is that dispositions possess directedness. Psillos assumes that Molnar (2003: 60-81) is right in attributing directedness to dispositions, a kind of intentionality. As explained in detail in section 1.3.3, the key idea is this: like many mental states are directed towards their possibly inexistent objects in the world (a belief can be about something that does not exist in the world), dispositions are directed towards their possible, but currently inexistent, manifestations (the 'object' of the disposition is its manifestation). Thus, if F is a disposition, then it has the property of being directed towards its characteristic manifestation, M. That is, F possesses the further property of directedness – i.e., directedness is a property of a property.

The second plausible assumption about dispositions that leads to the regress is that properties are defined in terms of the contributions they make to the causal powers of

their possessors, as Shoemaker (1980) argues.[31] In short, this is the properties-as-powers thesis. This implies that F's property of being directed towards M is a further dispositional or powerful property, Q: "directedness is a power of powers: it is the power they have to manifest themselves" (Psillos 2006: 139). For example, supposing F is fragility, if object *x* possesses F, then F possesses Q, "the power [of F] to manifest itself even when it is not manifested" (Psillos 2006: 139).

The directedness property of F gives the pure dispositions theorist an answer to the question above: when not manifested, pure dispositions *remain directed towards M.* That is what they *do* when not manifesting – they maintain directedness. This leads to the regress Psillos (2006) charges, and I formulate as follows:

> **Powers Regress**: Any pure disposition, F, needs another disposition, Q, i.e., the directedness of F towards F's manifestation. But, since Q is a disposition, then Q is directed toward Q's manifestation (i.e., maintaining F when F is not manifesting) but Q does not manifest when F is manifesting. Thus, Q requires a disposition, R, to maintain Q's directedness when Q is not manifesting, and so on…ad infinitum.

Thus, according to Psillos, pure dispositions require an infinite series of dispositions, since each pure disposition requires directedness. This is ontologically profligate and shows that 'pure' dispositions are not really pure since, in essence, they have a casual basis consisting of infinite, distinct dispositional properties of directedness. One might stop the regress with a non-disposition (a categorical property), but this would make F impure (Psillos 2006: 139). Or, one might suggest that Q (the disposition of directedness)

[31] Shoemaker (1980) contends that all 'real' properties are powers, i.e., properties are individuated in terms of the causal powers they contribute to or confer upon particulars; other kinds of properties, such as relations, are not powers.

itself stops the regress, but this begs the question. There is nothing so metaphysically special about Q such that it grounds F's directedness, yet its own directedness needs no further disposition (Psillos 2006: 139).[32]

2.3. Stopping the Powers Regress:

The Argument from Property Subtraction

The Powers Regress Argument hinges on the premise that directionality, Q, is an essential but distinct disposition (and hence a distinct property) of any supposedly pure disposition, F. In response, I claim that Q is not a distinct property apart from F.[33] I argue for this via the premise of property subtraction. Armstrong (1989: 72) suggests that it is metaphysically possible to take away one property at a time, slowly stripping an object of its properties.[34] I am interested in property subtraction as a tactic for revealing what is

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[32] One way to turn the Powers Regress into a non-vicious regress is to show that there is no fundamental level, rather there are infinite levels, and that each directedness property resides at a distinct level in the supervenience base supporting F. Schaffer (2003b) argues that we should take seriously the idea that there are infinite levels. If there were infinite levels, then the series of directedness powers needed to maintain the original pure disposition might all 'reside' at sequentially descending ontological levels: F resides at level 1, Q resides at level 2, R resides at level 3, and so on. I will assume that there are not infinite levels, and so critique the Powers Regress on other grounds.

[33] Kirk Ludwig (in conversation) raised the possibility to me that Q, the directedness of F, may not be a power. Perhaps it is a categorical property, and thus the Powers Regress does not ever get off the ground. Although this would contradict the properties-as-powers thesis that Psillos assumes, the Pure Dispositions Thesis I am defending does not require the properties-as-powers thesis. However, I would like to keep my assumptions consistent with those of dispositional essentialists (who assume the properties-as-powers thesis), so that the Pure Dispositions Thesis supports that metaphysic. Also, if Q were a categorical property, then it is not clear how the power 'purity' of F would be maintained. For, it seems that for any manifestation of F, the directedness of F will necessarily be involved in that manifestation – in other words, directedness would constitute a causal basis for F, regardless of whether directedness is categorical or dispositional.

[34] Armstrong (1989: 72) uses this kind of tactic against Russell's bundle theory of objects, pressing that any object x could have a near twin, or sub-duplicate x_t with one less property than x, and so on. Schaffer (2003a: 136) formulates this as the *generalized subtraction principle*: "it seems that for any n-properties object, it is possible for there to be an n-1 propertied subduplicate." Schaffer (2003a: 136) employs this in a subtraction argument for the possibility that the property mass could be a free or solo property – not pinned to any object or combined with any other properties (a conclusion Armstrong eschews). My point is that although Armstrong is the original inspiration for the argument I give below against the Powers Regress, it is Schaffer's subtraction principle that I am specifically employing in my argument. Also, note that I apply the property subtraction principle initially to a non-object – to the supposedly pure power F combined with infinite directedness powers. But I do not see that it matters one way or the other whether one starts subtracting properties from objects or collections of properties.

wrong with the conception of powers that Psillos assumes (along with Molnar), in particular the claim that Q is a distinct power from F. As a counter-argument to the Powers Regress, I submit the Argument from Property Subtraction:

(1) Suppose that properties F and Q are distinct properties. [Psillos' assumption]

(2) Suppose that we can subtract all the properties of some object until only the distinct properties F and Q remain.

If there are infinite powers or dispositions as conceived in the Powers Regress, then we must conduct an infinite subtraction.

(3) Suppose next that we subtract Q.

(4) So, F remains alone – a pure disposition. [(2) and (3)]

The Powers Regress concludes that (4) is not possible – F cannot be pure because it requires the power of directedness, Q, and thus R, etc. However, in principle, there *is* something (i.e., Q) that could be subtracted to get F alone. The mere logical possibility of inferring (4) from (2) and (3) hinges on the assumption that F is distinct from Q, i.e., premise (1).

But, I suggest that F could not stand apart from Q, even in principle, because subtracting Q leads to the contradictory conclusion that F is not even a property, whereas it is supposed to be a dispositional property. So my argument continues as follows:

(5) If F is a disposition, then it is directed towards its characteristic manifestation.

(6) Since we have subtracted Q at step (3), now F is *not* directed towards its manifestation.

(7) So, F is not a disposition. [(5) and (6)]

(8) If F is not a disposition, then F is not a property.

(9) So, F is not a property. [(7) and (8)]

(10) But F *is* a property.

(11) Contradiction. [(9) and (10)]

(12) Thus, ~ (1): it is not the case that F and Q are distinct properties.

The general conclusion is that viewing directionality, Q, as a separate property from a disposition, F – as premise (1) states and Psillos assumes to get the regress going – leads to the view that F is not a property at all. Since this is contradictory, there must be something wrong with the claim that Q and F are distinct properties. Concerning premise (5), the claim is that since F is a power it must possess or have directedness, or be directed, in *one way or another*. This is uncontroversial in the set-up and stated as I formulate it in (5) does not beg any questions on either side of the dispute: it is one of Molnar's (2003) basic theses about powerful properties, and Psillos (2006) presupposes it in the set-up of his Powers Regress. The Argument from Property Subtraction shows that conceiving of directedness, Q, as a *distinct* property from F – as premise (1) states – leads to not viewing the original disposition, F, as a property in its own right.[35]

According to the Powers Regress, Q is 'merely' supposed to maintain F's directedness when F is not manifesting, and not be essential to F's *being a property* whatsoever; it is supposed to be a property of a property. But, I contend, the initial steps of the argument, premises (2) and (3), help reveal what is wrong with the set-up that leads to the regress: F and Q are not distinct dispositions. The reason is that, as shown in steps (5) through (9), F without Q means that F is not really a disposition. So, the fact that (9)

[35] The Argument from Property Subtraction generalizes to other situations in which the property-status of a purportedly distinct property is in question: in any situation in which a property P is thought to be a second-order property of another property or a distinct property, one can use property subtraction to intuitively test the status of P.

results from the tactic of property subtraction, as a logical possibility, demonstrates that it is contradictory to conceive of Q and F as distinct.

Concerning premise (9), Psillos should accept that F cannot be a categorical property, since by hypothesis it is a dispositional property. So it must be a dispositional property on his view, but taking away Q shows that F is not a disposition, for being a disposition or having power in *some way* requires directionality, on Molnar's (2003) view. Perhaps F and Q necessarily 'go together' as components or aspects of a singular disposition, or perhaps upon subtracting Q we are left with some sort of primordial pre-property ooze that when combined with Q yields F. But these possibilities seem too obscure to take seriously.

I suggest that the best explanation for F's disappearing upon Q's departure is not that Q is a distinct power metaphysically required to maintain F's directedness when not manifesting. Rather, the best explanation is the more ontologically economical hypothesis that F and Q are one and the same.

F = Q: dispositionality = directionality.

To be a disposition *is* to be a property directed towards some possible manifestation. Another way of making this point is this: It is *not* the case that F *has the power* to bring about a manifestation, M, or *possesses directedness* towards bringing about M; rather, it is the case that F just *is the power* to bring about M, or *is directedness* towards M.[36] Thus, we have logical space to reject the premise that directionality is a property of, and distinct from, F.[37]

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[36] Supposing the property charge is a pure disposition, then if F=Q, charge just *is* directedness towards its various possible manifestations.

[37] On Molnar's (2003) account, as I understand it, directedness is supposed to be a characterization of powers, not an additional property of powers; the directedness thesis is a theory of what it is to be a power.

In response to the Argument from Property Subtraction, one might object that F supervenes on the base of directed properties Q, R, etc., and therefore subtracting that base immediately takes F away, but does not make F a non-property.[38] The same point can be made regarding any property that supervenes on another property or property-complex. By analogy, if a mental state supervenes on a brain state, then surely taking away the brain state involves taking away the mental state too. However, this objection misses the point of the Argument from Property Subtraction. My point is not that F would not exist with Q, but that F would not even qualify as a property. I recognize the *metaphysical* impossibility of retaining F while subtracting its base, if such a base exists. But my thought experiment hinges on the mere *logical* possibility of subtracting Q (and R, S, etc.) as an experiment for testing the nature of F. In principle, if Q is a distinct property apart from F, then F and Q have different identity conditions and so are properties unto themselves. This is true despite even a very tight supervenient relation between F and Q.[39] If we actually take away the supervenience base, of course F disappears; but my argument only relies on the logical possibility of isolating F conceptually to determine its nature.[40]

To summarize the argument so far: if one property at a time can be taken away from an object, we could get down to a 'pure' disposition. Psillos would claim that this supposedly pure power requires a directedness property to maintain its directedness

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Thus, the identity of F and Q, as opposed to the claim that they are distinct, is consistent with Molnar's conception of directedness.

[38] Bruce Glymour (in conversation) brought this possibility to my attention.

[39] Compare talking about properties of the world as a whole: if we take away the world, then we don't have any properties; but that need not prevent us from conceptually isolating them to test for the basis of their being.

[40] If the supervenience base of directedness properties just is identical to F (since the supervenience relation is consistent with the identity relation), then taking away the supervenience based just is taking away F. But that is to suppose the opposite of what Psillos assumes in the set-up to the Powers Regress: that Q, R, etc. are distinct properties ontologically supporting F.

towards its possible manifestation. I counter that to subtract the directedness of the power is equivalent to subtracting the power itself: there would be nothing else left. Directionality is not needed to maintain the being of a dispositional property, because, I suggest, directionality just is dispositionality. Thus, a regress does not ensue.[41]

I will now argue that, indeed, F = Q. Since we are restricting our discussion to property instances or tropes, as Molnar (2003) and Campbell (1981) do, then it is arguable that to be a trope is to be a 'here-such', not a 'this-such', to use Schaffer's (2001: 247) terms. The core idea is that tropes are individuated by spatiotemporal location.[42] Building on this conception of the spatiotemporal individuation of tropes (or, if one does not accept trope theory, property tokens), I suggest the following principle:

> **Principle of Property Identity**: A property token, G, is quantitatively identical to a property token, H, *iff* (i) G and H have identical causal profiles and (ii) G and H occupy identical spatiotemporal locations.[43]

G and H are the very same property tokens just in case conditions (i) and (ii) are satisfied. The 'causal profile' builds in the idea that properties are defined (at least partly) by the causal or functional roles they play. So the causal profile of a property consists of all the possible causal relations it may enter.[44] But there may be multiple instances of properties with qualitatively identical causal profiles, so individuating properties further requires a spatiotemporal condition – if G and H are spatiotemporally coextensive (and have the

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[41] On the Power Regress, there is an infinite number of exactly overlapping powers. This is, perhaps, too much for a single spacetime region to accommodate, hence why the Powers Regress is vicious. (Note that it is possible that some instances of properties, such as the redness and the roundness of red ball, overlap exactly, yet redness and roundness are distinct properties. But there is no charge of a regress to deal with here, since these are categorical properties.) On the view I am suggesting, there is no overlap of F and Q because F and Q are identical.

[42] That is, tropes are individuated by spatiotemporal relation (here fragility, there redness), not primitive quantity (this fragility, that redness) (Schaffer 2001: 247).

[43] Heil (2003: 141) proposes a similar principle of property identity.

[44] I am borrowing the term 'causal profile' from Hawthorne (2001).

same causal profile) then they are quantitatively identical.[45] The Principle of Property Identity will hold throughout the rest of this dissertation.

Regarding condition (ii), it is prima facie plausible that locating a disposition ('here fragility') at a specific spacetime location simultaneously involves locating directionality ('here directedness towards breaking') at the exact same spacetime location. So I contend that Q and F overlap identically: if disposition F exists at l_1, then directionality Q exists at l_1, and vice versa. If this is right, then this satisfies condition (ii) above, suggesting that F and Q are one and the same token. But what about condition (i) – do Q and F have different causal roles? Perhaps, as stated in the Powers Regress, directedness may maintain dispositionality. Q maintains F, but F cannot maintain itself, so Q and F have different causal roles, thus condition (i) is not met.

I have three responses. First, I have already given independent reasons for thinking Q and F are not distinct – the Argument from Property Subtraction which shows that F and Q could not play distinct causal roles. Second, the contention that Q and F *must* have different causal roles seems to beg the question against the advocate of pure dispositions. On the contrary, it is just as plausible *prima facie* that the causal role of being directed towards a manifestation, M, is the causal role of being disposed towards M. Finally, F might maintain itself because it is its own causal basis, as McKitrick (2003b) argues, thus there is no independent reason to think that F would need a distinct property Q to maintain its directedness towards manifestation. In sections 2.4 and 2.5 I

[45] Two notes on the relationship between conditions (i) and (ii): First, a problem is that two properties may be possessed by the same object and thus overlap perfectly (e.g., color and shape of a ball), so how can they have different causal profiles? However, arguably two property tokens with different causal profiles (like color and shape) can only be spatiotemporally *contiguous* – they could not really overlap perfectly. (The color of a ball *outlines* the shape, but does not occupy every point the shape occupies.) Second, the addition of condition (ii) seems to obviate the worry for causal structuralism advanced by Hawthorne (2001), that two properties with the same causal profile will not have unique essences; the worry is alleviated because though two properties have the same causal profile, they will not have the exact same location.

present and respond to an objection, advanced by Psillos (2006), to McKitrick's claim that F can be its own causal basis.

Defending **F = Q**, I think, is the most plausible strategy for stopping the Powers Regress, but not the only strategy. How else might we account for F's directionality without committing ourselves to the claim that Q is a distinct disposition apart from F, as Psillos contends?

Campbell (1981: 137) suggests that having shape (i.e., extension in spacetime) is not a property instance itself but a condition for being a property instance in the first place. Having shape, then, is an existence condition for any property, not a further property itself, on Campbell's view. Campbell (1981: 137) suggests that "geometric figures [i.e., shape] are doubly special; they are essential to ordinary tropes [property instances] and in themselves insufficient to count as proper beings. Form and volume are therefore best considered not as tropes in their own right at all. Real tropes are qualities-of-a-formed-volume." This idea suggests the following principle.

> **Existence Condition**: C is an existence condition (not necessarily a property) for a property, F, *iff* F cannot exist without C obtaining.

Concerning dispositions, my suggestion is that directedness, Q, fits the role of C for all dispositions, and thus for pure dispositions, and so Q is not distinct from F, because Q is not a disposition at all. Rather, Q is a necessary condition for the existence of F.[46, 47] Just

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[46] Thus, ∀x (x is a disposition, x is directed at M), where the consequent here is an existence condition, not a property.

[47] This view implies that if all properties are powers then directedness is an existence condition for being any property. We need not assume, along with Campbell, that shape is an existence condition for being a dispositoin – since some dispositions might be point properties – but just that powers have some existence condition(s), one of which is Q, being directed towards M. If not all properties are powers, contra Shoemaker (1980), then there are categorical properties and dispositional properties. Then, perhaps an existence condition of categorical properties is having shape, while dispositions have the existence

as tropes require shape, but shape is not a trope itself, power tropes require directedness, but directedness is not a trope itself. Thus, there is no regress of disposition tropes.[48]

2.4. The Insufficient Causal Basis Argument

Along with others, Psillos (2006: 147) claims that for any disposition, pure or otherwise, something must be the truth-maker of the power's associated manifestation conditional.

Manifestation Conditional: *If so-and-so were the case, then F would manifest*.

What makes it true that F would manifest if so-and-so were the case, i.e., if the appropriate circumstances of manifestation were present and F were triggered by its appropriate stimulus? Something must make true the fact that the disposition would manifest if triggered. For non-pure dispositions, the answer is: a causal basis. The pure dispositions theorist needs some answer as to the nature or being of unmanifested pure dispositions, something that makes the Manifestation Conditional true.

McKitrick (2003b) suggests that pure dispositions ('bare dispositions' as she calls them) can be their own causal basis, and Psillos critiques this proposal. In particular, McKitrick (2003b: 364) is concerned with dispositions that have "no distinct causal basis," i.e., no distinct causal basis in some property or property-complex other than the power itself. Thus, she holds the following:

> **Truth-maker**: The truth-maker of the Manifestation Conditional associated with F can be F itself.[49]

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condition of being directed. An existence condition for both kinds of properties (i.e., property tokens) is *being in spacetime.*

[48] One might insist that we should consider shape and directedness essential properties *of* properties (i.e., essential second-order properties), not existence conditions. However, perhaps the distinction between existence conditions and essential properties is merely a logical distinction – two ways to consider the same feature. But this is to admit that directedness is an existence condition, so the directedness of F is no addition to the being of F. Also, if I am right in my defense of the identity of directedness and dispositionality, then it is trivially true that dispositionality is an existence condition for directionality, and vice versa.

This suggests that when not manifesting F grounds its own being or continuous existence – that is what F *does*, to answer the question asked at the start of section 2.2. (This will be further discussed in section 2.12.)

Psillos (2006: 147) counters that F alone cannot be a causal basis for its manifestation, for dispositions "also need some external stimulus to" manifest. That is, dispositions need triggers to manifest. For example, a vase's fragility requires a hammer strike, or something similar, to manifest. For McKitrick (2003b: 361), however, "a causal basis is simply the object's causal contribution to the manifestation" of the disposition in question. So, on McKitrick's view, F can properly be its own causal basis so long as it *causally contributes* to the manifestation of F. Importantly, the fact of F causally contributing to F's manifestation is not equivalent to F being causally sufficient for F's manifestation; this will be a useful distinction in my evaluation of Psillos' critique below.

Still, Psillos (2006: 147) presses that a pure disposition does *more* than contribute to its own manifestation, for it also "causally contributes to the absence of this manifestation," that is, when the disposition is not manifested. But, "How does the very same power [disposition] contribute to the (occasional) presence and the (more frequent) absence of an effect?" (Psillos 2006: 147). Thus, we get the following objection:

> **Insufficient Causal Basis**: For a pure disposition, F, it is problematic how the very same F that causally contributes to its manifestation, M, also causally contributes to ~M.

The key idea behind the objection seems to be that there is no other intrinsic property of the object bearing F to causally explain why F does not manifest, because by definition F

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[49] This implies that there is no need for a further power Q (directedness) to maintain F, for on this view F maintains itself when it is not manifesting and is the causal basis of its own manifestation.

has no distinct causal basis, and thus no other property or property-complex that could explain why F is *not* manifesting.[50] (For example, when fragility is not manifested, it seems natural to say that its not being manifested is due to the microstructure of the vase not being stimulated.) So, this objection puts pressure on the idea that F is all is needed to explain the manifestation and non-manifestation of F.

Before critiquing the Insufficient Causal Basis Argument, it is useful to reflect on the structure of the overall attack on pure dispositions that Psillos presents. Essentially, in the Powers Regress he claims that F requires some other powers or dispositions (Q, R, etc.) to keep it directed towards manifesting, but this leads to a regress. In the present argument he is claiming that perhaps F does not require any other dispositions to keep it directed towards manifesting, for F alone might be sufficient; but it is not sufficient, Psillos claims, because it cannot account for F's *not* manifesting.

2.5. Critique of the Insufficient Causal Basis Argument

One might wonder why the Insufficient Causal Basis Argument is an objection, given that F can be its own causal basis for manifestation, per Truth-maker. Psillos does seem to assume Truth-maker for the sake of argument, but then claims that while F may be sufficient as a causal basis for manifestation (which is all Truth-maker states), it is *not* sufficient for its *non*-manifestation. However, if F casually contributes to its manifesting when appropriately triggered, then when not appropriately triggered F should causally contribute to F not manifesting (simply in virtue of *not* being triggered), just as any non-pure disposition does not manifest when not triggered. Thus, to suppose that a special

[50] One might argue along the following lines: that F does not need to causally contribute to the absence of an effect or manifestation. Otherwise, to accept Psillos' argument here is to accept that a pure disposition is somehow involved in negative causation, i.e., that it causally contributes to the absence of its possible manifestations.

problem arises for pure dispositions seems to suppose that a pure power cannot be its own causal basis for manifesting, not *just* that it cannot be a causal basis for non-manifesting, as the Insufficient Causal Basis Argument contends. Although the real worry behind Psillos' argument may be that a pure disposition is not doing anything when not manifesting (unlike non-pure dispositions which remain grounded in their causal bases), this seems to suppose that a pure disposition does not remain grounded in its causal basis, i.e., in itself (per Truth-maker), which at least seems possible. In sum, I am claiming that *prima facie* the non-manifestation of a pure disposition does not seem to require an explanation beyond not being stimulated, just as is the case with non-pure dispositions. However, Psillos does think that invoking the stimulus is problematic, as I will discuss shortly.

Psillos proposes two options for responding to the question of what contributes to F's manifesting *and* not manifesting, and he argues that both options are problematic. I will defend the first option from Psillos' criticism, and argue that the second option overlooks a plausible fact about dispositions.

The first option for responding to the Insufficient Causal Basis Argument is that the difference between the presence of the effect (or manifestation) and its absence is due to the presence or absence of the stimulus (Psillos 2006: 147). So, the first option is this:

> Option 1 – **Stimulus**: The presence or absence of the stimulus, S, is the causal difference-maker between M and ~M.

Psillos (2006: 148) thinks that this is problematic because S neutralizes the role of the pure disposition as a "causal contributor" to its manifestation, since the "causal burden" shifts to S which is external to the pure disposition. Thus, against taking the Stimulus

option in response to the Insufficient Causal Basis Argument, Psillos contends the following (my formulation):

> Problem with Option 1 – **Neutralizer**: If the stimulus, S, makes the difference in the manifestation of F, then S neutralizes the role of F in the manifestation, thus F does not make the Manifestation Conditional true.

Whatever F is, Psillos argues (2006: 148), it should be the truth-maker for *both* the manifestation and the non-manifestation of F.

However, I think that Stimulus is a viable response to the Insufficient Causal Basis Argument. I claim that F alone *can* be the truth-maker for both outcomes. This is because the "causal burden" does not shift to the external stimulus. Generally, the following principle seems true, and thus forms the basis of a solution to the problem with option 1:

> **Causal Contribution**: If something, X, bears a causal burden, this does not mean that X is *solely* responsible for bringing about some event or state of affairs, E. Rather, it means that X contributes to E in some way: X bears the burden of *contributing* to the occurrence of E.

For example, if one says 'Michael bears the burden of swimming well for his team to win', this does not mean that Michael doing so is sufficient for victory. He can share part of the causal burden, without bearing the burden full-stop; he just bears part of the burden, the burden of contributing something to the victory. Similarly, an external stimulus can share part of the causal burden without bearing the burden full-stop of the manifestation of F. Both F and the external stimulus may be *necessary* for the

manifestation of F, and so both share the causal burden – both contribute to the manifestation and thus both make the Manifestation Conditional true.

Thus, it is not true that the external stimulus neutralizes the causal role of F. Without F's presence, it is trivially true that the external stimulus could do nothing to bring about the manifestation of F; and when F is present, F causally contributes to its manifestation in virtue of being a non-continuously manifested, i.e., in virtue of being non-manifested at the time just prior to F being subjected to the external stimulus. If the stimulus does not contribute to the manifestation of F, this is because the stimulus was not appropriate for F's manifestation. But in this case, F remains partly causally responsible (shares the causal burden) for its non-manifestation, for clearly F plays a necessary role in whether or not F manifests when exposed to the appropriate stimulus. This is partly what it means to be a disposition, in general. If Psillos were correct that the causal burden shifts solely to the stimulus, then it seems we would have to conclude the same thing about dispositions in general. Thus, no causal basis of a disposition would meet the demands set by Psillos for being sufficient.

The second option for responding to the Insufficient Causal Basis Argument is to point out that in addition to F, there is another pure disposition, the disposition to remain unmanifested unless activated by the appropriate stimulus (Psillos 2006: 148). Thus, Psillos considers the following in response to the Insufficient Causal Basis Argument:

> Option 2 – **Multi-powers**: In order to be its own causal basis, any pure disposition F, requires another disposition, F_1, to remain unmanifested unless stimulated.

But, Psillos argues, suppose that a vase has a pure disposition to remain intact combined with the pure disposition of fragility (supposing for the sake of discussion, along with Psillos, that fragility is a pure power). Then, we have pure dispositions proliferating wildly: the pure disposition to remain intact when hit lightly, the pure disposition to lose fragility if masked, etc. This criticism is captured thus (again, my formulation):

> Problem with Option 2 – **Proliferation**: If Multi-powers is true, this will result in the proliferation of dispositions: F_1, the disposition to remain unmanifested unless activated by stimulus S_1; F_2, the disposition to remain unmanifested unless activated by stimulus S_2, and so on.

This, Psillos (2006: 148) objects, "defies Occam's razor" and we are "left totally in the dark as to how all these 'bare' powers [dispositions] are connected with each other."

If my defense of the first option for responding to the Insufficient Causal Basis Argument is sound, then the second option is not needed. Still, supposing the first option were no good, the second option is not needed (and thus does not lead to the problems Psillos raises) because there need not be anything but the pure disposition itself to account for all the phenomena needing explanation. There need not be a set of many connected pure dispositions, but one multi-track disposition.

As explained in section 1.3.5, the principle Multi-track maintains that pure dispositions may receive various stimuli and thus manifest in various ways. This forms the basis of the following solution to the Problem with Option 2:

> **Multi-track Solution**: Since F may receive multiple kinds of stimuli, F may manifest and thus *not* manifest in multiple ways.

Since the Insufficient Causal Basis Argument seems to assume that this is not possible for pure dispositions, the argument is insufficient to discount option 2 and thus the possibility of pure dispositions is preserved.

