PANDISPOSITIONALISM: A STUDY

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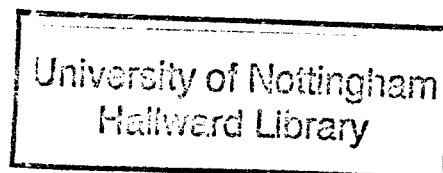
Short Thesis Abstract

In this thesis, I offer the first full-length study of the metaphysical view known as *pandispositionalism*. Pandispositionalism is a view about natural properties (and relations), and its central claim is that *all* such properties are irreducibly dispositional, or 'powerful', in nature. In recent decades, the idea that dispositions are real, irreducible features of reality has gained increased credibility, yet pandispositionalism – the strongest form of realism about dispositions – remains a possibility which has not been fully explored. During this thesis I aim to go some way towards remedying this.

The thesis is split into two parts. The first part of the thesis, which comprises six chapters, falls under the broad title 'The Metaphysics of Pandispositionalism'. My primary aim during this part of the thesis is to develop a metaphysical framework within which pandispositionalism can plausibly be sustained. In the course of doing this, the questions to be addressed include: Are irreducibly dispositional properties best viewed as universals or (sets of) tropes? In what ways are properties related on the pandispositionalist picture? How are relational structures of dispositional properties best represented? Can geometrical properties really be understood in dispositional terms?

The second part of the thesis, which comprises five chapters, falls under the broad title 'Pandispositionalism and Causation'. It has often been said that a plausible realist account of causation should fall out of a dispositional ontology, but the details are yet to be worked out. In this part of the thesis I aim to sketch the kind of view of causation we are arguably left with if pandispositionalism is accepted. Questions to be addressed include: Should the pandispositionalists accept that causes and effects can be simultaneous? Can the Salmon-type process theory of causation be straightforwardly understood in dispositionalist terms? Can the pandispositionalists plausibly view cases of property realisation as cases of causation?

Related Publications

<u>Acknowledgements</u>

Thesis Contents (abbreviated)

Word Count: 79,950

Thesis Contents (Detailed)

PART II: PANDISPOSITIONALISM AND CAUSATION

Chapter Seven: 'Simultaneity in Dispositional Interaction?'

Chapter Ten: 'Causation and Realisation'

Chapter Eleven: 'Pandispositionalism and Causal Necessity'

Thesis Introduction

0.1) The broad topic of the thesis

This thesis is a study of a view in metaphysics which is often now referred to as *pandispositionalism*. Pandispositionalism is a realist metaphysical view about natural properties. By 'realist' I mean that, unlike nominalists, pandispositionalists accept a distinct ontological category of properties. By identifying pandispositionalism as a thesis about natural properties, I mean that pandispositionalism concerns the properties (and relations) of *concrete*, rather than abstract, entities. Another way of putting the point is to say that pandispositionalism is a thesis about the properties of the entities studied in the empirical sciences[1].

Pandispositionalism is a thorough-going realist view about dispositions, or 'causal powers'. A disposition, or power, is a feature that a particular has which enables it to play certain causal roles in certain circumstances. Solubility is a typical example. If something is soluble then it is such that when it is submerged in water, it typically dissolves. Pandispositionalists hold, firstly, that dispositions are real, *irreducible* features of the world, and, secondly, that *all* natural properties are dispositional in nature. In other words, pandispositionalists claim that the identity of any property is determined (at least in part) by the causal potentialities that it, by its very nature, bestows upon its possessors. This view sets itself against the so-called 'categoricalist' views of properties advocated by, for example, Armstrong (1983, 1997) and Lewis (1986, 2009). According to categoricalist views, a property is nothing more than a

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[1] Logical and semantic properties (if there are any) are therefore exluded from the pandispositionalist thesis.

primitive quality[2], and any dispositions had by things with that property are had merely contingently. In other words, according to categoricalists, there are possible worlds in which things instantiate a certain property and yet fail to have the dispositions we would associate with that property in the actual world. Such a possibility is something which the pandispositionalist, on the other hand, will deny.

In recent years, thorough-going realism about dispositions has gained increasing credibility, partly due to the shortcomings of rival theories of properties, laws, and causation, and partly because the dispositional ontology has been thought to bring new advantages (see, for example, Ellis (2001) and Molnar (2003)). However, not many philosophers have yet committed to *pan*dispositionalism, and the few who do, such as Bird (2007), Martin (2008) and Mumford (2004), have not yet fully worked out the details of the pandispositionalist view. This is mainly because pandispositionalism plays a supporting role in the works mentioned. In Martin's recent book (2008), for example, his primary concern is to provide an account of the mind in nature (as the title of his book suggests), and in Mumford's book (2004), the primary topic is laws rather than properties (although, as Mumford successfully shows, the two topics are closely related). I think the time is right, therefore, for a full-length, detailed study of pandispositionalism. A project such as this will, I believe, be valuable for several reasons, and I will try to point out some of the benefits as this introductory chapter proceeds. I will now begin, in the next section, to outline the specific aims of this study.

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[2] Such qualities are often now referred to as 'quiddities'; see for e.g. Black (2000). The defining feature of a quiddity is that it has a primitive identity and so the same quiddity can play different causal / dispositional roles in different possible worlds. In other words, a quiddity is in and of itself non-dispositional.

0.2) The broad aim of the first half of the thesis: the metaphysics of pandispositionalism

The brief remarks above about pandispositionalism are only intended to provide a rough introduction to the view. Indeed, the question of how, precisely, pandispositionalism is best understood will stay with us for quite some time; the whole first half of the thesis will be devoted to the metaphysics of pandispositionalism. This will involve developing a detailed view about what properties would have to be like in order for pandispositionalism to be a coherent and *prima facie* plausible view.

Specifically, during the first half of the thesis, I will outline a metaphysical scheme which, I argue, best accommodates the main claims of pandispositionalism. These early chapters are important for the following reason. The basic claims of pandispositionalism are not difficult to state, but the question of how it is that the world could be such that pandispositionalism is true is not a straightforward question. Yet, this is a question that must be addressed. On one hand, if it turns out to be too difficult to make sense of how the world could be such that pandispositionalism is true, then we would have to bring the coherence of pandispositionalism into question. On the other hand, if pandispositionalism can be seen to be adequately supported by a coherent metaphysical picture, then not only will pandispositionalism become a view that cannot be immediately be dismissed, but the opponents will be clear about what kind of metaphysical picture they are arguing against.

Next, some comments about originality. The version of pandispositionalism that I recommend in the first half of the thesis will, in certain respects (but not others), bear some similarities to extant views, such as those of Bird (2007) and Mumford (2004). Nevertheless, there is much in each chapter which contributes new insights to the debate. In cases where I share an opinion with others, I will either provide my own arguments for those opinions, or else elaborate on existing arguments in ways that make them stronger. Often, I will argue for

conclusions which have not been previously asserted. Unless otherwise indicated, each argument presented is original (as far as I know). In places, I will also address questions which have not yet been properly addressed in the literature on dispositions. Note, however, that my primary task in chapter one is to survey existing accounts of pandispositionalism, and so this chapter will be more exegetical and less focused than the others. That said, I do try to make useful contributions to the dispositions debate even in this chapter. I highlight, for example, that whilst dispositional monism entails pandispositionalism, the converse is not true. This is a point that is often not duly acknowledged.

0.3) The broad aim of the second half of the thesis: pandispositionalism and causation

Once a metaphysical framework has been established within which pandispositionalism is best understood, I will, in the second half of the thesis, investigate some of the consequences of the pandispositionalist picture, with a specific focus on the topic of causation. I will argue that if one accepts pandispositionalism, then a certain picture of causation suggests itself. Whilst I see no hope of analysing causal talk in dispositional terms, acceptance of pandispositionalism does, I argue, have implications upon the kinds of features that causation may be thought to have.

Whilst many dispositionalists, such as Harré and Madden (1975), Cartwright (1989) and Molnar (2003), have indicated that an account of causation should fall out of the dispositionalists' ontology, it is only now that metaphysicians have begun to work out the details. Previous major works on dispositionalism such as those of Cartwright (1999), Ellis (2001), Mumford (2004) and Bird (2007), have tended to frame their discussions primarily in the context of debates about laws, rather than causation. As a result, there is not a great deal of dispositionalist literature on the issue of causation, and so much of what I say about the connection between dispositionalism and causation is new. Chapter twelve of Molnar's book

on powers (2003) deserves mention as one existing place in which causation is addressed from the perspective of a dispositional ontology. Unfortunately, however, Molnar's comments are brief. Since I have not had a great deal to build upon, I have only been able to provide a sketch in these chapters of how, in my view, causation should be construed from the perspective of pandispositionalism. But hopefully this will provide a useful platform for future work on this issue.

0.4) Intellectual debts

Before saying more about the general aim of my project, I would first like to acknowledge those who have helped to give realism about dispositions renewed credibility in recent decades. These include: Bird (2007), Cartwright (1989), Ellis & Lierse (1994), Harré & Madden (1975), Martin (1996), Mellor (1974), Molnar (2003), Mumford (2004), Shoemaker (1980), and Swoyer (1982). Each of these philosophers has contributed in a significant way to what one might call the recent 'dispositionalist' movement, and it is my hope that this thesis constitutes a worthwhile continuation of the work they have begun.

0.5) Am I trying to justify pandispositionalism?

The original aim of the thesis was not to argue for the truth of pandispositionalism. The question I initially set out to address has a conditional structure: *if* pandispositionalism is true, then which kind of metaphysical picture of the world are we left with? As indicated earlier, answering this question is in itself worthwhile, for various reasons. However, as I began answering this question, it occurred to me that I might in an indirect way be providing support for the view. As I indicated above, in the first half of the thesis, I outline a metaphysical framework which can plausibly sustain pandispositionalism. Given that this metaphysical framework is coherent, this at least shows that pandispositionalism is a sustainable view. As I

also explained above, in the second half of the thesis I explore what I see as some of the consequences of pandispositionalism, chiefly in relation to the topic of causation. If one sees these consequences as independently favourable, then one might think this provides further support for pandispositionalism. It is common practice in metaphysics to justify a position by showing that it has favourable consequences and / or helps us to tidy up issues which were previously problematic (how else can metaphysics be done?). Take Lewis's (1986) modal realism, for example. We obviously cannot check that concrete possible worlds are there by visiting them, but we should, argues Lewis, accept them because of the work they can do for us in philosophy[3].

0.6) Chapter-by-chapter overview of the first part of the thesis

I will now devote a mini-section to each chapter, outlining the questions to be raised and the answers argued for. In general, each chapter addresses different, though related, questions, and so the chapters largely stand independently of each other. They are, however, united by the common aims stated earlier, as I hope will be clear.

PART ONE: THE METAPHYSICS OF PANDISPOSITIONALISM

Chapter One: 'Varieties of Pandispositionalism'

In this chapter I introduce the metaphysical view of pandispositionalism in more detail. I identify and distinguish three views in the philosophical literature which are all, I argue, versions of pandispositionalism. The views in question are dispositional monism, the 'two-sided' view, and the identity view. The observation that pandispositionalism comes in more

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[3] Note that this is merely an example. Modal realism is certainly not a view that will be advocated in this thesis.

than one form is by no means trivial since, as I show, there is a tendency in the philosophical literature to view pandispositionalism and dispositional monism as equivalent views (see e.g. Bostock, 2008).

For the purposes of the thesis, I need not commit on the issue concerning which version of pandispositionalism is most favourable overall. This is because the claims argued during this thesis will in general be consistent with each version of pandispositionalism[4]. Nevertheless, in this chapter I do briefly indicate some of the objections that each particular version of pandispositionalism faces, and then say something about the prospects for overcoming each of these objections. Specifically, I argue that the identity view faces insurmountable objections, and so should be immediately discounted. On the other hand, dispositional monism and the two-sided view are more promising. Although these two versions do face their problems (as all theories do), I sketch ways in which advocates of these views might address these problems. Whilst it is not my intention to provide conclusive answers to these problems, I do, I hope, show pandispositionalism to be a view that is not to be easily dismissed.

Chapter Two: 'Dispositions as Universals'

The primary task of this chapter is to address a fundamental question in the metaphysics of pandispositionalism: should the pandispositionalists' properties be taken to be universals or (sets of) tropes? Opinion has differed on this issue. The way by which I approach this question is to consider whether and how the trope and universals theorists can accommodate and explain certain salient features of irreducible dispositionality. I highlight that pandispositionalists must accept that dispositions have the following three related features: i) dispositions are in some sense directed or orientated towards one manifestation (or

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[4] In cases where an issue is sensitive to the particular version of pandispositionalism that is accepted, this will be made clear.

manifestations) rather than another (or others); ii) disposition instances may be intrinsic to their possessors; iii) disposition instances may exist even if their manifestations never come into being. I then argue that it is the universals theorist who more obviously has the resources to accommodate and explain these features in a satisfactory way. Thus, my conclusion is that the pandispositionalist has special reasons for favouring a theory of universals over the pure trope view. Note, however, that for the purposes of this thesis I remain neutral on the question whether the pandispositionalist should understand universals in the immanent or transcendent sense.

I conclude this chapter with some further remarks concerning the 'universals' version of pandispositionalism, focusing in particular on the idea that irreducibly dispositional properties should be seen as universals which are internally related in the sense that they are, at least in part, relationally constituted.

Chapter three: 'The Relational Structure of Disposition Universals'

Following the comments made towards the end of the last chapter, I spend this chapter exploring in more detail the nature of the relatedness between irreducibly dispositional properties. I begin by discussing Russell's and Moore's work on internal relations and in doing so distinguish two different kinds of internal relation. I then suggest that the kind of internal relation appropriate to the dispositional monist's picture of properties is different to that to which the two-sided pandispositionalist must commit. I also distinguish the relations which are involved in each of these versions of pandispositionalism by distinguishing internal relations which are, in Armstrong's phrase, 'ontological free lunches' (1997: 12-13) and those that are not.

In the second half of this chapter I begin to turn to the question of how the

pandispositionalists' relational structures of properties may be represented, and what such structures may look like. Drawing upon the work of Bird (2007) and Dipert (1997), I appeal to graph-theory as a way of representing relational structures of powers. I point out, however (along with Bird), that not any graph-theoretic structure is apt for representing what a genuinely possible world can be like in terms of the property structure that obtains. Reflections upon the nature of dispositionality indicate that some constraints must be placed upon power graphs (with respect to how they are to be constructed). The remainder of this chapter will be spent discussing two constraints which Bird introduces, each of which I argue are necessary. In the first instance, Bird argues that power-graphs must have certain asymmetric features. I support Bird on this point and suggest reasons why the two-sided theorist should also accept the asymmetry constraint. Finally, I discuss what one may call the 'powerfulness' constraint.

Chapter Four: 'The Fundamentality Constraint and the Mutual Manifestation Constraint'.

A further power-graph constraint discussed by Bird is what I call the 'fundamentality' constraint. This constraint states that if a graph is to represent a network of fundamental powers, then each node in the graph must have *no more* than one outgoing manifestation relation. If the properties represented were to have more than a single manifestation, then they would be what dispositionalists often call 'multi-track' dispositions. Bird argues that multi-track powers are best understood as sets or clusters of *single*-track powers. And since single-track powers have logically simpler characteristics, it is those that come closer to being fundamental. In the first half of this chapter I add to Bird's arguments in favour of the fundamentality constraint by considering all the possible kinds of multi-track track disposition predicate, arguing that each are equivalent to conjunctions and / or disjunctions of *single-track* disposition predicates.

In the second part of this chapter I argue for a constraint which Bird does not allow. Bird rightly allows that power graphs should involve something like 'stimulus' relations. However, I argue that Bird's specific account of disposition stimulation is mistaken. On Bird's account, the manifestation of a 'stimulus' is typically different to the manifestation of the power it stimulates. I argue, however, that a stimulus makes no less a contribution to a manifestation than the power in question. That is, I argue in line with C.B. Martin (1993) that manifestations are the *mutual* manifestations of multiple (reciprocal) powers working together. I spend the remainder of this chapter showing how one might model mutual manifestation relationships in graph-theoretic terms.

Chapter Five: 'Constructing Acceptable Power Graphs'

In this chapter, I identify and solve various problems that will arise when one attempts to construct graphs which respect the four constraints argued for in the last two chapters. Beginning with simple graphs, I point out that no 3-node graph can simultaneously respect the four constraints as they stand. I then show that this problem extends to all graphs involving an odd number of nodes. I then propose remedying these problems by making a non-*ad hoc* modification to the mutual manifestation constraint.

Whilst the modification outlined solves the problem of 'odd' graphs in most cases, it unfortunately does not help with the three-node graph, which will still violate one of the constraints as stated. In order to avoid having to claim that a world involving just three powers is impossible, I suggest that a satisfactory three-node graph can be constructed if we allow that there can be powers which have no stimulus (i.e. reciprocal disposition partner) and thereby manifest of their own accord.

I conclude this chapter by pointing out that some of the powers in both mine and Bird's

graphs will themselves be unmanifestable (i.e. have no incoming manifestation relation). I argue that this should not be viewed as problematic, however, since there are good reasons for thinking there are 'unmanifestable' powers in the actual world.

Chapter Six: 'The Problem of Geometrical Properties for Pandispositionalists'

Having outlined in the first five chapters the kind of metaphysical scheme that pandispositionalism gives rise to, I now focus on a problem that many take pandispositionalism to face. Whilst many metaphysicians are sympathetic to the view that some properties are irreducibly dispositional in nature, it is often thought that certain properties resist being viewed in dispositional terms (see, for e.g., Ellis, 2002: 68-70). Invariably, the kinds of property that are thought to resist dispositionalist treatment are those relating to the geometrical form or three-dimensional 'shape' of things. In this chapter I defend pandispositionalism by suggesting how geometrical properties can be dealt with.

After responding to an initial, unsuccessful argument put forward by, for example, Choi (2005), I consider a more serious worry outlined by Shoemaker (2004 [1980]). His worry is that a particular geometrical property may contribute different dispositions on different occasions and so such a property cannot be identified with a particular disposition (or set of dispositions), as pandispositionalism demands. Shoemaker's pandispositionalist response is that shape properties, and properties in general, are in fact clusters of *conditional* powers, which are second-order powers to give rise to the ordinary powers we speak of. I argue that this move is unattractive, however, for various reasons.

In light of my criticism of Shoemaker's version of pandispositionalism, I propose a different version. Following a suggestion by Mumford (2007), I argue that the pandispositionalists should simply maintain that shape properties *do* always confer the same dispositions. The

reason why this may not be obvious is that the dispositions conferred by geometrical properties are sometimes 'finked' (i.e. interfered with) by the other intrinsic properties of the particulars in question. Thus, the debate concerning conditional powers boils down to the question whether one is happy to accept cases of intrinsic finkishness. I conclude the chapter by defending the notion of intrinsic finkishness against Choi's recent attack (2005).

0.7) Chapter-by-chapter overview of the second part of the thesis

PART TWO: PANDISPOSITIONALISM AND CAUSATION

Chapter Seven: 'Simultaneity in Dispositional Interaction?'

My aim in this chapter is to question an assumption that is often made in the philosophical literature on dispositions. This is the assumption that, generally, the concrete stimulation, or 'triggering', of a disposition temporally precedes the manifesting of that disposition. I begin by examining precisely what the concrete trigging of a disposition may be thought to consist in, and then identify two plausible views. According to the first of these views, disposition stimulation involves the action of one power upon another. On the second view, stimulation consists simply in the state of affairs of power and stimulus being in contact (i.e., contiguous).

I then argue that on either of these views about triggering a case can be made against the view that the triggering of a disposition always occurs before the manifesting of that disposition. More precisely, if the first view about triggering is accepted, and certain plausible assumptions about dispositions are put into place, a metaphysical argument can be formulated for the claim that the stimulation of a disposition never occurs before that disposition manifests. If the second view about triggering is accepted, the question concerning

simultaneity becomes an empirical one. There are, however, examples of dispositional interaction which, on the second view about triggering, clearly seem to involve simultaneity.

Chapter Eight: 'Towards a Dispositional Account of Causation (Part 1)'

Before sketching an account of causation in dispositional terms, I begin with some metaphilosophical comments. Like Dowe (2000), I wish to make it clear from the start that I am not attempting to provide a conceptual analysis of the concept of causation (i.e. an account of what the concept of causation means across all possible worlds). One reason for this is that the concept of a disposition is so closely intertwined with the concept of causation that any such analysis is likely to face the charge of circularity. Rather than offering a conceptual analysis, Dowe offers what he calls a this-worldly, empirical analysis of causation. One way of viewing Dowe's project is to see him as providing the truthmakers for causal claims *in our world* (which, for him, are the transferences of conserved quantities). My approach bears similarities with that of Dowe's, but rather than focusing on our world in particular, I want to focus on pandispositionalist worlds in general. For, whilst some dispositional (possible) worlds will contain conserved quantities, not all will. My general question will be: what is it about a pandispositional world that enables causal claims to be true?

I go on to argue that the trigger – manifestation distinction can plausibly be understood as corresponding to the cause-effect distinction, as long as triggering is understood in the right kind of way (i.e. as involving the 'partnering' of reciprocal dispositions). I defend this suggestion against Martin's claim (2008: 51) that 'partnerings' and 'manifestations' do not stand to each other as cause to effect.

I conclude this chapter by considering two further questions. Firstly, I consider whether there is any limit on the number of reciprocal partners that may be said to cause (when partnered) a

mutual manifestation event. Secondly, I discuss parallels between Molnar's concept of polygeny (2003: 194) and the concept of mutual manifestation.

Chapter Nine: 'Towards a Dispositional Account of Causation (Part 2)'.

In order to account for cases of causation that do not appear to fit the model outlined in the previous chapter, I introduce the distinction, discussed by Salmon (1984), between causal *interaction* (or 'production') and causal *propagation*. I suggest that the model outlined in the previous chapter applies to cases of causal interaction. I also point out that, like me, Salmon allows that cases of causal interaction may involve simultaneity. I then go on in this chapter to provide a dispositional account of causal propagation. Roughly, I suggest that such cases involve distinct mutual manifestations being connected by an intervening dispositional state or further mutual manifestation. The account of causation we are now left with has much in common with the *process* theory of causation, advocated by Salmon (1984) and Dowe (2000).

I then move to a discussion of causal asymmetry, and offer the suggestion that causal asymmetry may be rooted in the asymmetry of dispositional directedness. I conclude the chapter by distinguishing the concepts of *immanent* and *transeunt* causation (first introduced by W.E. Johnson (1964)), and point out that the dispositional account of causation offered in this and the previous chapter is an account of transeunt causation only.

Chapter Ten: 'Causation and Realisation'

In this chapter I turn to the topic of property realisation. Such realisation occurs when one property (or set of properties) gives rise to, i.e. 'makes real', a further property (or set of properties). Mental properties, for example, are often said to be realised by the neuronal properties of the brain. Although realisation obviously consists in some kind of dependency

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relation, the precise nature of this relation has been the matter of much dispute. I begin by outlining various accounts of realisation and some of the weaknesses they appear to have. Firstly, I discuss accounts of realisation which invoke levels of being, which tend to class the realisation relation as a kind of causal relation (e.g. Searle, 1992). I then explore Heil's deflationist account of realisation (2003) which is offered as a response to the problems facing the 'levels' view. I argue that Heil's view may be unsatisfactory, however.

I go on to sketch a possible account of realisation which is available to the pandispositionalist and which appears to avoid the problems facing both the 'levels' view and Heil's radically reductionist view. The central claim of the account I propose is that the realisation relation is a species of the manifestation relation. Since, on the view I argue for, causation may also be cashed out in terms of the manifestation relation, realisation may be viewed as involving causation. However, the account under consideration need not be committed to there being different levels of being. I conclude the chapter by drawing similarities between the account outlined and Shoemaker's recent 'subset' account of realisation (2008). I suggest that although Shoemaker's account is largely compelling, the account outlined in this chapter is superior in at least one important respect.

Chapter Eleven: Pandispositionalism and Causal Necessity

Those who advocate an ontology of irreducibly dispositional properties often

do so, in part, because they wish to accommodate the claim that when a causal effect occurs, it necessarily occurs (e.g. Ellis, 2002). However, there has recently been some concern over whether causal necessity really does fall unproblematically out of dispositionalism (see Schrenk (forthcoming) and Anjum & Mumford (forthcoming)). This concern has been due to the observation that an effect can always be prevented by interfering states of affairs. Indeed, this is precisely what the infamous cases of 'finkish' and 'antidotal' dispositions seem to

show. But if a causal effect *could* have been interfered with by a preventative factor, how can the effect occur necessarily?