To elaborate the solution, given that a pure disposition may be capable of manifesting in various ways depending on the circumstances it follows that it may also be capable of *not* manifesting in various ways. The trigger or stimulus of a disposition plays a part in how it manifests, and thus in how it does not manifest. The various possible stimuli, or disposition partners of a disposition, explain how a disposition might manifest in many different ways. Whether a hammer crushes a glass or a slight tap of a fork cracks it, it is the same disposition manifesting in different ways and to different degrees (and, when a hammer does *not* crush a glass, or a fork does *not* tap it, it is the same disposition *not* manifesting in different ways). When F does not manifest, it may appear that some separate disposition holds F back from manifesting, when in fact F is simply restrained from manifesting because of the lack of appropriate stimulus condition for its manifestation. In other words, a disposition F *does not* manifest in virtue of the *lack* of appropriate stimulus (disposition partner), just as F *does* manifest in virtue of having an appropriate stimulus (disposition partner).

I conclude that McKitrick's idea that F can be its own causal basis remains a viable thesis. Thus, the Insufficient Causal Basis Argument is unsound, and so the Pure Dispositions Thesis remains intact.

2.6. The Argument from the Identity Thesis

According to Heil (2003: 111), "every property of a concrete spatiotemporal object is simultaneously qualitative and dispositional." Similarly, according to Mumford (1998:

190), "The dispositional and the categorical are correctly understood just as two modes of presentation of the same instantiated properties."[51] These statements represent the following claim:

> **Identity Thesis**: For any instance, P, of any property type, P is simultaneously dispositional and categorical; in other words, every instantiated dispositional property, D, is identical to some instantiated categorical property, C. Thus, D = C.

I am using "D" to refer to any disposition token, in contrast with "F" which I used to refer to any pure disposition token. If every disposition is identical to a categorical property, then all property instances are both dispositional and categorical. Thus, it is trivially true that every disposition has a causal basis in a categorical property, namely the categorical property that is identical to the disposition in question. Thus, as Psillos (2006: 155) observes, if the Identity Thesis is true then the non-powerful nature of a property "can explain what the property does when it is not manifested." The Identity Thesis thereby logically excludes the Pure Dispositions Thesis.[52]

Heil (2003: 114) says that denial of the Identity Thesis "leads to a conception of properties of the fundamental things as pure powers [dispositions]" and this is "prima facie implausible," as he argues (Heil 2003: 97-107). However, it is not clear why denial of the Identity Thesis leads to this conception. Denial of the Identity Thesis does not imply that *no* categorical property is identical to a dispositional property, just that some

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[51] However, Mumford (2006) now accepts pure dispositions, so rebukes the Identity Thesis.

[52] Then again, perhaps the Identity Thesis does *not* exclude the Pure Dispositions Thesis. Supporters of the Identity Thesis, such as Heil (2003), typically reject talk of 'sides' or 'aspects' of a property token. A property just is both dispositional and categorical, and is defined in terms of its causal contribution to the object possessing the property (Shoemaker's 1980 thesis). Thus, it seems that properties are defined in terms of powers; so it might be thought that their categorical nature consists of the fact that they are 'categorically completely powerful.' But this just seems to be what pure dispositions are – properties defined completely in terms of powers to do things. Moreover, perhaps one of the causal roles of a pure disposition is just the causal role of continuous existence – that is, having a categorical nature.

are not. Thus, denial of the Identity Thesis does not necessarily lead to a conception of the properties of fundamental entities as pure dispositions. Thus, whether the claim that the properties of fundamental things are pure dispositions is plausible or not is tangential to the Pure Dispositions Thesis.

In section 2.7, I present the Modal Argument against the Identity Thesis, due to Rives (2005). In section 2.8, I defend the Modal Argument by raising some objections to it and responding to them. In section 2.9, I articulate the Temporal Identity Argument against the Identity Thesis. The Temporal Identity Argument is similar to the Modal Argument, but without the modal features. Just showing that the Identity Thesis is false is not sufficient, of course, to show that the Pure Dispositions Thesis is correct, since we would need to show that pure dispositions are not grounded in some other way besides identity. But showing that the Identity Thesis is false is necessary to keep alive the metaphysical possibility of pure dispositions.

2.7. The Modal Argument against the Identity Thesis

Rives (2005: 21) argues that the modal properties of disposition tokens differ from the modal properties of their categorical base properties; thus dispositions and their causal bases are not identical.[53] First, Rives (2005: 23) assumes that the categorical basis of a given disposition is instantiated by the very same particular that instantiates the disposition in question. For example, a vase V instantiates both the categorical property instance of having a *certain molecular bonding property*, C, and the disposition instance of *being fragile*, D.[54] Then, Rives (2005: 23) presents a case in which V instantiates both

[53] Although Rives targets Mumford's (1998) identity thesis, his argument works equally well against the more general Identity Thesis formed in section 2.6.

[54] If it were the case, for example, that V itself instantiated *being fragile*, while some atomic constituent particulars of V, and not V per se, instantiated a *certain molecular bonding structure*, then the Identity

D and C, yet in which C is differently realized by V (and so is a different token C) yet V possesses the same token D. I summarize the case as follows:

> In possible world PW, some of V's atoms are slightly rearranged to instantiate categorical realizer β of D, whereas in the actual world @, V's atomic arrangement instantiates categorical realizer α of D. α and β are different categorical properties that realize the same D; i.e., D is realized in different ways in the same object V, since both α and β, of V in different worlds, realize the same instance of F. Thus, D is distinct from its categorical base.

Rives (2005: 23) suggests that D is the same token property in both worlds because D meets the following identity condition:

> **Causal Role Identity**: Property-instance P is quantitatively identical to property-instance P1 *if and only if* P and P1 play identical causal roles.[55]

This principle assumes properties are defined in terms of their Causal Profile, a notion elaborated in section 1.3.5 (substituting 'disposition' for 'pure disposition' in the definition in that section). Causal Role Identity makes the further claim that the Causal Profile of a disposition yields a complete identity condition for a disposition token. Causal Role Identity or something sufficiently similar is advanced by Heil (2003: 141, 196) and Mumford (1998: 162) in arguing for the Identity Thesis,[56] and is essentially a

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Theorist could object that the setup assumes that *being fragile* and having a *certain molecular bonding structure* are not identical because they are instantiated by different particulars.

[55] This is essentially clause (i) of my Principle of Property Identity in section 2.3. Importantly, Causal Role Identity is not the same concept of 'causal profile' explained in section 1.3.4, where I claimed that dispositions have causal profiles, not that their identity consist of solely such a profile (for, the further condition of spatiotemporal location is needed, as I advocated in section 2.3).

[56] Heil (2003: 196) accepts that properties must contribute to the causal powers of their bearers, while also suggesting that if two property tokens are identical, then they are exactly similar, i.e., similar in terms of causal powers (Heil 2003: 141); thus he would accept Causal Role Identity. Heil (2003: 141) suggests the additional necessary condition that quantitatively identical properties must occupy the same spatiotemporal location, similar to condition (ii) of my Principle of Property Identity (section 2.3). Rives' Modal

principle advocated by Shoemaker (1980). Let us accept Causal Role Identity for the sake of argument. Now, in both PW and the actual world, D has the same causal roles (including spatiotemporal location causal roles), *so* D is the very same property. Yet, the categorical realizing property differs in V (due to the altered atomic arrangement). So, the Identity Thesis is false. (It is no objection to Rives argument that D is contingently identical to α in one world and to β in another world, since the Identity Thesis concerns necessity of identity.)

2.8. The Modal Argument: objections and replies

I think Rives' Modal Argument is sound. But there are some objections needing deflection, and the objections and responses that follow are mine. First, one may object that Rives' argument begs the question against the Identity Thesis by assuming that in both PW and @, D meets the requirement of Causal Role Identity. In response, it seems right that in both PW and @, D meets Causal Role Identity, for in all possible worlds in which V possesses D (and the laws of nature are the same) D would display identical manifestations in relevantly similar conditions. The only difference between PW and @ is the categorical realizer. Whether fragility is realized by α or β, intuitively it seems correct that the manifestations of fragility in the worlds corresponding to α and β would be the same: if V with realizer α were struck with a hammer H, V would break in a certain way, and if V with realizer β were struck with H, V would break in the same way.

However, a further objection might be advanced. Even if we suppose that Causal Role Identity is sufficient for correctly identifying D across worlds, it is not clear that that principle applies to dispositions. This is because it is not clear that dispositions play *any*

Argument, and my Temporal Identity Argument (section 2.9) and Causal Role Argument (section 2.10), are consistent with that further condition. Mumford's (1998: 162) formulation substitutes "all the same causal roles" for "identical causal roles" in Causal Role Identity.

causal role, since dispositions may not be causally relevant and/or efficacious (the idea is that the underlying categorical bases do all the causal work, along with stimuli). But if dispositions have no causal roles, because they are not causally relevant, then we cannot assume Causal Role Identity holds in the case of dispositions. So, there are no grounds for thinking that D is the same token in PW and the actual world. In response, although there certainly are those who claim that dispositions have no causal role or are impotent (e.g., Prior, Pargetter, and Jackson 1982), the causal efficacy of dispositions has garnered support in recent work on dispositions. Defending the causal efficacy of dispositions is beyond the scope of this chapter, but McKitrick (2004 and 2005) and Martin (2008), for example, defend the causal efficacy of dispositions. And, of course, dispositional essentialism, advocated by Bird (2007) and Mumford (2004) implies that fundamental dispositions just are causal powers. All that Causal Role Identity requires is that dispositions play *some* causal role, even a very limited role.

Another objection to the Modal Argument is also rooted in Causal Role Identity. This worry is that the categorical properties α and β (the molecular bonding structure of V) are identical, because they play the same causal role in both PW and the actual world. Even though α and β are realized in V by different atomic arrangements, they both serve as the causal basis for D and would seem to enter in all the same causal roles pertaining to V; e.g., V shattering in given circumstances and feeling smooth when touched. If their causal roles are identical, and we assume Causal Profile, then Rives' Modal Argument does not work. However, in response, α and β may in fact have different causal roles to play. What is relevant to Rives' case is that in both PW and @, α and β each realize the same disposition D. And they do. However, these categorical realizers of D are realized

in V by different atomic arrangements. This means that they will not share all the same causal roles, since α and β may each causally contribute to slightly different degrees of smoothness of V, or slightly different melting temperatures, or slightly different observational consequences – e.g., a possible observer may be able to visually detect the different molecular bonding of V in PW and @ – all of which seem to count as different causal roles.

Thus, the Modal Argument goes through. In order to further strengthen the case against the Identity Thesis, I will next present the Temporal Identity Argument.

2.9. The Temporal Identity Argument against the Identity Thesis

I now want to advance a new argument against the Identity Thesis. This argument concerns the identity of properties *over time*, not possible worlds. Here is the general idea:

> **Temporal Identity**: For some object, *x*, some instance of a categorical property or property-complex instance, C, and some instance of a disposition, D, where C and D are properties of *x*, different instances of C may realize the same instance of F over time.

For example, *x* can have different molecular bonding properties (categorical properties) over time, yet each of these categorical properties realizes the same disposition. Thus we get this picture:

Figure 2: The temporal identity of dispositions

$$\begin{array}{ccccc} D & = & D & = & D \\ \| & & \| & & \| \\ C1 & \neq & C2 & \neq & C3 \\ t_1 & & t_2 & & t_3 \end{array}$$

The "‖" represents the realization relation; "t_1", etc. represent times. The quantitatively distinct C's are instantiated by *x* (in virtue of *x*'s structure). The quantitatively identical D's are instantiated by *x*. D is the same property instance over time. In general, property instances or tokens can endure; e.g., the property instance of being white can last over the history of a house, or a portion of the history of a house. D endures across time, because D satisfies Causal Role Identity.

With this picture in mind, the Temporal Identity Argument is this.

(1) Suppose that D is identical to, and not merely realized by (contrary to the picture above), its categorical realizers, C1 at t_1, C2 at t_2, and so on.

(2) Thus, D = C1 at t_1. [(1)]

(3) D is the same token over time (D at t_1 = D at t_2).

(4) If D = C1 at t_1, then it is the case that C1 = C2. [(2) and (3)]

(5) However, C1 ≠ C2. Support follows:

(a) C at any given time = a molecular bonding structure, α.

(b) α may yield different observational consequences at t_1, t_2, etc.

(c) If α may yield different observational consequences at t_1, t_2, etc., then α at t_1 ≠ α at t_2. [Causal Role Identity and (b)]

(d) Thus, C at t_1 is not necessarily the same C at t_2. [(a) and (c)]

(6) Thus, C1 ≠ D at t_1. [(4) and (5)]

(7) Thus, ~ (2): the Identity Thesis is false.

Premises (1) and (2) reflect the Identity Theorists' position. And the Identity Theorist can grant premise (3), given Causal Role Identity. Premise (4) follows from (2) and (3).

The most contentious premise is (5), that C1 ≠ C2. First, we are supposing that C at any given time *is* the molecular bonding property at that time. Either C at different times is the same property token, or it is not. But, I contend, it cannot *necessarily* be the same token, since the molecular bonding structures can be slightly different tokens – they might be subject to different observational consequences, for example. So, given Causal Role Identity, C is not necessarily the same token at different times.

In response to premise (5), the Identity Theorist will likely retort that even very slight changes in α, and thus C, over time will yield slightly different corresponding D's over time. In other words, the more fine-grained of a manner in which the opponent begins to individuate categorical properties, the Identity Theorist will posit more fine-grained dispositional properties realized by the categorical properties. Perhaps, but some intuitive, actual-world examples may help to persuade the Identity Theorist.[57]

First, imagine that as a leaf grows its molecular structure, S, changes: over time, the leaf possesses a series of closely related structural properties, but *not* token-identical structural properties. (It is also true that the leaf's atomic realizers of S continually get replaced, but these are the particulars that realize S, not S itself.) So, the leaf has structural property S_1, S_2, S_3, and so on. It is not clear how long each structural property is instantiated, but it is plausible that the leaf instantiates different S's over time. And, each categorical property S may have slightly different causal roles (for example, one S might be subject to observational consequences X, and the next S subject to slightly

[57] Both examples below involve living organisms. That is sufficient to argue against the Identity Thesis, which does not distinguish between organic and inorganic identity. Does the Temporal Identity Argument work against inorganic properties? To adapt an example given by Rives (2005) in the Modal Argument, imagine that structural property α of a vase changes ever-so-slightly, e.g. due to some unusual magnetic disturbance or more mundanely as a result of the glass flowing (glass is a liquid) to yield structural property β (slightly different observational consequences under a microscope, for example). It seems intuitively plausible that despite the change from α to β, the vase possesses the same disposition token F: the vase will break in all the same circumstances and in all the same ways whether α, or β, realizes F.

different observational consequences Y: that is, each S might exhibit slightly different observational differences). The structural property S at each time is responsible for realizing disposition token O, the leaf's *disposition to absorb sunlight*. At various times (over many different S's), it is true that the leaf has the same O; in other words, O is the same token over time, while the S's are different tokens (albeit very similar tokens).

Second, imagine that an agent possesses the behavioral disposition courageousness, G – the agent is disposed to act bravely in certain circumstances.[58] It seems intuitively plausible that despite slight changes over time in brain process properties – b_1 at t_1, b_2 at t_2 – the agent possesses the same token G.[59]

In sum: The same disposition *token*, D, can be multiply realized in different structural (categorical) property tokens of the same object over time. Thus, D is not identical to any specific categorical property at any given time. Thus, dispositions and categorical properties are not identical. Thus, it is not the case that every pure disposition token, F, is identical to some categorical property. Thus, the Pure Dispositions Thesis stands. Two points deserve emphasis. First, each C does not necessarily realize a slightly different (but very similar) instance of D over time; so long as D over time has the same causal profile then it is the same D. Second, the idea advanced here is not multiple realization of a property type across many objects, but multiple realization of a single dispositional property token across time.

2.10. The Causal Role Argument against the Identity Thesis

Besides the arguments involving modal and temporal identity considerations, there are other reasons to disfavor the Identity Thesis that have to do with the view of property

[58] Thanks to David Chavez for recommending a psychological example.
[59] Also, F may be realized by a set of categorical properties, and it seems plausible that just one property of this set of categorical properties could change while F remains the same token.

identity assumed by Identity Thesis proponents, Causal Role Identity (see section 2.7). But Causal Role Identity is inconsistent with properties being categorical.

The basic idea I am claiming is that if one accepts Causal Role Identity, then one accepts that at least the fundamental properties are pure dispositions (since non-fundamental properties might have causal basis in pure dispositions). For the identity conditions of any property, P, just consist of the possible causal effects of P, i.e., the dispositional nature of P; so the Pure Dispositions Thesis stands. To add that all properties are simultaneously dispositional *and* categorical, per the Identity Thesis, does not change the identity condition of properties claimed by Causal Role Identity. In other words, to accept Causal Role Identity and the Identity Thesis together is to say there exists tokens of only one kind of property, properties whose identity is defined entirely in terms of what they can do, i.e., their dispositional nature. Thus, the Identity Thesis proponent should accept the Pure Dispositions Thesis.

I will now set out the argument a bit more precisely and elaborate:

(1) The Identity Thesis claims that for any type of property, P, any token of P is simultaneously dispositional and categorical.

(2) Causal Role Identity says that any property token P is quantitatively identical to property token P1 *if and only if* P and P1 play identical causal roles, i.e., have the same causal profile.

This means that a property's identity is defined solely in terms of its causal role, i.e., in terms of the possible manifestations it is disposed to bring about or display.[60] Thus, it is Causal Role Identity alone that determines a property's true nature or essence. But:

[60] However, one may want to add spatiotemporal location as an additional condition, as I have in section 2.3, but for purposes here it is sufficient to discuss identity in terms of causal role only. Spatiotemporal

(3) Causal Role Identity implies that P is purely dispositional.

This is because a property defined solely by its causal profile is the *sine qua non* of being purely dispositional.

(4) Thus, P is purely dispositional. [(2), (3)]

(5) Premise 4 is inconsistent with Identity Thesis. [(1), (4)]

Thus, the Identity Theorist must either give up Identity Thesis or Causal Role Identity. It may seem outlandish for an identity theorist to give up Identity Thesis faced with this dilemma. However, giving up Causal Role Identity is to deny a prime motivation for the Identity Thesis, that properties have intrinsic causal powers. So, one should instead deny the Identity Thesis. But this is not so bad, because the Identity Thesis holds that there is one kind of property, defined by Causal Role Identity, which the former Identity Theorist can still keep. So, one does not lose *anything* ontologically; there still is just one category of property, defined by a causal profile.

In other words, invoking the Identity Thesis does no extra ontological work that the identity theorist does not already have once Causal Role Identity is assumed. If they don't assume that, then they might as well just say that properties are strictly categorical, and invoke laws to explain dispositions or causal powers of properties (Armstrong 1997, 2004).[61]

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distinctness alone implies nothing about whether a property must be both categorical and dispositional as the Identity Theorist holds – for dispositions and categorical properties alike must have locations. Since dispositions must be located at a distinct space-time point or region just like categorical properties, spatiotemporal distinctness does not imply P is categorical (in the sense of 'just-there-ness', as Armstrong (2004) characterizes categorical properties) although it is *consistent* with P being categorical simultaneously.

[61] It may help to characterize the claim as follows: if a categorical property has a 'just-there-ness' quality to it (Armstrong 2004), and a dispositional properties has a 'directedness' quality to it, as discussed in sections 2.2 and 2.3, then on the Identity Thesis, properties have a 'just-there directedness' quality. That is, concerning any property, what is just there is directedness. But if so, then properties are purely dispositional, not categorical.

Perhaps the motivation for the Identity Thesis is that it accounts for a purportedly pure disposition's being or continuous existence – but why then invoke categoricalness to explain that?[62] Categoricalness is incompatible with Causal Role Identity, as the Identity Theorists accepts, for Causal Role Identity implies that properties are purely dispositional. It is a view of properties opposed to the categorical view, so one who accepts Causal Role Identity should not want to sneak categoricalness back into their view of properties. There is just a property at some location with a causal profile (or, simply, a causal profile at a location).

The upshot of these considerations is that the Identity Thesis is not a threat to the Pure Dispositions Thesis. This is because properties, according to the Identity Thesis plus Causal Role Identity, are purely dispositional. Thus, fundamental properties just are pure dispositions. And, if we accept Truth-maker, then any pure disposition is its own causal basis. Perhaps that is all the 'categoricalness' (if it is what it is) the Identity Thesis proponent sought.

2.11. The Argument from Spatial Occupation

Motivation for the Identity Thesis and worries about what pure dispositions do when they are not manifesting may ultimately stem from spatial occupation considerations. The intuition is that there must be 'something to' a property token at all times, that it must be extended or occupy space. Such worries threaten the Pure Dispositions Thesis.

Blackburn (1990), in arguing against a world of only dispositions, discusses the being of dispositions in terms of their object-bearer's ability to occupy space. If this is the correct conception of the being of dispositions, then the problem is: for any object *x*, if all

[62] Furthermore, there are other solutions to the problem of a pure disposition's being besides the Identity Thesis, and I put forward such a solution in section 2.12 and develop this in sections 3.6 and 3.7.

of *x*'s properties are directed towards manifesting (i.e., if all their properties of *x* are dispositional) then how can *x* be located in space? Thus, if the proponent of the Pure Dispositions Thesis rests his or her case on fundamental objects whose properties are purportedly exhausted by pure dispositions, then the worry is that during non-manifesting periods these properties are not located in space. But, intuitively, occupying space or having extension is a necessary condition for something to exist. If an object *x* bearing pure dispositions occupies space continuously, then *x* must be some non-dispositional *way* or *ways* at all times "and these non-dispositional 'ways' are nothing more than categorical properties" (Williams 2009: 17). These ways, it seems, would serve as a causal basis for the dispositional properties *x* bears. Thus, spatial occupation considerations seem to threaten the Pure Dispositions Thesis.

If properties, including pure dispositions, are necessarily borne by (or instantiated by) objects in some way, then there are two ways to interpret the Argument from Spatial Occupation. On one view of objects, objects are propertied substances. On this view, I think the Argument from Spatial Occupation presents relatively less cause for worry since substances would have their pure dispositions and the substances would occupy space – the object *x* would be disposed to do such-and-such, i.e., *x* would possess the disposition, so, perhaps, the disposition would occupy space *qua* the substance occupying space.[63] On another view of objects, objects are merely bundles of properties. On this view, the Argument from Spatial Occupation seems relatively more pressing; for

[63] However, one might press that there would still be a question about the spatial occupation of pure dispositions when not manifesting; even if pure dispositions are dispositions of objects viewed as propertied substances, this does not mean that when not manifested the disposition occupies space, and exists, just because its object-bearer does. Setting this aside, a deeper worry appears: if 'pure' dispositions are properties of substances, then how is it not the case that the substance plays a causally relevant role in one of its pure disposition's manifestations? That is, it seems its dispositions would not be pure in the sense of having no distinct causal basis.

example, if an electron is a mass-charge-spin bundle, then when these dispositions are not manifesting, where are the dispositions (or, where is the electron) located? There is nothing beyond the pure dispositions to occupy space.

Pure dispositions may not be properties of objects, for they might be solo entities or free properties. The Argument form Spatial Occupation seems most worrying supposing that pure dispositions are 'free-floating' – i.e., not borne by objects in any way (see Schaffer 2003a for an argument that properties can 'float free' of objects). Then, when not manifesting, does the pure disposition occupy space? What is located at location *l* when F is not manifesting – or, what event is occurring at *l* when F is not undergoing a manifestation event?

My discussion of the problem henceforth will concern the most-worrying construal of the objection. If my response to the problem so construed is effective, then it should also be effective against the interpretations on which pure dispositions are borne by objects (substances or bundles).

In general, the objection contends that if something exists then it continuously occupies space. Assume that dispositions occupy space when manifesting, and that pure dispositions need not continuously manifesting (there are nearby possible worlds in which a pure disposition does not manifest). Then, the question is: what occupies space during these latent periods? If pure dispositions exist, then when they are non-manifested (or non-manifesting), then must occupy space? If they do not, then intuitively they do not exist. And if they do occupy space continuously, then they are categorical. This is not just an objection if pure dispositions only reside at the fundamental level, for non-

fundamental pure dispositions would also be subject to the question of whether they occupy space. Here is the argument set out a bit more precisely:

(1) If P is a property token at any time *t*, then P must occupy a region *R* of space in order to exist.

(2) Thus, any pure disposition, F, at any time *t* (including non-manifesting periods) must occupy a region *R* in order to exist. [(1)]

(3) During non-manifesting periods, either F exists without occupying *R* or F does not exist.

(4) During non-manifesting periods, F does not exist. [(2), (3)]

(5) The Pure Dispositions Thesis requires that F exist even during non-manifesting periods.

(6) Thus, reject the Pure Dispositions Thesis. [(4), (5)]

In defense of the Pure Dispositions Thesis, I submit two responses to the Argument from Spatial Occupation. (Though I think these responses are plausible, in section 2.12 I offer a theory of the grounding of pure dispositions that avoids this objection altogether.)

First, granting that categorical properties need to occupy some region *R*, premise (2) is highly questionable. Why, during a non-manifesting period, do pure *dispositions* need to occupy, or be extended in, *R*? There might just be a disposition for a manifestation event to occur *within R*, without something occupying *R* in the extension sense. That is, it might be true of *R* that it is disposed to do something although it is a complete vacuum. Or there might be a disposition at a spacetime point (no extension, no occupation).[64] It may be a brute fact that *R* or some point is disposed to a particular

[64] (Maybe this suggests a shift in our conception of pure dispositions, from 'X can do M at *l*' to 'M can occur at *l*', the latter of which we often characterize as 'there is a disposition (an X) at *l*'.)

manifestation, yet there is *nothing but this potential* in *R* or at that point.[65] The opponent of pure dispositions might retort that this is to posit a mysterious fact about the world, but the opponent must also posit structural or categorical brute facts that are no less mysterious. The most meager such pure disposition without occupation might be a location. Locations in spacetime might themselves be dispositions –a disposition to be inhabited or occupied by something (another property, object, process, or event).[66] That is, locations might be the fundamental dispositions of reality.[67] [68]

The second response is to invoke the idea that spacetime is 'the one substance' with properties embedded in it, as Schaffer (2009b) suggests. The fundamental properties of the one substance might just be various dispositions at spacetime points. On this view, spacetime would be categorical, but it would *not* necessarily be a causal basis for F, but it would be the ontological grounds of F. This counters the Argument from Spatial Occupation since pure dispositions of spacetime would not, strictly speaking, occupy space, rather they would be properties of spacetime. This is because occupation requires a thing occupied and an occupier, but in this case there would just be a property of a

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[65] On the field interpretation of Quantum Field Theory (QFT), which holds that fields and their properties are ontologically fundamental, not particles. If these fundamental properties are dispositions, then the field interpretation of QFT is prima facie consistent with dispositions not occupying space (in a strict sense at least), since on the field interpretation we can ascribe energy and momentum to fields where no particles are present (Kuhlmann, 2006: §5.1.2). This is evidence for thinking that "an ontology of fields is the appropriate construal of the most fundamental entities to which QFT refers" (Kuhlmann 2006: §5.1.2).

[66] See Hawthorne and Sider (2003) for discussion of the need to posit locations in our ontology.

[67] In further support of this first response, categorical properties that occupy space can be given a completely dispositional reading, including the 'disposition to occupy space'. This may be more than just a linguistic phenomenon, for ontologically even paradigm categorical properties like shape or volume have dispositional features. Williams (2005) suggests that static dispositions exist – dispositions to persist, for example. Perhaps spatial occupation is just the manifestation of a static disposition. Franklin (1986) also suggests that persistence is a disposition.

[68] On some accounts of the laws of nature – such as accounts that claims that the laws are relations amongst universals, where the universal need not be instantiated – law statements are true of a world but there need not be anything occupying space at that world that makes the law true. Similarly, a statement about a pure disposition may be true, yet nothing occupying space makes that statement true.

substance. Because the second response relies on a controversial theory of what substances exist, I think the first response is more plausible.

2.12. The Being of Pure Dispositions

My defense of the Pure Dispositions Thesis in this chapter is not exhaustive, but I have defended it from four important objections: the Powers Regress Argument, the Insufficient Causal Basis Argument, the Argument from the Identity Thesis, and the Argument from Spatial Occupation. The picture of pure dispositions that emerges from my assessment of these arguments has two major components.

The first component is that all dispositions and thus pure dispositions are directed properties, per the principle Directedness discussed in detail in section 1.3.3. Mumford (2006: 482) also regards pure dispositions this way: "To be an ungrounded disposition [pure disposition] is to be so directed and nothing else." What is directed? The pure disposition, for what it means to be a pure disposition is simply to be directed towards a kind of manifestation.

The second component invokes the idea that a pure disposition can be its own causal basis, advanced by McKitrick (2003b), which I defended from Insufficient Causal Basis argument (section 2.5). If a pure disposition is its own causal basis for manifestation then it may also be its own ground for continuous existence, thereby maintaining its own being and thus keeping itself directed toward its characteristic possible manifestations.

How does a pure disposition ground itself? I suggest that a pure disposition, F, is self-grounded if and only if F undergoes a *minimally sufficient occurrence* of F's own disposition when F is not engaged in one of its more characteristic manifestations. I

develop this principle in detail in section 3.7. Briefly, however, it is a supposition to explain F's continuous existence or being when F is not manifesting one of its other possible – and generally more characteristic from our epistemic point-of-view – manifestations. A minimally sufficient occurrence, or MSO, is supposed to explain *how* F is self-grounded, i.e., how F *maintains* its being. While F does not manifest all it is capable of at any given time, it does manifest one track of its power thereby keeping itself ready for future manifestations characteristic of the kind of disposition it is. This is one of the *ways* F can manifest. Note that the MSO account alleviates the worry raised about spatial occupation in section 2.11; since the MSO is an event in spacetime and events occur in space, F (undergoing MSO) occupies space.

Combining these two components – directedness and self-grounding – yields a modest theory of pure dispositions:

> **Pure Disposition:** The being of a pure disposition consists in self-grounded directedness towards its characteristic possible manifestations.

The concept of directedness was developed in section 1.3.3, and the concepts of self-grounding and a minimally sufficient occurrence will receive further development in the next chapter. My point here was simply to sketch the positive view of the being pure dispositions suggested from the critique of the objections above.

It is critical to note that while the idea that F is self-grounded is *suggested* by the idea that F is its own causal basis, per Truth-maker, it is not entailed. This will be clear in the next chapter, where I will argue for a distinction between the *grounds of F* and the *causal basis of F*. This distinction opens up other grounding possibilities for pure dispositions that need evaluation; for example, some pure dispositions may be extrinsic

and thus extrinsically grounded. If some other grounding options are correct, then it further possible that some pure dispositions self-grounded while others are grounded in some other way. For example, self-grounded pure dispositions may exist at the fundamental level of reality, while extrinsically grounded pure dispositions exist at some non-fundamental level. This is just the view that will emerge and which I will argue for in the course of the next two chapters.

Chapter 3

THE CONTINUOUS EXISTENCE OF PURE DISPOSITIONS

3.1. The Problem of Being

What gives a dispositional property token its being when it is not manifesting? In other words, what is it that ontologically grounds a disposition? For a disposition such as the fragility of a vase, the most common answer invokes the categorical properties (typically, structural) of the vase. According to the Identity Thesis, dispositions are identical to categorical properties (e.g., an instance of fragility is identical to the microstructure of a vase). On another common theory, dispositions are realized by, but not identical to, categorical properties (e.g., an instance of fragility is realized by the microstructure of a vase). Regardless, both theories presuppose that dispositions exist, or have being, when not manifesting, because the underlying categorical properties ground them. But, how do pure dispositions, dispositions sans distinct causal bases, continuously exist when not manifesting?

The causal basis of a disposition is a property or property-complex, either constituted by dispositional or categorical properties, that is causally relevant to the manifestation of a disposition when appropriately triggered in the right circumstances. Importantly, besides being causally relevant to the manifestation of a given disposition, the causal basis also plausibly accounts for the disposition's being. When the disposition is not manifesting, the causal basis somehow anchors or grounds the being of the disposition. (See sections 1.3.1 and 1.3.4 for further discussion.)

However, the Pure Dispositions Thesis says that some dispositions do not possess distinct causal bases. Thus, given causal bases typically ground the being of dispositions,

the Pure Dispositions Thesis raises the question of how pure dispositions continuously exist. This chapter aims to investigate and solve this problem. Here is the problem more precisely stated:

> **Problem of Being**: For any instance of a pure disposition, F, assuming that F need not manifest continuously and that there is no property or property-complex distinct from F that constitutes a causal basis that grounds F, then there is nothing to ground the continuous existence (or, being) of F; but F must be grounded somehow.

Another way of putting the problem: In what does the being of a pure disposition consist, apart from its possible manifestations? Or, when a pure disposition at space-time location *l* is not manifesting, *what* is at *l*? Or, as Psillos (2006) asks: What does a pure disposition do when not manifesting? This problem is at the heart of many worries about pure dispositions, and systems of properties built up from them.[69] Extensive arguments have been given for the possibility and actuality of pure dispositions.[70] However, the nature of the continuous existence or being of pure dispositions appears to have received little attention.[71]

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[69] See especially Ellis (2002: 71), Heil (2003: 97-110), Mumford (2006), and Psillos (2006). Although he supports the Pure Dispositions Thesis, Mumford (2006: 481) explicitly raises the "question of *Being*."

[70] See McKitrick (2003b) for an argument for the possibility of pure dispositions based primarily on metaphysical considerations, and Molnar (2003:125-42) and Mumford (2006) for arguments for the actuality of pure dispositions based jointly on metaphysical and empirical considerations.

[71] Two exceptions are Handfield (2008) and Mumford (2006). Mumford (2006: 485) suggests that pure dispositions are self-grounded, and Handfield (2008) suggests that pure dispositions are either self-grounded globally grounded. Both theories are discussed below. Both Mumford (2006) and Handfield (2008) suppose that McKitrick's idea (2003b) that a disposition may be its own causal basis naturally suggests that a disposition is its own grounds as well. I think this is ultimately right (and I offer an account to support it in section 3.7), but this assumption is also questionable because grounds and causal bases may be are different (see section 1.3.4). This opens up several possible grounding options for pure dispositions that deserve evaluation.

One may think that the being of pure dispositions needs no explanation, especially if one thinks that pure dispositions form the ground floor of reality, as for example dispositional essentialism maintains.[72] Supposing that explanations must stop somewhere, one might simply accept the continuous existence of pure dispositions without explanation, just as one might accept the continuous existence of some other class of fundamental entities posited on some other metaphysic.

However, I have three responses to any 'no explanation' response to the Problem of Being. First, the same puzzling metaphysical questions previously raised about pure dispositions remain, e.g., about what pure dispositions do when they are not manifesting. Second, regardless of whatever considerations in favor of a 'no explanation' view one might offer, we should not consider the Problem of Being alleviated without at least canvassing various possible answers to it. There may be a plausible metaphysical explanation not yet identified or developed in sufficient detail, e.g., a solution that explains the being of pure dispositions by reference to conditions extrinsic to the objects that bear them. Third, given the modal nature of pure dispositions it seems there *must* be some explanation of their being when not manifesting, even if we judge that there are good reasons to posit them absent an explanation of their being; e.g., we may have

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[72] Dispositional essentialists such as Bird (2007) and Mumford (2004) maintain that all the fundamental properties are purely dispositional, but this does not necessarily mean they think no explanation is required in response to the Problem of Being. Ellis (2001), who accepts the Pure Dispositions Thesis but does not think *all* of the fundamental properties are essentially dispositional (he argues that fundamental spatiotemporal and numerical relations are categorical), argues for the 'no explanation' response to the Problem of Being. Ellis (2001: 114, and especially 139-40, footnote 12) maintains that the existence of higher-level entities plausibly depends on increasingly lower-level causal powers (dispositions), ultimately bottoming out in purely dispositional properties at the fundamental level of reality. Since we must ultimately posit fundamental pure dispositions (barring infinite levels), on this view, their continuous existence needs no explanation. Although it may be true that we must posit them, it is not clear why they must be posited with no explanation as to their continuous existence, for reasons given in the next paragraph. Furthermore, Ellis seems to assume that pure dispositions are intrinsic properties; however, if they are extrinsic they will necessarily have some grounds (though not necessarily a causal basis, per my arguments in section 3.2), and these grounds will figure in an explanation of their being.

sufficient reason to posit pure dispositions because of their explanatory power, yet this does not explain the continuous existence of pure dispositions. Moreover, if there is no explanation of the being of pure dispositions, then such entities would just seem to 'hang' ontologically on nothing, akin to how psychological dispositions do on Ryle's (1963: 114) account of mind. Even if pure dispositions do 'hang' in this way, some explanation of what this amount to is in order. Is it a causal process of some sort? Is it self-grounding, and if so what does this amount to? In light of these considerations, I suggest that taking the 'no explanation' stance is only epistemically permissible once we have reason to reject various theories of the being of pure dispositions. Hence, we should seek such a theory.[73]

In this chapter, I evaluate four theories that aim to solve the Problem of Being. I will proceed as follows. In section 3.2, I establish criteria for evaluating the theories and identify two key assumptions that will hold throughout the rest of the chapter. In sections 3.3 through 3.5, I present three theories that I argue do not satisfactorily answer the Problem of Being. I take none of the reasons I give against the three theories to be absolutely conclusive, but only to count against them. I sketch enough of each theory sufficient for an initial evaluation. One of these theories, (World) in section 3.5, will be developed in greater detail in chapter 4. In section 3.6, I explain why at least some pure dispositions are self-grounded, and I argue that the self-grounding theory is the most viable theory (i.e., the one that fully satisfies the two criteria established in section 3.2

[73] It is worthwhile noting that it does not seem sufficient as an answer to the Problem of Being to offer a characterization or analysis of dispositions (and pure dispositions), such as the directedness theory of dispositions (e.g., Molnar 2003) or some version of the conditional analysis of dispositions. These theories only raise more questions about the being of pure dispositions: e.g., on the directedness theory, what is for F to be in a state of directedness when not manifesting, and what is so directed? And, on the conditional analysis, when not subjected to its manifestation conditions stipulated in the antecedent of the condition, what is the nature of F's being?

and has the fewest additional problems). This theory maintains that a pure disposition grounds itself: a pure disposition is the grounds of its own being. This basic idea has been advanced by others, for example Mumford (2006) advocates the self-grounding of pure dispositions, but not much has been said about *how* pure dispositions are self-grounded or what exactly self-grounding amounts to. In section 3.7, I advance and develop an explanation of how pure dispositions are self-grounded, i.e. of what it means for a pure disposition to be self-grounded.

3.2. Criteria and Assumptions

As the Problem of Being indicates, for any pure disposition, F, any satisfactory theory of pure dispositions should satisfy the following criteria:

> **Criterion 1**: The theory explains the continuous existence or being of F.
>
> **Criterion 2**: The theory does not invoke additional properties that constitute a casual basis for F's manifestation.

I will reference these criteria in evaluating the four theories, though other considerations will also be discussed regarding each theory. Additionally, two assumptions will hold throughout the evaluation of the theories. For any pure disposition, F:

> **Assumption 1**: F may serve as its own causal basis.
>
> **Assumption 2**: There is a metaphysical distinction between the *grounds of F* and the *causal basis of F*.[74]

Assumption 1 is McKitrick's (2003b) proposal: a pure disposition (or, 'bare disposition' in her terminology) has no causal basis either in further dispositions or categorical

[74] It is sufficient for my purpose that there is a mere logical distinction between 'grounds of F' and 'causal basis of F', rather than a metaphysical distinction as I state (assuming logical and metaphysical distinctness are different), for a logical distinction still suggests that various grounding theories that do not invoke causal bases should be evaluated.

properties. When a manifestation occurs, it is F itself (and not some subvenient property of F) that is activated by an external stimulus, triggering F to manifest. Hence, F need not have a *distinct* causal basis. This is an important component of the theory of pure dispositions I advocate below (the fourth theory) since some explanation is needed to explain how or what is activated when F manifests.

The distinction in Assumption 2 was detailed in section 1.3.4. The basic idea is that there is a difference between the basis for F's continuous existence (i.e., ontological grounds) and the basis for F's manifesting given an appropriate stimulus (i.e., causal basis).

Given Assumptions 1 and 2, the question I am pursuing is: how is a pure disposition, F, ontologically grounded, but nonetheless remains a pure disposition in that it does not have a distinct causal basis? Given the metaphysical distinction between the grounds and causal basis of a disposition (i.e., Assumption 2), this opens up several possible theories of the grounding of a pure disposition. This is because we can look for various ways to explain the ground of F's being without necessarily positing a causal basis for F, thus violating Criterion 2. However, what I will ultimately suggest that at least some pure dispositions are self-grounded: in these cases, F is both its own causal basis *and* its own grounds for being. But other theories of the grounding of all pure dispositions needs ruling out. So, here is the structure of the overall argument of this chapter:

(1) Rule out these possible grounding theories as solutions to the problem of F's continuous existence:

(i) F is extrinsically grounded in all properties (i.e., global grounding);

(ii) F is extrinsically grounded in properties of the World, taken as whole ontologically prior to the part-objects of the World;

(iii) Supposing that F's object-bearer *x* is substantial, *x* grounds F.

(2) If (i), (ii), and (iii) are ruled out, then Assumption 1 implies that F is self-grounded.

(3) Thus, Assumption 1 implies that F is self-grounded, i.e., grounded in no properties distinct from itself. [(1), (2)]

(4) If F is self-grounded, then the intrinsic nature of F accounts for F's continuous existence.

(5) Thus, the intrinsic nature of F accounts for F's continuous existence. [(3), (4)]

This argument relies on the plausibility of ruling out other grounding options, i.e., premise (1), the task to which I now turn in sections 3.3 through 3.5. Then, sections 3.6 and 3.7 develop premises (2) and (4). The arguments below rule out (i) and (iii) more definitively than (ii). This is because I think there is a stronger case to be made for (ii), and I will do so in chapter four. Ultimately, what I propose in section 3.5 and argue for in detail in chapter 4 is that pure dispositions may indeed be grounded extrinsically in the World as a whole, and that one pure disposition (mass) *is* actually extrinsically grounded (per the Argument from the Higgs field in section 4.2). However, since it is possible that there could be a *lone* pure disposition (or, an object bearing one pure disposition), as in a possible world with one token property. This pure disposition would be intrinsic, and thus an account of self-grounding is needed because extrinsic grounding cannot cover all the possible cases of the grounding of pure dispositions.

3.3. The Global Theory

Handfield (2008: 298) distinguishes between the 'supervenience base' and the 'causal base' of a disposition, similar to the distinction between grounds and causal basis in Assumption 2. He then suggests that though pure dispositions lack causal bases, they "do have supervenience bases, but that they represent a degenerate case: their base includes every possible property, including extrinsic properties" (Handfield 2008: 304).[75] If the supervenience base of F is something like the grounds of F, then the theory being suggested (though not necessarily endorsed) by Handfield is this:

> **(Global)** The ontological ground of F consists of every possible property, including extrinsic properties.

By "every possible property" Handfield seems to mean (he does not say explicitly) every property in the actual world, not also properties of possible worlds. (Besides, it is a mystery how possible properties would ground actual properties.) So, the ground of F consists of the entire set of actual properties in a given world. In characterizing the supervenience base of a pure disposition as degenerate, I take him to simply mean that the base deviates from the common assumption (e.g., Mumford 2006) that the grounding property (or property-complex) of a disposition must be intrinsic to the disposition's bearer.

If (Global) is correct, then the set of global properties grounds F while not being a causal basis for F. Perhaps the best example of something approaching the content of (Global) is Mach's Principle, which maintains that the mass of an object, *x*, is determined by the total distribution of mass and energy in the rest of the system of which *x* is a

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[75] As a terminological note, Handfield (2008: 304) calls this the 'global hypothesis', and he uses the term 'bare dispositions' instead of pure dispositions (following McKitrick 2003b).

member. Thus, according to this principle mass is an extrinsic property. This principle is limited as an example of (Global), according to which *every* pure disposition, not just mass, is grounded in all other properties. But Mach's Principle at least serves as an intuitive analogy.

On (Global), the continuous existence of F is explained by appealing to all other properties, thus invoking the idea of the interconnectedness of all being. Let us assume for now that Criterion 1 is satisfied, though some considerations below will bring this into doubt. What about Criterion 2? If it is true that the global grounds do not play a role in F's manifestations, then Criterion 2 is satisfied. It is not a causal basis for F, one might argue, because all the properties in the supervenience base are extrinsic relative to the object bearing F. How could they be causally relevant to F's manifesting? How could the property of the moon looking beautiful to Galileo be causally relevant to some pure disposition's manifestation event? However, if even *one* is causally relevant, then part of the grounds of F is also a causal basis for F, and so F is not pure. Most of the global properties are going to be extrinsic relative to the object bearing F. But some will not, for some might be intrinsic properties of the object bearing F. But that may not be a problem for (Global) if those properties are simply other pure dispositions (as is plausible for the fundamental particles). Thus, if the global grounding properties are not part of the causal basis of F, yet they do form ontological grounds for F, then we have a solution to the Problem of Being.

Nonetheless, one might argue that the global grounding base *does* also form a causal basis for F somehow. This might be true in two ways: first, perhaps *some* of all the properties of the world may be causally relevant to F's manifesting; second, perhaps all

of the properties form a causal basis for F's manifesting in some 'degenerate' sense, in the same sense that they all form a 'degenerate' supervenience base or grounds. (Note that if it really is a supervenience base as Hanfield thinks, then some property or property-complex G in the base must co-vary with F, and since G is in the base of the supervenience relation, it looks like it will be causally relevant.) We might say that F has a 'hidden' or 'subdued' causal basis. It may be that F manifests in some circumstance even though F is not directly stimulated, because some or all of the global properties are stimulated.[76]

Setting aside the question of whether the global base just ontologically grounds F or also serves as a causal basis for F, (Global) is unappealing for two reasons. First, the *truth-maker* for the proposition 'F continuously exists' (or 'F is grounded') is every property of the world.[77] This is problematic on two counts: first, it seems like an unnecessarily large truth-maker, and second, one could reasonably claim that every property's truth-maker is the set of all other properties of the world. It may be true in a weak sense that all other properties make true the proposition 'F continuously exists', or 'the state of all the properties in the entire world is such that F is grounded'. This reflects Armstrong's (2004: 19) observation that the whole world is the "least discerning" (because of its non-specificity) and "most promiscuous" (because it makes every truth

[76] It is worth clarifying that some properties of the world besides F will be causally relevant to F's manifesting if (Global) is true, simply because the stimulus of F will be causally relevant. But typically the triggering or stimulus property is *not* considered part of a causal basis for any disposition. I assumed that was so in advancing the first possibility for what the causal basis might be, to the effect that the entire global grounds could not be the causal basis yet the causal basis could be some sub-set of the global properties not including the stimulus.

[77] This objection should not be confused with the objection that the manifestation conditional associated with F is made true by every property in the world. Although this too may seem counter-intuitive, this objection would assume that all the properties of the world are somehow causally relevant to F's manifesting, and thus form a causal basis for F, which would violate Criterion 2. (The associated manifestation conditional is 'the state of the entire world is such that, were *x* exposed to the characteristic stimulus *S*, it would yield the characteristic manifestation *M*' (Handfield 2008: 304).)

true) truth-maker. But this is not very informative; what would be informative is a "minimal" truth-maker (Armstrong 2004: 19) for F.

The second consideration against (Global) is that not *every* other property seems relevant to whether F continuously exists at a specific location, thus raising the concern that not all properties ground F (thus violating Criterion 1). If spin is a pure disposition, then on (Global) the property of earth being the fourth planet from the sun forms part of the grounds for an electron on Venus having spin ½. This is wildly counter-intuitive. Perhaps some more precisely defined set of global properties forms the grounds of F, such as all other sparse properties, or perhaps just properties of the world as a whole. But that is a different than (Global).

In sum, even if (Global) fares decently on Criteria 1 and 2, other considerations lead to a tentative rejection of this theory of the grounding of pure dispositions.

3.4. The Monistic Theory

In this section I consider two versions of monism to account for the continuous existence of pure dispositions. Monism is the idea that the World (i.e., the entire cosmos or universe) is a genuine object, not just a collection of smaller objects (the World is tantamount to the One discussed in Plato's *Parmenides*). The two versions of monism I will consider are priority monism and existence monism.[78]

Existence monism maintains that the World is the *only* object. Horgan and Potrč (2008) call it the Blobject. On their view, confluences of properties of the Blobject form what we call 'objects', e.g., atoms, cells, diamonds, and trees. By contrast, priority monism as defended by Schaffer (2010) holds that the World – again, the whole cosmos or universe – is ontologically prior to all the smaller objects in the world, but all those

[78] The distinction is due to Schaffer (2007, 2008 and 2010).

smaller parts of the World (the atoms, cells, diamonds, tress, etc.) are legitimate objects in their own right. The World has primary being and its part-objects have derivative being; i.e., the World has ontological priority over the part-objects.

Assume priority monism is true. Priority monism entails that some property or property-complex of the World partially grounds all of its part-objects and by extension also the properties of those part-objects. Thus, any pure disposition F, borne by a fundamental object *a*, is partially grounded in a property or property-complex of the World. (This argument is developed further in section 4.5). So the theory is this:

> **(World)** F is grounded in the World, the whole that is ontologically prior to all the part-objects in the cosmos.

This theory has an important implication. Properties, including dispositions, that are ontologically dependent on properties of objects (or environments) *other* than their bearers are extrinsic properties, and thus are grounded extrinsically. Thus, if priority monism is true, then pure dispositions are extrinsic.

(World) and (Global) both invoke the idea that F is grounded in properties external to the object bearing F. On both, F qualifies as extrinsic because F's being is not solely dependent on properties intrinsic to the object bearing F. But, on (World) the extrinsic grounding base is less robust in the sense that it only invoke properties of (or a single property of) the World as part of the grounds of F, whereas (Global) invokes all other properties beyond F. Compared to the truth-maker problem associated with (Global), (World) yields a more plausible truth-maker for 'F is grounded', since only the World (i.e., some property or set of properties of the World) preceding the part-objects is referenced, not *all* properties. So, per Occam's razor, (World) should be favored over

(Global).[79] Furthermore, F does not depend on *non*-fundamental properties as it does on (Global); F only depends on fundamental properties of the World. That is significant if pure dispositions must be fundamental properties, since it is counter-intuitive for fundamental properties to depend ontologically on non-fundamental properties.

Criterion 1 is satisfied since the World grounds everything, including all properties. As may be true with (Global), (World) does not necessarily violate Criterion 2, since the grounding properties of the World that account for F's being are not necessarily part of the causal basis of F's manifesting. Note that considerations discussed in section 3.3, pertaining to Criterion 2 relative to (Global), are also relevant to Criterion 2 relative to (World). However, in addition to those considerations, (World) and (Global) both pose the question of whether extrinsic grounding properties form part of the causal basis of F, thus violating Criterion 2. Some comments on that are in order, and these comments are relevant to (Global) as well, but I will couch my discussion of extrinsicness in terms of (World).

On (World), F could still be its own causal basis if the grounding properties in virtue of which F is extrinsic are not part of the causal basis for F's manifestations, given that grounds and causal bases may come apart (Assumption 2). But *if* the extrinsic grounds form a causal basis for F, one might respond on behalf of (World) that it is intrinsic purity (i.e., intrinsic 'causal base purity') that matters to whether F is a pure disposition. Thus, even if the extrinsic grounding properties form a causal basis for F, they at least do not form an *intrinsic* causal basis. But why does this matter? If the extrinsic base is causally relevant to F manifesting, then it should not make a difference between the intrinsicness/extrinsicness of the causal basis – a causal basis is a causal

[79] See Schaffer (forthcoming-a) for a 'one truth-maker' view.

basis. Still, it might be urged that if the extrinsic grounds of F form a causal basis, their casual relevance in F's manifestations are only indirect, in a way that the environmental conditions of any dispositional property are causally relevant to what happens in manifestation circumstances. So in this sense, F might have an extrinsic grounds and extrinsic causal base but still be pure intrinsically.

I think there is a good case to be made that the extrinsic grounds of F do not also serve as a causal basis for F, thus making (World) an attractive solution to the Problem of Being. However, a significant problem is that (World) issues from a radically different conception of the nature of world than most philosophers discussing pure dispositions assume. Although Schaffer (2010) defends priority monism, the standard assumption is *pluralism*, the view that the world is composed of abundant fundamental objects whereas priority monism says there is only one fundamental object. I will not evaluate these two competing theories of the number of fundamental objects in this chapter. But major proponents of pure dispositions, such as Bird (2007) and Mumford (2004) assume pluralism. Provided that a theory of the being of pure dispositions should be consistent with pluralism, at least for dialectical reasons, there is reason to tentatively set aside (World).

Another monistic option to account for the being of pure dispositions invokes existence monism. As discussed above, existence monism says that there is just one metaphysically genuine object, the Blobject. As an answer to the Problem of Being, we get the following:

(Blobject) F is ontologically grounded in virtue of being instantiated by the Blobject.

On this view all pure dispositions are grounded in the Blobject directly. If pure dispositions are fundamental properties, then they are the fundamental properties of the Blobject and their continuous existence is explained by the continuing existence of the Blobject. So, Criterion 1 is satisfied. Unlike (Global) and (World), (Blobject) does not invoke extrinsic properties to account for F's being simply because there is nothing extrinsic to the Blobject in virtue of which it has its properties. F is simply instantiated by the Blobject as any typical object instantiates a property (although on this version of monism there is only one genuine object). If there are no mediating properties (categorical or dispositional) between the Blobject and F, then no properties besides F itself constitute a causal basis for F, and Criterion 2 is satisfied.

I have two responses to (Blobject). First, as with (World), given the dominant pluralistic view of objects it is dialectically inadvisable to assume that the Blobject exists. It is merely a possibility to account for the being of pure dispositions and warrants further investigation. Second, and more importantly, (Blobject) raises a question about the nature of the relation between objects and pure dispositions, assuming that pure dispositions must be borne by objects and cannot 'float free' of objects, as Schaffer (2003a) argues. The question is this: if the instantiation of F by an object ontologically grounds F, and the fact that the object has the additional property, G, of *instantiating* F, then how is it that G is not thereby a causal basis for F? The next section will clarify this question, but note that the Blobject shares this potential problem with any ontology that maintains that properties must necessarily be borne or instantiated by objects.[80]

[80] The fact that (Blobject) is just one way to cash out an object-centered theory of the being of pure dispositions is another reason, in addition to it being a variation of monism along with priority monism, why I do not consider (Blobject) as one of four distinct theories of pure dispositions discussed in this chapter.

3.5. The Object Theory

Suppose that pure dispositions must be instantiated by objects.[81] Perhaps an object bearing or instantiating F accounts for F's continuous existence without invoking any further properties of the object that would constitute a causal basis for F's manifestation. Thus, for example, an electron's instantiation of a dispositional property token of charge accounts for the continued existence of that charge token during periods of non-manifestation.

In the dialectic concerning pure dispositions, some implicit assumptions are often made concerning the nature of objects, besides the fact that it is often assumed that pure dispositions are necessarily instantiated by objects. Sometimes it is assumed that the objects bearing pure dispositions are just bundles of tropes. And sometimes it is assumed that the objects bearing pure dispositions are substantial objects (i.e., substances distinct from their properties) that instantiate pure dispositions and other properties. On the former view, if some object is just a bundle of pure disposition tropes, then it is not clear how the object could account for the continuous existence of its pure dispositions when they are not manifesting, since there is nothing beyond the pure dispositions in the bundle. But on the latter view, the object could account for F's continuous existence because it is a substantial entity that *has* properties and the properties of the object depend on the object for their existence.

It is the substantial view of objects that I have in mind in evaluating objects as grounds of the being of pure dispositions. I will argue that objects, in this sense, cannot straightforwardly account for the being of pure dispositions without violating their

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[81] McKitrick (2003b: 254), for example, holds pure dispositions are dispositions *of* objects, or dispositions that objects *have*.

'purity', and thus if pure dispositions exist, then they are not instantiated by substantial objects. Thus, pure disposition tokens can either 'float free' of objects or are instantiated by objects as bundles of properties, and so some other theory of their ontological grounding is needed.[82] This does not necessarily imply that there are no substantial objects at higher levels of reality, for macro objects may be constituted by smaller objects that are bundles of properties.