After introducing this problem, I argue that there is nevertheless an important sense in which the pandispositionalist (and dispositionalists in general) should claim that when a causal effect occurs, it necessarily occurs. More precisely, the pandispositionalist should claim that a causal effect is necessary *given the totality of background conditions that obtain*. Thus, the kinds of causal conditionals that hold necessarily will be those that build all background conditions into their antecedent. I suggest how this can be done. I conclude the chapter by briefly considering the state of play if there are (as many physicists suggest) probabilistic dispositions. Such dispositions would obviously provide counter-examples to the claim that all effects occur necessarily. Nevertheless, I suggest that the dispositionalist can allow that probabilistic dispositions necessarily give rise to a certain probability of there being a certain effect, and so the notion of necessity can still be kept in the picture

'Summary of Conclusions'

I will conclude with a brief summary of the main conclusions argued for during each chapter of the thesis.

0.8) An issue that I would have liked to address during the thesis.

Goodman once said that '[W]e can hardly study at once all the ways in which everything is related to everything else' (1983: xx). I think Goodman was right. Although the title of my thesis is 'Pandispositionalism: A Study', the following title would have been more accurate: 'Pandispositionalism: A Partial Study'. One can hardly expect to address all aspects of a metaphysical topic, not least because all metaphysical topics are related to most others. I have

therefore had to be selective with the issues covered in this thesis. This means that, necessarily, some very interesting and important issues have not been properly discussed. Nevertheless, as I hope is clear, I have endeavoured to cover what I see as central questions concerning pandispositionalism, and my hope is that the answers offered to these central questions will stand regardless of the further details that may be added to the pandispositionalist picture.

I would have particularly liked to address in detail the important issue of probabilistic dispositions. According to many interpretations of quantum mechanics, the fundamental events of the world are indeterministic, or 'chancy'[5]. If this is correct, and if one wishes to explain the activity of the world in dispositional terms, this means that the notion of a probabilistic disposition would be amongst the fundamental metaphysical concepts. I do address the topic of probabilistic dispositions in chapter eleven, but do so only briefly. I make no apology for not thoroughly addressing this issue, however. It seems to me that most of what is said in this thesis would stand even if all irreducible dispositions turn out to be probabilistic. For example, dispositions would still be best understood as universals which are internally related in a certain way, and the general models of causation outlined in this thesis would still stand. The main difference would be that one would, in addition, need to build in an appropriate notion of chance into one's account of disposition manifestation.

0.9) Further important topics that I have not been able to address

In addition to the topic of probabilistic dispositions, there are four other issues in particular

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[5] Note, however, that not all interpretations of quantum mechanics are indeterministic (see Bohm (1952), for example), and so the argument in favour of something like chancy dispositions is not conclusive.

that I would have liked to investigate in more detail. I will now briefly mention these issues and explain why, in the end, I decided to leave out detailed discussions of them:

1) I would have liked to have said more about what the pandispositionalists ought to think the fundamental ontological elements of the world are. My feeling is that the pandispositionalist should adopt an Armstrong-type state-of-affairs ontology (see Armstrong, 1997). According to this view, objects are understood not merely as bundles of properties, but particulars-bearing-properties, with these being the fundamental elements of the world[6]. The reason I think the pandispositionalists should not be bundle theorists is that, as I argue in chapter two, irreducible dispositions are best viewed as universals, and as has been showed over the years, the bundle-of-universals theory of particulars faces very serious problems (see, for example, Armstrong, 1989: ch 4). Thus, I think the pandispositionalist needs particularity in the picture. However, questions concerning the precise nature of particularity are complicated and difficult, and giving this issue the care it deserves would have taken the thesis too far away from its central aims.

2) Related to the topic of states of affairs is the question whether property universals are best understood in the 'immanent' sense or the 'transcendent' sense. Whilst, in chapter two, I argue that irreducible dispositions are best understood as universals, I do not attempt to settle the 'immanent' versus 'transcendent' debate. When deciding between the two options, many considerations would have to come into play, and addressing these issues properly would perhaps require a thesis in itself. I do, however, mention some of the questions that are particularly relevant to this debate in a pandispositionalist setting.

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[6] Like Armstrong (1997: ch 7), I do not think that particulars could exist in abstraction from their properties: there are no 'bare' particulars. This is why 'particular-bearing-property' is the fundamental entity.

3) An interesting question concerning the pandispositionalist view is whether the concept of *essence* has any significant role to play. For example, does saying that a property is essentially dispositional *really* say anything more than that a property is irreducibly dispositional or identical with a certain set of dispositions? According to Ellis, it does: the concept of essence brings with it certain modal notions which have great explanatory value within the dispositionalist picture (see Ellis, 2001). Mumford (2005), on the other hand, fails to grasp Ellis's notion of essence, and fails to see what explanatory power it has which the identity thesis concerning property and disposition does not.

Originally, I did write a chapter concerning whether the notion of essence has any useful role to play in pandispositionalism. However, I quickly found that in order to properly explain the modern conception of essence, it was necessary to discuss, for example, Kripke's influential work (1980). What was intended to be discussed as a side issue began to take up a lot of room. In the end, I decided to drop this topic and take the following line: The minimal pandispositionalist thesis, which says simply that properties are irreducibly dispositional, has in itself significant explanatory power (as I hope to have indicated at various places in the thesis). If Ellis is correct, and there is an intelligible notion of essence which is applicable and which adds further explanatory power, then so much the better.

4) Finally, I will mention a further topic which is important and which will profit from future work on dispositions. This is the topic of induction. If one accepts the Humean mosaic of inert qualities, according to which anything is in principle free to behave in any way whatsoever on future occasions, one may despair of inductive practices. On the other hand, if through observing behaviour we gain insight about the dispositions of things (or, if one is Armstrong, we gain insight about the laws), one might think that our inductive practices are in much better shape. Certainly, Armstrong thought that his theory of nomological necessity would offer some kind of solution to the problem of induction (1983: 104). Towards the end of

chapter eleven, I briefly indicate why, even if one is a pandispositionalist or an Armstrongian, induction still cannot be trusted (entirely). But as I suggest this chapter, induction is nevertheless in better shape on the pandispositionalist picture than it was on the Humean scheme. Much more needs to be said, however, and unfortunately I have not been able to elaborate on my brief remarks in chapter eleven.

0.10) A brief metaphilosophical remark

For large parts of the 20th century, the primary task of the metaphysician was taken to be to analyse metaphysical *concepts*. This involves studying the meanings of the words we use, and providing definitions which sharpen our understanding of the concepts under consideration. Indeed, many philosophers seem to have thought that the *only* task of the metaphysician is to provide conceptual analyses. Strawson (1959) is one example of a philosopher who, by 'metaphysics' appears to mean conceptual analysis. There are many examples of such philosophers, particularly those influenced by the positivistic school that emerged in the 1930's and which embodied this view of metaphysics.

Before beginning the main part of the thesis, it is important to emphasise that this thesis does *not* fall within the metaphysical tradition just outlined. In contemporary metaphysics, conceptual analysis is generally taken to be only part of the metaphysicians' concern. The main concern in contemporary metaphysics is with *ontological* issues, which are taken to be issues concerning the metaphysical nature *of the world* and issues which cannot, it is argued, be answered by analysing concepts. The dominant assumption in contemporary philosophy is, therefore, that we cannot read off all there is to know about the world (metaphysically speaking) by examining the features of our language. Thus, what Heil calls the 'picture theory of language' (2003: 3.2) appears to have few adherents in contemporary philosophy.

As a result, during this thesis I will not merely be analysing concepts relating to, for example, properties, dispositions, and causation. Rather, I will be addressing questions relating to the mind (and language) independent world. Although I cannot begin to justify this meta-philosophical approach, let me conclude this introductory chapter by giving a flavour of how philosophers studying dispositions have traditionally ignored crucial questions as a result of being overly concerned with conceptual analysis.

Rudolph Carnap, for example, was one of the founding fathers of the positivistic school and, not surprisingly, his influential work on dispositions was concerned with the question how dispositional predicates are to be *analysed*. Carnap's suggestion (1936) was that in the case of disposition predicates, the analysans will have a *conditional* structure: the meaning of a disposition predicate will be given by a sentence with an 'if...then...' form. When one reflects upon ordinary disposition predicates, this kind of suggestion does seem to have initial plausibility. Most agree, for example, that to say of an object that it is fragile is to say (at least in part) something like '*if* a certain pressure is exerted upon the object, *then* it will break'. Since Carnap's suggestion, many philosophers have argued about the precise nature that such conditionals should take, but these details need not concern us here (see Schrenk (2007) for a clear and concise introduction to the history of conditional analyses). However, unfortunately, because Carnap was *only* concerned with conceptual analysis, he did not take seriously what metaphysicians now take to be a key question: what is it about the world that makes it the case that a certain disposition may be truly ascribed to a thing? If one takes it that dispositional predicates are reducible to conditionals, the question translates to: when a disposition is truly ascribable to a thing, *what is it about the world that makes the correlative conditional true of that thing?* Such questions go beyond merely conceptual issues; they are *ontological* questions. According to Armstrong (2004: 2-3), Ryle (1963) was also guilty of ignoring this crucial question, with his philosophical account of the mind suffering as a result.

Ever since this question concerning the ontological grounds of dispositions began to be taken seriously, philosophers such as Armstrong (1983), Ellis (2001) and Lewis (1986) have constructed various metaphysical schemes which each offer different truth-makers for disposition ascriptions. The pandispositionalist view, which is the focus of this thesis, is an emerging view which promises a new answer to the kind of ontological question just mentioned (amongst others).

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PART I: THE METAPHYSICS OF PANDISPOSITIONALISM

Chapter One: Varieties of Pandispositionalism

1.1) Introduction: pandispositionalism

During the introductory chapter, I briefly discussed realism about dispositional properties and stated that this thesis is going to be a study of dispositionalism in its strongest form: *pan*dispositionalism. In beginning this study, I must consider what kinds of views about properties may be considered as pandispositionalist views.

As was suggested in the introduction, pandispositionalism is most naturally understood as involving two main claims. Firstly, as a version of dispositionalism, pandispositionalism involves the claim that dispositions or 'causal powers' are irreducible features of things. Secondly, the 'pan' prefix indicates that, on this view, *all* (natural) properties and relations are taken to be irreducibly dispositional in nature. Do any existing views in the literature satisfy this definition? The answer is yes, although pandispositionalism is not widely held at present. Shoemaker was one of the first serious proponents of pandispositionalism about properties (or the 'causal theory of properties', as he calls it (1980). See also Mellor (1974) and Popper (1959: appendix 10) for early versions of pandispositionalism). However, in recent times, Mumford revived pandispositionalism by rejecting the existence of categorical properties, and has traced out many striking consequences of this rejection (2004). In some ways, it seems pandispositionalism presents a radical picture, rejecting as it does the metaphysics of discreta that has dominated since Hume. Since the identity of a dispositional property is fixed by what it is a disposition for (i.e., what its manifestation is), pandispositionalism presents a picture of the world in which all properties are interrelated, generating a huge holistic web. In summarising his view, Mumford writes:

'[P]roperties can plausibly be viewed as properties for something else: their effects. Properties are powerful and the particulars are thereby powerful when they instantiate properties. The properties that are real in a world must, therefore, form an interconnected web: a system with no property standing alone or outside (2004: 182).

I will say more about the relational structure of dispositions in the following chapters.

1.2) Distinguishing pandispositionalism and dispositional monism

In order to gain a greater understanding of pandispositionalism, it is worth pausing to consider whether there could be slightly different versions of pandispositionalism. My contention is that more than one kind of view can qualify as a pandispositionalist view, although there does seem to be a degree of confusion on this point in the literature, as I will now show.

Most obviously, the view known as dispositional monism is a pandispositionalist view. Mumford defines dispositional monism as the view that there is only one fundamental type of property: the dispositional type (1998: 19). In other words, on this view, all properties are nothing but pure dispositions or 'powers'. This is the view that Mumford (2004) and also Bird (2007) now hold. Their view is clearly pandispositionalist, because if all properties are nothing but pure dispositions, then all properties obviously have an irreducibly dispositional nature.

At this point, it is not obvious that there is any difference at all between pandispositionalism and dispositional monism, which might lead one to suspect that pandispositionalism just is dispositional monism by another name. I think it would be mistake to make this assumption, however. The simplest way to show that pandispositionalism and dispositional monism are

not equivalent is to identify a view which satisfies the natural definition of pandispositionalism (outlined above), but not the definition of dispositional monism. There is, I think, such a view, and it is a view that has appears to have been held (at one time) by C.B. Martin and John Heil.

In their earlier work, it was claimed by Martin and Heil that *all* properties (and relations) have *both* an irreducibly dispositional nature and also a categorical or 'qualitative' nature:

'[P]roperties are not purely qualitative ... [B]ut neither are properties purely dispositional ... [D]ispositionality and qualitativity are built into each property ... [A] property ... is a two-faced dispositional-qualitative coin' (1999: 44).

Furthermore, on this view dispositionality and qualitativity are taken to be equally irreducible: '[T]here is neither a direction of priority or dependence, nor a reduction of one to the other' (1999: 45). This view is usually referred to as the 'two-sided' theory (e.g. in Armstrong, 1997: 83). Does this kind of view satisfy the natural definition of pandispositionalism? It seems that it does. The two-sided view states both that dispositionality is an irreducible feature of the world and also that *all* properties have irreducibly dispositional characteristics[7]. Is the two-sided theory also a version of dispositional monism? It seems not. According to dispositional monism, all properties are nothing but pure dispositions, but this is something which Martin and Heil clearly reject in the quote above when they claim that properties have qualitative aspects to them. Whilst one might wish to argue that Martin and Heil are in some sense property monists, in the sense that according to them all properties are of the 'two-sided' kind, they are clearly not *dispositional* monists. This indicates, therefore, that pandispositionalism

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[7] During a talk at the Oxford 'Powers' conference (July 2008), Heil confirmed that he considers his and Martin's view to be a version of a pandispositionalism.

and dispositional monism are not equivalent views. Dispositional monism entails pandispositionalism, but not vice versa.

In sum, a distinction should be made between pandispositionalists who accept dispositional monism, and those that do not. A pandispositionalist may or may not be a dispositional monist, depending upon whether they think the natures of properties are *exhausted* by the dispositional features that all are thought to have. This point might appear elementary, but as I mentioned earlier, there appears to be a degree of confusion about this point in much of the dispositions literature. For example, Bostock and Molnar's broad definitions of pandispositionalism are essentially the same as mine. Bostock characterises pandispositionalism as the 'view that all properties ... are irreducibly dispositional' (2008: 139). Molnar characterises pandispositionalism in much the same way when he says that, on this view, 'every genuine property is a power' (2003: 153). Now, as was indicated in the last chapter, it seems that the two-sided view satisfies these definitions. Martin and Heil would agree that all properties are irreducibly dispositional or, to put it in a different way, that each property is a power. Curiously, however, Bostock and Molnar both go on to separate the two-sided view from pandispositionalism. Bostock classes the two-sided view not as a pandispositionalist view, but as a 'middle position' (2008: 139). Likewise, Molnar clearly separates out pandispositionalism and what he calls the 'dual-sided' theory when illustrating his taxonomy of realist views about properties (2003: 149, figure 5). This separation suggests that Bostock and Molnar intend to use the term 'pandispositionalism' to refer to the view that I have called dispositional monism. This suspicion is vindicated when Bostock identifies only Mumford, who is a dispositional monist, as a potential advocate of pandispositionalism. If this suspicion is correct, then Bostock and Molnar should have made their definition of pandispositionalism clearer, to avoid confusion. Rather than defining pandispositionalism merely as the view that all properties have an irreducibly dispositional nature, which is what I take to be the most natural definition, they should have defined pandispositionalism as the

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view that all properties have an irreducible dispositional nature *and that is all*. This would then have clearly explained why they do not class the two-sided view as a version of pandispositionalism.

1.3) Getting to grips with the early Martin-Heil view

Let us now explore Martin's and Heil's early 'two-sided' version of pandispositionalism in further detail, in order to get a grip on precisely how it differs from dispositional monism. As we saw, the early Martin and Heil view is often called the 'two-sided' or 'dual-aspect' view of properties. One must be careful, however, because such labels are potentially misleading. Properties, it seems, could be two-sided in a number of different ways. On one reading, a property may have two aspects to it in the sense that it can be picked out by either a categorical predicate or a dispositional predicate. In other words, on this view certain categorical predicates and dispositional predicates could pick out the very same property, but have different senses (for a persuasive account of the difference between categorical and dispositional predicates, see Mumford (1998, ch 4)).

It is doubtful, however, that this is all Martin's and Heil's two-sided view is intended to amount to. This kind of view, which has recently been endorsed by Galen Strawson (2008), sees the dispositional - categorical distinction as merely a distinction between predicates, rather than a distinction that applies out there in the world. As such, it would no longer be the case that properties *really* had irreducible dispositional natures, it would just be that such properties could be picked out via the kinds of causal roles they play, via dispositional predicates. This view also appears to be that held by Mellor in his 2000 paper. Such a view, I suggest, should not be classed as a pandispositionalist view. This is because pandispositionalism is an *ontological* thesis about the natures of mind-independent properties, whereas the kind of view just outlined is ultimately an account of the meaning of certain kinds

of predicates. Since Martin's and Heil's pandispositionalist view is intended to be an ontological thesis, it seems this cannot be the view that they intend to endorse. Indeed, the title of the joint paper in which they expound the two-sided view is 'The Ontological Turn'. When they say that properties are, in part, dispositional in nature, they appear to mean this in the ontological, realist sense of dispositional.

So, if Martin and Heil really are full-blooded dispositionalists, what exactly does their two-sided view amount to? When one reads Martin' and Heil's work – their early work especially – it is not entirely clear what their view amounts to. It may be useful, therefore, to consider the conceptual possibilities regarding what a two-sided view, as an ontological thesis, *could* amount to. An obvious interpretation of such a view would be that properties have, as it were, a dual nature: a categorical nature and a dispositional nature. More specifically, this would be to admit that properties are inert, categorical qualities, but qualities that are related to other properties in such a way that they have dispositional characteristics. Is this all that Martin and Heil intend their view to amount to? As characterised thus far, I do not think so. The reason is that this characterisation is consistent with Armstrong's view of properties, yet Armstrong is not a dispositionalist in the full-blooded sense, which is to say that properties, for him, are not in and of themselves powerful. This is because, on Armstrong's view, the relations between properties in virtue of which those properties have dispositional characteristics are contingent and external only[8] (see Armstrong, 1983). But recall Martin and Heil's claim that dispositionality is *built into* each and every property. Martin and Heil are, unlike Armstrong, thoroughgoing dispositionalists, and so the Armstrong-type view of properties cannot be what Martin and Heil endorse.

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[8] On Armstrong's view, properties are universals and so the relations which bestow dispositional characteristics are second-order relations.

As suggested already, the reason why Armstrong cannot be considered a thoroughgoing dispositionalist, and for that reason a *pan*dispositionalist, is that, for him, properties have dispositional characteristics contingently only. What the Martin-Heil version of dispositionalism must state, therefore, is that categorical properties are related dispositionally to other properties *necessarily*. This would make it the case that all properties had their dispositional characteristics essentially, thus making this version of the view a genuine version of pandispositionalism.

1.4) The identity view

There is another view that is closely related to the two-sided view outlined above, a view that Martin and Heil now officially endorse. They refer to this view as the 'identity' view (see Heil (2003, ch 11)). According to this view 'the qualitative and dispositional are identical with one another and with the unitary intrinsic property itself' (Martin, 2008: 65). In other words, certain qualities and certain dispositions are the self-same entity. So, rather than seeing qualities and dispositions as different *aspects* of properties, they now take it that a property's qualitative nature and dispositional nature are identical. In the end, then, it is perhaps better not to speak of a property having distinct 'sides' or aspects. It therefore seems fair to say that Martin's (and also Heil's (2003: ch11)) view of properties has shifted. But since Martin has not claimed to have rejected his realism about dispositions, it appears – at first glance at least – to be a minor shift only.

Shortly, I will discuss reasons why one may prefer certain versions of pandispositionalism over others. Our purpose thus far has merely been to survey the territory. Our discussion has indicated that there are at least three versions of pandispositionalism. The first is pure dispositional monism, as expounded by Mumford (2004) and Bird (2007). The second is a 'dual-aspect' view which is what Martin (and Heil) initially intended when he initially argued

for dispositionalism (see 1993: 519; see also Heil 1998). The third is the view that Martin and Heil now appear to endorse, which we may call the identity view (Heil 2003 & Martin 2008). Through the course of this discussion, I have also argued that two other kinds of view should be distinguished from pandispositionalism (and dispositionalist views generally): the 'predicate' view of Mellor, and Armstrong's theory of dispositions. The former may not be regarded as a pandispositionalist view because it is ultimately a thesis about the meaning of predicates. The latter may not be regarded as pandispositionalist view because according to Armstrong properties are not in and of themselves powerful. Rather, they inherit their power via the contingent relations they happen to bear to other properties[9].

1.5) Defending dispositional monism

Why might a pandispositionalist favour either dispositional monism, the two-sided view, or the identity theory over the others? Heil and Martin, as I have already highlighted, reject dispositional monism in favour of a view which also makes room for the notion of non-dispositional qualitativity. Heil's general worry about dispositional monism is that, in his view, it gives rise to 'a debilitating regress' (2003: 98). In fact, regress objections to dispositional monism are common, and they come in different forms (for a survey of the kinds of regress objection that exist in the philosophical literature, see Bird (2007a)). Indeed, I will discuss a distinctive kind of regress objection in chapter three, one that complains a power's identity can never be fixed in a world of pure powers (see Lowe (2006: 138)). However, at this point I will address what appears to be the most common regress objection, one which Armstrong put forward and one which Heil seems to have in mind[10]. Roughly, the objection is as follows. According to dispositional monism, all properties are nothing more than

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[9] Armstrong calls them 'natural necessitation' relations (1983).

[10] See also Swinburne (1980: 316-319), who was arguably the first to identify this kind of regress objection.

dispositions or powers. This means that the manifestation of one power can only result in another power. And the manifestation of this further power can only result in a further power, and so on. On the dispositional monist picture, this chain can never be broken by a 'categorical' manifestation because there simply are no categorical features on the pandispositionalist picture. This has been taken to be problematic. Opponents have argued that if causation consisted in nothing more than a shifting around of different powers, nothing concrete would ever be manifested. This objection has been labelled the 'always packing, never travelling' objection, due to Armstrong's witty way of expressing the worry. The problem with the regress, Armstrong claims, is that particulars would always be re-packing their bags as they change their powers, 'yet never taking a journey from potency to act' (1997: 80). Heil makes the same kind of point in an equally striking way using a domino analogy: '[I]f 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'. (2003: 98). In sum, a ghostly world of shifting powers, it is argued, could not have enough concrete reality to resemble the eventful world as we know it.

How have dispositional monists responded to this objection? Mumford has responded by highlighting that these conclusions are merely based on categoricalist intuitions and so such arguments are question begging. The very thesis of dispositional monism is that pure potencies are actual, substantial existences, rather than 'mere potentialities' (Mumford, 2004: 174). Indeed, the distinction between that which is categorical and that which is dispositional has a tendency to elicit confusion on this point, for if one is a pandispositionalist, there is an important sense in which unmanifested dispositions *do* exist categorically. It is only a disposition's *manifestation* that is conditional. Furthermore, it is likely that the pandispositionalists will be happy to accept that causal activity simply consists in the mere passing around of powers. Heil and Armstrong clearly see this as a problem, but dispositional monists like Mumford welcome this consequence, and argue that this offers a plausible

account of causation (see Mumford's 'Passing Powers Around' (2009) and also chapter nine of this thesis).

Although Armstrong's regress argument seems to rely on categoricalist intuitions, perhaps his point was merely that it is not obvious that pure dispositions alone could yield the substantial world as we know it, and that more detailed explanation is required. In response, Mumford (2006) and Bird (2007) have tried to show that pure powers are just as substantial as other kinds of properties found in rival metaphysical schemes. Mumford, for example, discusses the nature of properties in Lewis's neo-Humean metaphysical system and, after examining several quotes, remarks: 'Properties that are acceptable for inclusion in the Humean subvenient base are characterised in these excerpts as being a) those described by physics, b) intrinsic, c) point-sized occupants of points ... d) fundamental.' (2006: 73). Pure dispositions can adequately satisfy these requirements, it seems. For example, in relation to a), it may be pointed out that the fundamental physical quantities, such as energy and momentum, are generally characterised in terms of what they do, and so lend themselves to a dispositionalist theory.

Mumford also considers the rival concepts of property universals and property tropes. Pure dispositions, Mumford suggests, lend themselves equally well to universals and trope theories of properties[11]. For example, a feature that both property universals and tropes must have is that they be capable of instantiation in particulars (2006: 75). Again, as Mumford suggests, dispositions readily fit the bill. Pure dispositions may be instantiated in particulars even when they are unmanifested. If it were not true that certain uranium piles have the *unmanifested* disposition to catastrophically chain react, why would we bother putting safety mechanisms in place in nuclear plants?!