Suppose that F is grounded by the object of which it is a property, and that the grounding relation between F and its object, O, is simply F's being instantiated by O. The theory under consideration is thus:

(Object) F is grounded by O insofar as O is a substantial object that instantiates F. F is a property instantiated by O (or, exemplified in O) and since O continuously exists, F continuously exists. So an electron's charge disposition continuously exists simply because the electron, as a substantial object, that bears that charge token continuously exists.

Assuming the substantial view of objects and that objects instantiate properties, we can interpret (Object) in two ways. First, properties are *ways* objects are; second, properties *inhere in* objects. The latter idea, as I am using it, is to conceive of objects as discrete substrata onto which properties are 'pinned'. I am primarily concerned with the former view of objects in discussing (Object). This is because on the second view properties would be distinct entities that are separable from their object bearers, and so a problem would be that properties do not necessarily require their object bearers to exist, i.e., property tokens could possibly float free. Thus, in addition to assuming that objects

[82] It may be that any property, and so a pure disposition too, can float freely without inhering in objects – bundles or substratum – and so do not need objects for instantiation. I do think this is possible; see Schaffer (2003a) for a defense of this view. I return to this possibility in section 3.7.

are substantial, from here on in discussing (Object) I will further assume that properties are *ways* objects are, and thereby avoid possible worries about the view that properties inhere in objects. (Perhaps these two views of the relation between properties and substantial objects amount to the same thing; if so, then my critique is not affected.)

As a model for evaluating (Object) I will adopt the view of Lowe (2006), who argues that property tropes or tokens are *ways* objects are; in other words, property tokens are modes of objects. Moreover, Lowe (2006: 27, 75) thinks that property instantiation necessarily depends upon objects: there can be no property-instance that is independent of an object, for property-instances just are properties *of* objects (so no free-floating properties).[83] This implies that objects ontologically ground dispositional properties since one of the ways an object might be is to be disposed to manifest a certain way.[84]

Criterion 1 is satisfied on (Object), since O's continuous existence will ensure F's continuous existence. An event may *cause* O to lose F, as an apple may lose its redness due to decay, yet when O has F it is O that is ontologically responsible for F's continuous existence. To maintain the purity of F on this view, and thus satisfy Criterion 2, it must be that O does not constitute a causal basis for F's manifestation. Therein lurks a potential problem for (Object). O will be involved in interactions with other objects, and I suggest that some further property of O must be stimulated in some way so as to bring about the manifestation of F; what this further property of O is will be addressed below. But if some further property of O plays a causal role in F's manifestations, then it looks like F is

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[83] Although Lowe (2006) does not accept a substratum view of objects, he does include objects as distinct kinds in his Four-Category Ontology. Properties are ways objects are, not things that are pinned on their object-bearers. Heil (2003: 173) also holds that "properties are ways objects are."

[84] On Lowe's Four-Category Ontology (2006), dispositions are not modes or tropes, but universals, and universals characterize *kinds* of objects. So, Lowe does not accept pure disposition tokens and so I think he would deny the Pure Dispositions Thesis. I am just using Lowe's view as a model of how (Object) might be understood.

not its own causal basis, as Criterion 2 requires. So the worry is that the instantiation of F by O cannot constitute a ground for F's continuous existence without some further property of O also constituting a causal basis for F's manifesting.

In support of this, consider that when F is not manifesting, it is natural to say that O is disposed to manifest in such-and-such a way. But what makes it the case that O is so disposed? Here is one answer: O simply has F. But what does it mean to say that O *has* F, if not to say O has the property of being the way of having F, and having the property of being this way, W, is a categorical property. But given the tight connection between W and F, the worry is that W is causally relevant to F's manifesting. So F is not a pure disposition. A second answer: O is the kind of thing that has F. So, O has the categorical property of being an instance of the kind of thing that has F. This seems to repeat the view that F is a way that O is and this takes us back to the response to the first answer. A third answer: O has F in virtue of the instantiation relation between O and F. But O having this instantiation relation is a categorical property of O, and threatens to serve as a causal basis for F. For what is the nature of the instantiation relation? Suppose the instantiation relation is supervenience, then what is the supervenience base? It must be some intrinsic property of O, and this implies that the purity of F is lost. Because supervenience is a covariance relation, it seems that the supervenience base will form a causal basis for F.[85] Thus, by constantly having to invoke some non-F property of O to account for O being the way it is, the non-F property becomes not just a ground for F's being but also part of the causal basis of F, since the non-F property will be causally relevant to F's manifestation.

[85] Suppose the instantiation relation is identity (that is, F is its own instantiating property in O). Then F is pure, but F's being instantiated in an object makes no ontological difference – F grounds itself, exactly the theory to be elaborated below.

If F is grounded in its object-bearer by just being a way O is, then when F is not manifesting there remains a question about how this object instantiates F, or what it is about O that it has F, or what F is doing when not manifesting. This issue haunts all of the possible answers mentioned in the previous paragraph. The underlying idea behind the critique being advanced against (Object) is that if properties are ways objects are, then this way will be inextricably tied to this object (if not, then F could float free, and have no causal basis, and thus an object is not the grounds for F). This object will have the property of continuously existing, thus grounding F's being too. But whatever makes O the way that it is, if it is some further property beyond F, as it plausibly must be, then that property will be caught up in the causal process of F being stimulated. Thus, F will have a causal basis and not be pure.

One might retort that on (Object), it is simply a brute fact about O that it has F. If so – if this way O is does not subtly assume some further property that threatens to be a causal basis for F – then the pressing concern seems to be how O *grounds* F, the purpose of (Object) in the first place. If F is grounded by O, and grounding is a relation between properties, then some further property must be involved in the grounding base; then the worry is that this further property is causally relevant to F's manifesting, i.e., that it constitutes a causal basis for F.

This is problematic on *any* non-self-grounding account of pure dispositions, not just (Object), although it seems especially worrying on (Object) because the further grounding property is intrinsic to the very object that possesses F, unlike on other theories discussed above that invoke extrinsic grounding properties. It is true that I argued in section 3.2 that grounds and causal bases can come apart in intrinsic cases as

well as extrinsic cases. But the kind of case I envisioned there was a case where each property of a bundle object was grounded in the other properties of the bundle, and where each property had a distinct existence apart from the bundle. But in evaluating (Object), I have explicitly assumed a non-bundle theory of objects where the properties of objects are ways of the object, and not separable from them.

In sum, I tentatively conclude that (Object) is not a satisfactory account of the being of pure dispositions. If properties of objects are *ways* objects are, then if F is stimulated, so must be some further property of O; thus F has a causal basis. Note that my critique of (Object) applies straightforwardly to (Blobject) as well, to the extent that the Blobject is a substantial object and not a bundle object.

I want to return briefly to the bundle theory of objects as a possible account of F's being. The idea is that elementary particles are just bundles of compresent pure disposition tropes; e.g., electrons on this view would just be bundles of mass, charge, and spin. The other dispositions of a bundle-object ground a given F; e.g., mass-charge grounds spin, spin-charge grounds mass, etc. Do these other dispositions form a causal basis for F's manifestation, thus violating Criterion 2? I argued in section 3.2 that this is not the case, in arguing that grounds and causal basis may come apart (Assumption 2), using the bundle theory as a possible case of this (a *mass-charge-spin* bundle object). But even if I am right about this, I am reluctant to invoke the bundle theory because of other problems. First, there is the possibility of having 'free' mass, charge or spin: that is, these properties may be able to exist alone or float free, apart from the bundle objects that bear them. Second, if there are other options to account for the being of F that do not assume a particular view of objects, then it is dialectically advisable to pursue those options.

Other accounts have also rejected objects as grounds for the being of pure dispositions. Molnar (2003: 151-2) thinks that the properties of elementary particles are pure dispositions, but he holds that the objects that bear these pure dispositions are point-size elementary particles. So there is no *object*, properly speaking, if objects require extension. Mumford (2006) thinks that since fundamental particles have no parts (they are simple), and since fundamental particles have no other properties beyond their dispositions, this means that the fundamental dispositions do not supervene on either parts or properties of elementary particles. It seems that the elementary particles are just bundles of dispositions on this view. But whatever the object is, it is not something that grounds the being of pure dispositions.[86]

The upshot is that pure dispositions seem to be ontologically independent of objects; if they are instantiated in objects it is a contingent instantiation. I have argued that (Global), (World), (Object), and (Blobject) as a sub-theory of (World) and (Object), do not satisfactorily solve the Problem of Being. The theory that I think best answers the Problem of Being maintains that pure dispositions are self-grounded.

3.6. The Self-grounding Theory

The theories evaluated thus far appear to satisfy Criterion 1, while Criterion 2 and other considerations put pressure on the theories. If we interpret the Problem of Being as a question of what a pure disposition, F, is doing when it is not manifesting, then it is plausible that none of the theories satisfy Criterion 1. Moreover, it seems that coming to grips with the Problem of Being consists in explaining how F continues to exist when un-manifested *regardless* of what is happening outside the spatiotemporal boundaries of F

[86] Williams (2009: 17), arguing against Mumford (2006), argues that particular elementary particles must *be some way* at all times, and this is nothing less than having a categorical property. If this way an object is, is categorical and grounds a 'pure disposition', then that pure disposition would not really be pure.

itself and regardless of the status of other entities. One might think this is so because it seems there could be a world in which there is only one entity, a solo pure disposition; this is consistent with the self-grounding theory, but not the other theories which look beyond F itself.[87] If a solution can be given to the Problem of Being that satisfies Criteria 1 and 2, without the problems of the other theories, then that account holds favor.

I ruled out (Global) and likewise any holism about the grounding of pure dispositions, theories that preclude the self-grounding of any pure dispositions. Thus, ruling out (Global) suggests that at least some pure dispositions are self-grounded. I also attempted to rule out (Object) and (Blobject) as grounding options. Finally, I discussed (World), which is not only consistent with some pure dispositions being self-grounded, but seems to require at least one: a pure disposition of the World itself, to generate or ground all the non-fundamental pure dispositions of the part-objects of the World. If the World is fundamental, and its properties are fundamental, this suggests the World has at least one *pure* disposition. If so, then it will not be grounded by the World but will be its own grounds. Thus, self-grounding is required for at least one pure disposition on (World). However, this does not preclude the possibility that some non-fundamental pure dispositions are indeed extrinsically grounded as (World) holds, which I elaborate in detail in section 4.5.

As the Problem of Being indicates, for any pure disposition, F, a satisfactory theory should explain F's continued existence (i.e., the ontological grounding of F) without invoking additional categorical or dispositional properties that constitute a distinct causal basis for F's manifestation, lest F not retain its purity. Crucial to the self-

[87] However, a solo pure disposition is consistent with the priority monistic version of F's grounding too. But, in that case the World=F, so F is simply self-grounded.

grounding theory is the assumption that F can be its own causal basis, as defended by McKitrick (2003b) and formulated as Assumption 1 in section 3.2.[88] When a manifestation occurs, it is F itself (and not some additional property that F supervenes on, or is realized by, etc.) that is stimulated, triggering F to manifest. Hence, F does not have a *distinct* causal basis. This is important to the self-grounding theory, and really to any theory that posits pure dispositions, since some explanation is needed concerning what is causally relevant to F's manifesting.

So how is it that a pure disposition, F, is ontologically grounded, but nonetheless F does not have a distinct causal basis? The correct answer, I propose, is that (i) F is its own causal basis (so the causal basis is not distinct from F) and (ii) F is its own grounds for being. So the self-grounding theory is simply:

> **(Self-grounded)** Any pure disposition, F, grounds itself and is thus solely responsible for its continuous existence.

The theory of self-grounding holds that F accounts for its own continuous existence, without invoking any properties that would constitute a distinct causal basis for F; so, F remains pure as required by the Pure Dispositions Thesis. The self-grounding relation is a relation between a property and itself, akin to the relation of self-identity that any token entity possesses.[89]

Mumford (2006: 485) similarly answers the Problem of Being, arguing that a pure disposition is grounded in "Nothing other than itself. It grounds its own manifestations."

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[88] So, a pure disposition (or 'bare disposition' in McKitrick's terminology) has no causal basis either in further dispositions or categorical properties, but it is its own causal basis.

[89] So, self-grounding does not explicitly fit the definition of grounding set up in section 3.2. It should be noted, then, that the self-grounding of F is equivalent to F being ungrounded in any properties other than F itself, supposing grounding is a relation between two distinct properties. Regardless, self-grounding is a theory of the *being* of pure dispositions – and so constitutes a legitimate solution to the Problem of Being – if not a theory of their grounding per se.

However, in giving this answer he affirms McKitrick's idea that F can be its own causal basis but then seems to assume that this implies that F is self-grounded, without giving any further explanation of the phenomena of self-grounding as it pertains to dispositions. Similarly, Handfield (2008: 306) suggests that a pure disposition is identical to its causal basis in the context of trying to account for its grounds for being.[90]

However, if F is its own causal basis that does not necessarily mean that F is its own grounds for continuously existing. This is because the causal basis of a disposition and the grounds of a disposition may be different, as Assumption 2 states (and as argued in section 1.3.4). Importantly, this may be true of pure dispositions too: e.g., although a pure disposition might be its own causal basis, it may be ontologically grounded extrinsically (where the grounds are not part of the causal basis), or in other ways evaluated in sections 3.3 through 3.5. Thus, F's self-grounding does not necessarily follow from the fact that F is its own causal basis, as Mumford and Handfield suggest. To convincingly argue for the self-grounding theory – thus yielding a triple identification between F's causal basis, F's grounds, and F itself – one needs to rule out other grounding options. Thus, supposing the evaluation conducted in previous sections has effectively ruled out other grounding options, we can tentatively infer that (Self-grounded) is correct. Additionally, considerations of ontological simplicity seem to favor the self-grounding of F, at least as compared to options that invoke an additional ontological category of substantive objects (understood as substances instantiating properties). Regardless, whether or not I have effectively ruled out other grounding options, the (Self-grounded) remains a legitimate contender worthy of examination.

[90] Handfield (2008) does not necessarily affirm that this is the best solution to what I call the Problem of Being. He proposes two competing theories as plausible solutions: what I call (Global) and (Self-grounding) in sections 3.3 and 3.6, respectively.

Additionally, even if (World) is correct, then at least one property of the fundamental objects those views posit needs to be a pure disposition, as argued in section 3.4, and thus (Self-grounded) is needed.

Suppose that F is self-grounded. It is not clear how this accounts for F's continuous existence. That is, *how* is F self-grounded? How does F account for its own continuous existence through periods of non-manifestation? I will next develop a principle concerning how pure dispositions are self-grounded. Though having a viable explanation of F's self-grounding does not completely rule out other grounding options, it at least enhances the plausibility of (Self-grounded).

3.7. The Principle of Minimally Sufficient Occurrence

How does F ground itself? What does it mean for F to be self-grounded? I suggest the following principle in support of (Self-grounded):

> **Minimally Sufficient Occurrence**: A pure disposition, F, is self-grounded if and only if F undergoes a minimally sufficient occurrence of F's own power when F is not engaged in one of its more characteristic manifestations.

This principle is a supposition to explain F's continuous existence or being when F is not manifesting one of its other possible, and generally characteristic, manifestations. The characteristic manifestations are those manifestations comprising F's causal role in a system of dispositions (more on this below).

One motivation for this principle is the idea that we should look to the nature of F itself for an explanation of F's continuous existence, already implicit in the idea of self-grounding. In looking to the nature of F, we are drawn to the power-hood of F. The core idea is then that F's persistence of continuous existence lies in manifesting a minimally

sufficient range of its power.[91] By 'range' I mean the total set of possible manifestations F can undergo. So, this proposal assumes that pure dispositions are multi-track (see sections 1.3.5 and 2.5 for discussion and defense). Given that pure dispositions are multi-track, any token disposition, F, can manifest in multiple ways depending on the manifestation circumstances. F possesses the power to manifest in many ways, and a minimally sufficient occurrence is just *one* of the possible ways F can manifest, so F's total dispositional nature is much more than its capacity for minimal manifestation. Thus, while F does not nearly manifest all it is capable of at any given time, F does manifest some of its power thereby continuously existing and ready for future characteristic manifestations.

Mumford (2006: 485) raises the Problem of Being when he asks: "in what, actual, does an unmanifested, elementary casual power [i.e., a pure disposition] consist?" Similarly, Psillos (2006) asks what pure dispositions do when they are not manifesting. The answer I am proposing is: Pure dispositions are not ever in a non-manifesting state – yet they *are* dispositions. Thus, my proposal rejects the condition assumed in the Problem of Being that any pure disposition may be in a completely latent state.[92]

I will now develop my proposal by answering five questions about it, including whether a minimally sufficient occurrence implies that pure dispositions are categorical properties.

The first question is: *What kind of manifestation is a minimally sufficient occurrence of F?* Perhaps it is best to cast the answer negatively: The minimally

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[91] On this view, persistence is dispositional, not categorical; cf. Williams (2005) concept of static dispositions.

[92] Maybe the proposed theory of self-grounding only answers a narrow interpretation of the Problem of Being, concerning what F is doing when not manifesting. In that case, the proposal at least presents a narrowly defined solution worthy of examination.

sufficient occurrence of F is *not* a characteristic manifestation of F. The characteristic manifestations of F are those possible manifestations related to the causal role F typically occupies in a system of dispositions that includes some of F's disposition partners, i.e., dispositions that may trigger F (and that F may trigger).[93] This can be differently understood from an epistemological perspective: the characteristic manifestations of F are typically those by which we, observationally or theoretically, identify and define F, based on the variety of possible stimuli that in fact, or might, trigger F. But we don't identify or define F by its minimally sufficient occurrence, so it's not a characteristic manifestation in the sense given. Suppose mass is a pure disposition; mass is identified and defined in terms of its causal role with other instances of mass and other relevant dispositions, such that these resultant manifestations, but *not* a minimally sufficient occurrence of mass, constitute its characteristic manifestations.[94]

However, this account of F's characteristic manifestations does not imply that the minimally sufficient occurrence of F is not subsumed by the complete causal profile of F (as discussed in sections 1.3.5), for a minimally sufficient occurrence does have causal significance – specifically, in grounding F. (See section 1.3.5 for an explanation of 'causal profile').Two points, however, differentiate the causal roles related to all of the characteristic manifestations of F, and the causal role F has in maintaining its being via a minimally sufficient occurrence. First, the latter is not the kind of causal role typically used in identifying and defining F since *all* pure dispositions, if this theory is correct, will have such a power to occur minimally sufficiently to ground their being, and second, F's

[93] The idea of a disposition partner can be found, for example, in Heil (2003: 11).
[94] Given the distinction between 'characteristic manifestations' and the 'minimally sufficient occurrence' or manifestation, one might just call the latter "non-characteristic manifestation"; however, the former phrase captures the idea that the kind of manifestation picked out is *sufficient* for the continuous existence of F.

minimally sufficient occurrence is not the result of the interaction of F with a disposition partner as F's characteristic manifestations are.[95]

Given these details, here is a more precise statement of the relation between the minimally sufficient occurrence of F and F's characteristic manifestations: Given that F is multi-track, and has the power for both characteristic manifestations and a minimally sufficient occurrence, then F manifests its minimally sufficient occurrence during any segment of time, T, so long as during T, F is not activated by a stimulus, S, that triggers F to undergo a characteristic manifestation; and if S does trigger F into a characteristic manifestation, then when the characteristic manifestation stops, F reverts to its minimally sufficient occurrent state. So, F need not minimally sufficiently occur at all times, but only when F is not manifesting characteristically. Indeed, F need not *ever* manifest in a minimally sufficient way, supposing F is constantly involved in characteristic manifestations, as may be true of the dispositions of fundamental particles, for example (often cited by proponents as examples of pure dispositions).

So, a minimally sufficient occurrence is not an occurrence or manifestation of a kind that is characteristic for F, but it is consistent with the kind of disposition that F is, for it falls within the total cluster of possible manifestations of F. If F is mass, for instance, then the minimally sufficient occurrence necessary for mass' being is, indeed, a manifestation of mass. F's minimally sufficient occurrence means that F is undergoing the process of manifesting some of what it can do and it is this fact that accounts for F's continually existence when not engaged in its characteristic manifestations.

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[95] A minimally sufficient occurrence of F *may* be insufficient for detecting F, unlike F's characteristic manifestations. That is, our best possible observational techniques may indicate no manifestation of F even when F is undergoing a minimally sufficient occurrence.

As model for the notion of a minimally sufficient occurrence, suppose the familiar disposition fragility is a pure disposition. A characteristic manifestation of fragility would be cracking, for instance. But a minimal manifestation of fragility would be a case of the ever-so-slightest cracking or a prolonged (over days or longer) cracking, perhaps undetectable to unaided human observers. The suggestion is that fragility continuously manifests itself thus maintaining its being, yet it is continually capable of manifesting in many more ways.[96] It is important to note that because fragility has a distinct causal basis, the minimally sufficient occurrence of fragility requires that causal basis be triggered by a stimulus typically associated with fragility's characteristic manifestations. This is unlike pure dispositions, on the theory being offered. This is because – assuming characteristic manifestations are generally associated with what we might call characteristic stimuli – the minimally sufficient occurrence of F does not require a characteristic stimulus.

It is worth noting the parallel between the concept of a pure disposition continuously manifesting and Cartwright's notion of a capacity (she prefers the term 'capacity' for some powers). Cartwright (2007: 197) claims that one mass (a capacity) is "always *trying* to bring other masses closer to it" and "always *attracts* other masses no matter how the other masses actually move." In this sense, mass is continuously occurring, though not always interacting with its partners. The fundamental claim here is akin to my notion of a pure disposition undergoing minimally sufficient occurrence.

[96] It is not so implausible that fragility is continuously manifesting some of its power, if one considers that a fragile glass is constantly bombarded with particles, dirt, etc. So despite appearances it is not obviously false that the glass is minimally manifesting its fragility by slowly breaking over an extended time. Of course, this does not mean that fragility needs to manifest minimally in this way, whereas on my theory pure dispositions do need to manifest minimally sufficiently to continuously exist.

With the core of the theory now in place, one might object that any property X needs to exist (be instantiated) in order to do something, whereas my claim implies that X's doing something gives X existence; so F's existing in virtue of its minimally sufficient occurrence (a type of functioning) seems to incorrectly reverse the order of existence and functioning. Temporally, existence comes before functioning, whereas my account implies that functioning comes first. However, this is not what my theory claims. Rather, my theory is that F's continuous existence just *consists in* its functioning (i.e., displaying its power): existence and functioning are packaged together in pure dispositions.

The second question is: *If the minimally sufficient occurrence is an event (a manifestation event), how does an event ground a property?* In other words, given that properties generally ground properties, how is it that an event (i.e., a minimally sufficient occurrence) accounts for the grounding of F?

The manifestation event does *not* ground F; rather, the grounding of F's being just *is* a manifestation event. To explain this answer, following Kim (1976) I will suppose that events are property-exemplifications: An event, E, $=_{df}$ (*x*, P, *t*), an object x exemplifying a property P at a time slice *t* or temporal interval $t_1 \ldots t_n$. (If F is not borne by an object, then x drops out of the analysis, or perhaps spacetime exemplifies F). Assuming that this theory of events is right, F's manifestations are property-exemplifications. Thus, the event of F exemplifying one track of its power at any given time *t* or from t_1 to t_n, i.e., undergoing its minimally sufficient occurrence, is the basis of F's being or continuous existence over time.

On the proposed solution to the Problem of Being, F's self-grounding via a minimally sufficient occurrence is an event that keeps F remaining ready for further exemplifications of its power. If a given minimally sufficient occurrence of F is temporally extended, then it is a temporally extended event, or process – i.e., a powerful or dispositional process. Thus, F's existence consists in a process of variable occurrences as it continuously generates its next state of being.[97]

The third question is: *What happens when F manifests in a characteristic way?* Then, the minimally sufficient occurrence stops.[98] Thus, there are (near-by) possible worlds in which F is not manifesting a minimally sufficient range of its power, i.e., worlds in which F manifests in one of its characteristic ways. Thus, F is not continuously manifesting *all* it is capable of in all possible worlds (if it were, this would seem to make it a categorical property). When F displays one of its characteristic manifestations, then it is not minimally sufficiently occurring. Thus, the fact that F undergoes a minimally sufficient occurrence when not undergoing a characteristic manifestation does not make F categorical because it need not always undergo minimally sufficient occurrence, just as the other possible manifestations of F are occurrences of F and do not make F categorical.[99]

Still, one might press that because F is continually manifesting *some* of its disposition – or something of which it is capable – this makes it categorical. But why is

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[97] An interesting implication of this event-theory (or process-theory) of F's self-grounding, is that if pure dispositions are fundamental properties then the fundamental entities or constituents of the world are events (processes).

[98] We might call the minimally sufficient manifestation state of a pure disposition its 'static-side' as opposed to its more 'dynamic-side', to differently employ the distinction between static and dynamic dispositions introduced by Williams (2005). (He employs for instances of different kinds of disposition, whereas I am suggesting it be used for different tracks of power of a single token disposition.)

[99] Some pure dispositions may be gone forever once they undergo a certain type of manifestation, while others may retract back to a minimally sufficient occurrence state after any of their other possible manifestations occur.

this so? A categorical property, strictly speaking, is not capable of manifestations as dispositions are. A categorical property is what it is at any given time, whereas a disposition is full of possibilities, even while manifesting some power (although there are some dispositions like fragility that release all of their power, so to speak, on some of their manifestations).

The fourth question is: *What is the activating condition (or stimulus) for F's minimally sufficient occurrence?* Assuming that characteristic manifestations of F are generally associated with characteristic stimuli, the minimally sufficient occurrence of F does not require a characteristic stimulus.

However, it may not even require a non-characteristic stimulus, for perhaps F's minimally sufficient occurrence is spontaneous or self-generated (akin to radioactive decay). On that view, then F is its own stimulus for its minimally sufficient occurrence. But if a stimulus is required, perhaps it is constituted by negative conditions: F being in the absence of stimuli appropriate for F's characteristic manifestations. Yet another possibility is that F being situated in spacetime stimulates it to undergo its minimally sufficient occurrence (implying that F could not exist sans spacetime, which seems true for all concrete entities). For example, if mass is a pure disposition then perhaps its minimally sufficient occurrence is the bending of spacetime.[100]

The fifth question is: *Does a minimally sufficient occurrence of F make F categorical?* This is important because it questions the power-hood of pure dispositions. On the theory I am defending, pure dispositions continually manifest their power. In contrast to Psillos (2006: 141), I am claiming that continually manifesting dispositions may still be dispositions, not categorical properties. Once we accept that pure dispositions

[100] Thanks to Luke Elwonger for this example.

need not manifest everything they are capable of at any given time, we can allow that they undergo a minimally sufficient occurrence during stretches of time when they are not manifesting in more characteristic ways.

However, suppose that F undergoing minimal occurrence indeed implies that F is not a disposition but a categorical property. Then, if the proposed theory is the best available response to the Problem of Being, then the overall argument of this chapter should be construed as a *reductio* of the Pure Dispositions Thesis. This would be a significant conclusion in its own right. On the other hand, if a minimally sufficient occurrence of a pure disposition does not imply that pure dispositions are categorical properties, then we have a viable theory of the being of pure dispositions.

I maintain that we can avoid the problem – that F's continuous manifestation of any sort along F's possible lines of manifestations implies that F is categorical – by attending to the distinction between 'occurrent' and 'categorical'. Sometimes these terms are used interchangeably. However, by an 'occurrent' property I mean a disposition in a state of manifesting – a disposition is *occurring* or manifesting.[101] This is a dynamic process. As with all manifestations F may undergo, the minimally sufficient occurrence of F does not necessarily make it categorical. A categorical property like having shape is supposed to be static, possessing a quality of "just-there-ness" (Armstrong 2004: 141). A categorical property may be a leftover of some causal process involving dispositions in the past – a glass' microstructure, for example. But an *occurrence* of a pure disposition,

[101] Whereas as I am using 'occurring' and 'manifesting' interchangeably, Cartwright (2007: 197) distinguishes between the occurrence of a disposition and its being manifested (whereas there is no distinction like this for categorical properties). By 'occurring' she seems to mean the disposition being in a ready-state, or having an active potential, like a gravitational field; whereas 'manifesting' refers to the effect of the disposition when it displays it power. By contrast, my view holds that F is always in a state in which it manifests some of its power (i.e., where some of F's power is occurrent).

or any disposition, is the process of the disposition actively manifesting one track of its power.