[11] It will be suggested in the next chapter that dispositions are in fact best understood as universals, but we may accept Mumford's general point for present purposes.

Bird pushes these points further and argues that not only do pure powers bear all the features that rival metaphysicians claim properties to have, but that pure powers have *more* reality to them (2007:ch 5.2). Drawing upon Black's remark (2000) that all there is to a Humean fundamental quality is its identity with itself and its distinctness from other qualities, Bird lists the features of a non-dispositional categorical property as follows:

'a) it is distinct from (i.e. not identical with) other properties;

b) it is a universal and thus can have instances;

c) for some *n* it is an *n*-adic universal'[12]. (2007:103)

Bird then argues that dispositional properties (considered as universals) can clearly have all these features. What distinguishes disposition universals from categorical universals, for example, is that the former have a dispositional character, which is to say they are internally related to each other. (I will discuss these internal relations further in the next two chapters). It seems, then, that pure dispositional properties have *more* features than categorical universals and so the charge that dispositional properties have less reality than categorical properties seems rather unfair.

Although it is not my present aim to provide a detailed defence of dispositional monism, nor to argue that it is the most plausible form of pandispositionalism, I do not think that dispositional monism can immediately be rejected as one which presents an incoherent picture of the world, as Armstrong *et al.* suggest it does. At the very least, then, dispositional monism is a view that should be taken seriously and explored, at least initially.

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[12] This criterion for categoricity is consistent with Armstrong's account of quiddities (Armstrong, presentation handout, 2007).

1.6) Assessing the Martin-Heil views

If, at the end of the debate, any problems facing dispositional monism prove to be insurmountable, the pandispositionalists would have to retreat to a metaphysics allowing qualitativity (or 'categoricity'), as well as dispositionality. By allowing this, properties would no longer be seen to be *purely* powerful, even though they would still in some way be internally related to other properties. As we saw earlier, this is the kind of view advocated by Heil and Martin, and it has been presented in two forms: the two-sided theory and the identity view.

Do either of these views face obvious problems? The answer is that they do, but that the two-sided view fares better than the identity view that Heil and Martin now explicitly hold. To recap, the identity view states that properties are at once qualitative and dispositional, which is to say that the dispositional and qualitative are identical. This appears to be a radical move, because dispositions and qualities have always been assumed to be very different kinds of entity. It would be surprising, therefore, if it turned out, as Heil and Martin now suggest, that all previous debates concerning the categorical and dispositional were built on false assumptions. Thus, one might sympathise with Armstrong's rather impatient response that dispositions and categorical properties 'are just different, that's all' (2005: 315).

We might put Armstrong's objection in a clearer light in the following ways. To begin with, dispositions seem to have features that categorical properties do not, which suggests that Leibniz's law (concerning the indiscernibility of identity) is not satisfied. For example, the unmanifested / manifested distinction applies to dispositions, yet such a distinction does not seem to apply to qualities.

Worse still, there is some plausibility to the thought that dispositions and qualities are contrary kinds of property. In other words, perhaps one of these kinds of property is definable in terms of the negation of the other. For example, an irreducible disposition is often characterised as a potent property, and, in contrast, qualities are often said to be inert properties. And if being inert amounts to lacking potency, one might simply characterise a quality as a property that is essentially non-dispositional. But then if all natural properties are at once dispositional and qualitative, as Martin and Heil suggest, this would mean that such properties are essentially potent and not potent.

Unfortunately, I do not see any serious attempt by Martin and Heil to show, precisely, in what sense a property can at once be qualitative and dispositional (see Heil, (2002: ch 7), and Martin (2008: ch 6)). Such a task would, it seems, involve overhauling all previous thinking about dispositionality and qualitativity. For this reason it may be tempting for someone in Martin or Heil's position to maintain that there is a categorical –dispositional distinction, but concede that it is merely a distinction that applies to predicates. This would be a kind of identity view, ontologically speaking, as long as the very same property could be picked out by both a categorical predicate and a dispositional predicate. Such a view would be akin to the Mellor-type account (2000) discussed earlier. It seems clear, however, that this cannot be the route that Heil and Martin would wish to take. Such a move would involve conceding that properties are not *really* dispositional, and that the dispositional - categorical distinction is ultimately a mind-dependent distinction. As mentioned earlier, Heil and Martin claim their view to be ontologically serious, and so they must surely avoid making the dispositional – categorical distinction a purely conceptual one.

One wonders, however, whether, in the end, this mind-dependence view is what the recent Heil - Martin position must in the end amount to. For example, they both try to make the identity view comprehensible by using certain analogies. In his 2008 (pg 68), Martin appeals

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to Wittgenstein's infamous duck-rabbit illustration. The nature of a property is, according to Martin, analogous to the nature of this illustration. It may be seen as a rabbit, just as properties may be seen as qualitative, but the *very same* illustration may also be seen as a duck, just as properties may also be seen as dispositional. The problem with this analogy, however, is that whether one sees the illustration as a duck or a rabbit is surely a *perspectival* matter. Strictly speaking, the illustration itself is merely a static arrangement of lines. How those lines are interpreted depends on who is looking at the illustration and how it is looked at. The analogy that Martin uses therefore seems to favour a mind-dependence reading of Martin's view about dispositions. Indeed, this kind of conclusion is also arrived at in Molnar's discussion of Martin's later view (2003: 155).

In sum, there are strong reasons for a pandispositionalist to avoid the identity view, should they find the picture presented by dispositional monism unacceptable. This leaves the two-sided view. But might the two-sided view also threaten to make the dispositional – categorical distinction mind dependent? I do not see why it should. As long as the two-sided theorist can identify the features of properties in virtue of which they have dispositional characteristics, and also identify *different* features of those properties in virtue of which they have a categorical aspect, then the dispositional – categorical distinction will not be mind-dependent. I have already said enough about the nature of dispositionality and categoricity to be able to speculate how such an account might go. Plausibly, the property will be dispositional in virtue of being internally related to other properties in some way, but will also have a non-relational, qualitative nature (providing the 'categorical' side).

I will now discuss the main objection facing the two-sided view.

1.7) Can the two-sided theorists explain categorical – dispositional necessity?

The tricky question to face, for the two-sided theorist, concerns why it is that properties with a qualitative nature must *necessarily* be related in certain ways to other properties. To recall, dispositionalists cannot allow the relations in virtue of which a property has dispositional characteristics to be contingent. That is, they cannot adopt Armstrong's view of properties. On Armstrong's view (1983), dispositionality is not essential to any property, and so properties are not in and of themselves powerful. Therefore, if the dual-aspect theorist is to be classed as a genuine pandispositionalist, qualities must be seen to bear dispositional characteristics necessarily.

Can such necessity be explained? Necessity is usually explained in terms of identity. As Mumford, highlights, perhaps this is why Heil and Martin were attracted to the identity view, as it automatically yields necessary connections between certain qualitative characteristics and certain dispositional characteristics (2007: 86). But that view, I have suggested, faces serious problems.

The simplest route for the dual aspect-theorist to take would be to accept that such necessity is brute and so not further explainable. However, such a response will satisfy few, if any, opponents, for it is precisely because of their apparent opaqueness that such necessary connections are rejected. Armstrong, for example, writes: 'Is the power side necessitated by the categorical side … ? Given the categorical side, do you have to have just that power? The necessity, if there is one, seems totally opaque, a totally brute necessity' (Armstrong, 1997: 251). Can anything more be said, at this point, in defence of the two-sided theory? One response may be to highlight that if one already operates within a Humean metaphysical framework, then it is of course natural to take contingency to be the default position when questions about correlations arise. Within such a framework, no necessities are accepted

unless they are rooted in identity. This general framework, however, is one that pandispositionalists generally reject. According to dispositionalists, reality is full of necessities, such as causal necessities (Ellis, 2001: 286) and combinatorial necessities (Mumford, 2004, 10.8), for example. Perhaps, then, within this new kind of framework, necessity replaces contingency as the default position where the law-like correlations between qualities and dispositions are concerned.

The Humeans are likely to respond that they are able to conceive of counterexamples to claims about such necessary connections, however. The necessitarians, in turn, are likely to reply that when we attempt to conceive of non-actual, but possible, situations, it is easy to commit gross errors and that, therefore, conceivability should not be taken to be a reliable guide concerning what is possible. This kind of dialectical pattern is familiar where debates surrounding necessary connections are concerned. (See, for example, Bird (2001), responses by Beebee (2002) and Psillos (2002), and a counter-response by Bird (2002)).

There is the danger of a stand-off here, and so perhaps the two-sided theorist should at least try to make the alleged necessary connections between certain qualitative characteristics and dispositional characteristics more transparent.

1.8) Grounding categorical – dispositional necessity in geometry?

One avenue for exploration would be to consider whether categorical – dispositional necessity could somehow be grounded in the necessities found in the mathematical sciences. I will briefly discuss one strategy along these lines which has been proposed by Weissman (1978). The strategy in question involves identifying the categorical (or the 'qualitative') side of a property with certain structural or 'geometrical' features (see Ellis, 2002: 68-70 for a discussion of 'intrinsic' structures and 'block' structures). An example of a structural feature,

provided by Ellis, is the tetrahedral structure exemplified by methane, silane and carbon tetrachloride molecules (2002: 173). After identifying the categorical with the structural, the next step would be to appeal to the necessities of geometry in an attempt to explain why certain structures have to play some causal roles and not others.

The general strategy of appealing to geometry in order to posit necessities in nature has been implemented by Stevens (1974) and also mentioned by Mumford (2004: 81). Mumford remarks how, for example, Stevens argues that, necessarily, there could not be snowflakes with a pentagonal structure, based on the fact that, necessarily, space cannot be completely filled by pentagons (1974: 14-15). Now, the current proposal is that this kind of strategy be applied to all law-like facts relating to structural features, specifically facts relating to the causal abilities associated with various structures. Take, for example, the dispositions of carbon and hydrogen to covalently bond to form methane (CH_4). Can these dispositions be explained by the structural characteristics of both carbon and hydrogen, and go some way towards showing those dispositions to be necessary? There does appear to be some hope for doing this. A hydrogen atom contains, amongst other things, a single electron shell containing one electron and one free electron space. A carbon atom, on the other hand, has both a full inner electron shell and an outer shell containing 4 outer electrons[13]. Now, as has just been mentioned, chemistry tells us that carbon and hydrogen atoms have the ability to covalently form CH_4, but not, for example, the potential to form C_4H. Why is this so? Well, covalent bonding occurs when atoms with electron vacancies (e.g. hydrogen) fill those vacancies by latching on to the outer electron or electrons belonging to another atom (thus covalently bonding with the other atom). We might call the former atom the *receiver* and the latter the

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[13] Note that this example is somewhat misleading. Although, in elementary chemistry textbooks, atoms are represented as having clearly delineated electron shells, with each containing a fixed number of electrons, atoms are structurally more complicated than this. However, the example nevertheless serves to make the general point.

sharer. Different sharing atoms have different numbers of outer electrons that are available for sharing. Now, a receiving hydrogen atom only has a single electron vacancy and so is only able to receive a single electron. This means that, crucially, a hydrogen atom cannot attach to more than one carbon atom. In order to attach to more, it would have to have more electron vacancies than it actually has. In contrast, a single carbon atom is able to covalently bond with more than one hydrogen atom as it has more than one outer electron available for sharing. In fact, carbon has four outer electrons, which is why the formation of CH_4 is a possibility. In contrast, CH_8 is not possible because that would require carbon to have more electrons available for sharing than it actually has.

The proposal would be, then, that the necessary connections posited by the two-sided theorists, between certain categorical / structural aspects of an entity and certain of its dispositions, could be explained by the necessities of geometry. As a mentioned earlier, a similar view has been put forward some time ago by Weissman (1978). The aim in his 1978 paper is to:

'... justify the conclusion that no theory of dispositions is comprehensive, unless it provides for these two factors: 1) Geometrical-structural properties are necessary and sufficient to determine what a thing's dispositions shall be; but 2) these structural properties are distinguishable from dispositions as properties constitutive of a thing are different from its qualifications for relatedness, and especially causal relatedness, to other things' (1978: 276).

Now, because Weissman argues that dispositions are distinguishable from structural properties, he could easily be interpreted as holding that structures and dispositions are different kinds of properties, rather than that all properties have both a structural and dispositional *aspect.* However, later on he claims that '... dispositions have no standing in reality apart from structural properties. But there is a distinction between structural properties

in themselves, and that [causal] relatedness for which objects qualify...' (1978: 281). Such remarks are conducive to a two-sided reading. If Weissman was proposing a dualistic view of properties, then one would expect him to hold that dispositions *do* have a standing in reality apart from structural properties.

Weissman goes on to argue, contra-Hume, that there are no possible worlds in which entities have the same structural features, but different dispositions: '[T]here *is* a contradiction in the supposition that these other worlds are possible, as it is contradictory to think that we might fill a round hole with a square peg' (1978: 291). In short, his claim is that the facts of geometry dictate which dispositions a thing with certain structural features must, and must not, have.

There are, of course, further questions for an advocate of this kind of view to answer. Firstly, it may be asked how the static laws of geometry are able to constrain laws concerning *causal* activity, which involves change (e.g. motion). Secondly, if *all* dispositions are to be explained by geometrical laws, it must be that all the fundamental properties of our world are plausibly geometrical-structural properties. It would have to be showed, therefore, that current physical theory is not incompatible with such claims[14].

Apart from the challenges just mentioned, one may also expect Humean opponents to present counterexamples to the alleged necessity of dispositions, given certain structural features. To return to the case of the bonding dispositions of atoms, it was suggested that certain atoms could never have different bonding characteristics to those they do have. In response, a Humean might claim to imagine a possible world in which carbon atoms miraculously gain an extra outer electron when near hydrogen, thereby allowing CH5 to be formed. Or perhaps a possible case is imaginable in which, for some reason, no covalent bonding dispositions exist

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[14] For Weissman's comments on these issues, see section III of his paper (1978).

at all. It does seem, however, that replies to such counterexamples do present themselves. In response to the first putative counterexample, it may be highlighted by the necessitarian that if a carbon atom gains another electron in its outer shell, then its structural features will have changed. But then, according to the two-sided view being proposed, it is to be *expected* that its dispositions will then change, for different geometrical laws apply to different geometrical structures. Therefore, the first putative counterexample is no counterexample at all. The second putative counterexample presents more of a challenge, however. That does concern a possibility in which the structural features of carbon remain, yet atoms do not have bonding dispositions because, say, it is a world in which there is no electro-static attraction. How might the necessitarian reply? With respect to this latter putative counterexample, perhaps there is the prospect of running an argument similar to that in Bird's 2001 paper. If there are only a few fundamental physical forces, as tends to be assumed, then surely one should expect the fundamental forces responsible for the *composition* of atoms and molecules to be the very same forces that are responsible for the bonding abilities of those atoms and molecules. Therefore, it may be unreasonable for Humeans to claim that the atoms found in our world could be composed and yet fail to have certain bonding dispositions.

It has not been my intention to attempt a detailed account of categorical – dispositional necessity on behalf of the two-sided theorists. I have merely tried to suggest that an explanation of such necessity is not completely out of the question. It is not obvious, therefore, that such necessity must be opaque, as Armstrong and others have complained. However, even if categorical – dispositional necessity must in the end be brute and inexplicable, the two-sided theorists may well think that the advantages of their variety of pandispositionalism are so great, as compared with dispositional monism, that accepting brute necessity is a small price to pay. As well as avoiding some of the potential worries facing dispositional monism, the two-sided view may, perhaps, provide resources for tackling serious difficulties in other areas of philosophy. I will now provide one example.

1.9) The problem of consciousness

A key problem within the philosophy of mind concerns how conscious experiences, or 'qualia', are to be accounted for within a physicalist framework. If dispositional monism is correct, it seems conscious states must be characterised wholly in terms of their causal roles (i.e. what they are dispositions for). However, it is far from easy to say what these causal features could be, as functionalists about the mental have notoriously discovered[15]. This has led Kim, amongst others, to claim that phenomenal states must be regarded as epiphenomenal, standing outside the causal structure of the world (2005: 170-71). In contrast to Kim, Shoemaker does not give up on the thought that phenomenal states have causal features (2007, ch. 6). However, even if certain causal roles can plausibly be ascribed to qualia, it could still be objected that the nature of qualia cannot be *wholly* captured by such ascriptions. It is arguable, for example, that we could know about all the causal features of certain perceptual states and still not know the essence of them, unless we know 'what it is like' to be the subject of those states. Indeed this is the point behind Nagel's famous question: what is it like to be a bat? (see Nagel, 1974). If one accepts dispositional monism, it seems the only reply can be that such claims are mistaken, and that Nagel-type qualia are ultimately to be explained away in some way (this, famously, is Dennett's claim: see, for example, 'Quining Qualia' (1988)). If it is conceded that there are some states that cannot be wholly captured by their causal features, the *monism* of dispositional monism would be undermined. Of course, one could still claim that all *physical* properties are purely dispositional and simply add that

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[15] Note that functionalists, such as Prior (1985), generally do not try to find a 'causal role' definition of mental states in order to show that those states are irreducibly dispositional. Rather, they look for such definitions to show that those states have some physical causal base. This project is consistent with the claim that those physical bases are categorical. The point remains, however, that both functionalists and dispositional monists face the same sort of initial challenge regarding qualia, namely, of finding causal features to associate with them.

there is a nonphysical realm in which inert phenomenal states exist. However, although such a view would involve realism about dispositions, it would no longer be a *pan*dispositionalist view.

So, should the dispositional monist find the prospect of eliminating qualia appealing? Unfortunately, assessing the merits of Dennett-type eliminativism would take us too far away from the current topic. What is relevant, however, is that, as Kim highlights (2005: 10), in recent decades consciousness has (once again) often played a central role in philosophy of mind, not to mention in moral philosophy and value theory. This means that if dispositional monism entails the rejection of phenomenal qualities, it is likely to become unattractive to a significant number of philosophers.

It is at this point that the two-sided version of pandispositionalism may seem favourable, since it appears to have the resources for accepting the existence of qualitative perceptual states, whilst preserving pandispositionalism. According to the two-sided view, all properties have a qualitative and dispositional side. Therefore, mental states, like all other properties, will be seen to have qualitative as well as dispositional features, thereby preserving the notion of a perceptual quality[16]. Furthermore, since, on the two-sided view, *all* properties have a dual nature, there no longer seems any need to reject physicalism in order to account for perceptual mental states. Martin writes: 'If we accept this general ontological model, certain features thought to typify (and mystify) the mental can, with a little effort, be seen to present in the non-mental and even the nonsystemic cases that have been considered' (2008: 79). In sum, then, if one wishes to preserve the existence of qualia, the two-sided view has a distinct advantage over dispositional monism, its pandispositionalist rival.

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[16] The qualitative aspects of mental states are what Martin calls '... the light of the world' and 'the very *feel* of our feelings' (2008: 139).

1.10) Conclusion

During this chapter I have distinguished three main versions of pandispositionalism: dispositional monism, the dual-aspect view, and the identity view. I have argued, however, that the identity view faces serious difficulties and may not in the end be a genuine pandispositionalist view, for it seems to make the dispositional – categorical distinction mind-dependent. Dispositional monism and the two-sided view have been compared, and the merits of each discussed. I have also highlighted potential difficulties for each of these two varieties of pandispositionalism, but have provided some hope for each view by outlining some possible responses to these problems. My conclusion is, therefore, that both options are worthy of consideration and should be taken seriously by those who are disposed towards pandispositionalism. The choice that the pandispositionalist makes may depend on their views in other areas of philosophy, such as whether they accept the existence of phenomenal qualia.

All that follows in this thesis will (unless indicated) be consistent with both varieties of pandispositionalism, i.e. dispositional monism and the two-sided view. Therefore, I will not discuss these debates further.

Chapter Two: Dispositions as Universals

2.1) The aims of this chapter

During this chapter I will assume the pandispositionalist picture and begin by addressing the question whether, on this picture, properties are best understood as universals or (sets of) tropes. After briefly introducing the distinction between tropes and universals, I will approach the trope versus universals debate by considering whether and how each of these alternative views are able to accommodate and explain certain salient features of irreducible dispositionality. More precisely, I will claim that any satisfactory version of pandispositionalism must provide an account of the *directedness* of dispositions, whilst accommodating the fact that many (if not all) dispositions are *intrinsic* to their possessors and also the related fact that a disposition instance may exist unmanifested.

I will begin by considering how the 'universals' version of pandispositionalism (in both its 'two-sided' and dispositional monist forms) is able to accommodate these important facts, before examining 'trope' versions of pandispositionalism. My conclusion will be that a theory of universals is able to provide a more coherent and transparent account of the central features of irreducibly dispositional properties. If one adopts pandispositionalism, therefore, one has special reasons for favouring a universals account, reasons that, at the very least, put the onus of proof on those seeking to establish a trope version of pandispositionalism.

The 'universals' version of pandispositionalism to be recommended is one that sees universals as being, at least in part, *relationally constituted*. That is, on this picture universals are internally related in a certain way at the second-order level, and it is in virtue of such relations that a disposition's directedness is what it is. Such relations are what Bird calls second-order

manifestation relations (2007*a*). I will in the next chapter consider in further detail the nature of such relations.

Before beginning the argument, it should also be pointed out that although I am framing the tropes versus universals debate in terms of pandispositionalism, the reasons put forward in favour of a universals account should appeal equally to those who, whilst allowing a place in their ontology for irreducible dispositionality, do not claim that *all* properties (and relations) are irreducibly dispositional. Ellis (2001) and Molnar (2003) are two such philosophers.

Finally, it should also be noted that whilst I will be recommending a universals account of dispositionality, I will not address the question whether disposition universals are best understood in the 'immanent' sense, or the 'transcendent' sense[17]. At the end of the chapter I will make some brief comments about the kinds of considerations relevant for the immanent versus transcendent debate in the context of pandispositionalism. Unfortunately, however, I must leave the debate there; an attempt to settle this debate conclusively would demand several chapters in itself and would take us too far away from the central aims of the thesis.

2.2) The tropes versus universals debate

Those who hold there to be a distinct ontological category of natural properties (and relations) typically view those properties (and relations) as either universals or as (sets of) tropes. An initial way of capturing the difference between universals and tropes is to say that universals can exist in many places at the same time, whereas tropes cannot. Thus, if properties are

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[17] According to the immanent view, universals wholly exist in the space-time realm, in each of the particulars which instantiate them (they exist *in rebus*). In contrast, according to the transcendent view, universals (or 'Platonic forms') exist in a realm of being outside of space of time (they exist *ante rem*).

universals, then all objects that exemplify, say, a particular determinate shade of red may be said to share an *identical* property; the very *same* property is exemplified by all of those objects. On this view, a property is an entity that can spread itself across many concrete particulars. In contrast, according to trope theory, each instance of a property is *distinct*; properties are nonrepeatables. This means that each property instance is itself a particular, although since property instances cannot exist apart from their possessors, they must be classed as abstract particulars. On the trope view, then, the claim that a group of distinct objects share the same determinate property should, strictly speaking, be understood as the claim that those objects possess different property instances which resemble exactly.

Which view of properties should the pandispositionalist favour? One way of choosing between these alternatives is to consider which of these views offers the best resources for accommodating certain facts about irreducible dispositions. The facts about dispositions I will focus on are facts about the *directedness* of dispositions, *intrinsicality* of many (if not all) dispositions, and the related fact that an instance of a disposition may *exist unmanifested*. At first glance, these facts can appear to be at odds with each other, but with universals in play, one can, I argue, accommodate these facts in a coherent and transparent way. In contrast, it is less clear that a trope pandispositionalist is able to do so in a satisfactory way.

2.3) Three facts about irreducible dispositionality

Directedness

Firstly, as we have seen already, it is a fact about dispositions that they are in some sense connected with, or 'directed towards', that which they are dispositions for, i.e. their manifestation property. This is a key fact, for it is in virtue of such directedness that the identity of a disposition is fixed. To know the nature of charge, for example, is to know what outcomes being charged is orientated towards.

Intrinsicality

The second important fact about dispositions is that, intuitively, disposition instances may be intrinsic to their possessors. Defining the term 'intrinsic' in a precise way is no easy matter (see, for example, Langton and Lewis (1998)). However, a rough-and-ready definition capturing our main intuition about intrinsicness is all we need for current purposes. Our main intuition seems to be that a property *P* is an intrinsic property of *x* if and only if *x*'s having *P* is independent of the existence of wholly distinct entities and *x*'s relation to them. Do any dispositional properties satisfy this definition? It seems that they do. The negative charge possessed by, say, an electron, is surely a feature that it has independently of the situation external to the electron. If a particle is negatively charged, it would remain charged even if put in very different circumstances (unless, of course, the particle itself was changed in some way). That is not to say that the charge would ever have to be manifested in that alternative situation, however.

It should be pointed out that some philosophers argue that some typical dispositions are not *in*trinsic, but *ex*trinsic. McKitrick (2003), for example, cites weight as one such example. If a person is moved from one planet to another, her weight may change, even if the person herself remains qualitatively identical. This suggests that the dispositional property of having a certain weight is an extrinsic one. It seems clear enough, however, that not all dispositional properties are of this kind. When we come to *explain* why a person's weight would be different if she lived on a different planet, we inevitably appeal to properties that do seem to be intrinsic. To understand weight, for example, is to understand that weight is a function of the person's *mass* and of the magnitude of the gravitational field generated by the planet's *mass*. In contrast to weight, mass is plausibly an intrinsic dispositional property; no matter where a massive object, such as a planet, is located, it will have the same set of gravitational abilities. As Molnar puts it, '[S]uch is the resilience of the intrinsic' (2003: 107).

Given that weight can be explained by the mass that a person along with her local gravitational field, one may suspect that having a certain weight is really no addition of being, and that such a 'property' may be explained away. This is Molnar's suspicion (2003: 108-110), but McKitrick (2003) has a number of responses to this line of argument. This debate need not concern us, however. The important point is that at least some dispositions are wholly intrinsic to their possessors.

Existence unmanifested.

The third fact about dispositionality to be considered, which is related to intrinsicality, is that an instance of a disposition may exist even if it is never manifested. This point was mentioned in the last chapter and it is one which is central to the realist view about irreducible dispositions. According to pandispositionalism, dispositions are properties in their own right and they may be present even if they are not being displayed; whilst the manifestation of disposition is potential only, the disposition itself is *actual*. Given that this is so, the fragility of a vase, for example, would be ascribable to it even if the vase is never broken.

2.4) The challenge of accommodating the three facts

There is, I suggest, a *prima facie* tension between these three facts. Specifically, there is tension between the first fact, about directedness, and both the second and third facts, which concern intrinsicality and existence unmanifested. This tension is revealed as soon as we consider how we might go about accounting for the directedness of irreducible dispositions.

U.T. Place once remarked that when we cash out the directedness of a disposition '... we are characterizing it in terms of its 'relation' to something...' (1999: 226). This quote suggests an obvious way of accounting for the connection between a disposition and that which it is a disposition for; perhaps the directedness of a disposition to its manifestation is rooted in a

genuine relation. This seems the obvious way to go; when we say, for example, that the thigh bone is connected to the knee bone, what we ultimately mean is that the thigh bone bears a certain relation to the knee bone.

The first problem with this idea, however, is that since the nature of an irreducible disposition consists in *nothing more* than directedness, disposition instances would become purely relational features of the world. This result is at odds with our second fact, that many disposition instances are intrinsic (i.e. monadic). If we take dispositions to be purely relational entities it seems, at first glance, that the intrinsicality fact is compromised. If, on the other hand, the relational account of directedness is rejected, so that the intrinsicality fact may be preserved, we are left in the dark with regard to what dispositional directedness consists in.

The second problem is that the 'relational' view of directedness also seems at odds with the third fact, that a disposition may exist unmanifested. This is a worry that Place is well aware of. It is noticeable in the quote above that Place uses inverted commas when speaking of there being a 'relation' between a disposition and that which it is a disposition for. This suggests he holds some scepticism about the idea, and his reason for holding such scepticism is that it seems to compromise our third fact, that an instance of a disposition instance may exist even though its manifestation never does. The reason is that, intuitively, in order for a relation to exist, its relata must also exist. But in the case of unmanifested dispositions, one of the relata is missing, since the manifestation towards which the disposition is orientated does not exist. This is what some have called the Meinongian objection (see, for example, Armstrong, 1997: 79)[18]. If fact three is upheld, the relational account of directedness is in trouble, unless one is prepared to take the radical step of accepting relations which lack relata. Alternatively, one can of course simply reject the relational view of directedness, but then we are once again left

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[18] This objection is so-called because, famously, in a debate with Russell about reference, Meinong (1904) appeared to advocate the reification of non-existent entities.

in the dark with regard to what dispositional directedness consists in.

In sum, then, the challenge the pandispositionalist is left with is to provide a theory about dispositions which can account for the directedness of dispositions in an intelligible way whilst at the same time preserving the fact many dispositions may be instantiated by their possessors intrinsically and may exist unmanifested. I will now argue that if the pandispositionalist views properties as universals, this challenge can be straightforwardly met.

2.5) Universals to the rescue

With universals in play, one has the option of cashing out the directedness of dispositions in a relational way, by appealing to *second order* manifestation relations holding between a disposition universal and the universal corresponding to its manifestation[19]. If one is a pandispositionalist, such a relation must be seen to constitute, at least in part, the nature of the universals related. This means the relation must be internal in some sense[20]. If such a relation were not internal, but rather external, then properties would only have their dispositional characteristics contingently. Such a view would then leave us with a view close to that of Armstrong (1983)[21], which is clearly not a dispositionalist view. Now, with second order internal 'manifestation' relations in play, the pandispositionalist is able to preserve the intuition, mentioned earlier, that when we speak of there being some connection between a

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[19] This kind of view has been suggested both by Bird (2007*a*) and Mumford (2004).

[20] The sense in which such a relation may be said to be internal will be addressed in detail in the next chapter.

[21] Armstrong, to recall, calls the contingent second-order relations that bestow dispositional characteristics upon properties relations of nomological necessity, or 'N' relations (see 1997, ch 15 &16).

disposition and its manifestation property, we mean that they are related in a certain way. But how, on this picture, can facts about intrinsicality and existence unmanifested be satisfactorily accommodated?

Once directedness is viewed in terms of relations amongst universals, the following moves become available. With respect to our second fact, that many disposition instances are had intrinsically, the universals theorist may point out that the internal relations which determine a disposition's nature exist merely at the *second order* level of universals. This should not be confused with the first order level at which a disposition is instantiated by a particular. Crucially, a particular may instantiate a property intrinsically, even though the property kind is relationally constituted at the second-order level of universals[22]. In other words, although disposition instances at the first-order level may be said to be intrinsic to their possessors, the connection between that disposition and its manifestation property is nevertheless maintained due to the relations at the second-order level of universals.

What about the third fact concerning dispositions which exist unmanifested? Likewise, with universals in play, one can accommodate this fact without losing the connectedness that a disposition has with that which is its manifestation. Whilst the manifestation of a disposition *instance* possessed by a particular need never come into existence, the manifestation *type* may nevertheless exist at the level of universals. In other words, dispositions are not directed towards *particular* (possibly non-existent) manifestations but, rather, *kinds* of manifestation. Ellis was arguably the first to emphasise the importance of this point[23]. It gets around the Meinongian problem because, if like Ellis, one holds an immanent theory of universals, the generic kind towards which a powerful property is directed will automatically exist 'if

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[22] Bird (2007*a*: 141) also emphasizes the importance in this context of clearly distinguishing the second-order level of property universals with the first-order level of particulars.

[23] Mumford also explores this way of responding to the Meinongian objection (2004: 11.7)

something, somewhere, at some time, has an effect of this generic kind' (2001: 133). And if one holds a transcendent view of universals, then the existence of the kind towards which a property is directed is automatically guaranteed, because transcendent universals are plausibly necessary existents (see Bird, 2007: 3.2.2).

In sum, with universals in play, the identity of a disposition can be secured without having to claim that each instance of that disposition is related to a particular manifestation which, if that disposition instance remains unmanifested, does not exist. Rather, the nature of a disposition is secured by a connection to a manifestation type which *does* exist, at the second-order level.

Now that I have outlined how the 'universals' pandispositionalist can relieve the *prima facie* tension that arises with respect to the three facts, whilst at the same time explaining the directedness of dispositions (in terms of second-order internal relations), I will now see whether the trope pandispositionalist can do the same. I will argue that they cannot do so in a way that is satisfactory.

2.6) Heil's trope account

In contrast to pandispositionalists who adhere to a universals view, if one is a trope theorist, the claim that all dispositions are (at least in part) relationally constituted is rather hard to swallow. Unlike the universals theorist, the trope theorist is unable to make a distinction between property instances and property universals; for the trope theorist, there are only distinct property *instances*. Therefore, the relational constitution claim would, on a trope view, amount to the claim that all disposition *instances* are relationally constituted, and this seems to leave no room for ascribing dispositions to particulars which are purely intrinsic to them.

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Heil, as a pandispositionalist trope theorist, rightly sees that the rejection of the intrinsicality

fact concerning disposition instances is unappealing. Aware of the danger of Meinong-type

objections, Heil suggests that '[T]he existence of a disposition (trope) does not in any way

depend on the disposition's standing in a relation to its actual or possible manifestations ...'

(2003: 83; words in brackets added for clarity). Later, Heil makes the same point in terms of

truth-making: '[T]he truth-maker for 'this key would open a lock of kind K' is not the key,

possible lock of kind K, and a relation between the key and K' (2003: 124). Rather, according

to Heil, the powers are 'built in' to the intrinsic properties themselves: '[I]f the key 'points

beyond' itself to locks of a particular sort, it does so in virtue of its intrinsic features' (2003:

124).

Is Heil's trope account satisfactory? Before suggesting why it is not, it is important to note

that, as a trope theorist, Heil fails to see an alternative picture of dispositions which can

explain directedness in terms of relations without committing to the radical picture according

to which dispositions are purely relational features of the world. This is the view already

outlined: dispositions are relationally constituted *at the level of universals*. One can

consistently hold this view and yet deny that the particulars of our world have only relational

features at the first order level. Given that the version of pandispositionalism outlined in the

last section is a theory about the nature of *universals*, one is not automatically committed to

the view that all the property *instances* are relational.

Given Heil's penchant for intrinsicality, does this mean that Heil, as a trope theorist,

compromises the directedness thesis concerning dispositions? As we saw in the quotes above,

this is something that Heil certainly does not wish to do, for he rightly sees that the

directedness thesis is at the heart of pandispositionalism. This is made clear, in particular,

when Heil claims that a powerful thing (a key, in this instance) 'points beyond' itself to its

manifestation, and is 'ready to go' (2003: 124). The problem with this is, however, that if

directedness is not cashed out in terms of relations, what account of dispositional directedness can be provided? What are the ontological grounds of this directedness? This question becomes pressing when we recall the fact that dispositions may exist unmanifested. What, precisely, does it mean to say that an object with an unmanifested disposition trope 'points beyond' itself? Without further elucidation, the 'pointing beyond' claim seems merely to be a vague metaphor.

In fact, Heil makes little attempt to offer any further account of dispositional directedness and how it is possible. Yet, such an account is I think needed. What, for example, makes a particular trope directed towards one manifestation rather than another? Simply saying that dispositional directedness is 'built in' to the intrinsic properties themselves does not shed any light on his view, for the question at hand is how, precisely, an intrinsic physical property could indeed 'point beyond' (2003: 124) itself to something that may not exist.

It is at this point that the universals account of dispositions can be seen to have a distinct advantage over Heil's trope view, for it can give the 'pointing beyond' claim ontological backing in a way that Heil's cannot. Furthermore, this deficiency is not merely peculiar to Heil's view. Martin, another trope pandispositionalist, faces the same problems. Like Heil, Martin maintains that dispositions are not relational, on the grounds that '[T]he readiness of something's disposition for all of this may fully exist although its disposition partners and mutual manifestations do not' (2008: 6). If one is a trope theorist, this does seem like the sensible conclusion to draw, but then what metaphysical account can be given of the directedness of dispositions? Again, this is not a question that Martin is able to properly address. Martin resorts to capturing directedness using an array of metaphors and gestures: he speaks of 'dispositional readiness' (2008: 23), the 'would-have-been-if' of dispositions (2008: 2), the 'what for' of dispositionality (2008: 4), the 'ready to go (2008: 2) of dispositions, and dispositional 'selectiveness' (2008:7). The result is that the precise nature of dispositional

directedness remains somewhat opaque.

2.7) Molnar's intentionality view

Unlike Martin and Heil, Molnar is one trope dispositionalist who takes more seriously the need to provide an account of the metaphysical source of dispositional directedness[24]. Molnar accepts that disposition tropes are not relational, and, following U.T. Place (1996), uses the notion of intentionality to account for the 'directedness' of power tropes (Molnar, 2003: 61)[25]. Molnar identifies four main features that most contemporary philosophers take mental intentionality to have, and then argues that each of these features are features that dispositional states, or 'powers', also have (2003: 63-66). Briefly, the four features are: i) internal reference to, or 'directedness' towards, an (intentional) object; ii) the intentional object may not exist; iii) the intentional object may be indeterminate in some respects; iv) the truth of a description of an intentional state need not be preserved under substitution of co-referring expressions.

It should be pointed out immediately that several arguments have been provided in recent philosophical literature attempting to show that Molnar's account fails on the grounds that dispositionality differs in several crucial respects from intentionality[26]. I need not rehearse

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[24] Note that, unlike Heil and Martin, Molnar is not strictly speaking a pandispositionalist. He comes pretty close, however, because he takes all but spatial properties to be irreducibly powerful (see Molnar, 2003).

[25] See also Martin & Pfeifer (1986) who suggest that intentionality as traditionally conceived is not peculiar to the mental.

[26] Bird, for example, argues that the truth of statements concerning a disposition's manifestation *is* always preserved under substitution of genuine co-referring terms (2007: 123). Furthermore, Bird questions Molnar's claim that dispositions are directed towards indeterminate manifestations, and also

those arguments here, however. Even if Molnar is correct, and dispositional directedness does have all of the features of intentionality, it remains far from clear that Molnar's account of dispositional directedness is any more transparent than that offered by Heil or Martin. To begin with, Molnar's aim is not to provide an analysis of dispositional directedness, but instead to merely point out that dispositional directedness involves the same kind of directedness as that found in the mental intentional case. This becomes clear when Molnar indicates that the concept of intentionality is, on his account, taken to be an unanalysable primitive (2003: 81). In Molnar's defense, however, one might think that he does go at least some way towards alleviating the apparent tension between dispositional directedness and the fact that, for example, disposition tropes may exist unmanifested. Perhaps Molnar's point is simply that we usually do not have any qualms about accepting directedness towards non-existent objects in the mental case, so why should we feel uneasy in the physical case? Even if, as seems to be the case, there are problems surrounding intentional directedness, these are problems we already have in philosophy and so viewing physical dispositional states as intentional states does not bring any new problems to the table.

In response, it has to be said that such a move is clearly negative and does not tackle the problems at hand so much as avoids them. The intentionality claim by itself does not, for example, settle the important question whether dispositional directedness consists in a genuine relation. Now, although Molnar's stance on this further question is at times unclear, he does in one place indicate that intentional directedness should *not* be thought to consist in a genuine relation; he writes that 'the nexus between the intentional state and the object to

suggests two further features of intentionality which dispositional directedness does not share – features which Molnar has allegedly ignored (see Bird, 2007a: 118-126). These features are the extrinsicness of intentional states, and the feature that the object of a thought is often the cause of that thought. See also Mumford (1999) for further criticisms of the intentionality account of dispositionality.

which it refers is *not that of a genuine relation*' (2003:62) A 'pseudo-relation' would therefore seem to be a better label. The problem with this concession, however, is that Molnar's account of dispositional directedness seems to be no improvement on Heil's. On either account, we are left with a picture in which disposition tropes reach out in ghostly fashion to their non-existent manifestations in a way that, it seems, can only be captured in terms of Heil's 'pointing beyond' metaphor.

A route that some trope theorists might consider taking is to reject the 'pointing beyond' metaphor, and claim that the directedness of an unmanifested trope is not rooted in facts about the trope 'pointing beyond' itself, but, rather, is rooted in facts about how that trope resembles other tropes that *have* manifested in a certain way. This move comes with a whole host of problems, however. To begin with, if facts about what a trope is a disposition *for* are not determined by the nature of the trope itself, but, rather, resemblances to extrinsic circumstances, it is hard to see what in what sense that trope may any longer be said to be in itself powerful. Further puzzling questions can also be raised about the resembling tropes which *have* manifested. What fixes *their* directedness, which is to say what fixes their identity as dispositions, prior to *them* being manifested? This strategy would, I think, create more difficulties than it solves. The directedness must, as Heil maintains, be 'built in' to the disposition tropes themselves, as mysterious as that claim is.

2.8) The immanent versus transcendent universals debate and the problem of 'alien' dispositions

So far I have argued that the trope theorist, as opposed to the universals theorist, is at a significant disadvantage when it comes to providing an illuminating account of dispositional directedness. There is, however, a further important question for the universals theorist to face: are universals best seen as transcendent or immanent? The former view is usually

associated with Plato who argues that universals, or forms, exist in a realm of being outside of space and time (the 'Platonic' realm). In contrast to Plato, Aristotle denied the existence of a transcendent realm, and claimed that universals wholly exist in the space-time realm, in the particulars which instantiate them.

Unfortunately, I will not be able to settle the immanent versus transcendent universals debate here. Doing so would take me too far away from the core aims of the thesis. However, it will be worthwhile to conclude this chapter by identifying some of the key of issues upon which the immanent versus transcendent universals debate may rest in the context of pandispositionalism.

A key problem facing the *immanent* universals version of pandispositionalism is as follows. If the identity of a disposition universal is secured in virtue of a second-order (internal) relation to a certain manifestation property, then that manifestation property must exist. As we saw earlier, it seems a plausible metaphysical principle that a relation cannot exist in the absence of one or more of its relata. However, if universals exist only in the space time realm, as the immanent theorist maintains, then in order for a power's identity to be secured, there must be at least one place and time at which the manifestation property is instantiated by some particular. The implication of this seems to be that it is impossible for there to be a genuine disposition whose manifestation property never happens to be instantiated somewhere and somewhen. In other words, there can be no such thing as a disposition in this world which is directed towards an 'alien' property.

Many find this counterintuitive. Martin, for example, thinks it is perfectly coherent to entertain the possibility 'that there are kinds of elementary particles in some spatio-temporal region of the universe such that they are different from the kinds of elementary particles of our own region' and that this region is 'so vastly distant that the very many special

dispositions they have for intercourse with one another *never* have their very special manifestations...' (1996: 74). Most obviously, such a case can be accommodated by the 'universals' pandispositionalist by accepting universals in the transcendent sense. By doing this, it seems the pandispositionalist can accept that the manifestation properties of Martin's distant dispositions exist, thereby securing the identity of those dispositions, even though they are not instanced in the space-time realm[27]. On the other hand, if one sides with the immanent universals view, it is less clear how the apparent possibility of Martin's scenario can be accommodated unless dispositions are thought to secure their identity by being directed towards something which does not exist. This 'Meinongian' position is, as we have seen, the kind of view that trope dispositionalists must hold and one that is unattractive.

So, can the 'transcendent' pandispositionalists declare victory on these grounds? Not necessarily. There seem to be several responses available to the immanent universals theorist. One option for the immanent dispositionalists would be to dig their heels in, and highlight that it is simply a consequence of their view that the world described by Martin is impossible, and that to maintain otherwise is to beg the question against their position. On their view, the identity of a disposition universal is secured by its second order (internal) relation to a further *immanent* manifestation universal. If the manifestation universal is never instantiated then it does not exist, on their view, and so there is no question of the dispositions posited by Martin existing.

Whilst the former response is an option, there may be less radical responses available which do not involve denying the possibility of the dispositions posited by Martin in his imaginary case. I will mention one strategy which is employed by Armstrong, who is also vulnerable to the kind of objection outlined. Although Armstrong does not accept irreducible dispositionality, he does account for dispositional truths in terms of laws which, on his

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[27] This, incidentally, is how Bird is inclined to respond to the kind of problem at hand (2007: 51-55)

account, consist in contingent second order 'natural necessitation' relations amongst (categorical) property universals (see his 1983 & 1997). Since he holds an *immanent* theory of universals, in order for these second-order states of affairs (i.e. laws) to exist, they must be instanced somewhere and somewhen. But given that this is so, Martin's thought experiment appears to present a problem. Given that Martin's isolated particles have never actually interacted with particles on our side of the universe, then, on Armstrong's account, it seems as though laws governing such interactions do not exist. This strikes Martin as a problem.

In one place, Armstrong attempts to minimalise the discomfort created by Martin's argument by claiming that, plausibly, we will probably never actually come across a situation in which there are simply no facts about how a certain entity *would* behave in certain circumstances. Armstrong's response is based on the thought that, according to physics, fundamental physical properties are quantitative and 'will be governed for the most part by functional laws' (1996: 103). As long as at least one instance of a functional law exists somewhere and somewhen, that law will exist and provide the truthmakers for facts about how objects with each and every *determinate* value of the property in question would behave, even if objects with many of these determinate properties never exist or never interact with anything else. Of course, it is still a requirement that at least one instance of each functional law exists somewhere and somewhen, but the world does not have to be 'all that busy' (1996:103) for this to be the case.

What precisely is a functional law supposed to be? On Armstrong's account, functional laws involve a nomic relation between determin*able* quantities, rather than determin*ate* quantities, with those determinables considered as universals. Examples of such generic universals are those corresponding to mass and charge, for example. Of course, the pandispositionalist will not accept, as Armstrong does, contingent nomic relations amongst universals, although it seems a similar account of functional laws could be provided. Functional laws could be

grounded in the second-order relations amongst determinable universals, but given the dispositional nature of such universals, such relations would hold *internally*, in a sense to be cashed out in the following chapter. Unfortunately, the question whether the existence of determinable property universals should ultimately be accepted by the pandispositionalist is not one I will consider further here. However, if the pandispositionalist does opt for an immanent universals theory, accepting the existence of determinable universals may bring the advantage just outlined.

2.9) Some comments regarding transcendent disposition universals

If the transcendent panidispositionalists are to win the debate with the immanent dispositionalists, then some important questions must be answered, in addition to those which Platonists have traditionally had to face[28]. One of the key principles lying behind pandispositionalism is the Eleatic principle. Armstrong formulates the principle as: '[E]verything that exists makes a difference to the causal powers of something' (1997:41). According to this principle, therefore, the existence of an entity should only be accepted if it 'makes a difference to the causal powers of something'.

Now, can transcendental universals be said to pass this Eleatic reality test? If universals do not exist in the concrete, spatiotemporal realm, how can they be causally powerful? Of course, property *instances* bestow powers upon things in our world, but the transcendent universals upon which they depend seem to exist in what seems to be a causally isolated, abstract realm.

Certain responses to this challenge do suggest themselves. I will conclude by outlining a possible line of response by Bird, who leans towards a transcendent universals version of

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[28] Such traditional questions include: how can *physical* properties somehow exist in a non-physical realm? What is the nature of the relation between a transcendent universal and its concrete instances?

pandispositionalism (see 2007: 3.2.2 for Bird's full discussion on this issue). Since transcendental universals are abstract rather than concrete, then they plausibly exist necessarily[29]. But, Bird's response goes, the Eleatic reality test is designed to apply only to contingent entities, and so transcendent universals are immune to the Eleatic test. As long as the concrete instances of the property universal bestow power, the Eleatic principle is not compromised by the existence of transcendent universals. But why, exactly, should one think that the Eleatic principle applies only to contingent beings? Bird's answer is that the 'makes a difference' clause, which figures in the formulation of the Eleatic principle above, simply cannot apply to necessary beings. The reason is that in evaluating the difference that an entity makes, one must draw '...a comparison between having the entity and not having the entity, and that comparison makes no sense with respect to necessary beings.' (2007: 54-55)

The necessity claim regarding transcendent universals may therefore help the Platonist pandispositionalist get around the Eleatic problem. Whether proponents of the Eleatic test could modify it in a plausible way such that it also applies to necessary existents is a question I will leave open.

2.10) Summary

In this chapter I have argued that if one is a pandispositionalist, one has special reasons for viewing properties as universals. More precisely, they will be universals which are, at least in part, relationally constituted. I have argued for this on the grounds that with universals in play, the pandispositionalist can satisfactorily account for the directedness of dispositions whilst at the same time respecting the fact that disposition instances are often intrinsic to their possessors and may exist even if their particular manifestations never come about. In contrast,

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[29] This kind of claim is typically made by those who argue that, for example, sets and numbers are abstract entities (e.g. Lowe, 1996)

it seems unlikely that a trope pandispositionalist is able to simultaneously account for these all these facts in an adequate way.

Now that I have argued that trope versions of pandispositionalism are at a significant disadvantage as compared with the universals account, I will in the next chapter begin to explore the details of a plausible 'universals' version of pandispositionalism (in both its 'two-sided' and dispositional monist forms). In particular, I will focus on questions concerning the nature of the second-order internal relations which, on the 'universals' view, account for the directedness (and so identity) of dispositions. Note that, from now on, when I speak of dispositional monism and the two-sided view, I will be referring to the versions of those views which take properties to be universals rather than (sets of) tropes.