Categorical properties are complete in the sense that they fully 'manifest' all they are capable of at any given time. By contrast, dispositional properties are not fully manifest. Each manifestation of a disposition, including a pure disposition, just taps the surface of potentiality built into it. This is why they are modal properties. Hence, F continuously manifesting some of its power (whether a minimally sufficient occurrence or a characteristic manifestation) does not imply that F is categorical. F's total multi-track power remains intact even while manifesting some of its power. Thus, since pure dispositions do not display all they are capable of at any given time, to say they are categorical like traditional categorical properties is misleading. F is not categorical because it is always full of threats: even as it is manifesting in one way, it is capable of manifesting in another way. At the most, some limited range of F's power is displayed at any given time, which is to say that the disposition is undergoing a process of manifesting, not that it is categorical.[102]

The opponent of The Pure Dispositions Thesis might respond that the principle of minimally sufficient occurrences implies that any pure disposition has a categorical aspect in addition to its dispositionality (as according to the dual-aspect theory, as found in Martin 2008), or that it implies that any pure disposition is identical to a categorical property (Heil 2003); if either view is true, then the Pure Dispositions Thesis is false. It is worth noting that on both of these views properties have dispositional natures and are identified in terms of their causal roles. A prime motivation for adding a categorical

[102] Still, one might maintain along with Mumford (2006: 485), who accepts the Pure Dispositions Thesis, that pure dispositions are just as 'categorical' as traditional categorical properties. That is, pure dispositions have a categorical existence just as categorical properties do, yet throughout their existence they are potent.

dimension, to what are otherwise fully dispositional properties, is to account for their continuous existence (the idea is that to say a property X is 'categorical' is to say that X is always there). Despite this, restricting discussion to the fundamental properties on the dual-aspect view or identity thesis, it is plausible that it is the dispositional nature of these properties, *not* the added categorical dimension, in virtue of which they continually exist. This is because continuous existence appears to a causal process.

Rather than invoking a categorical aspect or an identical categorical property to explain the continuous existence of what would otherwise be pure dispositions, my account offers an explanation of the being of pure dispositions that invokes the powerful nature of such properties. On my view, pure dispositions are purely powerful and continuously manifesting some of that power. Perhaps this is similar to the sense of categoricalness sought by the dual-aspect or identity theorist. But my account differs from these views in that F's being is explained by reference to F's power, i.e., by reference to F's dispositionality.

In sum, this chapter proposes that some pure dispositions are self-grounded in virtue of continually manifesting a minimally sufficient range of their total multi-track power. Thus, some pure dispositions continuously exist because of their own power and thereby remain ready for all of their other possible manifestations.

3.8. Multiple ways of Grounding Pure Dispositions

If we reject holisms about the grounding of pure dispositions, like (Global) and Mumford's view, on grounds that there is a possible world with just one pure disposition (or one object with that property) that must therefore be intrinsic, then we need a theory of self-grounding of pure dispositions, hence the account given in sections 3.6 and 3.7.

But there may be some extrinsically grounded pure dispositions; I will argue in the next chapter that there is at least one non-fundamental pure disposition (mass) that is extrinsically grounded, and that possibly all non-fundamental pure dispositions are extrinsic grounded if (World) is true.

If those accounts are plausible, then the need for multiple accounts of grounding becomes clear: extrinsic grounding cannot cover all the possible cases of the grounding of pure dispositions. Thus, some pure dispositions are self-grounded (which is a grounding 'relation' intrinsic to the object bearing F), and some are extrinsically grounded. It may be that just one F is self-grounded if the World as a whole is a fundamental object (the only fundamental object) apart from its parts, and many are self-grounded if some form of pluralism about fundamental objects is correct.[103]

[103] However, not all pure dispositions are self-grounded if there is a plurality of fundamental pure dispositions, since there may be higher-level (non-fundamental) pure dispositions, as section 5.4 will suggest.

Chapter 4

EXTRINSIC PURE DISPOSITIONS

4.1. Introduction

Mumford (2006: 471-80), Molnar (2003: 131-7), and Ellis (2001: 114-5) all accept the reality of pure dispositions on the basis that properties of fundamental particles are pure dispositions.[104] These properties include at least mass, charge, and spin. The reasoning often employed, made formally explicit by Mumford (2006), is what I shall call the Argument from Physics. The core of the argument is that the properties of fundamental particles are dispositions,[105] and that since fundamental particles are metaphysically simple (containing no micro-components) they afford no further properties – i.e., properties besides mass, charge, and spin – to ground these dispositions; thus fundamental dispositions are ungrounded in any distinct properties apart from themselves, which is the same as their being self-grounded per the terminology of chapter 3.

If mass, charge, and spin are ungrounded, then they have no causal basis; thus, they are pure dispositions in the sense stipulated by the Pure Dispositions Thesis. Mumford (2006: 479) and Molnar (2003: 131), two principal proponents of the Argument from Physics, specifically use the term 'grounds' in referring to the causal basis of a disposition (so they hold that the set of ungrounded disposition just is the set of pure dispositions). However, the grounds and causal basis of a disposition may be different, as

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[104] This is not to imply that this is the only reason they think favors pure dispositions, but it is one they do accept as sufficient for believing pure dispositions exist.

[105] Are properties like mass, charge, and spin dispositional properties? Mumford (2006: 476) cites Isaacs (2000) as identifying properties of fundamental particles as completely dispositional and giving them disposition-laden definitions. Ellis (2002: 47) and Martin (1993: 184) argue that properties of fundamental particles are dispositional. So, I will assume that the properties of fundamental particles are dispositions. Note that fundamental particles like electrons apparently have characteristic manifestations that are triggered by other properties (e.g., an electron, due to its mass, will be pulled in a gravitational field).

argued in section 1.3.4 and employed in various ways in chapter 3. Therefore, even the pure dispositions of fundamental particles – and I will assume that at least some of these dispositions are indeed pure – may in fact be grounded in some way other than self-grounded. My main concern in this chapter is to challenge the assumption that dispositions of fundamental particles are intrinsic, and so intrinsically grounded *if* grounded in other properties at all, as proponents of the Argument from Physics assume.

To clarify, the Argument from Physics makes a significant metaphysical assumption, which I characterize as follows:

> **Intrinsic Assumption**: Dispositions of fundamental particles are intrinsic properties of the objects that instantiate them, and thus *if* they are grounded in any further properties, then they are intrinsically grounded.

It is important to note that the main proponents of the Argument from Physics do think that dispositions of fundamental particles are *intrinsic* properties, but they do *not* think that they are *intrinsically grounded* in any further properties (per the definitions in section 1.3.4). Although a proponent of the Argument from Physics may admit that some other kinds of dispositions are extrinsic (McKitrick 2003a), they need not hold that sparse dispositions like mass and charge are intrinsic. (I will discuss sparse properties below.) My arguments in this chapter challenge the Intrinsic Assumption by showing that dispositions of fundamental particles may be extrinsically grounded.

Here is justification for attributing the Intrinsic Assumption to key proponents of the Argument from Physics, i.e., Ellis, Molnar and Mumford. Ellis (2001: 28) appears to accept that mass is intrinsic, although he thinks it is not an a priori truth because we should let physical theory guide our understanding of what is intrinsic v. extrinsic (which

is exactly what I do in this chapter). Ellis (2001: 31) also seems to accept that other dispositions of fundamental particles are intrinsic, since he thinks the real essences of things – which presumably include the mass, charge, and spin of fundamental particles – are defined in terms of their intrinsic properties. Molnar (2003: 102-7) argues for the intrinsicness of all dispositions, and he separately argues against extrinsic dispositions (Molnar 2003: 108-10). Mumford (2006: 479-80) gives this formulation of the Intrinsic Assumption: "The grounds of a dispositional property can be found only among the lower-level components or properties of that of which it is a property." Grounding in "lower levels" is equivalent to micro-grounding (a sub-kind of intrinsic grounding, as noted in section 1.3.4), because by "lower-level" of an object, *x*, Mumford means components spatiotemporally contained by *x* (that could ground properties), or properties of *x* that could serve as the supervenience base for grounding further properties. This implies that an object, *x*, having a lower-level *l*, has *l* intrinsically. In support of this claim, one might offer that duplicates of *x* will have *l* and *x*'s having *l* depends on *no* other objects. In other words, if there is a ground for F, then necessarily it is in virtue of components or properties of *x*, and not dependent on other objects or anything beyond *x* itself. Thus, Mumford, like Molnar and Ellis, advocates the Intrinsic Assumption. Note additionally that, although he does not explicitly accept the Argument from Physics, Bird (2007: 30) suggests that the sparse property mass is an intrinsic pure disposition. So, although he accepts that some extrinsic dispositions may exist (Bird 2007: 30), he appears to accept the Intrinsic Assumption.

In this chapter I argue that some pure dispositions, specifically some dispositions of fundamental particles, are extrinsic properties and thus extrinsically grounded. I focus

in particular on dispositions of particles as do proponents of the Argument from Physics. An extrinsically grounded disposition depends for its existence at least partially on some property or property-complex beyond the properties of the object bearing the disposition in question. More precisely, the thesis I will defend is this:

> **Extrinsic Pure Dispositions Thesis:** A pure disposition, F, of a fundamental particle, *a*, may be grounded either in a property or property-complex of another object, *b*, distinct from *a*, or in a property or property-complex of *a*'s environment, hence F is not intrinsic to *a*.

The two varieties of extrinsic grounding mentioned above are extrinsic grounding [object] and extrinsic grounding [environment], both discussed in detail in section 1.3.4. This Extrinsic Pure Dispositions Thesis is important for at least three reasons. First, it challenges the widely held assumption about the intrinsic nature of dispositions of fundamental particles – properties which I will assume are part of the set of sparse properties for the purposes of this chapter.[106] Second, it points to an under-appreciated interconnected view of reality on which the grounding of sparse dispositions fundamentally relies upon other objects or features of the environment. In short, the arguments I present for my thesis take a small but significant step towards justifying a more holistic, inter-connected, and anti-Humean view of physical reality. Third, it shows that some sparse (and pure) dispositions are extrinsically grounded; this is consistent with there being some self-grounded pure dispositions, as discussed in section 3.6 and 3.7.

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[106] Lewis (1986b: 59) distinguishes sparse properties from abundant properties. The sparse properties are the natural properties, those typically discovered by and discussed by various sciences, especially fundamental physical properties, though it is not necessarily the case that all the sparse properties are fundamental (e.g., acidity is arguably a sparse property but is not fundamental). The abundant properties are non-natural properties (including all sorts of disjunctive properties).

My thesis is similar in some respects to the extrinsic dispositions thesis (that not all dispositions are intrinsic) argued for by McKitrick (2003a). McKitrick offers several examples of extrinsic dispositions (some of which I will discuss below) and she critiques the main arguments in favor of the intrinsic dispositions thesis (that all dispositions are intrinsic). But there are important differences between her project and mine. First, I specifically focus my discussion on the extrinsic *grounding* of dispositions. Second, I present arguments for the extrinsic grounding of some sparse dispositions. My first argument is based partly on theoretical physics – the argument from the Higgs field.[107] This argument specifically makes the case for the extrinsic grounding of one sparse disposition, mass. This is philosophically significant because, as Bird (2007: 30) observes, McKitrick's examples all involve abundant dispositional properties, not sparse dispositional properties like mass. So her case for the extrinsic dispositions thesis only negates a narrowly construed version of the intrinsic dispositions thesis limited to abundant properties. My second argument is a more general, purely metaphysical argument – the Argument from Priority Monism – that makes a case for the possibility of the extrinsic grounding of many sparse dispositions.

I will assume in this chapter that the grounds of F and the casual basis of F are distinct, as argued in section 1.3.4. I will further assume the conceptions of extrinsic grounding [object] and extrinsic grounding [environment] established in section 1.3.4. With those concepts in place, I will take the following steps. In section 4.2, I develop the Argument from the Higgs Field. Section 4.3 evaluates four objections I foresee to the argument, and section 4.4 discusses an important implication of the argument. In section 4.5, I present the Argument from Priority Monism. Section 4.6 evaluates three objections

[107] The Higgs field is named after physicist Peter Higgs, who posited its existence.

I foresee to the argument, along with responses. Section 4.7 offers some concluding remarks.

4.2. The Argument from the Higgs Field

McKitrick (2003a: 159-60) discusses weight as an extrinsic disposition, an example suggested by Yablo (1999: 611). The disposition weight of an object *a* varies depending on the strength of the gravitational field inhabited by *a*; thus, weight is extrinsically grounded [environment]. This kind of example comes closest to being an example of a sparse and pure extrinsic disposition. However, Bird (2007: 30) suggests that "In the case of weight, it is tempting to regard mass as the real and natural property" and thus the sparse property. But Bird (2007: 125) also observes that nobody has suggested that mass is not intrinsic.

In contrast, my Argument from the Higgs Field concludes that mass is extrinsically grounded [environment], thus the Intrinsic Assumption is false. The argument has an empirical and a metaphysical premise. The empirical premise issues from the Standard Model of physics, upon which testable empirical predictions are made concerning the nature of fundamental particles. The metaphysical premise is the notion of extrinsic grounding [environment]. Here is the empirical premise:

(1) The mass of any fundamental particle, *a*, is generated by *a*'s interaction with the Higgs field. [Empirical premise]

The Standard Model of physics assumes the existence of the Higgs field, a scalar field that "permeates all of space" and "endows particles with mass" (Jammer 2000: 162). The Higgs field explains why particles resist acceleration: "mass is not 'generated' in the particle by a miraculous *creatio ex nihilo*," rather it is "transferred to the particle from the

Higgs field, which contained it in the form of energy" (Jammer 2000: 163). This transfer process is causal: the energy in the Higgs field interacts with all the particles in the field, causing them to gain a mass value. Since particles must be situated in and interact with the Higgs field in order to obtain mass, it is reasonable to conclude that some property or property-complex of the Higgs field is nomically necessary for particle *a* to have mass. But it is also necessary that some property or property-complex of *a* permits *a* to interact with the Higgs field in the appropriate manner required to generate mass.

What is the nature of this interaction? Per the Standard Model, all of the known fundamental particles, except photons[108], interact with the Higgs field, thus acquiring potential energy, and thus acquiring a certain mass, in accordance with the mass-energy relation (Jammer 2000: 162).[109] A stronger interaction between a particle and the Higgs field yields a more massive particle. Jammer (2000: 163) offers Veltmann's (1986) analogy to help explain the nature of this interaction:

> The way particles are thought to acquire mass in their interactions with the Higgs field is somewhat analogous to the way pieces of blotting paper absorb ink. In such an analogy the pieces of paper represent individual particles and the ink represents energy, or mass. Just as pieces of paper of different size and thickness soak up varying amounts of ink, different particles "soak up" varying amounts of energy or mass. The observed mass of a particle depends on the particle's "energy absorbing" ability, and on the strength of the Higgs field in space.

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[108] Photons are mass-less since they move through the Higgs field "completely unhindered" (Greene 2004: 263).

[109] In accordance with Einstein's equation, $E=mc^2$, a "store of energy can be thought of as a source of inertial mass" just as "inertial mass can be thought of as a store of energy" (Jammer 2000: 163, footnote 51). Thus, it might be that the causal process between the Higgs field and the particle is one of transformation, not transference. Either way, the Higgs field ontologically grounds particle *a*'s mass, since sans Higgs field *a* would not have mass.

To clarify the analogy, imagine that the ink field permeates all of space. Thus, we cannot remove the pieces of paper (signifying particles) from the field. The paper pieces, regardless of their size or thickness, would eventually become fully soaked with ink. What being fully soaked means is relative to the size and thickness of the piece of paper, and this parallels the idea that each kind of particle gains a different amount of energy (and thus mass) from the Higgs field, relative to the kind of particle in question.[110] The general point is that if a fundamental particle were not in the Higgs field, then it would not have mass. Thus, it is plausible that, since the Higgs field co-extends with all of space, without the Higgs field fundamental particles would be mass-less.

Moving to the second premise:

(2) The nature of the interaction between a particle, *a*, and the Higgs field meets the conditions of extrinsic grounding [environment]. [Metaphysical premise]

The basic idea behind (2) is that *a*'s having mass depends upon some property or property-complex in *a*'s environment. The Higgs field is part of the environment of *a*, and it has an independent existence apart from *a*. Since if *a* were not in the Higgs field, *a* would be mass-less, then some property or property-complex of the Higgs field is a partial grounds of mass, in addition to some property or property-complex of the particle bearing mass. It is important to note that the interaction per se between the Higgs field and particle *a* does not determine the *particular* mass of fundamental particles. Rather, it determines *that* a particle has some mass given how that specific particle moves through

[110] Here are two other analogies. Kane (2003: 74) suggests that the way particles interact with the Higgs field is similar to people wading through water. Greene (2004: 261) imagines a particle's resistance to the Higgs field akin to how "a vat of molasses resists the motion of a Ping-Pong ball that's been submerged" in the molasses. Which analogy – water, molasses, or ink – best captures the interaction between the Higgs field and particles, I do not know. The important point is that the mass is generated by particle-Higgs field interaction.

the Higgs field; Jammer (2000: 163) and Greene (2004: 262) support this point. If a particle had the disposition to interact with the Higgs field differently than it actually does, then it would have a different mass value; but, it would still possess mass.

To be more precise about the metaphysical nature of particle-Higgs field interaction, particle *a* has a disposition to interact with the Higgs field. This disposition to interact might be intrinsic to the particle, but it alone is not sufficient grounds for the particle's having the further disposition mass, for it is a disposition *to gain the disposition mass* – call this disposition F_m. F_m is triggered when *a* is immersed in the Higgs field, thus *a* then gains the disposition mass. However, *a*'s immersion in the Higgs field does not mean it always manifests mass, since the manifestation of mass further requires an acceleration of *a*. The immersion is just what gives *a* the disposition mass, which can then be activated if *a* is accelerated. Perhaps particle *a* possesses F_m in virtue of the bundling of charge and spin properties. Even if F_m is intrinsic to particle *a* (as seems to be true), because F_m is insufficient by itself to ground mass, mass would not count as being micro-grounded by F_m (see section 1.3.4 for a discussion of micro-grounding); rather, mass would be partially grounded by F_m in combination with the relevant property (or property-complex) of the Higgs field, and this just means that mass is extrinsically grounded [environment].[111]

Since both grounding properties of mass – that possessed by the Higgs field and F_m – are dispositions to so interact with the other in order to generate mass, one might wonder whether they are grounded. Supposing their bearers have no further property

[111] Perhaps particle *a* becomes a different natural kind after entering the Higgs field, if mass is essential property for being a certain kind of particle. If so, then mass is an essential extrinsic property of some kinds of particle. But *a* becomes a new kind only if natural kinds are not determined exclusively by their intrinsic properties. Either way, this point does not affect the fundamental claim advanced concerning the extrinsic grounding of mass.

structure, and thus that they are fundamental, and supposing that they are not identical to categorical properties (per my arguments against the Identity Thesis in sections 2.7 through 2.10), then I suggest that they are self-grounded pure dispositions. Regardless, my aim has been to establish the possibility of the extrinsic grounding of mass, a pure disposition of fundamental particles.

Given (1) and (2), I conclude:

(3) Thus, mass is extrinsically grounded [environment]. [(1) and (2)]

Another way to formulate the argument involves employing McKitrick's (2003a: 155) conception of extrinsic dispositions, according to which two qualitatively identical objects, x and x_1, can differ with respect to having dispositions when x and x_1 are located in different environments, even if the laws of nature are fixed.[112] Applying this notion of extrinsicness to the case of mass, suppose object x is located in an environment with the Higgs field, and object x_1 is not so located. Object x will have mass, and object x_1 will not. Thus, mass is an extrinsic disposition, and thus mass is extrinsically grounded [environment].[113]

Putting the point differently, suppose we create a complete vacuum, removing the Higgs field and everything in a region of spacetime while maintaining the actual world's laws of nature (since some philosophers, such as Lewis (1986a), hold that dispositions depend on the laws of nature); then, if in this vacuum, particle *a* would not have mass, then mass is an extrinsic property.

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[112] Some supporters of the intrinsic dispositions thesis (that all dispositions are intrinsic) think that perfect duplicates subject to different laws of nature could have different dispositions (e.g., Lewis 1997).

[113] Does the Higgs field's ability to generate mass in particles require the laws of nature to be a certain way? No. The Higgs field may have had a different value if the laws of nature were different (if, for instance, events at the beginning of the universe were different), yet the Higgs field would still have existed and been responsible for generating mass in particles. See Greene (2004: 254-63) for a discussion of the different values the Higgs field could have depending on early events in the formation of the universe.

The Argument from the Higgs Field entails that the Intrinsic Assumption is incorrect: the grounds of mass are extrinsic. In sum, if the argument is sound, the Higgs field extrinsically grounds [environment] the disposition mass in since it coextends with all of spacetime and each particles' interaction with it grounds the particular mass possessed by that particle.[114, 115]

Importantly, there is a good case to be made for mass being still being a pure disposition. This is because it does not have a causal basis, other than itself, for manifesting. The grounding properties of the Higgs field and F_m (the relevant grounding property of particle *a* bearing mass) are not necessarily causally relevant to mass manifesting its power; that is, they do not receive the stimulus – mass alone does so. Thus, if this is correct, then mass is a case of an *extrinsically grounded pure disposition*. To further clarify this point, given that mass is extrinsic, being grounded in F_m and the relevant disposition of the Higgs field (call this F_{Higgs}), and that F_m and F_{Higgs} do not constitute a causal basis for mass, then mass remains a pure disposition. This is because F_m and F_{Higgs} are not causally relevant to mass manifesting. In the case of F_m, F_m manifests its power, such that the particle bearing F_m gains mass, a new pure disposition. But this does not imply that the manifestation of mass is triggered via F_m. It is mass itself that is triggered.

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[114] According to Haisch, Rueda, and Dobyns (2001: 393), physicists working on problems of mass, when we detect the Higgs boson (the particle constituent of the Higgs field) a legitimate question concerning "whether the inertia of matter as a reaction force opposing acceleration is an intrinsic or extrinsic property of matter" will remain. My Argument from the Higgs Field aims to give some reason for thinking that mass is an extrinsically grounded disposition (and thus that mass is extrinsic), provided that the Higgs field is real. See Peskin and Schroeder (1995: 781-800), and Zee (2003), for introductions to the mathematics of the Higgs field.

[115] Psillos (2006) also discusses the Higgs field in drawing attention to the inconclusiveness of physics regarding the nature of mass, charge and spin, by pointing out disputes over particle vs. field theory and supersymmetry. Psillos, however, does not specifically argue for the extrinsic grounding of mass from the Higgs field as I do.

Note that this is consistent with the grounding properties (F_m and F_{Higgs}) of mass also counting as pure dispositions, although they are intrinsic properties of their bearers. Hence, on this account, they would be self-grounded pure dispositions if they are truly fundamental, and assuming my argument against holistic theories of grounding, such as (Global), is sound (see section 3.3). If F_m and F_{Higgs} are fundamental, then mass is a higher-level (non-fundamental) pure disposition, since it is derivative or dependent on fundamental dispositions. The general idea of higher-level pure dispositions is further addressed in chapter 5, especially section 5.4.[116]

4.3. The Argument from Higgs Field: Objections and Replies

In this section, I explain four objections I foresee to the Argument from the Higgs Field and respond to each of them. There may of course be other objections, but these four objections seem the most powerful or the most likely to be raised.

Objection 1: The first objection is that the Higgs field is only relevant to inertial mass. To clarify, there are two concepts of mass. Inertial mass is the property in virtue of which an object resists acceleration. Gravitational or rest mass is the property in virtue of which an object is pulled by a gravitational field of a specified strength. Thus, it seems that the Higgs field only implies the extrinsicness of inertial mass since the interaction between particles and the Higgs field involves the acceleration of particles through the Higgs field (the Higgs field only resists accelerated motion). If so, then the Argument from the Higgs Field shows nothing new, since as Bird (2007: 125) observes, according

[116] Suppose we adopt the conception of sparse dispositions held by Bird (2007). Bird (2007: 45) holds that all the sparse dispositions, or "potencies" in his terminology, are pure dispositions (or, essentially dispositional properties). Furthermore, Bird (2007: 13) holds that the sparse – or "fully natural" since Bird (2007: 9) considers 'sparse' and 'natural' interchangeable – properties "include at least the fundamental properties," suggesting that some *non*-fundamental properties are still natural, sparse properties. According to the Argument from the Higgs Field, mass is non-fundamental because ontologically dependent on other properties. Yet, mass is an excellent candidate for a sparse, fully natural property. If this is right, then mass is a non-fundamental, sparse, pure disposition.

to the special theory of relativity inertial mass is extrinsic. Bird (2007: 125) then goes on to observe that nobody "has suggested that charge, rest mass, and spin are not intrinsic."

Response to Objection 1: In response to the objection from inertial mass, the Argument from the Higgs Field does suggest that rest mass is extrinsic. Although inertial mass and rest mass seem like two different properties because we can make the conceptual distinction between them, according to Einstein's equivalence principle rest mass and inertial mass are equivalent. Because of this, Greene (2004: 518) concludes that "the Higgs field is relevant for both kinds of mass." The equivalence between rest mass and inertial mass may be contingent, but such equivalence comes in the same world (the actual world) as the dependence of mass on the Higgs field. And that is all that is needed for the claim that mass is extrinsically grounded [environment].

Objection 2: The second objection is that the Higgs field is a theoretical posit not based on empirical evidence, thus (1) is insufficient to conclude (3).

Response to Objection 2: In response, the Standard Model, probably the most successful empirical theory in the history of science, predicts the existence of the Higgs field. Specifically, the Standard Model predicts the existence of the Higgs boson, the particle constituent of the Higgs field. Although the Higgs boson has not been found yet, the 1983 discovery of the W^+, W^-, and Z bosons at CERN[117] gives plausibility to the claim that it will be found, and thus confirm the Higgs mechanism (Jammer 2000: 163). Robert Kane (2003: 74) argues that the expected mass of the Higgs boson is less than about 200 giga-electron-volts, and the fact that there is a predicted answer at all is "strong evidence that the Higgs exists," since "A similar type of prediction proved accurate for

[117] The name "CERN" stands for the French Conseil Européen pour la Recherche Nucléaire, or European Council for Nuclear Research (from the CERN website, http://public.web.cern.ch/public/en/About/Name-en.html).

the top quark mass." (With the turning on of the Large Hadron Collider in Europe on September 10, 2008, claims about the existence of the Higgs boson entered the empirical testing phase.) Given the empirical plausibility of the Higgs field, the Intrinsic Assumption looks overly presumptuous.

Objection 3: The third objection is that the argument is too limited because it only shows that one disposition (i.e., mass) of a fundamental particle is extrinsically grounded, but others such as spin or charge may be ungrounded.

Response to Objection 3: In response, the third objection overlooks the importance of the Argument from the Higgs Field. First, if my argument is sound, it at least shows that the Intrinsic Assumption – the claim that if grounded at all, any disposition of a fundamental particle would be intrinsically grounded – is mistaken. This means that proponents of the Argument from Physics cannot necessarily deduce the conclusion at which their argument aims. Second, the argument highlights the metaphysical and empirical possibility of extrinsic grounding in general and at the fundamental level in particular. Another species of Higgs field, the electroweak Higgs, is thought by some physicists to unify the electromagnetic and weak nuclear forces (Jammer 2000: 162), suggesting the possibility of some kind of ultimate grounding field. Furthermore, it seems to be a metaphysical possibility that a particle, *a*, cannot possess charge and spin unless *a* also possesses mass. Therefore, if *a*'s mass is extrinsically grounded [environment], and if charge and spin depend on a having mass, then charge and spin are also extrinsically grounded [environment].