Chapter Three: The Relational Structure of Property Universals

3.1) Introduction

During the last chapter, I argued that irreducibly dispositional properties are best seen as universals rather than (sets of) tropes. The trope pandispositionalist, I argued, has difficulty in providing an adequate account of the directedness (and so identity) of instances of unmanifested dispositions. If one has universals in play, however, one can give an account of dispositional directedness in terms of second-order internal relations between universals. Such relations have been labelled second-order 'manifestation' relations by Bird (2007:139).

In this chapter, I will begin by exploring what it means to say that a relation is internal. We will see that there may be more than one sense in which a relation can be internal. It will then be suggested that the sense of internality appropriate to the 'two-sided' version of pandispositionalism is slightly different to that appropriate to dispositional monism.

Following my discussion of the internality of relations amongst dispositional universals, I will identify some of the features that a relational network of dispositional universals will have, focusing in particular on relational structures of *fundamental* dispositional universals. In doing this, I will draw upon the recent work of Bird, in which he appeals to graph theory. Whilst I will, for the most part, be in agreement with the features that Bird claims to be essential to relational networks of fundamental powers, I will argue for certain modifications.

3.2) How must the internality of power universals be understood?

Famously, the notion of an internal relation, and the extent to which the world contains such relations, was strongly debated by British philosophers during the early part of the 20th

century. Bradley, a British idealist, says of an internal relation that it '... must at both ends *affect*, and pass into, the being of its terms.' (1893: 364). Joachim, another British idealist passes an equally elaborate comment when he writes that internal relations 'qualify or modify or make a difference to the terms between which they hold', (1906: 12). Importantly the British idealists held that all relations were in fact internal, but for my purposes this is not a question that needs to be considered. Our concern, rather, is merely to unpack the kinds of assertions that are commonly made with respect to relations that are internal.

Russell tries to sum up what is common to all accounts of internal relations with the claim that internal relations (i.e. *all* relations, according to the British idealists), are 'grounded in the natures of the related terms' (1910: 160). This expression is itself somewhat vague, however, and Russell confesses to be uncertain precisely how the expression 'natures of the related terms' is best understood in this context. In discussing this issue, Moore offers two possible interpretations: either internal relations are grounded merely in the numerical identity of the terms themselves, or, more specifically, they are grounded in the 'qualities' the terms have, independently of their 'relational properties' (1919; 62). The crucial difference seems to be that, on the second view, essential reference is made to the intrinsic, qualitative natures of the things internally related, whereas on the first interpretation, internal relations are said merely to make a numerical difference to the terms related.

In fact, Moore thinks that, generally, those who speak of internal relations understand them in the second, stronger sense. However, one could commit to the view that internal relations make a difference to the numerical identity of its terms, without committing to the further claim that internal relations are grounded in the intrinsic qualities of its terms. Moore defines internal relations in the first, weaker sense in the following way: 'The assertion with regard to a particular term A and a particular relational property ϕ, which A actually has, that ϕ is internal to A means then: $(x) \neg \phi x$. entails . $x \neq A$' (1919: 54). In English, this states that if

some object does not bear relational property φ, then that object cannot be identical to A (given that φ is internal to A). This claim is also logically equivalent to the claim that if x is identical to A, then x must bear relational property φ (given that φ is internal to A), i.e.: $(x) x = A$. entails . $φx$ (1919:54).

The question relevant for us is: is this the kind of feature that the pandispositionalists require second-order manifestations to have? The answer is 'yes'. It follows from Moore's definitions that A could not exist in any possible world without bearing relational property φ (given that φ is internal to A). In other words, A bears relational property φ *necessarily*. This is, in fact, precisely the kind of claim that the pandispositionalists must endorse with respect to dispositional universals. If the pandispositionalists were to deny that second-order manifestation relations between universals hold necessarily, thereby accepting contingency, they would ultimately be committing to the claim that properties are in and of themselves categorical. This is because, on such a view, if a certain property were to bring any power at all to a world, it would do so only because a certain contingent relation (or relations) between universals happened to hold. The properties *themselves* would not be essentially or irreducibly dispositional. Clearly, if one held this view, one could no longer be claim to be a pandispositionalist. Rather, one would have a view closer to that of Armstrong (1983), mentioned in earlier chapters.

So, at the very least, the pandispositionalists must clearly accept the internality of (second-order) manifestation relations in the weaker sense defined by Moore above. Recall, however, that a stronger sense of internality was also outlined. On the stronger view, a relation is said to be internal if it is grounded in the intrinsic 'qualities' of its terms. In other words, if A bears relational property φ, and φ is internal in this sense, then if some object x does not bear φ, then not only is x not identical to A, but x must be qualitatively different to A. An important question, then, is this: are the second-order manifestation relations posited by the

pandispositionalists internal in this stronger sense? In order to answer this question, one must ask whether it really makes sense for a pandispositionalists to speak of universals being *qualitative*. As was briefly indicated earlier, on one version of pandispositionalism it does seem to make sense to speak in this way, whereas on the other main version, it does not.

In chapter one I distinguished two forms of pandispositionalism: dispositional monism and the two-sided view. According to dispositional monism, the natures of all properties are *exhausted* by their dispositional characteristics, which would mean on the universals view under consideration that they are exhausted by their second-order manifestation relations. Thus, on this view, property universals are *wholly* relationally constituted, and so such universals can have no 'qualities' which ground second-order manifestation relations[30]. Therefore, if one advocates dispositional monism, second-order manifestations can only be internal in the weaker sense defined by Moore, which does not make reference to the qualities of the terms that are internally related.

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[30] The coherence of the thought that an entity may be wholly relationally constituted has been questioned by, for example, Heil (see 2003: 102-105, where Heil discusses Dipert's relationalist view about particulars (1997), which is the analogue of the dispositional monists' view about properties). Roughly, the objection is that if the 'relata' have no intrinsic features, then there is ultimately nothing there for the relations to relate, and so the picture collapses into nothingness. If this objection is fair, then this suggests the two-sided version of pandispositionalism is superior to dispositional monism. It should be noted, however, that many philosophers argue, against Heil, that it is perfectly coherent to posit relata that have no features other than the relations they enter in to. In order to avoid losing the relata, there merely has to be a *mutual* ontological dependence between the relata and relations; relata do not exist independently of their relations, and the relations do not exist independently of their relata. This is the kind of view maintained by moderate structural realists; for further discussion of this position see Esfeld and Lam (2008).

The case seems somewhat different with respect to the two-sided version of pandispositionalism, however. It is at this point that the difference between the two-sided view and dispositional monism can once again clearly be seen. According to the two-sided view, all properties have both an irreducibly dispositional aspect and a categorical (or 'qualitative') aspect. According to the view advocated in chapter two, the dispositional characteristics associated with properties are best understood as being rooted in second-order 'manifestation' relations amongst property universals. But what about the 'qualitative' aspect that the two-sided theorists speak of? Unlike dispositional characteristics, these need not be rooted in relations amongst universals; unlike dispositionality, qualitativity does not involve directedness towards other properties.

Therefore, if one is a two-sided theorist, sense can be made of the thought that there is a qualitative aspect to properties which may in some sense ground the internal relations between universals. In order for there to be such grounding, it would have to be the case that if a certain universal bears a certain internal relation (internal in the strong sense under consideration), then if a universal does not bear such a relation, it must have a different qualitative side to the universal in question. In other words, there must be a necessary connection between a property's dispositional characteristics and its qualitative aspects.

It should be highlighted at this point that, contrary to this suggestion, Martin left open the possibility that the dispositional aspects and categorical aspects of a property may be merely contingently related (1996: 87). If they were contingently related, then manifestation relations would clearly not be internal in the sense under consideration. Martin's allowance of contingency has been heavily criticised, however. As Mumford highlights when discussing Armstrong's dislike of the two-sided view (2007: 85), if the categorical aspects and the dispositional aspects of the world really could exist apart, then the Martin-type position would

look more like a version of property dualism[31], in which case it would no longer be a version of pandispositionalism. To avoid this problem, the two-sided pandispositionalist has to consider second-order manifestation relations to be internal in the stronger sense outlined by Moore; qualitative aspects and dispositional characteristics must be seen to be necessarily related[32]. Not only would some universal x fail to be identical to universal A by lacking a certain manifestation relation that A bears, but if it did lack such a relation, then, necessarily, x would bear a different qualitative aspect.

In sum, since property universals must, on the dispositional monist picture, be *wholly* relationally constituted, the manifestation relations that play this constituting role must be internal in the weaker sense defined by Moore. In contrast, since, on the two-sided picture, property universals have a qualitative aspect and so are not wholly relationally constituted, manifestation relations can be seen to be internal according to the stronger definition which makes essential reference to the 'qualities' of the terms which are internally related.

3.3) Internality and the 'ontological free lunch'

A further way of expressing the difference between the two sided and dispositional monist versions of pandispositionalism is as follows. Armstrong has often characterised internal relations as 'ontological free lunches' in the sense that once the relata, with all their intrinsic features, exist, the relations are automatically there: they supervene upon their relata and so are 'no addition of being' (1997: 12). An example of an ontological free lunch in this context is the resemblance relation: given the intrinsic natures of two objects, the nature of their resemblance is automatically fixed. It can now be seen, however, that speaking of second-

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[31] Place (1996) and Prior (1985) are two prominent figures who hold there to be both categorical and dispositional properties.

[32] As we also saw in chapter one, this appears to be Weissman's view (1978)

order manifestation relations as 'ontological free lunches' would be more appropriate in the case of the two-sided view than the dispositional monist view. If, as the dispositional monist maintains, second-order manifestation relations are what *wholly* constitute the nature of property universals, it would seem somewhat inappropriate to class them as 'ontological free lunches'. One can hardly say that such relations supervene upon the prior nature of the universals, because they simply have no prior nature[33]. On the dispositional monist picture, therefore, internal second-order manifestation relations are quite different to many kinds of internal relation that philosophers speak of, such as the resemblance relation. Unlike the dispositional monists' internal manifestation relations, it would appear strange to claim the resemblance relations an entity bears to others *constitute* the entity in question. All of this suggests that when Armstrong speaks of internal relations as 'ontological free lunches', he has in mind those relations which satisfy the stronger definition of internality, discussed by Moore, which makes essential reference to the 'qualities' of the related terms.

3.4) Bird's powers graphs

In *Nature's Metaphysics: Laws and Properties* (2007), Bird appeals to graph theory in order to represent the relational structure of the fundamental dispositional or 'power' universals. A similar project had been undertaken in an influential paper by Dipert (1997), in which he uses graph theory to represent relations amongst first-order *particulars*. Such graphs are an important tool for the metaphysician, according to Dipert, because, he suggests, an adequate description of reality need only appeal to relations. This is a view he calls 'exclusive relationalism' (1997: 337). On this view relations are basic, whilst monadic, i.e. one-place properties, are merely derivative phenomena. Thus, the world is ultimately a large holistic structure, and such structures are best represented as a graph. In such graphs, the concrete

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[33] This point has been emphasised by Barker in a recent discussion of dispositional monism (2009).

entities of the world '... are individuated (and hence contemplated) solely by their graph theoretic structural features' (1997: 329).

The details of Dipert's view need not concern us; the important point for my purposes is that the version of pandispositionalism we are exploring will be the second-order analogue of Dipert's relationalism. That is, the dispositional characteristics of the pandispositionalists' universals (i.e. properties) will be determined purely by the relations in which they stand or, in other words, their position within the holistic property network. It is thus not hard to see why Dipert-type graphs are a useful tool for those wishing to represent this network. This is especially so for the dispositional monist who, to recall, claims there is nothing more to a property than its dispositional characteristics, which is to say nothing more than its relational features. Thus, like Dipert's particulars, the dispositional monist's universals will be individuated *solely* by their place within the holistic property network. It is important to not confuse Dipert's view with dispositional monism, however. One could be a dispositional monist and yet coherently reject Dipert's suggestion that concrete particulars fundamentally have only relational features. Indeed, in the last chapter I discussed some reasons for thinking that at least some disposition *instances* are intrinsic to their possessors (again, see Molnar (2003: 107)).

Note that the two-sided version of pandispositionalism bears less resemblance to Dipert's radical relationalism, for it allows that properties have a non-relational, qualitative aspect. Nevertheless, the graph theoretic framework I will now introduce will also be invaluable to the two-sided theorist, as it provides a means of representing the way in which properties are related in virtue of having a dispositional 'side'.

Now, the graphs that Dipert uses involve black dots called 'nodes'. These dots represent the relata (whatever they may be), and the relations in which they stand – which, on Dipert's

view, are the only features they have – are represented by lines connecting the nodes, which are called 'edges'. In the power universals case, the nodes will represent the universals, whilst the lines connecting the nodes will represent the internal manifestation relations. As Bird acknowledges, however, an important modification is required in the disposition universals case. The relations in Dipert's graph are all symmetrical, but manifestation relations are plausibly not symmetrical: usually, if not invariably, if B is the manifestation property for A, then A is not the manifestation of B. For example, the manifestation of flammability is combustion, but it would be very odd to say that combustion is manifested in flammability. Rather, the manifestation of combustion consists in something further, e.g. heat, brightness, and destruction.

This means that the relations in a power graph need a direction. This feature of manifestation relations may be straightforwardly represented by attaching arrows to each relation, with the arrow pointing away from one property and towards the property which is its manifestation property. Graph-theoretic relations which are directed (rather than symmetrical) are known as 'arcs' (rather than edges). We are now in a position to see how a very simple power graph would look:

Figure 3.1

This simple graph involves one node being directed towards a distinct node, and therefore represents a power which has a different property as its manifestation. However, Bird also allows the possibility of reflexive manifestation relations, i.e. manifestation relations that are directed back towards the node involved. According to Bird, such relations should be accepted in order to accommodate powers whose manifestations are further instances of that same power, i.e. powers that manifest more of the same. Given that there appear to be actual

examples of such powers, this allowance seems reasonable. An example of a reflexive power provided by Bird is that of magnetism; the state of being magnetic, instantiated in a piece of iron, say, 'may manifest itself by inducing a state of being magnetic in some other piece of iron' (Bird, 2007:141). Other examples of such powers are also mentioned by Mumford (2009). The manifestation of the state of being hot, for example, may simply consist in the passing on of heat to a further particular. The obvious way to represent a reflexive manifestation relation in a power graph is to use a loop which intersects the node concerned (see Bird, 2007: 141-142), as is illustrated in the following:
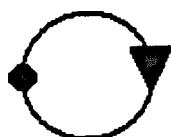
Figure 3.2

3.5) The first power graph constraint: asymmetry

In order for a graph to successfully represent what a possible world could be like in terms of the property structure (or 'power structure') that obtains, certain constraints must plausibly be in place. Not any graph whatsoever can represent a genuinely possible power structure. In particular, I will follow Bird in considering what features structures of *fundamental* powers would have to be like. By 'fundamental', I mean those powers which physicists aim to investigate and which will figure in the laws of our complete physical theory[34]. Since we would not expect such laws to mention the property of fragility, for example, we may take that to be a non-fundamental property.

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[34] We might also expect that the fundamental dispositions will be those which in some sense explain all other dispositions.

In his recent book, Bird has put forward four such constraints. I will now discuss each one in turn. During this and the two chapters to follow, I will offer arguments in favour of these constraints, apart from the fourth 'stimulus' constraint which I believe requires modification. This modification will, in chapter five, lead to further constraints on the graph-theoretic framework.

The first constraint I will discuss is one which I will call the *identity* constraint. This constraint states, roughly, that *no* power structure (graph) must be symmetrical as a whole, which is to say that it must be *a*symmetrical. To be symmetrical is to be such that rotating the structure in some way will result in a mapping of some nodes onto others *whilst preserving the appearance of the overall structure*. A mapping of this kind is known in graph theory as a non-trivial automorphism. Thus, the asymmetry constraint may be captured by saying that no power graph should be such that a non-trivial automorphism is possible.

3.6) Responding to the Lowe-type regress objection

Why, then, must a power graph not be susceptible to non-trivial automorphisms? To understand Bird's reason for putting this constraint forward, we must recall that Bird is a pandispositionalist of a *dispositional monist* persuasion. In other words, he holds that there is no categorical aspect to any property and that, therefore, the nature of a property (i.e. a universal) is exhausted by its internal relations to other properties. Recall from chapter one, however, that opponents of this form of pandispositionalism take it to be vulnerable to a variety of regress objections. I have already discussed in chapter one the Armstrong-type regress objection which asserts that if the manifestation of a power is nothing but a further power, and the manifestation of this further power is nothing but a further power etc., then nothing concrete ever gets manifested. When discussing this objection, I suggested reasons for supposing that the objection is unfair. There is another, more challenging, version of the

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regress objection, however, and it is this objection that the asymmetry constraint is, in part, designed to assuage. The objection is most obviously one that is put forward by Lowe (2006: 138), but it is also attributed by Bird to Robinson (1982: 114-15). The objection is framed in terms of property identity and runs as follows.

According to dispositional monism, the nature of a property is wholly determined by its dispositional characteristics, and, as we have also seen, the identity of a disposition is fixed by that which it is a disposition for, i.e. what its manifestation property is. But then if this further manifestation property is equally dispositional, as the dispositional monist maintains, then its identity must also be fixed by its orientation towards a further manifestation. The worry here, some claim, is that if the identity of each and every property is dependent on something further, then, ultimately, no property ever gets its identity fixed. In other words, there is no ultimate way of distinguishing each property from any other, on this view. Lowe explains this objection by saying that, on this view, '... each property owes its identity to another, which, in turn owes its identity to another – and so on, in a way that very plausibly, generates either a vicious infinite regress or a vicious circle' (2006: 138).

Is this objection successful? At this point, it is worth discussing Dipert's radically relationalist view once again, for it seems that he did not think the individuation of purely relational particulars would be a problem. According to Dipert, there is nothing wrong with simply individuating concrete entities by the relations they bear to other things. And these further things will themselves be individuated by the relations they bear to other things. In other words, on his relational view, it is claimed each entity is distinguishable from every other purely by occupying a unique relational position in the overall holistic structure. But is this possible? Dipert argues it is. As long as the overall relational structure of particulars is not symmetrical, i.e. not susceptible to non-trivial automorphisms, each particular will occupy a position (relationally speaking) that is unique. Might this kind of response be open to

dispositional monists, who occupy the second-order analogue of Dipert's relationalist position? It seems such a response is available, which is why Bird introduces the *asymmetry* constraint. The dispositional monist may, it seems, respond by pointing out that as long as no two powers in a structure have identical relational features, they can clearly be distinguished from one another. Lowe is of course right that there is a sense in which the dispositional monists' picture is regressive, for the nature of each property is always dependent upon a further property. Thus, a property network must either be circular or infinitely large. Crucially, however, not all regressions or circles are vicious, as is well known. In the current case, in order for the identity of all the powers at a world is to be determinate, the overall structure of powers merely has to be asymmetric. As long as one considers the relational position of a property in the structure *as an asymmetric whole*, rather than, say, a symmetrical *part* of the structure, there seems no obstacle to distinguishing each power from every other.

An important question remains, however. The possibility of property individuation, according to the dispositional monist response outlined, trades on power structures being asymmetric. But is it not conceivable that a power structure as a whole could be symmetrical, thereby involving powers that could never be individuated? Even if there are reasons to suppose that the fundamental power structure of the actual world is asymmetric, the mere possibility of symmetrical power structures would be embarrassing, for the Lowe-type objection would bite in worlds instantiating such structures. Even if we do happen to escape the Lowe-type objection in this world, it would only be through luck, it seems.

In response, I believe the dispositional monists should deny that worlds with symmetric power structures are metaphysically possible. Given that the nature of a pure power is exhausted by its manifestation relations, there can be no question of a power graph representing two distinct powers which share all the same relational features. This is because if the 'two' powers did bear the same relational features, then the dispositional monist would

have no reason at all to think of 'them' as being distinct powers, rather than being the very same power. In other words, a power graph which appeared symmetric would, so to speak, collapse into an asymmetric one[35]. Thus, asymmetry of structure must be seen as an *a priori* restriction on what a world of pure powers must be like[36].

In sum, then, Bird's asymmetry constraint must not merely be seen as an expression of what the property structure of the world would be like if, luckily, property individuation was possible. Rather, the asymmetry constraint must be one that applies *necessarily* to power structures. Curiously, although this point is important, it not one that Bird makes explicit (for example, during his discussion of asymmetry (2007: 145), he does not raise the question under consideration). I can only assume that Bird would deny the metaphysical possibility of a world containing a symmetric power structure. Either way, a good case can be made for such a claim, as I have tried to suggest.

3.7) Modifying the asymmetry constraint

A minimum requirement, then, is that the power graph as a whole is asymmetric. This will always allow each and every node to have unique relational features. As Bird observes, however, this will only be the case if the *whole* graph determines the identity of each of its nodes. Recall that manifestation relations are directed; as a result, nodes may have 'incoming' as well as 'outgoing' relations. In assuming that the graph as a whole determines identity, we

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[35] I am grateful to Stephen Mumford for emphasising this point to me.

[36] Indeed, Dipert believes there will turn out to be many such *a priori* restrictions on what a relational world of the sort he describes could be like (1997: 356), including an asymmetry restriction (for reasons similar to those I have canvassed in the dispositions case). If Dipert is right about this, it may turn out that the range of possible pure dispositional structures are also be much narrower than one might at first expect.

are assuming that 'incoming' as well as 'outgoing' relations play a determining role. In other words, we are assuming that the identity of a property is determined not only by what its manifestation property is, but also what that property is the manifestation *of*.

Bird suggests that this may be a mistake, however (2007: 143). When considering certain dispositions, it is very natural to think that their identity is fixed only by that which they are a disposition for, i.e. what their manifestations are. For example, if two objects were such that they would shatter into pieces after undergoing the same kinds of forces, it would seem intuitive to think that they shared the same property of fragility, even if we knew nothing about the circumstances which had brought about the brittleness of each of those objects. This suggests, then, that only the manifestation relations directed *away* from a node contribute to its identity. Thus, what is relevant for property identity is not the *whole* graph, but, rather, '... that subgraph consisting just of those vertices and arcs lying on some directed walk (sequence of arcs) *directed away* from (and including) the vertex in question' (2007: 143; my italics). I will call this an 'outgoing' subgraph. How is this observation relevant for the asymmetry condition? Well, if it is possible for a graph to be asymmetric as whole, but yet contain two 'outgoing' subgraphs which are structurally indiscernible, then we would have, it seems, a graph in which the identity of some nodes are ultimately not fully determined. Graphs of this kind are constructible, as is demonstrated by my own example:
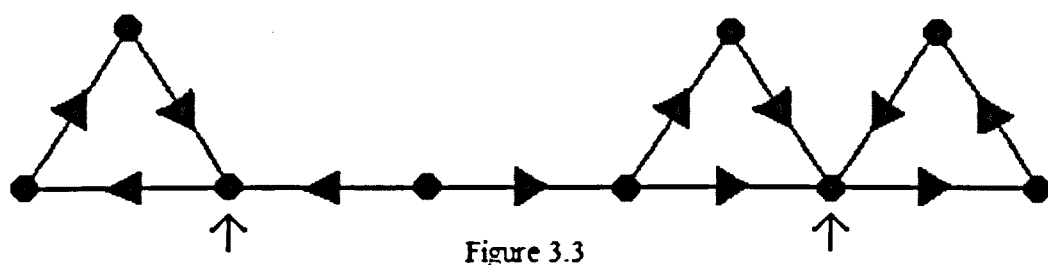
Figure 3.3

Consider the two nodes picked out by the arrows, for example. The 'walks' leading away from each of these nodes consist in a self contained triangle and are structurally identical. In

other words, each of these nodes are caught in a self-contained sub-graph which is isomorphic with that associated with the other. Thus, although the graph as a whole is asymmetrical, as things stand the nodes highlighted will be indistinguishable, it seems.

Graphs of this kind therefore have to be ruled out as a possibility where pure power structures are concerned, for reasons discussed earlier. Thus, the asymmetry constraint must be modified in such a way that no two nodes have outgoing subgraphs which are structurally indiscernible, i.e. isomorphic. In other words, no two outgoing subgraphs should be such that they can be perfectly mapped onto one another. Bird calls this the 'strong asymmetry' condition (2007: 144). Given that the above example fails to meet this condition, only a proper subset of graphs which are asymmetrical as a whole will be acceptable power graphs.

3.8) Might 'backward-looking' features be essential after all?