Objection 4: The final objection to the argument from Higgs field I will consider is that the nature of the interaction between the particle bearing F, and the Higgs field, is

a causal relation, not a grounding relation. Just because *x* causes *y*, does not mean that *x* is grounded in *y*. For example, a house is caused to be white by painters, but that does not mean the house's whiteness is grounded in the painters or some property of the painters. Similarly, a particle is caused to have mass because of the particle's interaction with the Higgs field, but this does not mean that the Higgs field grounds the particle's mass.

Response to Objection 4: First, there is a distinction between the cause for *x* 'coming into being', which is a causal relation (*y* causes *x*), and the grounds for the 'continued existence' or being of *x*, which is ontological dependence (*y* sustains *x*). So, for a relation, R, between *x* and *y* (i.e., properties of *x* and *y*), to be a grounding relation and not a causal relation, it seems like R must be constituted by some kind of continual dependence between *x* and *y*, or just by the mere co-presence or co-existence of *x* and *y*, and not by *y* causing *x* to come into being and then *y* disappearing. For the latter seems causal if *x* can continue existing after *y* disappears. To exemplify the grounding relation relative to extrinsic properties, I will invoke one of McKitrick's (2003a: 159) examples: a key's disposition, D, to a open a door, X depends on the nature of the lock in X. If the key fits the lock, then the key has D; but change the lock in X, and now the key does not have D. So D is an extrinsic disposition, and is thus extrinsically grounded. But does the lock in X *cause* the key to have D? Perhaps, but the nature of the relation R in this case is not one of typical causal interaction, like causing the key to have a different shape.

The case of mass and the Higgs field is a bit different than the key and door. Admittedly, there is interaction between the particle and the field, and that interaction is the basis for the particle's having mass; this may seem to make it a causal, not a grounding relation. However, it is the continual interaction with the Higgs field that

yields the particles' mass; the particle would immediately lose its mass if removed from the Higgs field. If mass were simply caused (i.e., if a particle were caused to have mass) by the Higgs field then the particle would not immediately lose its mass when removed. Thus, R looks like a grounding relation, not a causal relation.[118]

4.4. The Vindication of Ultra-grounding

An important implication is that the Argument from the Higgs Field vindicates the idea of ultra-grounding introduced by Rom Harré (1986: 295). Ultra-grounding is the grounding of a property in "a property [or properties] of the universe as a whole" (Harré 1986: 295). Mumford (2006: 478) explicitly rules out the grounding of dispositions at a "relatively higher level" as with ultra-grounding because "there is insufficient description or justification and ultra-grounding appears a *deus ex machina* for the avoidance of the very notion of ungroundedness," where ungroundedness just is self-groundedness, and thus represents the Intrinsic Assumption. Furthermore, Mumford (2006: 478) notes the widespread support in favor of the micro-reductive program, "whereas ultra-grounding has no such advocates." Molnar (2003: 132-5) also rejects ultra-grounding for similar reasons.

As an example of ultra-grounding, Harré (1986: 295) offers Mach's Principle – the idea that an object's mass is determined by the total distribution of mass and energy in the rest of the system of which the object is a member.[119] Moreover, Harré (1975: 161-85 and 1986: 196) suggests fields as possible ultra-grounding mechanisms. On ultra-grounding, Harré (1986: 196) suggests that all dispositions would ultimately be grounded

[118] Similarly, an animal's being alive requires oxygen from its environment; in some sense, oxygen (partially) causes the animal to be alive. But if we take a long-term view of the animal's being, it makes intuitive sense at least to maintain that the environment is part of the grounds of the animal's being alive.
[119] Molnar (2003: 133) discusses this example but thinks it is insufficient to justify ultra-grounding.

in occurrent properties "embracing such matters as the quantity and distribution of energy fields."[120]

Because the Higgs field permeates all of space, this suggests it or some aspect of it qualifies as an ultra-grounding property or property-complex. Ultra-grounding, I suggest, is a kind of extrinsic grounding [environment], and is grounding in what Mumford (2006: 478) calls a "higher-level" as opposed to "lower-level" grounding (i.e., micro-grounding). Given these claims, the following analysis of ultra-grounding seems reasonable: a disposition, F, of an object, *a*, is ultra-grounded iff the grounds of F includes a property or property-complex of the whole physical environment (as opposed to just one region of it) in which *a* participates or exists. This entails that F is *not* intrinsically grounded, and thus not micro-grounded, because it is not exclusively grounded in intrinsic properties of *a*, but partially grounded in a property or property-complex of *a*'s whole physical environment. This is exactly the case with mass, I have argued; for, mass depends on the Higgs field for its being, and the Higgs field qualifies as a property or property-complex of the whole physical environment, in keeping with ultra-grounding.

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[120] Why invoke fields? Energy fields, such as gravity fields and electromagnetic fields, have far-reaching spatial extension and so could ground dispositions in many objects/particles, as the Argument from the Higgs Field tries to show. Plus, fields affect and interact with things at many levels of reality. Thus, *prima facie* fields represent a distinct possibility for the grounding of dispositions. The particle interpretation of Quantum Field Theory (QFT) takes particles and their properties as the basic ontological elements of the universe. But significant problems exist for the particle interpretation (see Kuhlmann 2006 and Harré 1986: 261-80). The alternative is the field interpretation of QFT, which holds that fields and their properties are ontologically fundamental. On the field interpretation of QFT, we can ascribe energy and momentum to fields where no particles are present (Kuhlmann, 2006: §5.1.2). Thus, there are reasons to think that "an ontology of fields is the appropriate construal of the most fundamental entities to which QFT refers" (Kuhlmann 2006: §5.1.2).

4.5. The Argument from Priority Monism

This argument reaches much further ontologically than the Argument from the Higgs Field, as it aims to show the extrinsic grounding of many pure dispositions. Specifically, the conclusion is the conditional claim that if priority monism is true, then perhaps many pure dispositions are extrinsically grounded [object].

The starting point is monism, the idea that the whole cosmos is a concrete object unto itself and is the only fundamental object. Monism contrasts with nihilism, the idea that no concrete objects exist, and pluralism, the idea that numerous fundamental concrete objects exists (e.g., millions of atoms or strings). I will say more about monism below, but assuming for conditional proof that monism is true, I will argue that all non-fundamental dispositions, including those of all particles, are grounded extrinsically in the World,[121] understood as the whole-object that ontologically precedes its part-objects (including all the particles). On this view the World is fundamental, so what are typically known as the fundamental particles are not fundamental since they depend on the World. Yet, the properties of mass, charge, and spin of those particles remain pure dispositions because the properties of the World as a whole do not form a causal basis for any given F. The idea is that the being of any pure disposition, F, partially depends and is thus extrinsically grounded [object] in some categorical property or property-complex of the World.[122]

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[121] "The world" is Schaffer's (2008) term (see the quotation from Schaffer below) for the whole cosmos that precedes the parts, but for clarity I will use "the World". It is important to note that the term "the World" it is not equivalent to "the actual world". The actual world includes the whole and all of its parts, whereas the World is the whole, fundamental object that precedes its parts.

[122] The argument does not assume a particular view of the metaphysics of objects, and thus as to whether the World is a bundle of properties or some kind of property-less substratum with properties pinned to it.

Schaffer (2008: §1) identifies two versions of monism: existence monism and priority monism. Existence monism holds that only one concrete particular thing exists, the One. Priority monism holds that many concrete particular things (part-objects of the whole) exist, but the whole (the World) is fundamental, i.e., it has ontological priority: the World is an integrated whole possessing some property or property-complex that grounds its part-objects and their properties.[123] Both theories may be taken to claim either that monism is a contingent truth of the actual world or that monism is a metaphysically necessary truth. Furthermore, both theories may be taken to claim that either concrete objects and their properties are fundamental, or that some other kinds of entities such as abstract entities are fundamental, but that in terms of concrete objects the World (priority monism) or the One (existence monism) is fundamental. Regarding the choice between metaphysical necessity/contingency as it pertains to priority monism, I will assume it is metaphysical necessary that the World has ontological priority.[124] Regarding the choice whether concrete or abstract objects are fundamental, I will assume that concrete objects are ontologically prior to abstract objects, so that the World and its properties are fundamental entities.[125]

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[123] Existence monism is more developed than priority monism in the contemporary literature, as exemplified by blobjectivism, the existence monist theory forwarded by Horgan and Potrč (2000 and 2008, chapter 7). Schaffer (2008: §2) critiques existence monism and defends priority monism (Schaffer 2008: §3 and 2010). John Heil (2003: 108) also entertains the possibility of a one-object world (just spacetime) as a "live option" – "that there is but one substance: space, or space-time, or some all-embracing quantum field" so that powers "might be powers of regions of space to affect and be affected by powers possesses by other regions; relations might be relations among these regions." This might be compatible with Blobjectivism, if on that view all the properties instantiated by the Blobject are power properties.

[124] Whether the Argument from Priority Monism constitutes a refutation of the mere metaphysical *possibility* of ungrounded dispositions turns on whether priority monism is itself necessary or contingent; I will not evaluate this issue in this paper.

[125] These options from which I make these two assumptions about priority monism (that concrete objects come before other kinds of entities, and that priority monism is a claim of metaphysical necessity) are discussed by Schaffer (2008).

Unlike existence monism, priority monism takes it as implausible to deny that posits of empirical science (e.g., electrons and genes) and posits of commonsense (e.g., rocks and trees) are actual concrete objects. So priority monism grants that such objects exist: they are not mere quasi-objects formed by the confluence of properties at some precise region of the One, as Horgan and Potrč (2000 and 2008, chapter 7) maintain.[126]

In addition to challenging the Intrinsic Assumption, priority monism challenges the assumption that there exists a plurality of fundamental or basic objects, e.g., a plurality of fundamental particles. This assumption is a specific strand of the dominant microphysical view of reality that proponents of the Argument from Physics seem to assume. If priority monism is true, then there is just *one* fundamental or basic object (the World) that has ontological priority, a priority normally attributed to a plurality of smaller objects constituting the whole cosmos.[127]

So on priority monism many concrete objects exist, each bearing some set of properties.[128] Schaffer (2008: §3) characterizes priority monism thus:

> It holds that exactly one basic concrete object exists—there may be many other concrete objects, but these only exist derivatively. The priority monist will hold that the one basic concrete object is *the world* (the maximal concrete whole). She will allow that the world has proper parts, but hold that the whole is basic and the parts are derivative. In short, she will hold the classical monist doctrine that the

[126] According to blobjectivism (Horgan and Potrč 2000, 2008) there is just one object (the blobject) which has tremendously complex local variations that account for the vast diversity of the cosmos. Since there is only the blobject, and all properties are properties of the blobject, all properties are intrinsically grounded by the blobject. Thus, blobjectivism (and existence monism) is not a good candidate for the extrinsic grounding of properties.

[127] Thus, the Argument from Priority Monism, and priority monism per se, echo a recent critique made by Hütteman (2004) against micro-physicalism, the doctrine that micro-physical components (and their properties) have ontological priority.

[128] Priority monism is neutral as to the nature of derivative part-objects; e.g., they might be bundles of properties or substrata with properties attached to them.

> whole is prior to its parts. This doctrine *presupposes* that the many parts exist, for the whole to be prior to.

These parts are not merely regions of the World, but concrete derivative part-objects. The World and thus properties of the World, qua World, have ontologically priority over part-objects and properties of part-objects, and the World possesses properties irreducible to its part-objects (Schaffer 2007: 185). Priority monism is similar to the monistic theories advocated by Plato in the *Parmenides*, Plotinus, Spinoza, Hegel, and Bradley.[129] More recently, David Armstrong (1997: 263) hints at the possibility of the primacy of the whole world over its parts.

Schaffer does not explicitly discuss the relationship between properties of the World and part-objects in terms of the intrinsic/extrinsic distinction, or intrinsic/extrinsic grounding, as I aim to do now. Table 1 below summarizes some key relationships between the World and a given particle *a* (a part-object of the World), and their respective properties. My Argument from Priority Monism issues straightforwardly from the relations noted in Table 1. After discussing the table below, I will formalize the Argument from Priority Monism.

[129] Schaffer (2008: §3) cites these and other philosophers as advocating versions of priority monism. Note that priority monism concerns the relation between the whole world and its parts, but for a defense of the priority of the whole over its parts regarding smaller physical systems (smaller than the whole world) see Maudlin (2007).

Table 1: Some features of the World and particle *a*, according to priority monism

Object:	**the World (whole-object)**	**particle *a* (a part-object)**
Ontological priority of object:	fundamental	derivative
Object's properties:	fundamental + intrinsic (independent of properties of other objects)[130]	derivative + extrinsic (partially dependent on properties of the World)
Property grounding:	no further grounds	extrinsic grounding [object]

Looking at the column labeled **the World (whole-object)** in Figure 1, the World is fundamental, so it does not ontologically depend on any other objects. It possesses the fundamental intrinsic property or property-complex of grounding derivative part-objects and their properties (it is intrinsic because it is independent of any other objects). The World and properties of the World qua World have no grounds; this is what it means for it and its properties, qua properties of the World, to be fundamental.[131]

Looking at the column labeled **particle *a* (part-object)** in Figure 1, particle *a* is derivative and ontologically depends on the World. Since particle *a* ontologically depends on the World, particle *a*'s properties partially depend on some property or property-complex of the World. Particle *a*'s properties partially depend on the World, and partially depend on *a* itself, since *a* must have the capacity to instantiate or bear any

[130] However, it may be that some properties of the World, qua World, are not fundamental, but derivative of fundamental properties of the World. So, some of the World's properties may depend on its fundamental properties.

[131] It might be thought that the World has dispositional properties – e.g., dispositions to ground or instantiate part-objects – hence raising worries about their grounds. But, it seems that the dispositions (to ground part-objects) of the World qua World are necessarily continuously manifesting dispositions. Following Psillos (2006: 141), necessarily continuously manifesting dispositions are really categorical properties, not dispositions. The World always manifests its power to instantiate its part-objects; if it did not, then it would not really be the World (i.e., the whole that has priority over the parts), for there would be no whole, properly speaking, without the instantiation of parts. Note that the World does not necessarily temporally precede its part-objects, but ontologically precedes them.

given property. Thus, the properties (including the dispositions) of particle *a* are extrinsically grounded [object]; their very being depends on the World as well as *a*.[132]

Formalizing the Argument from Priority Monism, here is the first premise:

(1) Assume *priority monism*. [For conditional proof]

I do not intend to defend priority monism but draw out its implications concerning the grounding of dispositions; for a full defense of priority monism, see Schaffer (2010). However, since it is a contentious thesis, briefly here are two reasons why priority monism might be true. First, as Schaffer (2007, 2008) notes, it satisfies the criterion of simplicity understood as positing the fewest number of fundamental or basic objects, contrary to the traditional pluralist view, which holds that there are many fundamental objects (atoms, strings, or whatever). Second, it provides an agreeable ontological framework for quantum field theory: the World might be a vast physical field that instantiates myriad local derivative objects and/or derivative fields.

The next premise is:

(2) Premise (1) entails that some property or property-complex of the World partially ground(s) all of its part-objects and properties of those part-objects.

The World and properties of the World, qua World, are fundamental. One fundamental property or property-complex of the World as a whole is serving as the fundamental grounds of the being of derivative part-objects. Thus, the World ontologically grounds its part-objects and the properties of its part-objects.

Some of the part-objects are particles bearing pure dispositions, thus the next premise follows from (2):

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[132] According to some theologies, everything in the universe and the universe itself depend on the existence of God. This parallels priority monism's claim that everything in the world depends on the World (the whole).

(3) Any pure disposition F, borne by a particle *a*, is partially grounded in a property or property-complex of the World. [From (2)]

Although F is a property possessed by particle *a*, part of F's ontological grounds, or basis for being, is some property of the World. Thus, F ontologically depends partially on the World for its being. I say "partially" because F will also depend for its being on the part-object (particle) which bears it (more precisely, F depends partially on *a*'s property of instantiating, or bearing, F).

Next, per the notion of extrinsic grounding [object] (introduced in section 1.3.4):

(4) Properties that ontologically depend on properties of objects other than their bearers are extrinsically grounded [object] properties.

Since "properties" in (4) subsumes dispositions, it thus follows that:

(5) Any pure disposition, F (such as mass), of a particle *a*, is an extrinsically grounded [object] property. [From (3) and (4)]

Finally, here is the conditional conclusion of the Argument from Priority Monism:

(6) If priority monism is true, then any pure disposition, F (such as mass), is extrinsically grounded [object]. [(1)-(5)]

This completes the Argument from Priority Monism.

The argument presents a challenge to the Intrinsic Assumption by showing how all properties of objects, including dispositions, may be partially ontologically grounded by the whole of which they are part. Everything in the world may be more inter-connected than we often assume. Furthermore, if Priority Monism is true, then all of the dispositions grounded in properties of the World are non-fundamental pure dispositions;

however, it still remains that a least one disposition must be pure if (World) is true, per the argument in section 3.6.

4.6. The Argument from Priority Monism: Objections and Replies

In this section, I develop three objections I foresee to the Argument from Priority Monism and respond to each of them. There may of course be other objections, but these three objections seem the most powerful.

Objection 1: The first objection is from the possible duplication of particle *a*. Supplementing the definition of intrinsic properties advanced in section 1.3.4, one might invoke the duplication conception of intrinsic properties, advanced by Lewis and Langton (1998: 121): "a property is *intrinsic* iff it never can differ between duplicates; iff whenever two things (actual or possible) are duplicates, either both of them have the property or both of them lack it."[133] The duplication condition implies that, if F is intrinsic, then any duplicate of particle *a*, regardless of its environment or relation to other objects, will have F. That is, all the possible worlds in which a perfect duplicate of *a* exists, *a* possesses F. Thus, the objector might argue as follows:

(i) Any perfect duplicate of particle *a* will bear disposition F.

(ii) So, F is an intrinsic disposition. [From (i)]

(iii) So, if F is grounded, then F is intrinsically grounded, contra (9). [From (ii) + definition of intrinsic grounding in section 1.3.4]

The duplication definition of intrinsicness is prima facie plausible, so the objector's argument seems to provide a serious test for the Argument from Priority Monism.[134]

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[133] The definition of intrinsic properties in section 1.3.4 is similar to the duplication conception, since the latter implies that *a*'s having F does not depend on other objects.

[134] For some criticism of the duplication analysis of intrinsicness, see Francescotti (1999).

Response to Objection 1: In response to the objection from the duplication of particle *a*, since all part-objects of the World ontologically depend on the World, any perfect duplicate of *a*, bearing F, also depends on the World. The objection from the duplication of *a* ignores this metaphysical claim. Since the Argument from Priority Monism assumes the truth of priority monism for the sake of a conditional proof, it seems fair to ask the objector to assume priority monism as well in order to see what follows from it. So, a background assumption relevant to the objector's argument above is:

(A) The World partially grounds the being of F of particle *a*.

Particle *a* may have a perfect duplicate, a_1, and it would also have F, regardless of its location or relation to other objects; thus, F is intrinsic, or so the objector's argument goes. But granting assumption (A) for the sake of argument, the objector cannot infer (ii) or (iii) from (i). Rather, given (A), from (i) the objector can only infer:

(iii*) So, if F is grounded, then F is *partially* intrinsically grounded in *a*.

But (iii*) is consistent with (9). (iii*) is all that the objector can infer because partial grounds of F are found in the World, as (A) states but which the objector assumes away; thus, F is extrinsically grounded [object]. This means that the objector's premise (ii) is false: F is not an intrinsic property, because it is not solely an intrinsically grounded property (although it is *partially* intrinsically grounded). Even though the multiple grounding properties of F – in *a* and in the World – are intrinsic relative to their object bearers, F itself is extrinsically grounded [object]. Thus, the Argument from Priority Monism stands.

However, suppose that the duplicate of *a*, a_1, is alone. That is, *a* is duplicated in an 'a_1-only' possible world. My response is that in this case a_1 = the World. So, this kind

of case is not really an objection to the Argument from Priority Monism, because the whole that precedes the part-objects according to priority monism still does so; it just happens that there are no parts, for the whole World *is a*. One might say that in this case, F is intrinsically grounded, because F is just an intrinsic property of the World, for there is only one object (the World). That seems right, but the duplication condition is supposed to apply to all duplicates of *a*, not just one case in which a_1 happens to be lonely.

Where does this leave the duplication condition of intrinsicness? It may be a legitimate indicator of intrinsicness if priority monism is false, but if priority monism is true, then it is not a reliable guide to property intrinsicness.

Objection 2: The second objection is that the World and object *a*, bearing F, are not distinct objects. The Argument from Priority Monism, specifically premises (7) and (8), relies upon the definition of extrinsic grounding established in section 1.3.4. This definition implies that the grounding duties for F must be shared by two distinct objects in order for the required ontological dependence relation to obtain. But is object *a* truly distinct from the World? The objection says no: object *a* is not distinct from the World because *a* is (merely) a part of a larger whole.

Contrast the question of distinctness between object *a* and the World with the question of distinctness between two objects *a* and *b* in the World. If one were to make a claim about a property of *a* at location L1 being dependent upon a property of *b* at location L2, then extrinsic grounding would obtain because *a* and *b* would be distinct from each other within the World. But, in regards to *a* and the World, we do not have one

object at L1 and another objection at L2, but a part of a larger whole that cannot yield the required distinctness.

Response to Objection 2: In response to the second objection, much depends on what is meant by "distinct". I have two responses to the objection. For the first response I will assume "distinct" means spatiotemporally distinct and employ this analysis in order to refine the objection:

(ST) Two objects are spatiotemporally distinct *iff* they occupy completely different spatiotemporal regions.

So, in terms of (ST), objection 2 states that object *a* must occupy a different spatiotemporal region from the World in order for them to be distinct, such that the proper dependence relation holds for the extrinsic grounding [object] of F to obtain. Thus, the refined objection is that the World and particle *a*, bearing F, are *not* spatiotemporally distinct since *a* is just a part of the World – i.e., *a* is spatiotemporally contained in the World. This means that F, of *a*, cannot properly depend on properties of the World because *a* and the World are not distinct objects such that the required dependence relation obtains. So, F is not extrinsically grounded [object], so goes the refined objection 2.

Given the objection refined in terms of (ST), I respond by first recognizing that spatiotemporally distinct objects generally have different spatiotemporal locations. Particle *a*, we suppose, has a precise spatiotemporal location. But the World, it seems, does *not* have a precise location. In fact, it seems not to have any spatiotemporal location. This is because the World, as the whole, encompasses all of spacetime. Supposing spacetime is relational, not substantial, the World provides the necessary relational

framework against which the part-objects of the World have precise locations; but, the World itself does not have a spatiotemporal location because it is not located anywhere in relation to something else. Supposing spacetime is substantial, not relational, then spacetime is a substantial part or property of the World; the World itself would provide for, or contain, locations but would not itself have a location. Thus, on either a substantial or relational interpretation of spacetime, the World is not located at any precise location. Thus, the World and *a* are spatiotemporally distinct.

To put my first response differently: can we reasonably assign the World – the whole cosmos – a location? In some sense, I admit, it is everywhere, yet anywhere one could point is not where the World is, but just a part-object of the World, i.e., that which has a precise location, like *a*. In other words, the World is in some sense everywhere its part-objects are, simply because they are parts of the World, but this just means that one small part of the World is here, not the World itself. In this first response, I have tried to show that if the objector means that two objects must be spatiotemporally distinct in order for the required sense of extrinsic grounding to obtain, then there is a sense in which this is true because the World and *a* have different locations.

My second response to objection 2 begins by conceding that the World and *a* share some space or overlap, so there remains a strong sense in which they are not distinct in terms of (ST), contrary to the argument I presented in the preceding paragraph. And in general because parts and wholes spatiotemporally overlap to some degree, they are not completely spatiotemporally distinct. So perhaps the real question behind objection 2 is whether a part of a whole can properly be thought of as a distinct object from its whole.

I will defend the claim that although parts and wholes are not completely spatiotemporally distinct, they might be sufficiently spatiotemporally distinct in order for a property of a part-object of a whole to be extrinsically grounded in the whole.[135] The following is an example of how properties of a part-object may yet be extrinsically grounded in the whole of which it is part, even though the whole and the part-object overlap spatiotemporally. Suppose a page of a book is the last page, so it has the property, P, of being the last page of the book. The book and the page spatiotemporally overlap. In the merological sense, the book and the page are distinct objects: there is a book, and there is a page that is part of the book. But in the spatiotemporal sense, they are not completely distinct because they overlap to some degree. However, the lack of complete spatiotemporal distinctness of the book and the page seems not to prevent P from being an extrinsic property of the page. That is, the page only possesses P in virtue of being part of the book. So, although the book and the page in fact overlap spatiotemporally to some degree, this does not prevent P from being extrinsically grounded.[136] Thus, connecting this general point up with the Argument from Priority Monism, although the World and *a* are not completely spatiotemporally distinct, they are sufficiently spatiotemporally distinct for F to count as an extrinsic, and extrinsically grounded, property of *a*.

Objection 3: The third objection is from the micro-grounds of F (see section 1.3.4 for a discussion of micro-grounding). Disposition F, contrary to the conclusion of the Argument from Priority Monism, is micro-grounded at a precise location of the World, not extrinsically grounded [object] in the World. The reason is that, for any property F of

[135] Beyond the part-whole relation, perhaps some spatiotemporal overlap between any two objects may be allowed, as a rainbow and a cloud may overlap, yet still the two objects are distinct objects.
[136] Thanks to Jennifer McKitrick for the book/page example.

a part-object *a*, which is derivative of the World, a region of the World of merely sufficient size to ground *a* is what actually grounds *a* and thus F.

Response to Objection 3: In response to the third objection, the objection begs the question against the Argument from Priority Monism. Per the theory of priority monism, we treat the World as the whole that precedes its part-objects. We cannot non-arbitrarily carve up regions of the World to serve as individualized grounding regions for part-objects, for the World is a whole (with pervasive fundamental properties) that grounds its part-objects. There are no properties possessed by part-objects of the World that are not derivative, and so are not at least partially grounded by fundamental properties of the World. Moreover, the World is clearly not a micro-component of particle *a* bearing F, so it cannot be that properties of such micro-components ground F.

4.7. Concluding Remarks

The general moral I want to draw from the Argument from Priority Monism and the Argument from the Higgs Field, is to look beyond the objects bearing dispositions to properties of their environment and of other objects in exploring the ontological grounds of dispositions. I suggest that we should accept that at least some pure dispositions of particles (whether such particles are fundamental as the Argument from the Higgs Field assumes, or non-fundamental as the Argument from Priority Monism assumes) are extrinsically grounded before accepting that the Intrinsic Assumption. It is important to note that, given that the grounds of a disposition and the causal basis of a disposition are not the same thing (as argued in section 1.3.4), then even if some pure dispositions are extrinsically grounded as I have argued in this chapter, there may still be – indeed, sparse dispositions may still be – pure in the sense that they do not have distinct causal bases for

their manifestation. In short, extrinsic properties may ground F, yet not constitute a causal basis for F.

Although I presented the two arguments in this chapter as independent proposals regarding the extrinsic grounding of some pure dispositions, priority monism seems compatible with the grounding of mass in the Higgs field. This is because it is possible that one fundamental property of the World qua *world* is the property of having the Higgs field. If so, then the grounding of mass in the Higgs field is tantamount to the grounding of mass in a property of the World.[137]

One important implication of the preceding arguments is that pure dispositions working together in a system may ground or realize higher-level properties, including further pure dispositions. For example, if the Argument from the Higgs Field is sound, then F_m and F_{Higgs}, fundamental pure dispositions, together realize and ground a higher-level, non-fundamental pure disposition, mass. How do systems of dispositions, in general, realize higher-level properties, and is such a phenomena even metaphysically possible? The next chapter concerns such issues.

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[137] Perhaps the World just is an enormous field, or set of fields, that precedes and grounds all other objects and properties. Conceiving of fields as lines of force, Michael Faraday states that "What I mean by the word [i.e., force] is the source or sources of all possible actions of the particles or materials of the universe: these being often called the powers of nature when spoken of in relation to the different manners in which their effects are shown" (qtd. in Harré 1975: 175). Harré (1975: 175) concludes from this: "The fundamental entity then becomes a single, unified field, and in perpetual process of change as its structure modulates from one distribution of potentials of certain value to another." See Harré (1975: 161-85) for a discussion of the history of the field concept.

Chapter 5

PURE DISPOSITIONAL SYSTEMS

5.1. Dispositional Systems and Higher-level Properties

Systems of properties abound in the world. A property system consists of a set of properties that do some metaphysical work together. So a property system is not just *any* set of properties – the properties in the set must *do*, or be *capable of doing*, something *together* to count as a property system. So, for example, the properties of sweetness, crunchiness, and juiciness conjointly yield the distinctive gustatory experience of a red delicious apple. As another general example, supposing that objects are bundles of properties, then property systems work together to generate objects. Property systems may contain categorical or dispositional properties, which I assume are the two most general types of natural properties, or some mix of those two types.

A dispositional system is a sub-type of a property system. A dispositional system consists of a set of two or more instances of dispositional properties existing in a dynamic relation, and contains no categorical properties (though it could ontologically ground some categorical properties, as will be discussed). By 'dynamic relation' is meant that every disposition in the system can interact with at least one other disposition in the same system, such that each disposition has a manifestation partner, as discussed by Heil (2003) and Martin (2008), for example. A dispositional system might contain as few as two dispositions; if they indeed interact then they manifest some third property, perhaps another disposition. They need not ever interact, but as long as they are capable of doing so the set counts as a dispositional system. Perhaps computer programs and minds, if mental states are entirely dispositional (Ryle 1963: 114), are dispositional systems.

Dispositional systems may exist at different organizational levels of reality. For example, a set of higher-level dispositional properties may be realized by a set of lower-level categorical properties, as a computer program's set of functions may be realized by the lower-level properties of a physical machine. In this kind of case, the higher-level properties constitute a dispositional system, while the lower-level properties plausibly constitute a categorical system.

Dispositions typically have causal bases for their manifestations, where a causal basis consists of a property or property-complex that is causally relevant to the manifestation of the disposition. For example, a vase possesses the disposition fragility, and it is some micro-structural, categorical property of the vase that is causally relevant to fragility manifesting when stimulated: the micro-structure of the vase is struck by a hammer, and it shatters, so fragility is manifested. The causal basis is typically thought to be the grounds of a disposition, but grounds and causal basis can come apart, implying that dispositions of S may be grounded in some other properties yet S's dispositions remain pure.

In contrast to dispositions with causal bases, a pure disposition has no distinct causal basis for its manifestation. So, a *pure* dispositional system is a set of pure dispositions in a dynamic relation. The idea of a system of pure dispositional properties working together in some way to produce higher-level properties and objects lies at the heart of those versions of dispositional essentialism that hold that all of the fundamental properties of the world are purely dispositional, as maintained by Bird (2007) and Mumford (2004).[138,139] That is, the dispositions inhabiting the fundamental level of

[138] Similar terms that pick out a pure dispositional system include 'causal structuralism' (Hawthorne 2001) and 'powers maximalism' (Armstrong 2004). Armstrong argues against powers maximalism, Hawthorne is

reality have no causal bases in categorical properties, so fundamental level of reality is a pure dispositional system. [140]

The versions of dispositional essentialism mentioned in the preceding paragraph require a vast pure dispositional system, stretching over all of fundamental reality, to ontologically suffice for the non-fundamental properties and particulars of the world – all levels of reality beyond the ground level. These higher levels plausibly include categorical properties like the shapes of objects, non-pure dispositional properties like the flammability of gasoline, chemical and biological properties, and subjective states (i.e., consciousness). The question of whether pure dispositional systems are sufficient for the higher-level properties in the world is found, for example, in various forms and with varying answers in Armstrong (2004: 139), Bird (2007: 147-68), Blackburn (1990), and Holton (1999).

There are many features to account for in higher-level systems of the world, but my question is whether any pure dispositional system can account for even a *single* higher-level property, let alone generate some higher-level complex system consisting of myriad higher-level properties. So my question is this:

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critical of causal structuralism but thinks it is promising, and Mumford and Bird argue for dispositional essentialism but disagree on some details. The basic idea of a purely dispositional system, or a system of properties defined exclusively in terms of causal powers, seems to trace to Shoemaker (1980).

[139] See footnote 1 in chapter 1 for discussion of various versions of dispositional essentialism.

[140] To my knowledge no one in the literature on dispositions has discussed sets of interactive dispositions specifically in terms of *dispositional systems* or *pure dispositional systems*, as this paper does. However, the basic idea of a dispositional system, and that such a system is coherent, is patent in Shoemaker (1980) and all of the dispositional essentialist literature (e.g., Bird 2007, Mumford 2004). The motivation for using 'dispositional system' and 'pure dispositional system' stems from considering the claim made by dispositional essentialists that pure dispositions are sufficient for higher-level properties, in combination with recognizing that pure dispositions must form a system or 'team up' in order to produce higher-level properties.

Question of Higher-level Properties: Can any pure dispositional system ontologically suffice for a single higher-level categorical or dispositional property?

A successful answer to the Question of Higher-level Properties appears necessary to answering the broader question of whether a pure dispositional system, such as that posited in dispositional essentialism, can account for higher-level property systems. This is because the question both widens and narrows the issue. It widens the question to one faced by any pure dispositional system, whether it exists in causal isolation from other property systems, or constitutes the ground floor of reality as in dispositional essentialism.[141] And it narrows the issue by focusing on the generation of just one higher-level property out of a pure dispositional system.

This chapter first defends the possibility of a pure dispositional system from several objections, and then argues that a pure dispositional system is sufficient for producing higher-level dispositional and categorical properties. Thus, a pure dispositional system can in principle produce complex higher-level systems of properties. It is suggested that the relation between a pure dispositional system and any higher-level properties it grounds must be an emergence relation, not a reducibility relation. To explain how this works, a theory is proposed that specifies how pure disposition manifestation partners in a system undergo a generative process that produces emergent, i.e., non-reducible, higher-level properties.

[141] Pure dispositions may be continuously manifesting, per my self-grounded (via minimally sufficient occurrence) account of the being or continuous existence of pure dispositions (section 3.7). Yet, this alone does not account for higher-level categorical and dispositional properties. For the MSO does not necessarily, by itself, yield new properties.

The rest of the chapter proceeds as follows. Section 5.2 gives an analysis of a pure dispositional system. Section 5.3 evaluates three objections to the possibility of a pure dispositional system. Finally, section 5.4 evaluates an objection, the Argument from Composition (Heil 2003), aimed at showing that a pure dispositional system cannot generate higher-level properties of the kind required to answer the Question of Higher-level Properties. In response, the chapter advances a theory of emergence that attempts to explain how a pure dispositional system may generate emergent higher-level properties.

5.2. Analysis of a Pure Dispositional System

A system of properties is a pure dispositional system, S, at a single level of reality, L, *if and only if*: (i) S contains ≥ 2 pure disposition tokens, F_1 and F_2, that are partners for each other's manifestation; (ii) S contains no categorical properties, i.e., it is not a system of mixed types of property instances; (iii) S is causally self-contained or isolated.[142] An explanation of the key terms on the left and right side of the analysis follows.

This proposal assumes that there are distinct organizational levels of properties. So, a lower-level system of properties, L1, working together in a certain way, may generate a higher-level system of properties, L2; Gillett (2002) gives the example that carbon atoms in the appropriate relation will realize the hardness of a diamond. These assumptions about levels are not uncontroversial, but are sufficiently plausible to continue. Probably, there will be many intermediate organizational levels of properties, thus increasing organizational complexity. As related to pure dispositional systems, it is logically possible that dispositions of S are either grounded in but causally independent

[142] Let PD stand for the set of pure dispositional properties; that is, PD = {x ⎪ x is a pure disposition}. Then, S is a subset of PD; that is, S ⊆ PD. However, it is possible that S is not distinct from PD, so that S = PD. This is the case if and only if there can be no subset of pure dispositions within PD that is causally isolated from PD, e.g., if all pure dispositions are at the fundamental level of reality and no subset of these properties can be causally isolated from the rest.

of some lower-level properties, or that dispositions of S form the lowest level of properties. This is because of the ontological distinction between grounds and causal bases. So long as the dispositions of S do not have causal bases in lower-level properties, such that the lower-level properties are not causally relevant to the dispositions of S manifesting, then S's dispositions remain pure even though they are grounded in the lower-level properties. Thus, there could be a *higher-level*, and thus non-fundamental, pure dispositional system that yet meets the conditions of S as analyzed. (If the Argument form Priority Monism in chapter 4 is sound, it exemplifies this possibility.) However, this chapter is mainly concerned with the case where S exists at the fundamental level of reality and generates some higher-level properties.[143]

Condition (i) assumes that there can be instances or tokens of pure dispositions. Add the following sub-condition (i_1): the identity of each token, F, of S consists of the causal role F has in S *and* F's spatiotemporal location.[144] So, S must consist only of pure dispositions each whose identity is in accord with (i_1), in order to be a pure dispositional system, so one instance of a non-pure dispositional property in a dispositional system negates the purity of the system. As stated in section 5.1, a pure disposition has no distinct causal basis for its manifestation. Though a pure disposition has no distinct causal basis, it serves as its own causal basis for manifesting (McKitrick 2003b). For instance, supposing fragility is a pure disposition, fragility itself and not some micro-structural

[143] It also seems metaphysically possible that S can exist at any spatiotemporal region, in addition to existing at any level of reality. So long as S is causally isolated from any other properties outside S, such that properties of S do not interact with any non-S properties, it will count as a pure dispositional system.
[144] See the Principle of Property Identity in section 2.3 for more details. The addition of spatiotemporal location as an element of identity conditions of pure dispositions helps to evade worries that two pure dispositions with identical causal roles in a system will be indistinguishable (Hawthorne 2001). I will address this issue further in section 3.3. See Bird (2007: 138-46) for further discussion of the identity of pure dispositions in a system. Some of the worries Bird raises I think are also remedied by the spatiotemporal location element of identity, for this condition gives each pure disposition a unique role in a system.

property of the object bearing fragility is casually relevant to fragility manifesting when appropriately triggered.

Condition (i) invokes the idea of dispositional manifestation partners (Heil 2003, Martin 2008). All dispositions, to include pure dispositions, have one or more disposition partners. These partners can activate each other under the appropriate manifestation conditions.[145] It is because of this feature that I characterize S as dynamic, which means dispositions of S may, but need not, interact under the appropriate conditions; this is what makes dispositions in S more than a more set of properties, but a *system*. The mutual manifestation of disposition partners is necessary in order for S to be dynamic, for it to undergo change and causal processes under its own power, without influence of properties outside S. If there were no dispositional partners in S, and nothing else in S (save substances the bear the pure dispositions) including no metaphysical laws that govern S, then events could not occur in S. None of the dispositions in S would 'connect' or 'partner up' to yield manifestations. Thus, condition (i) implies that S is dynamic, given that pure dispositions have the capacity to mutually manifest their powers at some time.[146]

Condition (ii) indicates that S, existent at *one* level of reality, will contain no non-dispositional properties. Otherwise, S is not a pure dispositional system. However, S may realize higher-level categorical properties, and this possibility will be defended below.

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[145] For instance, the hardness of a hammer is a dispositional partner for the fragility of a glass. Hardness has the power to break something fragile, and fragility has the power to be broken by something hard, i.e., to activate the hammer's power to break.

[146] A further plausible assumption (not explicit in the analysis since not strictly necessary) is that pure dispositions are multi-track: each pure dispositional token possesses a set of causal powers. That is, a single disposition has the power to manifest in many ways (Martin 2008 and Mumford 2004). This also suggests that dispositions can have multiple kinds of disposition partners.

Condition (iii) means that properties within S have no causal dependence on properties external to S. In this sense, no properties outside of S are causally relevant to the manifestation of dispositions within S. This is consistent with dispositions of S being either ontologically dependent (grounded) on some lower-level set of properties, or not being so grounded, so long as the grounds of the pure dispositions in S do not also constitute causal bases for them. If the pure dispositions of S are not grounded in any further properties, then they may be self-grounded or grounded holistically, such that each pure disposition in S is grounded in the set of all other pure dispositions in S and no disposition in S can stand alone. For example, Mumford (2004) maintains this view of pure dispositions.

Conditions (i), (ii) and (iii) represent an analysis of S at a time *t*, but S may persist from t_1 to t_n (i.e., S is disposed to persist, and manifests this disposition).[147] If S persists, and S contains disposition partners per the given analysis, then disposition properties of S may interact; thus, S then manifests or displays its dynamism, i.e., disposition partners will meet up and manifest. For any given S, there is some probability value P_1 that S will become active, and some probability value P_2 that a specific pair of disposition partners in S will reciprocally manifest.[148]

Moreover, S may produce system-wide dispositional properties diachronically. These may be complex, irreducible emergent properties of a higher-level system S^H that are nonetheless ontologically grounded in S, such that S^H depends on S for its existence

[147] See Franklin (1986) and Williams (2005) for discussions of persistence as a disposition.
[148] For example, suppose there is system of two dispositional belief states. At a given time *t*, these beliefs will be not interact, but over a period of time, the two beliefs may reciprocally interact, so the system becomes active. For instance, imagine T beliefs that *he is hungry* and that *there is food in the cupboard*; when these two beliefs interact – are considered together – then T will form, or manifest, the belief that *he should get food out of the cupboard*. So T becomes an active dispositional system.

although processes in S^H may be causally independent of properties and processes in S. The nature of this kind of emergent phenomenon is developed below, and is crucial to answering the Question of Higher-level Properties. This is important, because it will be suggested that the only way a fundamental pure dispositional system can yield the required higher-level properties is via the appropriate emergence relation. (So that, if the appropriate emergence relation does not hold, then we can validly infer that the fundamental system of properties is a not a pure dispositional system – i.e., there must be other kinds of properties at work at the fundamental level.)

It may be that all property tokens must be instantiated by objects.[149] So, the ontology of S might consist of dispositions plus objects if objects are metaphysically necessary for property instantiation. This would not make S a non-pure dispositional system, since it would not add any further properties to S. Through there may be objects bearing the pure dispositions in S system, it is the pure dispositions that are the causally powerful entities in the system. Moreover, it may be that objects are bundles of properties (construed as universals or tropes), rather than discrete substratum instantiating properties (universals or tropes). Thus, if a system or properties ontologically requires objects, these objects may just be generated by the properties in the system. Given this considerations, the theory of objects is tangential to the proposed analysis of a pure dispositional system.

How can S, a pure dispositional system, ontologically ground higher-level systems of properties? To further clarify what is at issue, it is helpful to explicitly map out the relationships between various systems of properties existing at different levels of reality. Suppose there are two kinds of properties, dispositional and categorical. Then,

[149] However, Schaffer (2003a) argues that properties may float free of objects; there could be a free-floating property token of mass, he contends.

there are three kinds of systems of properties: a system of properties may consist either entirely of categorical properties, dispositional properties, or a mix of categorical and dispositional). Suppose there are two levels of properties, higher and lower (while really there are probably intermediate levels). Then, there are nine possibilities regarding relationships between levels consisting of systems of properties, yielding various multi-level systems of properties, as represented in the following table.

Table 2: Multi-level systems of properties

Types of Multi-level Systems of Properties	**Lower-level system**	**Higher-level system**
Multi-level System 1	Dispositional	Dispositional
Multi-level System 2	Dispositional	Categorical
Multi-level System 3	*Dispositional*	*Mixed*
Multi-level System 4	Categorical	Dispositional
Multi-level System 5	Categorical	Categorical
Multi-level System 6	Categorical	Mixed
Multi-level System 7	Mixed	Dispositional
Multi-level System 8	Mixed	Categorical
Multi-level System 9	Mixed	Mixed

Henceforth this chapter concerns the possibility of Multi-level System 3. Specifically, it concerns a multi-level system that contains a pure dispositional system, S, at a lower-level of reality, which realizes a mixed system of higher-level dispositional and categorical properties, as the world seems to contain. I will frequently refer to Multi-level System 3 simply as System 3, but it is important to note that System 3 contains two subsystems of properties, one of which is the base level S, and one of which is the higher-level system S^H. System 3 is a complex system of pure dispositions that realizes a higher-level system of properties.

Is System 3 metaphysically possible? Before arguing that it is, I will first evaluate objections to S, for if S is not possible then System 3 is not; this is done in section 5.3.[150] Then, in section 5.4, I evaluate an objection targeted specifically at System 3 (which is also applicable to Systems 1 and 2). The result of this evaluation will be the theory of Disposition Emergence, specifying how higher-level properties emerge from a pure dispositional system, thus solving the Question of Higher-level Properties.

5.3. Objections to a Pure Dispositional System

5.3.1. The Act Exclusion Argument

Armstrong (2004: 139) presents what I shall term the Act Exclusion Argument. The core idea is that a dispositional system, absent any categorical properties whatsoever, excludes *act*. Armstrong (2004: 139) states the argument as follows:

> It will follow that the manifestations of these powers, when they occur, can themselves be nothing but cases of particulars coming to have certain properties, and on the theory being criticized all properties dissolve into powers. But could there be a world of this sort? Powers must surely issue in manifestations that are something more than just powers. A world where potency never issued in act, but only in more potency, would be one where one travelled without ever having the possibility of arriving.[151]

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[150] I only deal with metaphysical objections to S (and System 3), leaving aside objections to pure dispositional systems couched in epistemological concerns, such as the infinite regress argument advanced by Swineburne (1980: 316-9).

[151] Armstrong's objection is to what he calls Powers Maximalism, the view that *all* the properties of the world in total are dispositions. On such a view the fundamental level of properties must consist entirely of pure dispositional properties. What I call System 3 says that some higher-level properties are categorical properties. Yet, on System 3 the base level of properties is a self-contained subsystem of pure dispositions. If we restrict Armstrong's Act Exclusion Argument to any self-contained system of pure dispositions, as S (the base level of System 3) is, then the Act Exclusion Argument poses a threat to S.

We can suppose that the term 'world' in the above passage designates a system of properties. Then, here is the argument formulated more explicitly:

(1) All the properties of S are powerful. (This is Powers Maximalism, and it implies there must be a pure dispositional system like S at the fundamental level of reality.)

(2) If all the properties of S are powerful, then there is only potency and shifting of potency in S.

(a) If F1 (a powerful property) of *x* (a particular bearing F1) manifests, then *x* or some other particular, *y*, gains F2 (a powerful property).

(b) If F2 manifests, then *x*, *y*, or some other particular, *z*, gains F3…ad infinitum

(3) Thus, there is only Potency and shifting of potency in S (no Act). [(1) and (2)]

(4) But any S must have Act (i.e., non-potency).

(5) Contradiction. [(3) and (4)]

(6) Thus, reject (1).

If the Act Exclusion Argument is sound, then this negates the possibility of a pure dispositional system such as S (and thus System 3), since everything in the system would consist of potency only.

I contend that the Act Exclusion Argument is unsound, and below I offer several reasons why S would not consist entirely of the mere shifting around of potency.[152] My first two reasons focus on premise (2).

[152] Even if S did consist merely of the shifting around of potency, this does not seem to threaten the metaphysical possibility of S.

The first reason why premise (2) is false is that pure dispositions of S are *actual* causal property instances, having real being and possessing their various powers independently of their characteristic manifestations. Similar points have been advanced against the Act Exclusion Argument. Chakravartty (2007: 139) contends that the Act Exclusion Argument confuses the manifestation of causal properties with the causal properties themselves. Mumford (2004: 174) claims that pure dispositions are not mere potentialities; they are actual properties exhausted by their set of powers. Dispositions have powers *to* manifest in various ways, so do not consist solely of their manifestations. The suggestion, then, is that causal properties or dispositions exist independently of their manifestations, while the Act Exclusion Argument seems to assume without argument that dispositions consist entirely of their possible manifestations – and thus in their potential for manifestation (since dispositions need not manifest their potential).

This first reason is a considerable counter-point to the Act Exclusion Argument. However, the worry might still be that, apart from its possible manifestations, there is nothing to a pure disposition – literally, there is nothing there. Mumford, as noted above, suggests that there is a dispositional property, a real property that can manifest. But the problem with this is that it seems to give pure dispositions a categorical dimension: that is, pure dispositions are 'always there' or continuously manifest, as with the property of being triangular. One possible response to this is that pure dispositions *are* always manifesting at least one track of their power, so they consist of their set of possible (*and* actual) manifestations. This assumes that dispositions are multi-track. Even while manifesting along one track, pure dispositions remain saturated with power to manifest in a number of other ways.

Here is a second reason why premise (2) is false. Suppose that every manifestation, M, of a pure power, F_1, results in (i) either the creation of new property that is a pure disposition, F_2 (where F_1 is either retained or lost), or (ii) the persistence of the original disposition, F_1. M is characterized as an event that is the result of powerful property F_1, but M is not necessarily a property itself, so M is not itself 'mere potency' but the *action* of potency, i.e., the realizing of F_1 or F_2. If the new temporal stage of F_1 (the persistence of F_1) is realized, or F_2 is realized, then this is plausibly construed as an 'arrival' of the sort the Act Exclusion Argument suggests is not possible.

So, the manifestation events of pure dispositions in S are actual events, even if the result of these events is just more dispositional properties and thus more potency. The coming-to-be of new dispositions (the 'shifting of potency') is a causal process, signifying the dynamic nature of S and a real change in S. If S is dynamic, then there is a continual arriving at a new set of properties or a new temporal stage of S.

The second reason implies a third, more general, reason to reject the Act Exclusion Argument: the distinction between 'traveling' and 'arriving' appears blurry, for the act is an event: it is the issuance of a further property that can act. A world where properties ever 'arrived', and stopped 'traveling', would be static. A particular object bearing F comes to have an instance of F, or G, etc., and this is a change in the world. The destination (place of arrival) is a change; so there is continual traveling, signifying the dynamic nature of S. Thus, given S and an initial activation condition, where all powers have dispositional partners, then at any given time *t*, some dispositions will be manifesting tracks of their power, yielding more dispositions.

Finally, as a fourth reason to deny the conclusion of the Act Exclusion Argument, premise (4) appears to beg the question. In Armstrong's terms (2004: 139), "Powers must surely issue in manifestations that are something more than just powers." As stated in previous points, manifestation events are something more than just powers. Plus, if S consists of dispositions continually passing around powers, then S is an active, dynamic system. Thus, there is act in S, and S is more than mere potency: it is the continual actualization of potency.

5.3.2. The Argument from Affectability

Heil (2003: 98) presents what I term the Argument from Affectability. The core idea is that any ontological system needs *substance*: "If an object's qualities are reduced to or replaced by pure powers, anything resembling substantial nature fades away" (Heil 2003: 98). Without substance, a thing cannot be affected by anything else. Thus, a system without substance is inert.[153] Here is my formulation of the objection:

(1) If an entity, X, can be affected, then it is substantial. (Assumption)

(2) If X is real, then X can be affected by other entities. (Assumption)

(3) Pure dispositions are not substantial.

(4) Thus, pure dispositions cannot be affected. [(1) and (3)]

(5) Thus, pure dispositions are non-real. [(2) and (4)]

(6) Thus, a pure disposition system, S, could not exist. [From (5)]

[153] This is, in a sense, the flipside of the Act Exclusion Argument. The Act Exclusion Argument contends that a system consisting entirely of dispositions could not *do* anything (or, affect anything), whereas as the Argument from Affectability contends that properties in such a system could not have anything *done to them* (or, they could not be affected by anything).

If pure dispositions consist entirely of powers to manifest in certain ways, then if a pure disposition really is 'a something' it should be capable of being affected. But how can something, consisting of potential manifestations, be affected?

The motivation for this objection is similar to that of the Act Exclusion Argument. Heil (2003: 98) imagines a series of powers, A to produce B, B to produce C, and so on. For example, imagine a series of dominos with the power (and only the power) to topple the next: "If all there is to a domino is a power to topple or be toppled by an adjacent domino, nothing happens: no domino topples because there is nothing—no thing—to topple." If the domino is just a power to topple or be toppled, then what is toppled – i.e., what is affected by a toppling power? Is there an act without something acted upon? Heil's fundamental intuition is that at some point, an ontology needs substances with intrinsic qualities *and* powers.

Heil assumes that something that can potentially be affected is substantial. A substantial entity possesses continuous reality or being at a spacetime point and can causally interact with other things, at least in a passive way. Furthermore, Heil (2003: 173) maintains that "properties are ways objects are." So he assumes that there are no properties independently of substances: all properties are properties *of* substances or objects.

In response to the Argument from Affectability, I first note that pure dispositions are actual entities, as explained in response to the Act Exclusion Argument. Supposing pure dispositions are actual, continually existing properties with sets of powers, and supposing that pure dispositions are partnered with other pure dispositions, then each pure disposition is capable of being *affected by its manifestation partner*. That is, pure

dispositions can be affected because they can be caused to manifest by their manifestation partners. So, pure dispositions meet the requirement of affectability. If substances are those entities capable of being affected, then pure dispositions are substantial.

A further counterpoint raises significant doubts about the soundness of the Argument from Affectability. The core idea is that pure dispositions in S may bundle, thus forming the required substances or objects that bear the dispositions; the Argument from Affectability implicitly assumes this is not possible. This would fit comfortably with Heil's claim (2003: 173) that "properties are ways objects are," implying that objects must exist for such ways to be real. If pure dispositions necessarily bundle to form objects, then the substances required by the Argument from Affectability are realized. Perhaps the required 'bundling relation' necessary for forming substances or objects is a unique kind of dispositional partnership between two pure dispositions; that is, perhaps part of the powerful repertoire of pure dispositions is the capacity two bundle together. So, two pure dispositions, F_1 and F_2, form an object via this bundling relation (or perhaps a third pure disposition, F_3, is needed, etc.). For example, perhaps mass, charge and spin (pure dispositions) *necessarily* co-instantiate as the bundle-objects 'electron'.

The possibility of objects or substances as bundles of pure dispositions is consistent with a pure dispositional system. This is because pure dispositions alone would form the required substances. This possibility essentially falsifies an implicit assumption behind premise (3), that pure dispositions cannot from substances (even if they are not substances themselves) and thus that substances are something other than pure

disposition bundles. In sum, pure dispositions working together may achieve the requirement of affectability.[154]

5.3.3. The Problem of Individuation

Hawthorne (2001: 374) presents what I refer to as the Problem of Individuation, as a critique of the theory that maintains "that each property has a unique individual essence consisting of a causal profile."[155] So this is a problem for any system of properties in which every property's essence consists of a set of causal roles in which the properties may participate. The problem is this: for two properties, F and G, with duplicate casual profiles (i.e., identical causal roles) there is no principled way to metaphysically distinguish, or individuate, F and G. This problem is similar, as Hawthorne notes (2001: 374), to the problem of distinguishing two qualitatively identical metal balls in an otherwise barren possible world (Black 1962). Although raising this comparison emphasizes the strength of the worry for S, it also serves notice that this problem is a general problem for *any* set of two (or more) identical properties or entities.[156] Thus, the Problem of Individuation is not a special problem for a pure dispositional system. Nonetheless, it would be good to resist the problem.

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[154] Perhaps at least one of the pure dispositions in a bundle-object needs to manifest at any given time to make the object 'substantial' and thus 'affectable'. On this view, substantiality is achieved via continuous manifestation of at least one of the bundled pure dispositions. So substances are networks of dispositions in which there is some continuous manifestation of some dispositions.

[155] Hawthorne (2001) labels this theory 'causal structuralism'. This view purportedly concerns property instances or tokens, not kinds. So it cannot be the view that each property token has an absolutely 'unique' causal profile, but that properties are instances of property-kinds each whose essence consists of a causal profile. On such a view there may be two or more instances of a kind of disposition, and this is what is purportedly problematic: that two or more instances will have the same 'unique' causal profile. If the causal profiles of the two dispositional property instances were indeed unique, then they would not be instances of the same kind of disposition. But if they are instances of the same kind, then the causal profile of each instance cannot truly be unique, according to the Problem of Property Individuation. In sum, the view under critique is that disposition tokens may have qualitatively identical causal profiles; Hawthorne's critique is that this leads to ontological ambiguity between two property instances.