Before moving on, however, it should be noted that it is perhaps not immediately obvious that a power's identity is not, in part, determined by the property (or properties) of which it is the manifestation. There is, for example, an argument presented by Shoemaker, not considered by Bird, in which Shoemaker suggests that a property's 'backward looking' causal features, as well as its 'forward looking' causal features, should be considered to be of its essence (1998: 64). If Shoemaker is right, then perhaps Bird's stronger asymmetry requirement is not necessary after all. Shoemaker's claim is prompted by an imaginary case put forward to him by Boyd, a case in which we are supposed to have two different properties that nevertheless bestow the same 'forward-looking' causal features. In other words, we are supposed to have two different properties with all the same 'outgoing' manifestation relations. The case involves two compounds, X and Y, which are each made by combining different substances. We are then to suppose that both compounds behave exactly alike in all possible circumstances. Even though both compounds would exhibit identical behavioural features, the

property of being compound X and the property of being compound Y are plausibly different properties, according to Shoemaker, since each of these properties were brought about in different ways, i.e. brought about by combining substances with different properties (or 'powers').

Is this argument successful? I have to say that I do not find it convincing. In the first place, one may be sceptical that there really are such properties as 'being compound X'. Ellis, for example, argues, that the property *being an electron* is not a genuine property since, plausibly, property universals can logically be instantiated by any particular (see, for example, 2001: 75, 92). However, even if we concede that there really can be such properties, there is a deeper worry. What grounds Shoemaker's claim that being compound X and being compound Y really are distinct properties? If the two compounds behaved in the same way in all possible circumstances, then they would look alike, feel the same, smell the same etc. In fact, there could be no possible test that would confirm our claim that being compound X and being compound Y were in fact different properties. This alone, I suggest, would give us sufficient reason to suppose that being compound X and being compound Y *were* the same properties. Of course, it must be accepted that in the case described each of those property instances were manifested in different ways, but why should that be a problem? At no stage does Shoemaker suggest why a property must be such that it can be manifested in a single way. In fact, most properties one can think of are such that they can be brought about in many different ways. For example, heat can be generated through friction, through combustion, through passing a current through a resistant conductor etc.. Yet it would not seem natural to claim that, because of this, the 'heat' in each case corresponds to a property of a different kind.

I conclude therefore, that Shoemaker's argument is not convincing as it stands. Unless a successful argument is presented to the contrary, we should accept the Bird's *strong* asymmetry constraint.

3.9) Asymmetry and the two-sided version of pandispositionalism

Before moving on to further constraints that must be placed upon the form that acceptable fundamental power graphs can take, I must briefly consider whether the asymmetry constraint would still apply if one accepts the two-sided version of pandispositionalism. This is a further question, since Bird, to recall, argues for the asymmetry constraint in the context of dispositional monism. At first glance, one may suspect that the asymmetry constraint is not necessary in the two sided case. If one is a two-sided theorist, then one will not think that the nature of a property is exhausted by its second-order relational features. According to the two-sided view, properties also have a categorical or qualitative aspect to them. Therefore, even if a power structure was symmetrical, perhaps the nodes involved could still be distinguished in virtue of having different qualitative aspects to them. In graph-theoretic terms, perhaps such qualitative differences could be represented in a symmetrical graph using different node colours. Take, for example, the following modified version of the graph from figure 3.3. Here, the nodes highlighted have a different colour, indicating that although they are similarly powerful, they have a different qualitative aspect and are therefore distinguishable.

Figure 3.4
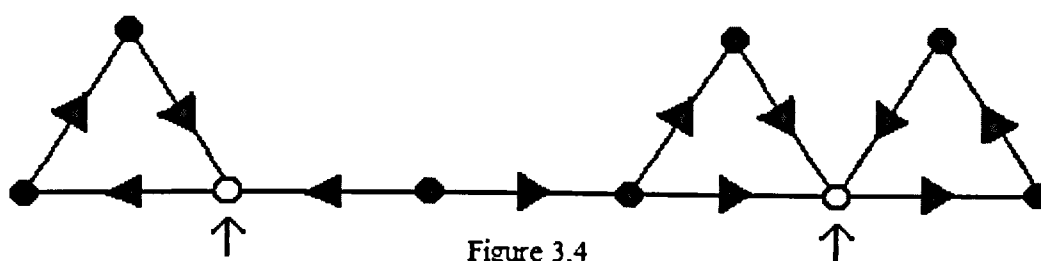
There appears to be something deeply problematic about such graphs, however. In order for such graphs to be possible, it has to be that properties with the same 'power' side can nevertheless have a different 'qualitative' side. However, in earlier discussion of the two-sided view (e.g. in chapter one and 3.2) of the current chapter), I highlighted that if the two-

sided theorist is a genuine pandispositionalist, he must maintain that the relation between a certain power side and a certain qualitative side is one of necessity. If contingency is accepted, then the view slides dangerously towards property dualism, thereby compromising its claim to be a pandispositionalist view. Once necessity is accepted, however, the above kind of graph is precluded. If a certain 'power' side is necessarily connected to a certain 'qualitative' side, it has to be the case that all instances of that power side are also instances of that 'qualitative' side. It cannot therefore be possible, as the above graph (figure 3.4) suggests it is, for two properties to have the same dispositional features and yet be qualitatively distinguishable.

It seems that Heil, a two-sided theorist, agrees on this point, which vindicates the thought that he is a genuine pandispositionalist, rather than a property dualist. According to Heil (2003: 116), for example, although it may seem that particulars which have, say, different categorical 'structural' features could have the very same dispositional features, this is not in fact the case. In discussing the case of fragility, he remarks that 'light bulbs, ice cubes, and kneecaps', which are all structurally different, 'shatter in very different ways', and that this indicates the objects' possession of 'distinct, though similar, dispositions'. Such diverse objects will only appear to instantiate the very same complex property, i.e. fragility, as long as 'you remain content to characterize fragility in a relatively non-specific way'. Objects that are qualitatively different will, in fact, be fragile to different degrees: '[T]ry changing a fragile object qualitatively, without altering it dispositionally. The object might remain fragile, but become fragile 'in a different way' (2003: 116).

In order to respect the claim that properties with different 'qualitative' sides will have different 'power' sides, the node to the left and the node to the right in the above graph should be of the same colour. But then, of course, these nodes become indistinguishable, in which case we are left with properties that do not have a unique, determinate identity. In order to

solve this potential problem, I conclude, therefore, that Bird's 'strong' asymmetry constraint should be equally embraced by the 'two-sided' pandispositionalists.

3.10) The powerfulness constraint

Before moving on to discuss what I call Bird's *fundamentality* and *stimulus* constraints in the next chapter, I will now introduce the *powerfulness* constraint. Of Bird's four constraints, this is the most uncontroversial, and so I will not dwell on it. This constraint says that all nodes in a power graph must have at least one outgoing manifestation relation (2007: 143). In other words, if one is a dispositional monist (or a two-sided theorist) one must not accept that there could be properties represented by nodes which bear no outgoing manifestation relations. This seems relatively obvious. If a node were not related to a manifestation node, then it could not represent a power, since a property is only powerful insofar as it is a property for a certain manifestation. And since, according to pandispositionalism, all properties are powerful, a node with no outgoing manifestation relations would not represent a genuine property, and so would have no place in the kind of graph under consideration. If anything, such a node could only represent a categorical property, and they are banished from the pandispositionalist picture.

Chapter Four: The Fundamentality Constraint and the Mutual Manifestation Constraint

4.1) Introduction

During this chapter the two remaining constraints that Bird places upon graphs representing fundamental power structures will be discussed. The first of these constraints I call the *fundamentality* constraint, and the second the *stimulus* constraint. I will offer support for the fundamentality constraint, but will go on to criticise, and then modify, an important aspect of Bird's stimulus constraint. In the next chapter, I will then discuss some important consequences of the modification.

4.2) Third power graph constraint: fundamentality

According to another constraint, each node in a graph representing *fundamental* powers should have *at most* one outgoing manifestation relation. That is to say that all fundamental power properties are for a single manifestation.

If fundamental powers were powers for a variety of distinct manifestations, they would be what many now call *multi-track* powers (see (Bird, 2007: 21) and Molnar (2003: 198)). Arguably, Ryle was the first to acknowledge that there could be these kinds of dispositions, when he drew a distinction between he called determin*able* disposition predicates and determin*ate* disposition predicates. The determinable disposition terms are generic and '[T]hey signify abilities, tendencies or pronenesses to do, not things of one unique kind, but things of lots of different kinds' (Ryle, 1958: 118). In other words, determinable dispositions can manifest in a variety of ways. The determinate dispositions, in contrast, manifest in one, unique way. Dispositions which give rise to a unique type of manifestation, (in response to a

unique stimulus type), are now commonly called *single track* dispositions.

Bird's general argument is that a *fundamental* property, by its very definition, is one that cannot be broken down into any simpler elements, for that is precisely what makes it fundamental. With this in mind, his strategy in arguing for the fundamentality constraint is to show that the positing of a multi-track disposition is equivalent to the positing of multiple single-track dispositions. Given that single-track dispositions are more basic, there is no reason to regard multi-track dispositions as fundamental.

I will now offer support for Bird's claim. In the next section I will consider putative multi-track dispositions relating to functional laws, and will argue that such dispositions may be straightforwardly regarded as sets of single-track dispositions. In the following section I will discuss what Bird calls 'pure' multi-track dispositions. In that section, I will identify eight different kinds of 'pure' multi-track disposition predicate, before arguing that such predicates can be broken down into conjunctions and / or disjunctions of single-track disposition predicates. If the argument is successful, this suggests there is no reason to suppose there are multi-track dispositions which are irreducible and fundamental.

4.3) Multi-track dispositions

In our discussion of Ryle, above, multi-track dispositions were characterised as abilities to do things 'of lots of different kinds'. This is somewhat vague, however. There are a number of ways in which a disposition might be a disposition for a variety of manifestations. For example, there is a sense in which properties which enter into functional laws, such as charge and mass, are properties for a variety of determinate manifestations. Let us take Newton's inverse square law of gravity, for example. The law tells us that an object with a particular mass (M1) will manifest different determinate gravitational forces (F), depending on

particular the determinate values of the other body's mass (M2), together with the distance at which it is located (r):

Specifically, the law states that $\mathbf{F = G\,\underline{M1\,M2}}$ (G represents the gravitational constant)

$$\mathbf{r^2}$$

Let us consider a case in which an object (x) has gravitational mass of 1000kg. If we plug this value in to the law, and then play around with the M2 and r variables, it can be seen that, for example, if x were located 10m from a mass of 100kg, then x would attract that mass with a force of 1000G Newtons. If, on the other hand, x were located 10m from a mass of 500kg, then x will attract that mass with force 5000G Newtons. So, x's mass would manifest a force of 1000G Newtons in some circumstances, and 5000G Newtons in others (and a many different forces in other circumstances). The important question, however, is can this determinate property (of having mass 1000kg) be understood as a cluster multiple single-track dispositions? There seems no reason why not. By plugging the value 1000kg into the functional law and playing around with the M2 and r variables, we can generate a conjunction of counterfactuals, associated with the property of having a mass of 1000kg, each of which involves unique stimulus conditions in the antecedent, and a single, specific manifestation in the consequent. Crucially, given that each of these counterfactuals has a single manifestation, in response to unique stimulus conditions, a distinct, single-track disposition can be associated with each of the counterfactuals associated with having mass 1000kg. Thus, ascription of 'mass 1000kg' may be understood equivalent to ascribing a conjunction of single track dispositions, one of which, for example, will be the disposition to attract a 100kg body located 10m away with force 1000G Newtons, and one which is the disposition to attract a 500kg mass that is 10m away with force 5000G Newtons, and so on.

Bird discusses another property associated with a functional law, namely, the property of

charge, and comes to the same conclusion as that just established in the mass case. Given that the ascriptions of such properties are equivalent to the ascription of a conjunction of single-track power properties, they should not be thought to be fundamental, since it is 'the conjuncts that are closer to being fundamental' (2007: 22). Incidentally, Bird also suggests that mental properties, which Ryle was interested in (such that of knowing French), also fall into this category, and cannot therefore be regarded as fundamental properties.

It seems, however, that the sense in which mass and charge appear to be multi-track is not the only sense in which a property could be multi-track. In the case of a certain mass property, the thing with that property always gives rise to unique manifestation in response to a specific stimulus. One might argue, however, that it is conceivable that a certain property could manifest differently on various occasions in response to the *very same* stimulus. In other words, such a property would be a property for a disjunction of manifestations. Unlike a certain mass property, this property would support a single counterfactual only, but one with a logically complex consequent i.e. S $\square \rightarrow$ (M1$\vee$ M2). Given the consequent involves multiple manifestations, it seems such a property should be regarded as a multi-track disposition. But, to repeat, unlike a certain mass property, it supports a *single*, albeit logically complex, conditional. For this reason Bird calls this kind of property a *pure* disposition (2007: 22). Other kinds of pure, yet multi-track, dispositions are also conceivable. For example, a 'pure' multi-track disposition property might give rise to a conjunction of different manifestations in response to a particular stimulus. Dispositions with conjunctive or disjunctive stimuli are also conceivable. If one thought that a single-track disposition must have a single stimulus, one might also class dispositions with multiple stimuli as multi-track powers.

4.4) 8 kinds of multi-track disposition predicate

All in all, eight kinds of 'pure' disposition predicates are conceivable, ones which can be

associated with multiple stimuli and / or multiple manifestations. Below are the eight permutations together with examples of the corresponding disposition predicates:

1) Disjunction of stimuli, single manifestation: 'D(S1∨S2,M)x'

2) Disjunction of stimuli, conjunction of manifestations: 'D(S1∨S2, M1∧M2)x'

3) Single stimulus, disjunction of manifestations: 'D(S, M1∨M2)x'

4) Conjunction of stimuli, disjunction of manifestations: 'D(S1∧S2, M1∨M2)x'

5) Disjunction of stimuli, disjunction of manifestations: 'D(S1∨S2, M1∨M2)x'

6) Single stimulus, conjunction of manifestations: 'D(S, M1∧M2)x'

7) Conjunction of stimuli, single manifestation: 'D(S1∧S2, M)x'

8) Conjunction of stimuli, conjunction of manifestations: 'D(S1∧S2, M1∧ M2) x'

I will now investigate whether these multi-track predicates can be considered equivalent to conjunctions and / or disjunctions of single-track disposition predicates. If the argument is successful, this suggests there is no reason to suppose there are multi-track dispositions which are irreducible and fundamental, and so Bird's fundamentality constraint would appear justified. Note that Bird himself investigates four cases of pure, multi-track dispositions which he takes to be most important, namely, cases 1), 3),6), 7) above (2007: 23-24). He argues that the ascription of each of these dispositions is equivalent to the ascription of a conjunction and / or disjunction of single-track dispositions. I will draw upon his arguments where appropriate, and also argue that the four remaining kinds of pure, multi-track disposition predicates can also be broken down in this way. The deconstruction of certain of these predicates will help us break down others, which is why I will examine the predicates in a particular order.

Before I discuss cases 1) - 8), it should be highlighted that I am not implying that there an

actual candidate property corresponding to each of these predicates, although there will be obvious candidates for some of them. For example, it seems that each dropping of a particular kind of vase on a particular surface results in a slightly different breakage – sometimes vases break into ten pieces, and sometimes into one hundred. One might wish therefore to regard fragility as a case of 3). Alternatively, one might argue that there are various stimuli for fragility, such as squeezing as well as dropping, in which case one might wish to regard fragility as case of 5)[37]. Fortunately, I do not have to go through each of the above, deciding whether there is an actual candidate property for each one. Our project is to consider what any *possible* fundamental power graph may look like, and so the mere conceivability of pure, multi-track dispositions raises the question whether such dispositions *could* issue in the fundamental power structure of a world.

4.5) Breaking down multi-track disposition predicates

Let us begin with case 1) involving a disjunction of stimuli and a single manifestation (e.g. 'D(S1∨S2,M)x'), a case which seems relatively unproblematic. This is clearly a case in which any one of several stimuli is able to trigger a certain unique manifestation. Such a predicate may therefore be regarded as equivalent to a conjunction of distinct, single track disposition predicates each of which is associated has the same manifestation, but a different stimulus (see Bird, 2007: 23):

1) $((S1 \lor S2) \to M)$ **is logically equivalent to** $((S1 \to M) \land (S2 \to M)$

So: 'D(S1∨S2,M)x'   **may be replaced by**   'D(S1,M)x ∧ D(S2,M)x'

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[37] Note, however, that if Heil's discussion of fragility (2003: 116) mentioned in the last chapter is to be believed, perhaps this appearance can be explained away. Perhaps, for example, the varying manifestations are best explained by the fact that each vase is fragile in a slightly different way (rather than sharing very the same pure, but multi-track disposition).

Before reducing case 2) (e.g. '$D(S1\lor S2, M1\land M2)x$'), I first need to establish how a predicate involving a conjunction of manifestations can be broken down into a conjunction of simpler predicates. Let us now consider case 6), then, which involves a single stimulus, but a conjunction of manifestations ('$D(S, M1\land M2)x$'). Again, this case seems relatively unproblematic. If an object gives rise to both M1 and M2 when stimulated in certain way, we may simply say that it has both the (single-track) disposition to give rise to M1 in certain circumstances, and also the (single-track) disposition to give rise to M2 in those same circumstances (see Bird, 2007: 23). Thus:

6) $(S \rightarrow (M1\land M2))$ **is logically equivalent to** $((S \rightarrow M1) \land (S \rightarrow M2))$

So: '$D(S, M1\land M2)x$' **may be replaced by** '$D(S,M1)x \land D(S, M2)x$'

By examining cases 1) and 6), we have established how to reduce a disjunction of stimuli, and a conjunction of manifestations. With this in mind, we are in a position to reduce predicate 2), which involves a disjunction of stimuli and a conjunction of manifestations (e.g. '$D(S1\lor S2, M1\land M2)x$'). We saw that where a predicate is associated with a conjunction of manifestations, two single-track disposition predicates are required, each involving the same stimulus but a different manifestation. However, in this case, we also have a disjunction of stimuli, and so the strategy for dealing with a conjunctive manifestation must be repeated for each possible stimulus. In other words, each possible stimulus must appear in a pair of disposition predicates each of which involves a different manifestation (to account for the conjunctive manifestation in each case). Thus:

2) $((S1\lor S2) \rightarrow (M1\land M2))$ **is logically equivalent to**

$(((S1 \rightarrow M1) \land (S1 \rightarrow M2)) \land ((S2 \rightarrow M1) \land (S2 \rightarrow M2)))$

So: '$D(S1 \vee S2, M1 \wedge M2)x$' may be replaced by

'$(D(S1,M1)x \wedge D(S1, M2)x) \wedge (D(S2, M1)x \wedge D(S2,M2)x)$'

Case 3) involves a single stimulus and a disjunction of manifestations ('$D(S, M1 \vee M2)x$'). Now, as Bird observes (2007: 23), it is well known that conditionals with a disjunctive consequent resist logical reduction to any compound of simpler conditionals. The fact that an object will either give rise to M1 or M2 can only be expressed by ascribing the predicate '$D(S, M1 \vee M2)x$'. However, one may wonder whether, in possible concrete cases, it would be plausible to ascribe this kind of disposition, rather than single-track dispositions. Let us consider the following example of a concrete case which may have the appearance of involving something like a multi-track disposition of the form '$D(S, M1 \vee M2)x$'. Imagine a house which has seen better days. On one occasion, for whatever reason, the house is dealt a certain blow, and, although it wavers, the house withstands the blow and remains upright. Imagine, however, that some time later, the house is dealt an identical blow, but responds by collapsing to the floor. In other words, the house reacts in an M1- like way (i.e. with sturdiness) in response to S on one occasion, and behaves in an M2-like way (i.e. it collapses) on another occasion. Does this mean we should ascribe to the house a single disposition of the form '$D(S, M1 \vee M2)x$'? Arguably, this would not be what we would be inclined to do. Given that the house collapsed on the second occasion in response to the stimulus, but not the first, the obvious explanation of the change would be that the house's structure had weakened between trials, and that, therefore, the house had a *different* disposition to the one it had during the first trial. Therefore, it would seem more natural to say of the house on each occasion that it either instantiates **D(S, M1)** *or* **D (S, M2)**, rather than ascribing to the house the single, irreducibly multi-track disposition **D(S, M1 \vee M2)**. To take the second option would be to accept that the different response (i.e. the collapse) on the second trial, was utterly unexplainable. The former option is a more attractive alternative, due to its explanatory

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power, and this provides a good reason to avoid ascribing a single, irreducibly disjunctive disposition in such cases. Thus, on explanatory grounds:

3)   'D(S, M1∨M2)x' may be replaced by 'D(S,M1)x ∨ D(S,M2)x'

Bird uses a slightly different case in order to argue for the same kind of conclusion. Rather than focusing on a particular object and explaining different responses at different times in terms of change in dispositions, he imagines a case in which many different objects of the same type are tested (i.e. glasses) with varying outcomes. His conclusion is that there would be no reason to ascribe to each object a multi-track disposition; rather we simply say of each one that it instantiates either **D(S,M1)** or **D(S,M2)**.

Are these arguments conclusive? One may think not, for reasons that Bird does not appear to consider. The cases discussed involved macroscopic objects e.g. houses and glasses. Such objects are structurally complex, which allows the possibility of explaining varying behaviour in terms of some varying (internal) structural features. Varying structural features bestow slightly different dispositions, which is why there is no need to posit a common, multi-track disposition. It may pointed out by the opponent, however, that at the fundamental level investigated by physicists, where entities are arguably structurally simple, the same kinds of explanations are not available. It is common for physicists to think that entities behave in one way in a certain situation on a certain occasion, and yet behave differently in that same situation on a different occasion, without that entity undergoing an intrinsic change. For example, on some occasions an isotope will not decay when a neutron is fired at it, and on another occasion it will, but this variation cannot be explained in terms of intrinsic changes in the isotope, for there may be no reasons to suppose there have been such changes. Therefore, it seems there is often no significant explanation of behavioural variation at the microscopic

level other than that such activity is probabilistic[38]. If one then opts for a propensity account of probabilistic phenomena, as the realist about dispositions will, then one may feel the need to ascribe to microscopic entities, such as isotopes, single multi-track dispositions of the form $D(S, M1 \lor M2)$[39]. Perhaps, then, Bird's argument against the positing of dispositions of the form $D(S, M1 \lor M2)$ cannot be sustained across the board. In establishing whether this is so, the crucial question to be considered at this point, is this: is it really necessary for the propensity theorist to posit irreducible dispositions of the form $D(S, M1 \lor M2)$ in order to account for genuinely probabilistic behaviour? As we will now see the answer is 'no', in which case the objection under consideration may lose its force.

Martin is one who provides a dispositional account of probabilistic behaviour and yet denies that there are dispositions for a disjunction of manifestations. On his account, microscopic entities do not have single, stable multi-track dispositions, but, rather, oscillate over time between having one disposition and certain others, each of which are dispositions for a unique, determinate manifestation. Thus, Martin's account does away with the 'irreducible disjunctivity' that is part of the putative multi-track dispositions I have been discussing. The oscillation between various determinate dispositions is what Martin calls a disposition 'fluttering' (2008: 73), and as the fluttering cannot be explained by something more basic, it is best seen as an 'ontologically primitive oscillator' (2008: 73). These 'flutterings' explain why

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[38] Note, however, that some quantum theorists have questioned this, and so it is not obvious that this is a real concern. Bohm (1952), for example, argues that what appears to be probabilistic variation can be explained in terms of variation in position of the entities concerned (variations which cannot in fact be measured).

[39] In some places Armstrong has spoken of probabilistic laws which have an analogous form, i.e. '... if P, then either Q or R will occur' (1983: 124). (Armstrong's laws, to recall, are his surrogates for irreducible dispositionality.)

microscopic entities manifest certain behaviour on one occasion, and other behaviour on different occasions, without having to invoke pure disjunctive (i.e. multi-track) dispositions.

Martin's own reason for preferring this account is that the alternative account, which appeals to pure disjunctive (multi-track) dispositions, faces a serious problem. The problem, according to Martin, is that '[T]he explanation of the success of a candidate or production of a (manifestation) disjunct, short of magic, would be incomplete ...' (2008: 72; my brackets). In other words, Martin finds it mysterious how a disposition which is indeterminate as to which outcome will come about, could settle, as it were, on one outcome rather than another in a particular concrete case. Martin thinks there is a 'metaphysical gap' here, and that what is needed is an '...account of disjunctivity that could take us all the way to the result' (2008: 73). There does not appear to be any such account, however.

A more general justification for the rejection of pure, disjunctive (multi-track) dispositions at the fundamental level of physics is that, by definition, such a level is one of minimal complexity, and as we have seen, multi-track dispositions are logically more complex than single-track dispositions. Thus, we have no reason to posit irreducibly multi-track dispositions at the fundamental level if the phenomena can be explained in terms of single-track dispositions. Martin offers one account in which the phenomena can be explained in this way, and so we should not accept the existence of fundamental and irreducible multi-track dispositions unless a special reason is found for doing so.