[156] Thanks to Jennifer McKitrick for making this point to me.

Assuming 'property' refers to property tokens, not types (since it is tokens and not types that are duplicates) then the Problem of Individuation is relevant to the possibility of S. This is because, first, in S the essence of each pure disposition token will consist of a causal profile (i.e., a set of possible manifestations which the disposition might display – see section 1.3.5 for further discussion), and second, multiple instances of the same kind of pure disposition may exist in S.[157]

In response, each individual pure disposition token in S occupies a unique spatiotemporal location. Occupation at a particular location issues a 'fine-grained' (i.e., narrowly defined) causal profile for that disposition. So the complete individuation condition of causal properties or dispositions is given by spatiotemporal factors plus the causal role of the type of which the token disposition is an instance. But locations do not add a haecceity or additional primitive essence on top of the causal profile of a disposition. It is just that the complete, distinct causal profile of a given disposition token is given in terms of it being of a certain type and occupying a particular spacetime location. Thus, the Problem of Individuation dissolves.

Absent locations, there may be tokens with identical causal profiles; but given that each pure disposition is *at* a location occupies a location) its total causal 'history' (past, present, future) will be slightly different than other pure disposition tokens of the same type. Given a particular location, a pure disposition token gains a unique causal profile history that individuates that token from all other tokens of the same property

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[157] Hawthorne (2001) attempts to solve the Problem of Individuation by invoking counterpart theory as developed by Lewis (1986b). The basic idea of counterpart theory is that an entity, X, in the actual world, has counterparts in those possible worlds in which X exists. X may also have a twin counterpart X_2 in the actual world; X_2 is qualitatively identical to X, but is not X; so X is distinguishable on grounds of being this X, not X_2. Whether this view avoids invoking haecceities as marking the essences of individual entities is highly controversial. I will not evaluate this proposed solution, and instead focus on a solution that avoids the controversy of counterpart theory.

type. For example, consider two instances, F_1 and F_2, of the dispositional property mass. Given that these instances occupy distinct locations, they will have distinct, contingent causal profiles. If $F_1$is closer to a body B than F_2 is, it will exert a different gravitational force on B than F_2. Although it is that case that if F_2were in F_1's position, F_2would do exactly what F_1would, the contingent fact that they occupy different locations yields distinct causal histories. So their historical causal profiles are different, and this is sufficient to distinguish them within S.

One might object that locations are categorical properties (i.e., the property of being a point that is just *there*). So, assigning locations a necessary role in the individuation conditions of a pure disposition, F, violates the pureness of F. In response, locations can be legitimately conceived as *dispositions to be occupied*. So, although 'location dispositions' serve to yield the complete causal profile of given instances of a pure dispositions, this does not mean that they are categorical. Locations, perhaps, are just dispositions manifestation partners of the pure dispositions occupying locations. Furthermore, locations do not constitute a causal bases for their occupying dispositions, since locations are not stimulated when their occupying dispositions manifest; a location is already manifest once occupied by a pure disposition.[158]

5.4. Dispositional Emergence and the Argument from Composition

In section 5.3, I defended S itself from three objections. Now, this section argues that S can ground System 3 (as defined at the end of section 5.2). How does S account for System 3? I will approach this question by focusing on the Argument from Composition (Heil 2003), which maintains that pure dispositions cannot compose or in any way

[158] Suppose locations are pure dispositions (they are dispositions to be occupied, and they are pure because they have no causal basis). Then, the system of locations in the world is a pure dispositional system. Thus, S is not only possible, but actual, and it grounds all higher-level physical properties.

produce the necessary higher-level properties found at higher levels. The argument implies that categorical properties of complex wholes must reduce to at least some categorical properties of simpler parts making up the wholes. This argument gets to the heart of the Question of Higher-level Properties, by questioning that claim that S could ever generate higher-level categorical properties. In response to the Argument from Composition, I will assume along with Heil that categorical properties cannot reduce to just dispositional properties, but I will argue that categorical properties can emerge from a system consisting entirely of dispositional properties.[159]

Heil (2003: 114-5) advances the Argument from Composition against the possibility of a system such as S realizing any higher-level properties of the world, the key premise of which is this: "[…] the qualities of wholes are built up from qualities of the parts (and the arrangement of these)." This needs three clarifications. First, I will assume that 'parts' refers to objects, where objects may be either property bundles or substratum instantiating properties.[160] Second, Heil equates 'qualities' and 'categorical properties', and I will use the latter term hereafter. Third, I will assume as Heil does that at least some of the properties of complex wholes are categorical (and not that all properties of complex wholes are dispositional, as might be the case). The general principle at work here in the Argument from Compositions is this:

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[159] If categorical properties can emerge from S, then it seems just as or more likely that further dispositions can emerge from S as well.

[160] This further supposes that objects are ontologically necessary. If objects are not necessary, then according to the Argument from Composition we should just expect categorical properties all the way down, sans objects, where lower-level categorical properties play the role of constituent 'parts' of higher-level categorical properties. However, if objects are necessary, then it is worth noting that the possibility of S is consistent with pure dispositions forming bundle objects (as suggested in section 5.3.2), and thus forming the basis for composing higher-level objects and their properties.

> **Composition**: If a complex whole, O, possesses one or more categorical properties, then the smaller parts composing O must also possess categorical properties.

Heil (2003: 114-5) suggests that every day we see that complex wholes owe their categorical natures to some categorical properties of their constituent parts. For example: the structural properties of a building are due to the structural properties of its constituent parts; and, the carbon items in a diamond are arranged such that the diamond possesses hardness, where some non-hardness categorical properties of the carbon atoms compositionally (reducibly) determine the property of hardness in the diamond.[161]

More precisely, the Argument from Composition claims that the categorical properties of entities of some higher-level, H, require that entities at some lower-level, L, that compose the entities at H, have categorical properties.[162] This view implies the following brand of reductionism about properties: given that H entities are compositionally determined by L entities, then properties of H entities are ontologically reducible to the properties of L entities and furthermore that *at least some* properties of L entities must be of the same type as the properties of H entities (call this 'categorical reductionism'). Thus, any higher-level categorical properties must reduce to at least some lower-level categorical properties – or properties that are simultaneously categorical and dispositional, per Heil's Identity Thesis (2003: 111). So, there cannot be *just* dispositions all the way down to the lowest level of reality, contrary to Holton (1999). In other words,

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[161] This kind of example is given by Gillett (2002) as an example of the realization relation between lower and higher-level properties, and I'm using it to illustrate the kind of reductionism about properties assumed by Heil.

[162] Note that Heil (2003: 31-9) does not accept ontological levels of reality. However, the discussion in this section does not require ontological levels, but merely organizational levels, per the analysis in section 5.2. So, Heil thinks categorical properties of organizationally complex objects require that the simpler parts making up those objects possess at least some categorical properties.

the fundamental parts cannot consist entirely of pure dispositions – they must have some categorical properties.

The Argument from Composition is an important objection because it challenges the assumption that System 3 can be 'built up' out of purely dispositional properties (or, built up out of simple objects possessing only purely dispositional properties). It is not an objection to the possibility of S, per se. Rather, the Argument from Composition directly challenges the idea that S can possibly compose or generate higher-level properties like System 3 contains.

One possible response the proponent of S's capacity to generate System 3 might offer to the Argument form Compositions is this: a set of pure dispositions in dynamic relation, at least some of which are continuously manifesting at any given time *t*, will give the appearance of categorical properties of X at *t*. This would be absolve the Question of Higher-level Properties by suggesting higher-level properties are apparent or illusory, and thus do not need a deeper solution. That is one approach, but I am assuming System 3 contains actual, not merely apparent, higher-level categorical (and dispositional) properties.

My contention is that the principle of Composition is false, assuming as I suggested above that it implies categorical reductionism. Just because complex wholes have categorical properties does not necessarily mean the parts that make up the whole must have categorical properties.[163] In contrast to Composition, something roughly like the following principle is true:

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[163] It may be true that at all non-fundamental levels of reality (e.g., all levels observable without special equipment), the categorical properties of a complex object are due to the categorical properties of its parts. However, we know that the quantum level of reality (what many believe is the fundamental level) is full of

Emergence: A complex whole, O, can possess or instantiate types of properties that O's constituent parts do not instantiate or possess.

To take a common type of example, a red ball may be red but the quarks and electrons that make up the ball are not red. So, just because a ball, taken as a whole, has categorical properties does not mean that its ultimate constituents have categorical properties. Dispositions may combine to form some non-dispositional properties. It might be that there are dispositions 'all the way up' – all properties, fundamental or complex, are dispositional, but an account would still be needed of how higher-level non-pure dispositional properties come about. Nonetheless, it is as least logically possible, and arguably metaphysically possible, that combinations of fundamental pure dispositions might conjoin to yield higher-level categorical properties not found at the lower levels.

The principle of Emergence merely distinguishes the possibility of objects having higher-level properties emerge from lower-level properties of a different kind. It is important to note that the basic principle specifies an emergence relation, not simply a realization relation, given that assumption that the realization relation can only yield higher-level properties of the same kind (i.e., categorical v. dispositional) as the lower-level properties. I am assuming along with the proponent of the principle of Composition that higher-level categorical properties like structure do not ontologically reduce to pure dispositions, thus ruling out a reducibility relation, and therefore necessitating the emergence relation between properties of S and higher-level properties of System 3. Such an emergence relation is implicitly ruled out the principle of Composition.

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surprises. We do not have sufficient epistemic grounds for taking our assumptions about the world of medium-sized observable objects into the quantum world or fundamental level of reality.

In further support of the need for an account of an emergence relation, and not simply a reducibility relation, Molnar (1999: 15) argues that Bell's Theorem falsifies attribute, or property, atomism (i.e., that higher-level properties ontologically reduce to lower-level properties) because it shows that magnitudes of a complex whole are *not* ontologically reducible to magnitudes of parts of that whole. Assuming this is right, it shows that reductive accounts, including those that specify a realization between the reduced entity and its reductive components, do not explain how higher-level properties of System 3 arise out of S. The other option is that properties of System 3 emerge out of pure dispositions of S. Thus, assuming that System 3 accurately represents the property structure of the world, higher-level properties must emerge out of S.

As a solution to the Question of Higher-level Properties, I speculatively propose the following theory of emergent properties:

> **Dispositional Emergence**: Two instances of pure dispositions, F_1 and F_2, constituting S or contained within S, may yield an ontologically distinct, emergent property, P, through their reciprocal manifestation.

Dispositional Emergence, I concede, is rather speculative, although this is arguably true of all current theories of emergent properties. Since I am assuming along with the proponent of the principle of Composition that higher-level categorical properties cannot reduce to just dispositional properties, some account of emergence is needed, and therefore Dispositional Emergence is at least worthy of elaboration and further examination.

The core idea is that F_1 and F_2 may activate each other in such a way to yield a higher-level property P that takes on an ontological role causally independent of the

individual causal roles of F_1 and F_2. Once they activate each other, via mutual manifestation, the prior pure dispositions combine unite to generate a new kind of property. Epistemologically, P is unpredictable given the ground-level dispositions in the system, unlike in the case of the hardness of the diamond.

Dispositional Emergence is inspired by the fusion account of emergent properties advanced by Humphreys (1997: 10-1), who claims that fusion is a dynamic, diachronic physical operation occurring on property instances, in which the fused properties go out of existence or get 'used up' as a new property emerges. This contrasts with standard realization relations, such as supervenience, on which the realization of higher-level properties is synchronic. For example, in the case of the hardness of a diamond, the properties of the carbon atoms synchronically yield the hardness of the diamond.[164]

My proposal is significantly different than Humphreys' because the 'fused' properties do *not* go out of existence on my view, but temporarily lose their particular causal efficacy, in yielding a higher-level property. That is, in their fused state the two dispositions cannot actually do what they are normally directed at doing – their individual causal profiles become masked. The process of Dispositional Emergence involves the reciprocal manifestation of disposition partners, with the causal powers of dispositions F_1 and F_2 'concentrating' on their mutual manifestation. So, the original properties are still there, but they enter a new state of existence that binds each to the other (and so the term 'fuse' is still apropos). For example, two instances of pure dispositional mass co-reciprocate and form a higher-level categorical property of mass (assuming mass is a pure disposition) that structures complex objects. This mutual manifestation allows for a higher-level property P to emerge, which may be a further disposition or even a pure

[164] Gillett (2002) uses this example.

disposition. The contributing dispositions F_1 and F_2 do not possess the causal powers of the emergent property P, but P's powers do emerge out of the prior powers of F_1 and F_2; so P's powers are novel relative to F_1 and F_2. Finally, all properties emerging from a pure dispositional system, S, ontologically depend on S, such that the properties of S constitute a lower-level system of properties relative to the higher-level system of properties, System 3, that S produces.

As an analogy for explaining the relation of dispositional emergence between S and System 3, consider John Conway's cellular automaton, the Game of Life.[165] The game consists of a matrix of discrete cells, which can be activated or deactivated in accordance with a set of simple rules; these cells are analogous to dispositional states or properties. What patterns arise depends on the rules and the initial set-up or assignment of activated cells. Suppose that three neighboring activated cells (e.g., A to the left of B, and C to the top of B) cooperate in accordance with the game's rule that each cell with two or three neighbors survives. In this case, the convergence of the three cells yields a stable unchanging 'structure', T. This convergence is akin to the reciprocal manifestation of dispositions in Dispositional Emergence; so, if the cells are dispositional states, then T is analogous to a categorical property that arises from the dispositional states. T may be altered if another cell proximate to T becomes activated. One limitation of the analogy is that T seems reducible to the individual energy cells or dispositional states and the rules that govern them, whereas Dispositional Emergence involves non-reducibility. An emergent property, P, is not ontologically reducible to F_1 and F_2, though P does ontologically require F_1 and F_2.

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[165] See Dennett (1991) for discussion of the Game of Life.

Dispositional Emergence has several interesting features. One, P may be pure because it has no causal basis, though is grounded, in F_1 and F_2. Two, P may possess new powers, not found in F_1 or F_2, relevant to causal roles at the higher level at which it operates. Three, just because P is emergent does not mean it is epiphenomenal as Kim (1999) might object. This is because (assuming P is a dispositional property) dispositions are causally relevant properties, typically defined in terms of their causal role. But P need not be an emergent disposition; it may be an emergent categorical property.

If correct, Dispositional Emergence advances the debate over dispositional essentialism or any view that posits a system of pure dispositional properties. This is because such views require an account of how higher-level properties come into existence given that all of the fundamental properties are purely dispositional, as those views maintain.

5.5. Concluding Remarks

This chapter offered an analysis of a system of pure dispositional properties, S. Then, against prominent objections, it maintained that S consists of more than mere potency, that properties of S may be affected (and so qualify as 'substantial'), and that qualitatively identical properties of S are metaphysically distinguishable. With the possibility of S more firmly established, the remaining problem was to show that, contrary to the Argument from Composition (Heil 2003), S may generate a higher-level system (i.e., System 3) of categorical and dispositional properties, such as we appear to have in the world of everyday complex objects. In support of this, the chapter developed the theory of Dispositional Emergence, holding that higher-level properties of System 3 emerge from the mutual interaction of pure dispositions in S. Thus, Dispositional

Emergence provides a viable solution as to how a system of pure dispositions may generate higher-level categorical and dispositional properties.

REFERENCES

Aristotle. *Metaphysics*. Trans. by W.D. Ross. In *The Basic Works of Aristotle*. 1941. Richard McKeon, ed. New York: Random House.

Alluntis, Felix, O.F.M. and Allan B. Wolter, O.F.M. 1975. Glossary in Duns Scotus' *God and Creatures: The Quodlibetal Questions*. Princeton: Princeton University Press.

Armstrong, David. 1989. *Universals: An Opinionated Introduction*. Boulder: Westview Press.

———. 1997. *A World of States of Affairs*. Cambridge: Cambridge University Press.

———. 2004. *Truth and Truthmakers*. Cambridge: Cambridge University Press.

Bird, Alexander. 2007. *Nature's Metaphysics: Laws and Properties*. Oxford: Oxford University Press.

———. 1998. Dispositions and Antidotes. *The Philosophical Quarterly* 48: 227–34.

Black, Max. 1952. The Identity of Indiscernibles. *Mind* 51: 153-64.

Blackburn, Simon. 1990. Filling in Space. *Analysis* 50: 62-5.

Campbell, Keith. 1981. The Metaphysics of Abstract Particulars. (Reprinted in D.H. Mellor and Alex Oliver, eds., *Properties*, New York: Oxford University Press, 1997.)

Cartwright, Nancy. 2007. What Makes a Capacity a Disposition? In *Dispositions and Causal Powers*, edited by Max Kistler and Bruno Gnassounou. Ashgate Publishing. 195-206.

Chakravartty, Anjan. 2007. *A Metaphysics for Scientific Realism*. Cambridge: Cambridge University Press.

Cohen, S. Marc. 2008. Aristotle's Metaphysics. *The Stanford Encyclopedia of Philosophy (Spring 2009 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/spr2009/entries/aristotle-metaphysics/>.

Cross, Richard. 1998. *The Physics of Duns Scotus: The Scientific Context of a Theological Vision*. New York: Oxford University Press.

Dennett, Daniel. 1991. Real Patterns. *Journal of Philosophy* 88(1): 27-51.

Davidson, Donald. 1970. Mental Events. In *Philosophy of Mind: Classical and Contemporary Readings*. David J. Chalmers, ed. New York: Oxford University Press.

Dunn, J. Michael. 1990. Relevant Predication 2: Intrinsic Properties and Internal Relations. *Philosophical Studies* 60: 177-206.

Duns Scotus, John. 1975. *God and Creatures: The Quodlibetal Questions*. Translated by Felix Alluntis, O.F.M. and Allan B. Wolter, O.F.M. Princeton.

———. 1950-. *Opera Omnia*. The Vatican Edition. Civitas Vaticana: Typis Polyglottis Vaticanis.

———. 1962. *Philosophical Writings*. A selection edited and translated by Allan Wolter, O.F.M. New York: Thomas Nelson and Sons Ltd.

Ellis, Brian 2001. *Scientific Essentialism*. Cambridge: Cambridge University Press.

———. 2002. *The Philosophy of Nature: A Guide to the New Essentialism*. Chesham: Acumen.

Francescotti, Robert. 1999. How to Define Intrinsic Properties. *Noûs* 33: 590-609.

Franklin, James. 1986. Are dispositions reducible to categorical properties? *The Philosophical Quarterly* 36(142): 62-4.

Gillett, Carl. 2002. The dimensions of realization: a critique of the Standard view. *Analysis* 62(4): 316-23.

Grajewski, Maurice J. 1944. *The Formal Distinction of Duns Scotus*. Washington, D.C.: The Catholic University of America.

Greene, Brian. 2004. *The Fabric of the Cosmos: Space, Time, and the Texture of Reality*. New York: Random House.

Haisch, Bernard, Alfonso Rueda, and York Dobyns. 2001. Inertial Mass and Quantum Vacuum Fields. *Annalen der Physik* 10(5): 393-414.

Handfield, Toby. 2008. Unfinkable dispositions. *Synthese* 160(2): 297-308.

Hawthorne, John and Sider, Theodore. 2003. Locations. *Philosophical Topics*: 53-76. (Reprinted in John Hawthorne, *Metaphysical Essays*. Oxford: Oxford University Press.)

Hawthorne, John. 2001. Causal Structuralism. *Philosophical Perspectives* 15: 361-78.

Harré, Rom. 1986. *Varieties of Realism: A Rationale for the Natural Sciences.* Oxford: Blackwell.

Harré, Rom and E.H. Madden. 1975. *Causal Powers*. Oxford: Blackwell.

Heil, John. 2003. *From an Ontological Point of View*. Oxford: Oxford University Press.

Holton, Richard. 1999. Dispositions All the Way Round. *Analysis* 59: 9-14.

Horgan, Terry and Matjaž Potrč. 2008. *Austere Realism: Contextual Semantics Meets Minimal Ontology*. Cambridge: MIT Press.

———. 2000. Blobjectivism and Indirect Correspondence. *Facta Philosophica* 2: 249-270.

Humphreys, Paul. 1997. How Properties Emerge. *Philosophy of Science* 64: 1-17.

Hüttemann, Andreas. 2004. *What's Wrong With Microphysicalism?* London: Routledge.

Isaacs, Alan. 2000. *Oxford Dictionary of Physics*, fourth edition. Oxford: Oxford University Press.

Jammer, Max. 2000. *Concepts of Mass in Contemporary Physics and Philosophy*. Princeton: Princeton University Press.

Johnston, Mark. 1992. How to Speak of the Colors. *Philosophical Studies* 68: 221-63.

Kane, Gordon. 2003. The Dawn of Physics beyond the Standard Model. *Scientific American* (June 2003): 68-75.

Kim, Jaegwon. 1976. Events as Property Exemplifications. In Myles Brand and Douglas Walton, eds. *Action Theory*. Reidel Publishing Co. 159-77.

Kim, Jaegwon. 1999. Making Sense of Emergence. *Philosophical Studies* 95: 3-36.

Kuhlmann, Meinard. 2006. Quantum Field Theory. *The Stanford Encyclopedia of Philosophy* (Fall 2008 Edition), Edward N. Zalta (ed.), forthcoming URL = <http://plato.stanford.edu/archives/fall2008/entries/quantum-field-theory/>.

Lewis, Lewis and Rae Langton. 1999. Defining 'intrinsic'. In David Lewis, *Papers in Metaphysics and Epistemology*. New York: Cambridge University Press: 116-32.

Lewis, David. 1986a. Introduction. *Philosophical Papers, vol. II*. Oxford: Oxford University Press. (Reprinted in Lange 2007: 322-4. All citations refer to the reprinted version.)

———. 1986b. *On the Plurality of Worlds*. Malden, MA: Blackwell.

———. 1989. Dispositional theories of value. *The Proceedings of the Aristotelian Society*, Supplementary Volume 63: 113-37.

———. 1997. Finkish Dispositions. *Philosophical Quarterly* 47: 143-58.

Locke, John. 1690/1964. *An Essay Concerning Human Understanding*. London: Fontana.

Lowe, Jonathan. 1998. *The Possibility of Metaphysics: Substance, Identity, and Time*. Oxford: Oxford University Press.

———. 2006. *The Four-Category Ontology: A Metaphysical Foundation for Natural Science*. Oxford: Oxford University Press.

Martin, C.B. and Pfeifer, K. 1986. Intentionality and the Non-Psychological. *Philosophy and Phenomenological Research* 46: 531-54.

Martin, C. B. 1993. Power for Realists. *Ontology, Causality, and Mind: Essays in Honour of D. M. Armstrong*. J. Bacon, K. Campbell and L. Reinhardt, eds. Dordrecht: Kluwer. 175-86.

Martin, C. B. 1994. Dispositions and Conditionals. *The Philosophical Quarterly* 44: 1-8.

Martin, C.B. 2008. *The Mind in Nature*. Oxford: Oxford University Press.

McKitrick, Jennifer. 2003a. A Case for Extrinsic Dispositions. *Australasian Journal of Philosophy* 81(2): 155-74.

———. 2003b. The Bare Metaphysical Possibility of Bare Dispositions. *Philosophy and Phenomenological Research* 66(2): 349-69.

———. 2004. A Defense of the Causal Efficacy of Dispositions. *Sats – Nordic Journal of Philosophy* 5(1): 110-29.

———. 2005. Are Dispositions Causally Relevant? *Synthese* 144(3): 357-71.

Maudlin, Tim. 2007. Part and Whole in Quantum Mechanics. In *Philosophy of Science: An Anthology*. Ed. Marc Lange. Malden, MA: Blackwell. (Originally published in 1998 in *Interpreting Bodies: Classical and Quantum Objects in Modern Physics*. Elena Castellani, ed. Princeton: Princeton University Press.)

Molnar, George. 1999. Are dispositions reducible? *The Philosophical Quarterly* 49(194): 1-17.

Molnar, George. 2003. *Powers: A Study in Metaphysics*. Oxford: Oxford University Press.

Mumford, Stephen. 1998. *Dispositions*. Oxford: Oxford University Press.

———. 1999. Intentionality and the Physical: A New Theory of Disposition Ascription. *The Philosophical Quarterly* 49(195): 215-25.

———. 2004. *Laws in Nature*. New York: Routledge.

———. 2006. The Ungrounded Argument. *Synthese* 149: 471-89.

Place, Ullin T. 1999. Intentionality and the Physical: A Reply to Mumford. *The Philosophical Quarterly* 49(195): 226-31.

Peskin, Michael E. and Dan V. Schroeder. 1995. *An Introduction to Quantum Field Theory*. HarperCollins.

Place, Ullin T. 1996. Intentionality as the mark of the dispositional. *Dialectica* 50: 91-120.

Prior, E.W., Pargetter, R., and Jackson, F. 1982. Three Theses about Dispositions. *American Philosophical Quarterly* 19: 251-7.

Prior, E.W. 1985. *Dispositions*. Aberdeen: Aberdeen University Press.

Psillos, Stathis. 2006. What do powers do when they are not manifested? *Philosophy and Phenomenological Research* 72(1): 137-56.

Rives, Bradley. 2005. Why Dispositions are (Still) Distinct from their Bases and Causally Impotent. *American Philosophical Quarterly* 42(1): 19-31.

Ryle, Gilbert. 1963. *The Concept of Mind*. Harmondsworth: Penguin.

Schaffer, Jonathan. 2001. The Individuation of Tropes. *Australasian Journal of Philosophy* 79(2): 247-57.

———. 2003a. The Problem of Free Mass: Must Properties Cluster? *Philosophy and Phenomenological Research* 66(1): 125-38.

———. 2003b. Is there a fundamental level? *Noûs* 37(3): 498-517.

———. 2007. From Nihilism to Monism. *Australasian Journal of Philosophy* 85(2): 175-91.

———. 2008. Monism. *The Stanford Encyclopedia of Philosophy* (Fall 2008 Edition), Edward N. Zalta (ed.), forthcoming URL = <http://plato.stanford.edu/archives/fall2008/entries/monism/>.

———. 2009a. On What Grounds What. In *Metametaphysics*. Chalmers, Manley, and Wasserman, eds. Oxford: Oxford University Press. 347-83.

———. 2009b. Spacetime the One Substance. *Philosophical Studies* 145(1): 131-48.

———. 2010. Monism: The Priority of the Whole. *Philosophical Review* 119(1): 31-76.

———. Forthcoming-a. The Least Discerning and Most Promiscuous Truth-maker. *Philosophical Quarterly*.

———. Forthcoming-b. The Internal Relatedness of All Things. *Mind.*

Schwitzgebel, Eric. 2002. A Phenomenal, Dispositional Account of Belief. *Nous* 36(2): 249-75.

Shoemaker, Sydney. 1980. Causality and Properties. In *Time and Cause*, Peter van Inwagen, ed. D. Reidel Pub. Company. 109-35.

Swineburne, Richard. 1980. Properties, Causation, and Projectability: Reply to Shoemaker. In *Applications of Inductive Logic* (L.J. Cohen and M. Hesse, eds.), Oxford: Oxford University Press. 313-20.

Veltman, M.J.G. 1986. The Higgs Boson. *Scientific American* (November 2003): 88-94.

Williams, Neil. 2005. Static and Dynamic Dispositions. *Synthese* 146(3): 303-24.

———. 2009. The Ungrounded Argument is Unfounded: A Response to Mumford. *Synthese* 170(1): 7-19.

———. Forthcoming. Dispositions and the Argument from Science. *Australasian Journal of Philosophy*.

Yablo, Stephen. 1999. Intrinsicness. *Philosophical Topics* 26: 590-627.

Zee, Anthony. 2003. *Quantum Field Theory in a Nutshell*. Princeton: Princeton University Press.