Before reducing predicate 4), which involves a conjunction of stimuli (e.g. 'D(S1∧S2, M1∨M2)x'), it will be useful to see whether predicate 7), which also involves a conjunction of stimuli (and a single manifestation, e.g. 'D(S1∧S2, M)x')), can be broken down into simpler elements. The answer, as Bird suggests (2007: 23), appears to be that it cannot. No simpler dispositions involving anything less than (S1∧S2) as stimulus could do justice to the

features of this dispositional property, given that both S1 and S2 are both necessary for the manifestation. Thus, a conjunctive stimulus is ineliminable.

This need not worry us, however, as long as we can still collapse predicate 4) (e.g. '$D(S1 \wedge S2, M1 \vee M2)x$') into a compound of dispositions that does not involve a disjunction of stimuli or a disjunction of manifestations. As Bird observes (2007: 23-24), a conjunctive stimulus indicates a stimulus which is characterised in a complex way, and not that there are multiple possible stimuli. Thus, as long as this stimulus is the *only* stimulus, there is no reason to regard such a disposition as anything other than a single-track disposition, as long as there is also a unique manifestation.

The previous discussion shows that in case 4), which involves a conjunctive stimulus and disjunctive manifestation (e.g. '$D(S1 \wedge S2, M1 \vee M2)x$'), we must leave the conjunctive stimulus as it is. On the other hand, during our discussion of case 3) it was argued that we *can* justifiably eliminate putative cases of irreducibly disjunctive manifestation by ascribing, instead, a disjunction of separate dispositions, each with a single manifestation. Putting these observations together yields the following:

4)   '$D(S1 \wedge S2, M1 \vee M2)x$' may be replaced by

        '$D(S1 \wedge S2, M1)x \vee D(S1 \wedge S2, M2)x$'

Finally, we come to predicate 5), which involves a disjunctive stimulus and a disjunctive manifestation ('$D(S1 \vee S2, M1 \vee M2)x$'). Now, in our discussion of predicate 1), we saw that a predicate involving a disjunctive stimulus can be replaced by a conjunction of predicates each involving a single stimulus. However, each conjunct can itself be broken down into simpler predicates, for as we saw in our discussion of case 3), it is reasonable to replace the ascription of a disjunctive manifestation with the ascription of a disjunction of single-track dispositions.

Putting these observations together, we may break down case 5) into a conjunction of disjunctions involving predicates associated with unique manifestations:

5)   'D(S1∨S2, M1∨M2)x' may be replaced by

        '(D(S1,M1)x ∨ D(S1,M2)x) ∧ (D(S2,M1)x ∨ D(S2,M2)x)'

This concludes the investigation of multi-track disposition predicates. My aim has been to show that multi-track disposition predicates can plausibly be replaced by conjunctions and / or disjunctions of single track predicates. Crucially, this means that the truth of propositions involving multi-track ascriptions can be accounted for in terms of multiple single-track dispositions. Given that it is these single track powers which come closer to being fundamental, a fundamental power structure need only involve single track powers. Hence, the nodes involved in graphs representing such structures should have at most *one* outgoing manifestation relation.

4.6) Bird's stimulus constraint

So far, then, it has been argued that dispositional structures must bear certain asymmetric features, and, also, that each element in a fundamental disposition structure must have one, and only one, manifestation relation directed away from it. Is that all that can be said of dispositional structures? Bird suggests not. In our discussion of power graphs so far, the conditional aspect of dispositions has not yet been considered. As was highlighted in earlier chapters (and indeed the last section), typically, in order for a disposition manifestation to arise, it is necessary that the object with the disposition finds itself in appropriate 'stimulating' circumstances. Most, if not all, of the dispositions we speak of are of this nature. For example, the manifestation of fragility is breakage, but this only occurs *if* the fragile object is first

struck with a suitable force by, say, a hammer. The manifestation of solubility is dissolving, but this only occurs *if* the soluble substance comes into contact with a solvent.

What this observation indicates, then, is that not only is a disposition a disposition for a certain manifestation, but, typically, it is also a disposition to do something *in particular kinds of circumstances*. Bird writes that the dispositionalist '... maintains that a potency is not only essentially a disposition to do something but is also essentially a disposition to do something in response to something else, the stimulus' (2007: 145). Bird captures the conditionality of dispositions, therefore, by claiming that a disposition's manifestation is a reaction to a *stimulus*[40].

To do justice to facts about disposition stimulation, Bird suggests that stimulus relations must find a place in our power graphs. Thus, not only will the nature of a power be defined by the manifestation property towards which it is directed, but it will also be defined, in part, by that which is its stimulus property. (Note that this thought is congenial to the identity constraint discussed in the last chapter, since the addition of stimulus relations will provide another potential source of asymmetry). With the addition of stimulus relations, a disposition is seen as something which enters into a *three*-place relation – a 'stimulus-response' relation – and this will be what, for the dispositional monist, constitutes the nature of a property. Note, however, that if this is an accurate account of the nature of dispositionality, then it should also be embraced by the 'two-sided' pandispositionalists. The difference will be, of course, that on their view, stimulus-response relations will only constitute the nature of the dispositional 'side' of a property, and not the property as a whole. This is because, to recall, on the two-sided view, properties also have a non-dispositional 'qualitative' side.

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[40] Note that usually a particular's disposition will be stimulated by some external object, but this is not always the case. It seems many complex particulars, such as organisms, can often stimulate certain of their own dispositions, by acting upon themselves in a certain way.

One might object at this point that it is a little odd to introduce stimulus relations into power graphs, graphs which represent the nature of *properties*. This, it may be argued, is odd because it is more natural to think of a disposition's stimulus as being an event or a state of affairs. For example, in the concrete case of a live wire manifesting its electric current, the stimulus is plausibly the event (or state of affairs) of the wire's being in contact with, say, a piece of metal (or some other conductor). Now, whilst this observation seems right, it should be pointed out that if one is a dispositional monist, one will view these concrete stimulus events as ones which invariably involve a further power whose presence is necessary for prompting the manifestation in question. For example, the reason why a live wire's being in contact with metal is a stimulus for the flowing of the wire's current is that metal has certain properties (in virtue of which it is conductive), and according to dispositional monism these properties will be nothing more than further powers. Thus, as Bird's graphs indicate, dispositions depend on other dispositions for their manifestations. I think this dependence also explains why more than one kind of particular is able to stimulate a certain disposition had by another. For example, a hard floor, as well as a hammer, is able to trigger the manifestation of a vase's fragility, and the reason for this is that the hard floor and hammer share a common property: they are both rigid, and so remain resistant when they collide with vases[41].

How, precisely, can these stimulus relations be represented in a power graph? Bird suggests that, like manifestation relations, stimulus relations should be represented by directed arcs, but should contain arrows which are not filled in with colour so that stimulus relations may be distinguished from manifestation relations (2007: 145). Note that since stimulus relations are directed on Bird's account, he is assuming that stimulus relations are not symmetric. As we

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[41] This also explains why complex particulars are often able to trigger certain of their own dispositions. They are able to do this because they have certain other properties which give them the appropriate stimulating abilities.

will see shortly, this assumption is questionable, but for now I will accept this view for the purposes of seeing what kinds of power graphs it leaves us with. The final requirement of Bird's graph-theoretic framework is that it be clearly be shown when a certain stimulus and manifestation relation belong together as part of the same three-place relation (i.e. when a stimulation relation and manifestation relation are characterising the nature of the same property). Bird suggests this be done by allowing arcs with the same hatching to represent relations that belong together (2007:145). This leaves us with the following basic three-node graph structure, on Bird's account (labelling added for clarity):
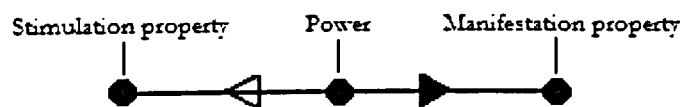
Figure 4.1

Now that I have introduced Bird's 'stimulus constraint', I will now argue that it is misleading in certain respects. In light of this, I will then suggest certain modifications to Bird's graph-theoretic constraints.

4.7) The mutual manifestation model

Thus far, we have introduced the claim that the concrete manifestations of a disposition are dependent upon the presence of stimulating particulars, and that a particular can only stimulate a certain disposition, such as fragility, if it has the right kind of properties. But what more can be said about the nature of these 'stimulus' properties? Well, crucially, if one is pandispositionalist, like Bird, then one must accept that all properties are irreducibly dispositional in nature. But if that is the case, then it seems the contribution made by a stimulus must itself be cashed out in dispositional terms. This would seem to fit our ordinary way of talking rather well. Consider, for example, the case of a particle manifesting its charge

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by accelerating through an electro-static field. In such a case, the stimulating agent is the field. But in virtue of what is the field able to prompt the acceleration of the particle? The obvious answer, for the pandispositionalist, will be that it has this ability in virtue of some power that it has. Thus, it seems the acceleration event depends upon the exercise of more than one power. In explaining the acceleration event, it would also be natural to speak of the *field's* power to set the particle in motion, as well as the charge of the particle itself.

The crucial question I believe we must ask at this point, is this: what does the manifestation of the field's stimulus power consist in? There would seem to be two possibilities: either the stimulus power manifests in the acceleration event itself, or something else. Now, examination of Bird's graphs suggests that he would take the latter view. In Bird's power graphs the manifestation property to which a power is connected is *not* also classed as the manifestation property of the stimulus property; the manifestation of the stimulus property is not the same as the property which it stimulates (see, for example, Bird's graphs in 2007: 145 figure 6.10, and also the graph in figure 5.7 of the present work, which illustrates one of Bird's graphs). It is clear that in Bird's graphs, the stimulus disposition always has a different manifestation to the disposition stimulated.

It should be pointed out that Bird's view on this matter is not obviously correct. In any case, it certainly should not be taken for granted, as Bird seems to do. C.B. Martin, for example, maintains a different view and argues that the manifestation of a stimulating disposition is always the same as the manifestation of the disposition stimulated. He expresses this idea by saying that manifestations are always *mutual* manifestations of disposition partners working together, rather than manifestations of one power alone (1996: 136). The case Martin often focuses on is that of dissolving. A dissolving event seems not only to be the manifestation of the salt's solubility, but also of the powers of the solvent: the dissolving event is the 'common product' (1993: 182) of the salt solvent and solute working together. The salt and water are, in

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Martin's terminology, reciprocal partners. Since Martin believes his mutual manifestation model is a general one, he would, in the particle case discussed above, class the manifestation of the stimulating field as the acceleration event, rather than something else.

Which of these possible views about stimulation is the most plausible? An obvious problem with Bird's view is that one is left wondering where it leaves the contribution made by the stimulus disposition. In the particle-field case I have been focusing on, it seems implausible to suppose that the field's power manifests in an event that is distinct from the acceleration event itself. What, in the particle case, can the manifestation of the stimulus possibly be, if not the acceleration event itself? What other event can the manifestation of the field's power be thought to consist in? The problem is that there only seems to be one event taking place in the particle case: the acceleration event. Furthermore, evidence suggests that the acceleration begins the very instant that the particle finds itself in the field, and so there is simply no time for the field to bring about a distinct 'stimulating' manifestation (whatever that may be) which, say, then causes the acceleration of the particle. Similar conclusions can also be drawn from the case mentioned above of salt manifesting its solubility by dissolving. In the dissolving case, the stimulus for the manifestation of salt's solubility is the water's reciprocal power. But what, precisely, can this power be thought to be if not the power to dissolve the salt – the manifestation of which is (obviously) the dissolving event itself?

I also think there is a good metaphysical reason for accepting the mutual manifestation view as a general theory (note that this is not a reason that Martin himself puts forward). The reason is that if one accepts Bird's view that the concrete manifestations of a disposition and its stimulus are different, a potential regress problem emerges. The regress looms when we ask what stimulates a stimulating power. This is surely a reasonable question, if, generally, dispositions are taken to have a conditional aspect to them. But once it is acknowledged that a stimulus disposition may itself need to be acted upon (i.e. stimulated) in order for it to

manifest its power, one can then ask what it is that stimulates the contribution made by this further stimulating power, and so on, *ad infinitum*. If powers have to wait for an infinite number of concrete events before being stimulated, it becomes a mystery how powers ever get around to manifesting. The obvious solution, I suggest, is to view powers as forming reciprocal groups for mutual manifestation[42]. In the particle case, whilst the field's power may be regarded as the trigger for the particle's charge, the particle's charge may equally be regarded as the trigger for the field's reciprocal power. Thus, rather than a regress of stimuli, we have a mutual, symmetrical dependence between reciprocal powers[43].

4.8) The possible roots of Bird's understanding of 'stimulation'

In sum, there are, I suggest, good reasons for favouring Martin's model of dispositional activity. Before suggesting how this model affects the nature of power graphs, it is worth pausing at this point to consider why Bird fails to do justice to the fact that a 'stimulus' is just as operative in bringing about a certain manifestation as the power itself. As was suggested earlier, Bird seems to take his view of stimulation for granted and so does not attempt to offer specific reasons for it. However, the following considerations may help to explain why Bird takes his view of dispositional activity to be the natural one. Dispositionalists have traditionally made a distinction between active and passive dispositions. Active dispositions,

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[42] It should be pointed out that in one place Bird does briefly acknowledge the possibility that dispositions may sometimes come in reciprocal groups (2007*a*: 533), but the notion of reciprocity he invokes must be different to that I am discussing: in the three-node graph which Bird suggests represents reciprocal powers, the powers in question are not directed towards the *same* manifestation, i.e. there is no mutual manifestation involved (see Bird, 2007a: 533).

[43] In one place, Martin uses a nice analogy to express the reciprocity view. He indicates that reciprocal powers are like two cards propping each other up (1996: 136); neither card could play their part without the presence of the other.

it is thought, are somehow the driving force behind an interaction. When a large mass's gravitational attraction is triggered by the presence of a small mass in its vicinity, it is often natural to think of the attractive disposition of the huge mass as the *active* disposition of the interaction, with the smaller mass merely passively obliging. Armstrong (1997: 73) points out that this kind of view has its roots in the action –reaction principle stemming from Newton's Third law. On this kind of view, when the question is asked which particular in an interaction is ultimately responsible for the resultant effect, there seems an immediate bias in favour of the particular falling on the active side of the active - passive distinction.

Perhaps this goes some way towards explaining Bird's view. Just as there is often thought to be a real distinction between passive and active contributions, Bird thinks there is a real distinction between the manifestation of stimulus, and the manifestation made by the disposition in question. According to Martin's reciprocity view, however, it is a mistake to try to draw such distinctions (1993: 182).

There are also other distinctions which could engender the Bird-type way of thinking. Molnar, for example, makes a distinction between causal efficacy and mere causal relevance (2003: ch 10). A property is causally efficacious with respect to a certain effect if that effect may be said to be its manifestation, whereas a property is causally relevant with respect to a certain effect if the presence of that property is necessary for that effect, but that the effect cannot be said to be a manifestation of that property. Molnar holds that spatial relations, for example, are causally relevant, but not causally efficacious (2003: 165). Perhaps Bird has a similar distinction in mind here, viewing stimuli as causally relevant as opposed to the dispositions stimulated which are causally efficacious. On reflection, however, it is difficult to see how Bird could help himself to such a distinction. Molnar has some justification for maintaining a distinction between causal efficacy and causal relevance, since he holds there to be categorical, as well as powerful, features of the world. On Molnar's view, it is the categorical

features of the world, e.g. spatial relations, which are causally relevant but not causally efficacious. Given that Bird holds that no features of the world are categorical, it is not obvious how the distinction between causal efficacy and causal relevance could be made out.

Indeed, Mumford argues that even in the context of Molnar's view, the distinction between properties which are causally efficacious and those which are merely causally relevant is not easy to make sense of. Why, in Molnar's gravitational case, should mass-attraction be considered as the manifestation of the gravitational powers of the particulars involved, but not the spatial relations holding between those particulars (Mumford, 2004: 188; see also Bird, 2007: ch 7.3)? After all, the spatial variable in Newton's law of gravity plays a role that is just as important as the mass variables. One might think, therefore, that the contributions made in gravitation cases by the mass properties and the spatial relations involved are on a par. There is no obvious reason, therefore, why it is only the mass properties which should be thought to be causally efficacious.

It should be clear by now that if one embraces the Martin-type mutual manifestation model, as I have argued we should, then the putative distinctions between active / passive powers, and causally efficacious / relevant properties, no longer have a place in our metaphysical picture. According to the Martin-type model, a manifestation event is the mutual manifestation of several reciprocal dispositions working together, and each disposition involved makes no less a contribution as any other. In other words, no one power can be singled out as making a special contribution to the resultant manifestation.

4.9) Further consequences of the mutual manifestation model

A further important consequence of the mutual manifestation view can also be seen at this point. Whilst it may often be natural to single out one of the reciprocal partners involved in a

manifestation episode as being *the* triggering or stimulating factor, this can only be a perspectival matter, for each reciprocal partner is ultimately on a par. Although we may often say that, for example, the triggering agent in a dissolving event is the solvent, one may equally say that, from the perspective of the solvent's dissolving power, it is the solute that plays the triggering role. Likewise, whilst an electro-static force field may be considered to be the triggering agent for a particle's charge, the charged particle may equally be regarded as the stimulus for the field's reciprocal power.

This point can also be made by considering the kinds of conditionals that disposition ascriptions are often thought to entail (or be analysed in terms of). As we saw in the introduction to this thesis, in 'dispositional' conditionals, the antecedent refers to that which we would call the disposition's stimulus, whilst the consequent refers to the manifestation event. Now, the current point can be put by highlighting that where two reciprocal disposition partners are involved in a mutual manifestation episode, each will issue in the antecedent of the conditional associated with the other. Thus, if we consider a dissolving event *qua* manifestation of water's dissolving power, the presence of the soluble substance will be classed as the trigger. On the other hand, if we consider the dissolving event *qua* manifestation of the substance's solubility, the presence of water will be classed as the trigger. This observation supports the thought that stimulus identification is merely a perspectival matter.

Importantly, this observation reveals a further aspect of Bird's power graphs which is misleading. As we saw earlier, according to Bird's view stimulus relations are best represented on a graph by a *directed* arc, which implies that stimulus relations are not symmetrical. But as we have seen, the relationship between a disposition property and that which may be classed as its stimulus property is arguably reciprocal. This suggests that the second-order stimulus relation (if, indeed, the relation still deserves that name) is in fact

symmetrical. From now on, to avoid confusion with the account of stimulation that Bird's account of power graphs entails, I will rarely speak of 'stimulus' relations in what follows. Instead, borrowing a term used in Martin's work, I will call the relationship between properties that depend on each other for their manifestation as the relationship of *reciprocity*. Note that, like Bird's stimulus relations, facts about reciprocity will add another source of asymmetry to power graphs. For example, even if the directed walks along the manifestation relations leading away from two nodes are structurally isomorphic, those nodes may nevertheless be distinguishable if the reciprocal relations they bear are structurally different (i.e. if the powers being represented each have different reciprocal partners).

In sum, I have argued, in line with C.B. Martin, that manifestations are best seen as *mutual* manifestations of *reciprocal* dispositions. In other words, a manifestation is, in Martin's words, the 'common product' of reciprocal disposition partners working together. This means that a disposition and its reciprocal disposition partner should be regarded as being directed towards the very same manifestation. Furthermore, no single power involved in a manifestation episode may be singled out as being *the* stimulus. It is perhaps better, therefore, to replace talk of stimulation with talk of disposition partner reciprocity. Unlike Bird's stimulus relations, this reciprocity is symmetrical.

4.10) Representing mutual manifestation relationships

How might these foregoing insights be accommodated when constructing power graphs? Well, to represent the relationship between a property and that which Bird would call the stimulus property, we need a symmetrical edge, rather than a directed arc, to do justice to reciprocity. The properties related in this way must then both be directed towards the same manifestation, to do justice to the fact that manifestations are the mutual manifestations of disposition partners working together, rather than the manifestation of a single power. As

established earlier, manifestation relations must be represented by directed arcs, since the manifestation relation is not symmetrical. The fact that manifestation relations are directed, whereas reciprocal-partner relations are not, will suffice to distinguish manifestation relations from reciprocal-partner relations. Finally, for clarity, it will be useful to represent those manifestation and reciprocal relations which belong together, i.e. those that define the nature of a particular disposition pair by forming a three place relation, with lines of similar hatching[44]. Thus, the basic dispositional structure will be as follows (labelling added for clarity):

Mutual Manifestation
(acceleration, dissolving, etc.)

Reciprocal Powers
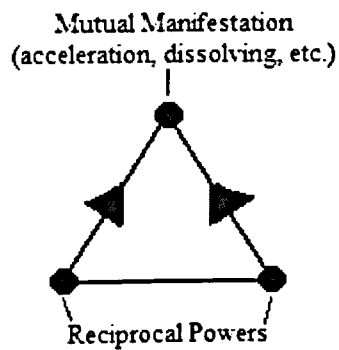
Figure 4.2

Given our earlier acceptance of reflexive manifestation relations, we may also allow mutual manifestation structures which take the following form:

Figure 4.3

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[44] It has been pointed out to me by Charlotte Matheson that the vertex representing reciprocal dependence is not an ineliminable feature of the power graph. This is because all and only properties which are directed towards the same manifestation will be those which are reciprocal partners. Thus, reciprocal partnerships can be deduced from manifestation relations alone. This seems correct, but since the inclusion of these vertices aids clarity, I will continue to include them.

Chapter Five: Constructing Acceptable Power Graphs

5.1) Introduction

During the last two chapters, I argued for four constraints concerning the structure that an acceptable power graph can have. An acceptable power graph is one that represents a genuine possibility concerning the power structure that a world may have. To recap, the first (identity) constraint dictates that an acceptable power graph must be strongly asymmetric. This is so that the identity of each power represented is fully determinate. This constraint can be satisfied in several ways. If the directed walks leading away from each node (along the arcs representing manifestation relations) include every other node, and the graph as a whole is asymmetric, then each node will automatically have a unique structural position. If the directed walks away from each node do not include every other node, the asymmetry constraint can still be met as long as no two self-contained directed walks are structurally isomorphic. Finally, if one accepts that a power is not only a power for a certain manifestation, but also a power for a certain manifestation *in conjunction with a certain reciprocal partner*, then another source of asymmetry is available. Thus, even if the *directed walks* leading away from two different nodes are structurally isomorphic, those nodes may nevertheless be distinguishable if the reciprocal relations involved are structurally different (i.e. if the powers being represented each have different reciprocal partners). During chapter three it was also argued that, plausibly, relational structures of properties must be asymmetric even if one holds a 'two-sided' version of pandispositionalism.

The second 'powerfulness' constraint is quite simple. All nodes in a power graph must have *at least* one outgoing manifestation relation. This is because the nature of a power is always determined, in part, by that which it is a power for. Therefore, a node which does not have an

outgoing manifestation relation cannot represent a genuine power. A property lacking power would be entirely categorical (i.e. inert), and such a property has no place in a power graph.

The third 'fundamentality' constraint also concerns manifestation relations. This constraint dictates that the nodes in graphs representing *fundamental* power structures must have at most one outgoing manifestation relation. Thus, in conjunction with the second constraint, this constraint implies that each and every node in a graph representing a fundamental power structure must have a *single* outgoing manifestation relation. This means that all fundamental powers must be single-track, rather than multi-track. Drawing upon some of Bird's work, I argued for this constraint by showing that predicates ascribing multi-track powers – powers with logically complex manifestations and / or stimuli – may be broken down into the multiple predicates which ascribe only single-track powers. As such, the truth of statements about multi-track disposition can be accounted for in terms of (clusters of) single-track dispositions, and given that single-track powers, rather than multi-track powers, come closer to being fundamental, we may conclude that multi-track properties will not figure in a graph of *fundamental* powers[45].

The fourth and final 'stimulus' constraint dictates that a power is not only essentially something for a certain manifestation, but also a power to give rise to a certain manifestation *in conjunction with something else*. Thus, what Bird calls 'stimulus' relations should also be included in an adequate power graph. I then argued that Bird's version of the stimulus constraint should be modified, however, because in the graphs he constructs, 'stimulus' properties do not have the same manifestations as the properties which they stimulate. The picture Bird is left with therefore fails to do justice to the plausible thought that manifestations

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[45] The arguments of chapter four suggest that multi-track dispositions in the non-fundamental case are also best understood as clusters of single-track dispositions; see Mumford (2004: 10.6) for further discussion of this 'cluster' view of properties.

are 'mutual' manifestations of both a disposition and its stimulating disposition – or what are better called *reciprocal* dispositions. In order to do justice to the mutuality of manifestation, the basic three-place dispositional structure was modified accordingly. On this modification, reciprocal dispositions have outgoing manifestation relations to the very same property, and the relation of reciprocity holding between disposition partners is symmetrical, as opposed to Bird's 'stimulus' relations which are asymmetrical.

5.2) Problems concerning the constraints: the 3-node graph

Unfortunately, when one comes to applying all of these constraints simultaneously to fundamental power graphs of certain sizes, a tension often arises between the four constraints in a way such that the application of all those constraints seems incompatible. During this chapter, I will identify these problem cases and then suggest further modifications to our theory of dispositions which can assuage these problems. These modifications, I will argue, should also be accepted for independent reasons, and so my modifications are not susceptible to the charge of being *ad hoc*.

In order to highlight the first problem, consider, for example, the very simple graph below (figure 5.1) which involves 3 nodes partaking in the basic three-place relationship of mutual manifestation. Clearly, this graph violates several of our constraints. Firstly, the graph does not meet the asymmetry requirement: the bottom two nodes are structurally indistinguishable. As we saw in chapter three, there can be no question of two distinct powers (i.e. nodes in a graph) having the same second-order structural features. Secondly, the top node has no outgoing manifestation relation, and so the property corresponding to this node is inert. Thus, the 'powerfulness' constraint outlined in chapter three is also violated:
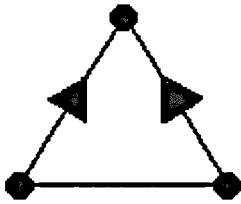
Figure 5.1

This last problem, as well as the symmetry problem, can be remedied by adding further manifestation relations, thereby allowing the uppermost node to have an outgoing manifestation, as is illustrated in the following:
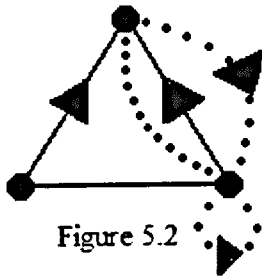
Figure 5.2

Clearly, the three nodes now bear unique relational features, and the uppermost node now has an outgoing manifestation relation and so represents a property which is genuinely powerful. This adjustment has also been made in way which respects our 'mutual manifestation' constraint. However, remedying these problems has produced a new one: there is a bubble in the carpet. The node to the right (in figure 5.2) now has two distinct manifestations, and so the fundamentality constraint is violated. Such a graph is therefore only apt for representing a structure of *non*-fundamental powers. The upshot of all of this is that it seems a three node fundamental power graph is unable to respect all of our constraints. Thus, unless our account of dispositional structures is modified, it must be accepted as things stand that a world containing just three fundamental powers is impossible.

5.3) Extending the problem: graphs with odd numbers of nodes

One might think that accepting the impossibility of a three node power graph is not too big a price to pay. The arguments for each of the four constraints are, I have suggested, plausible, and so could it not be a case of spoils to the victor? Unfortunately, the opponent may point out that the dilemma concerning the three node graph is going to arise for any model containing an *odd* number of nodes (i.e. properties). The mutual manifestation requirement says that each manifestation is in fact a *mutual* manifestation of reciprocal partners, and so where there is a manifestation power, there will have to be two incoming manifestation relations (i.e. one outgoing from each of the two reciprocal dispositions involved). This means that as things stand, a power graph will always contain an even number of manifestation relations in total. Thus, if the mutual manifestation constraint is respected, then where graphs with an odd number of nodes are concerned either at least one node must lack an outgoing manifestation relation or at least one node must be multi-track. More precisely, for all n, where n is an *odd* number of nodes, if there are $((n-1) \div 2)$ sets of mutual manifestation relationships, there will in total be (n-1) manifestation relations in the structure and so one of the properties represented is bound to be powerless. If one remedies this by adding another mutual manifestation relationship (and so $((n+1) \div 2)$ in total), there will then be (n+1) manifestation relations and so one of the powers will bound to be multi-track.

5.4) The options

At this point, we seem to have four options: 1) simply accept that a world containing an odd number of fundamental powers is impossible; 2) reject the mutual manifestation requirement; 3) reject the powerfulness constraint or the fundamentality constraint, or both; or 4) modify one of the constraints in such a way that a power graph with an odd number of nodes is able to simultaneously satisfy all constraints.

Which of these options is most appealing? It must be said that the first option is quite unappealing. It would be surprising if it turned out to be a consequence of an otherwise plausible version of pandispositionalism that a world with an odd number of properties is impossible. This consequence would perhaps be tolerable if there were some independent reasons for denying the possibility of worlds containing odd numbers of properties, but there do not seem to be any. As things stand, the thought that worlds containing 'odd' numbers of powers are impossible has arisen solely as a consequence of the particular way in which I have formulated pandispositionalism thus far. So much the worse of this version of pandispositionalism, the opponent is likely to claim.

This leaves options 2, 3, and 4. Options 2 and 3 involve rejecting one or more of our constraints. In light of the last two chapters, I think we should only consider these options as a last resort. Therefore, before rejecting any of these constraints outright, I should first investigate whether any of our existing constraints can be modified in a way which is independently plausible and which will enable satisfactory graphs to be formulated which contain odd numbers of nodes. This is what I will try to do in the next section. Fortunately, we will see that the problem at hand can be resolved by making an independently plausible modification to the mutual manifestation constraint.

5.5) The adicity of mutual manifestation relationships

One can allow the possibility of fundamental power structures with odd numbers of elements, whilst respecting the identity, powerfulness, and fundamentality constraints, in the following way. The problem has been that for each mutual manifestation structure as described thus far, there have been two manifestation relations, i.e. one outgoing from each of the two reciprocal powers involved. If we now propose that some manifestation properties can be the manifestations of more than two reciprocal powers, then we can allow that there could be an

odd number of manifestation relations being directed towards a particular manifestation property. If, for example, a manifestation property was the mutual manifestation of *three* reciprocal dispositions, then that manifestation would have three incoming manifestation relations. If all other manifestation properties in that same world were then the manifestations of an even number of reciprocal dispositions, and so involve an even number of manifestation relations, then the power structure of that world could contain an odd number of manifestation relations in total. Thus, the problem of 'odd' fundamental structures dissolves, because if an 'odd' graph can involve an odd number of manifestation relations in total, then there is no reason why each and every property represented cannot be powerful and yet be fundamental (i.e. have one and only one outgoing manifestation relation).

It should be noted that Bird does not acknowledge that his stimulus-response relationships could be of varying adicity. In his graphs, each power has a single outgoing stimulus relationship or, in the terminology I am using, each of the powers in his graphs has just one reciprocal disposition. There are good reasons for being more permissive in terms of the adicity of such relationships, however. As well as yielding the benefit of being able to deal with worlds containing odd numbers of dispositions, the modification under consideration is supported by the fact that there appear to be actual cases of disposition manifestation which involve more than two reciprocal dispositions. The igniting of a match, for example, is plausibly a manifestation that is brought about by at least *three* distinct reciprocal dispositional partners: the flammable match, the rough surface on which it is struck, and the surrounding oxygen. Given that there are such cases, the proposed modification is not merely *ad hoc*. It should be acknowledged of course that in the match case the relevant dispositional properties, such as flammability, are not fundamental properties, but there seems no reason why the interaction of any number of fundamental dispositions could not be responsible for a certain fundamental manifestation. As such, there is no reason to think that graphs representing fundamental structures containing an odd number of dispositions pose a problem.

5.6) The problem of the 3-node graph returns

Unfortunately, there is one case for which the 'adicity' modification is of little help. The case in question is that of the simple world containing just three fundamental powers. If we ensure that such a graph respects the powerfulness and fundamentality constraint, by imposing a triadic reciprocal relationship, we are left with the following graph:
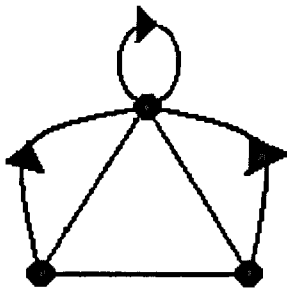
Figure 5.3

Whilst each node has just one outgoing manifestation relation, the asymmetry constraint is clearly violated: the bottom two nodes are relationally indistinguishable. And as we saw in chapter three, there is simply no question of there being two distinct powers which are relationally indistinguishable. Therefore, this three-node graph does not represent a genuine possibility. I will now consider in the next section how the problem posed by three-power worlds can be overcome.

5.7) Spontaneously manifesting powers

One pandispositionalist response to the problem at hand would be to simply accept the conclusion that there cannot be a world involving just 3 fundamental properties. However, as before, this may strike many as a strange consequence and one that is a potential source of embarrassment. Fortunately, the problem posed by three-node power graphs can straightforwardly be overcome. What is required in order to create asymmetry in a three node

graph is for one the nodes to be the manifestation of a single power only. In other words, the power which is directed towards the manifestation in question must not enter into any reciprocal relationships, i.e. it must have no reciprocal partners. So, unlike typical powers, this power would be able bring about its manifestation without the aid of a further reciprocal power (or powers), or what Bird would call a 'stimulus'. That is, there would be no conditional aspect to this power since it would be able manifest entirely of its own accord. We might therefore call such a power a *spontaneously manifesting power* (this the kind of terminology used by Molnar (2003: 85) when discussing such powers).

Spontaneously manifesting powers may be represented in a graph in a very simple way, using just a single manifestation relation, as is illustrated in the following:

Figure 5.4

Once we allow the possibility of such powers, we are in a position to allow that a three-node fundamental power graph could be asymmetric. Consider, for example, the following:
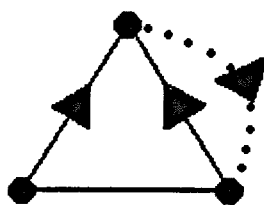
Figure 5.5

In this graph (figure 5.5), we have a basic reciprocal relationship involving the two powers at the bottom, and the power at the top (which is the manifestation of the two reciprocal dispositions) is empowered by virtue of a single manifestation relation. Crucially, this uppermost node is a spontaneously manifesting power, since it does not stand as reciprocal

power to any other. Because of this, each node is able to have a single outgoing manifestation relation, and at the same time, the graph respects the asymmetry constraint. Thus, the identity of each power in a fundamental three-power structure may be fully determinate.

It should be noted that Bird's graphs do not contain spontaneously manifesting dispositions. As soon as Bird introduces his stimulus constraint, all the dispositions which appear in his graphs bear stimulus relations. The modification currently proposed therefore involves a further loosening of what I have called Bird's 'stimulus' constraint. Recall from the last chapter that Bird remarked 'a potency is not only essentially a disposition to do something but is also essentially a disposition to do something in response to something else, the stimulus' (2007: 145). If the possibility of spontaneously manifesting dispositions is accepted, however, then it cannot be that all powers essentially have a certain stimulus, or reciprocal partner. Whilst many powers will require stimulation, not all will. It should also be pointed out that when Martin offers his mutual manifestation model as a generalised account of dispositional interaction, he also appears to disregard powers which might manifest entirely of their own accord.

Are Bird and Martin justified in not taking account of the possibility of spontaneously manifesting dispositions? I do not think so. As well as yielding the benefit of being able to deal with the three-node case just discussed, the possibility of spontaneously manifesting powers should be accepted on independent grounds. As with the case of varying adicity, there seem to be *actual* cases of dispositional activity which involve spontaneously manifesting dispositions. For example, when particles radio-actively decay, they seem to do so spontaneously (see Molnar, 2003: 85). That is, their decay behaviour does not appear to depend upon an interaction with anything else, i.e. a reciprocal partner. Thus, it seems there is no conditional aspect to particle decay: the particle simply either decays or it does not, regardless of extrinsic circumstances. That is not to say that particle decay is a completely

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unexplainable occurrence, however. Perhaps we would want to say that a particle's ability to decay is explained in some way by the properties that those particles have, because particles with very different properties do not have those same behavioural characteristics. And if one holds all properties to be dispositional, as the pandispositionalist does, then decay behaviour will ultimately be explained in terms of a certain power, had by the particle, which manifests of its own accord.

Although Martin does not identify spontaneously manifesting powers as a potential counter-example to his mutual manifestation model, Heil does. Whilst Heil is an advocate of the mutual manifestation model in all cases where more than one power is involved, Heil does concede that there can also be cases involving a single power which manifests without the assistance of any reciprocal dispositions (see (2003: 198), for example). Thus, of all existing pandispositionalists, Heil is arguably the one whose view on these matters comes closest to the one proposed here.

Before moving on, a further consequence of the spontaneous dispositions modification is well worth highlighting. Accepting the possibility of spontaneously manifesting powers furnishes us with further possibilities concerning the form that a power structure, and so a power graph, could take. Specifically, the addition of such powers can add a source of asymmetry to graphs that would otherwise violate the asymmetry constraint discussed in chapter three. As we have just seen in the three-node case, for example, the addition of a spontaneously manifesting disposition creates asymmetry in a graph that would otherwise be symmetrical. Thus, the 'spontaneous dispositions' modification is advantageous in the sense that it makes the asymmetry constraint easier to satisfy.

5.8) Structures with even numbers of nodes

In contrast to graphs involving an odd number of dispositions, satisfactory structures containing an even number of fundamental properties can be constructed which include only reciprocal relationships involving *two* reciprocal powers. In other words, it is possible for each manifestation property in an 'even' graph to have exactly two incoming manifestation relations, making them the *mutual* manifestations of just two reciprocal powers. Thus, worlds with even numbers of fundamental powers may often lack spontaneously manifesting dispositions, as well as mutual manifestation relationships involving an odd number of reciprocal dispositions. The graph below represents one such world. This graph involves an even number of nodes, and respects all of our constraints concerning what a fundamental power graph may look like. More precisely, the following graph is asymmetrical and each node has one, and only one, outgoing manifestation. Thus, the identity of each property is fully determinate, and each property is both powerful and single track:
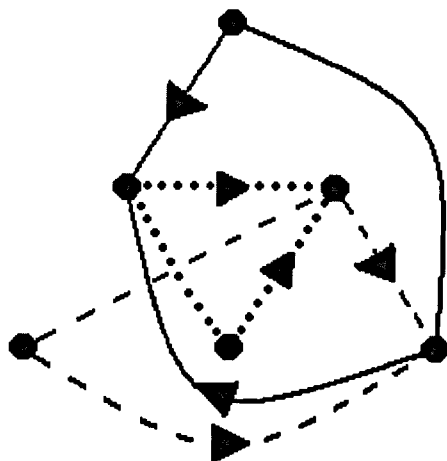
Figure 5.6

5.9) A further consequence: unmanifestable powers

It is noticeable that in the above six-node graph (figure 5.6), four of the nodes have no

manifestation relations leading to them. This means that this graph represents properties which are not the manifestations of any other powers in that world; we might say the properties in question are *unmanifestable* by other powers. In fact, it appears that all satisfactory structures on the proposed system will involve at least one property (but obviously not all properties) that has no manifestation relations leading to it from one or more other properties. It should be pointed out, however, that it is also a consequence of Bird's system that in some structures, certain properties will unavoidably lack incoming manifestation relations from elsewhere. For example, all satisfactory 3-node structures on Bird's system will involve such powers. The following two graphs provide an illustration: the left-hand nodes in each of the following are unmanifestable. Note that the graph to the left (figure 5.7) is one that Bird himself uses as an example of a satisfactory structure (2007: 145):
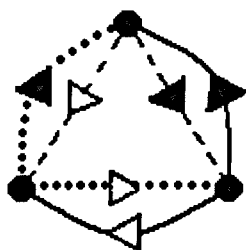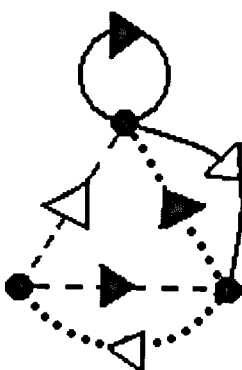
Figure 5.7   Figure 5.8

Should the possibility of worlds with dispositions that are not the manifestation of anything else be seen as a problematic consequence of the version of pandispositionalism presented? I think not. The central claim of the pandispositionalist view is merely that each and every property is a property *for something else*, often in conjunction with a certain other reciprocal properties. All this claim amounts to is that each property is able to make a causal impact on the world, by giving rise to a particular manifestation. This view in its essence leaves open the question whether each property must also be the manifestation of another or others.

Furthermore, there may be independent reasons for thinking that there can be properties which are themselves unmanifestible by any other properties. This is because, arguably, there are *actual* properties which are not manifestible by any further properties in our world. For example physicists often speak of a group of properties known as *conserved* quantities, such as mass-energy and charge, which are amongst the more fundamental properties of our world. By definition, new instances of these properties cannot be brought into existence by different properties. That is, given that the quantity of these properties must by their very nature be conserved, instances of these properties cannot be created out of nowhere, so to speak. Thus, there seems a real sense in which these properties cannot be manifested by others. Yet, this clearly does not compromise their status as properties. As long as those properties themselves have manifestations, i.e. exhibit power, they will count as genuine properties according to the pandispositionalist view. Properties such as charge clearly satisfy this requirement: a particle's charge may be manifested by its accelerating through an electro-static field, for example.

5.10) Summary

In the last chapter, I argued for certain modifications to Bird's account of fundamental power structures. We have seen in this chapter that these modifications give rise to certain *prima facie* problems, problems which threaten the constraints argued for in the previous two chapters. It has been showed, however, that these problems dissolve as long as two main (plausible) modifications are accepted. These modifications are as follows: 1) we should allow that reciprocal relationships may have varying adicity, and 2) we should allow that some dispositions may manifest spontaneously. I have suggested independent reasons for accepting each of these claims. Finally, it was highlighted that the pandispositionalists must accept that some dispositions in a graph will themselves unmanifestable by others. I suggested that this should not be thought to be problematic, however.

Chapter Six: The Problem of Geometrical Properties for Pandispositionalists

6.1) The problem of geometrical properties

During this chapter I will discuss what many take to be a serious problem for the view that all (natural) properties are irreducibly dispositional, or 'powerful', in nature. It has been argued by some opponents of pandispositionalism that there is a class of properties which resist being captured in dispositional terms, more than any other. The nature of these properties, it is thought, clearly cannot be adequately captured in terms of causal potentiality. In this chapter, I will defend pandispositionalism against this charge.

The properties in question are what I will call *intrinsic geometrical properties*. The geometrical properties of things are, simply put, their three-dimensional shape, such as the sphericality of a ball, or the cubic form of a die. It is alleged that there is something about these properties, had by all voluminous particulars, which make them particularly resistant to dispositional characterisation. In other words, it is alleged that geometrical properties must have an inert, *categorical* essence.

Even metaphysicians who are generally sympathetic to realism about dispositions have claimed that geometrical properties are non-powerful. Brian Ellis, for example, has contributed much to the dispositional realist movement, yet he thinks that geometrical properties are clearly categorical[46]. Ellis calls such properties *structural* properties, and provides as an example of a ['block'] structural property the tetrahedral structure exemplified by methane, silane and carbon tetrachloride molecules (2002: 173). Ellis admits that '[I]t is, of course, only from the behaviour of an atom or molecule that we can infer its structure', but

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[46] Elizabeth Prior (1985: 59-62) is another property dualist and argues that triangularity, unlike many other properties, is categorical.

maintains that '... the structure exists independently of its disposition to behave in this way' (2002: 69).

As Bostock (2008: 150) highlights, Ellis appears to take the non-dispositional nature of such properties to be relatively uncontroversial and so explicit arguments for his view on the matter are not easy to find. However, elsewhere in the dispositions literature, attempts have been made to cash out the kinds of arguments lying behind 'categoricalist' intuitions about geometrical properties. In this chapter, I will address what I take to be the two most common lines of argument and will try to show that neither of these arguments are conclusive against the pandispositionalist thesis. If pandispositionalism is false, it is not because geometrical properties pose a special problem[47].

6.2) The argument from unconditionality

As we have seen in earlier chapters, it is a feature of dispositions that they only manifest themselves in certain circumstances. For example, fragility, which is a paradigmatic dispositional property, is only displayed once the thing that is fragile is struck with suitable force. In contrast, it has been argued by some that there is no such conditional aspect to geometrical properties since they are manifested permanently and unconditionally. Therefore,

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[47] Alexander Bird has suggested to me that even if geometrical properties do resist being captured in dispositional terms, this may not be a problem for the pandispositionalists since it is far from clear that geometrical properties, such as those had by macro-objects, should qualify as natural properties. In other words, it is far from clear that our completed scientific theory of the world will appeal to such properties. In response, even if Bird is right, it does seem likely that there will be structural properties of some sort at the fundamental level of reality. Consideration of whether macro-geometrical properties can be captured in dispositional terms is therefore important, for it serves to indicate the prospects pandispositionalism has for dealing with structural properties generally.

it is claimed, geometrical properties cannot be understood in dispositional terms. Choi is one example of a philosopher who pushes this line. Choi writes: '[W]hen x has a categorical property, x has to exhibit some distinctive manifestation actually or occurently without undergoing any stimulus' (2005: 502). Following that claim, Choi then cites roundness, i.e., a geometrical property, as an example of a categorical property.

The first thing to point out in responding to this line of argument is that the term 'manifestation', which is at the heart of Choi's claim, is an ambiguous term. On one hand, when one says that a property is 'manifested', one might mean that it is *on display,* in the sense that it can be seen to be bringing about a characteristic effect, such as when a soluble substance is dissolving. This is the way in which the term is typically used in the literature on dispositions. On the other hand, one might understand the term 'manifestation' in a way which does not imply that any characteristic effects are on display (see Molnar (2003: 60) who makes a related point). One might, for example, say that a property is manifested simply in the sense that it is *instantiated* by a concrete particular. However, since the former use of the term is more typical in dispositional contexts, we should perhaps assume that this is Choi's use of the word. But let us first see whether the argument would go through if 'manifestation' is used in a way that simply means instantiation. Do geometrical properties differ from dispositions in the sense that they are instantiated occurently and unconditionally, whereas dispositions are not? This would be a poor argument. To object to pandispositionalism in this way would be to misunderstand the view. If one is a realist about irreducible dispositionality, one holds that dispositions are instantiated occurently and unconditionally in a particular even if that disposition is not revealing itself. Whilst a disposition's characteristics effects are potential only, the instantiation of the disposition itself is *actual.* Thus, a distinction cannot be drawn between geometrical properties and dispositions on the basis that geometrical properties are instantiated occurently and unconditionally.

Let us now understand 'manifestation' in the second sense, and see if Choi's understanding of categoricity implies that geometrical properties are not dispositional. On the second understanding of manifestation outlined, to say that a thing's property is manifested is to say that the property is on display, in the sense that it is producing its characteristic effects. Understood in this way, Choi's statement above amounts to the claim that categorical properties display their characteristic effects occurently and without undergoing any stimulus. Is this the case with geometrical properties? I suggest not. There are many candidate manifestations that one could associate with geometrical properties, and none of them seem to be unconditional. For example, Molnar claims that 'the quantum of heat lost through friction is, in part, the manifestation of the shapes of the bodies when rubbing against each other' (2003: 172). Clearly, though, this is not a manifestation that shaped bodies exhibit permanently and unconditionally; as Molnar says, this manifestation only occurs when bodies rub against each other. Various philosophers have suggested other manifestations associated with geometrical properties. For example, Kant (1778 [2004]: ch. 2) claims that a thing's geometrical properties determine (in part) its disposition to resist penetration, and Goodman speaks of the geometrical properties of things manifesting in their interactions with measuring instruments ('a cubical object is one capable of fitting try squares and measuring instruments in certain ways' (1983: 40)). Again, clearly, none of these manifestations occur unconditionally; shaped objects do not permanently collide with other objects nor are they permanently measured by instruments. The Choi-type argument for the categoricity of geometrical properties, under the current interpretation, seems clearly mistaken.

To be fair, I think what philosophers like Choi must have in mind is something like this. Geometrical properties, unlike dispositional properties, are *readily observable* at all times, unconditionally. Another way to bring out this alleged difference, perhaps, would be to say, as Ellis does, that geometrical properties (or *structural* properties, as he calls them) are 'readily imaginable' (2002: 68). The thought may be, then, that we can imagine a particular having a

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certain geometrical property in all sorts of circumstances, whereas we can only imagine a particular in our world being, say, fragile insofar as we can imagine it breaking when force is applied to it. Therefore, geometrical properties differ from paradigmatic dispositional properties in a crucial respect.

I think, however, that the pandispositionalist again has an obvious response. What, precisely, could it mean to say that the shape of an object is readily observable at all times? Presumably, it must mean that the shape of a thing can always be seen or felt, or observed with an instrument. Crucially, however, what the pandispositionalist should point out is that such observations are themselves conditional upon certain circumstances obtaining. The shape of a particular can only be seen when certain lighting conditions obtain and when that particular is not camouflaged, for example. The shape of thing can only be felt if, for example, that thing is at such a temperature that the human hand is able to tolerate contact with it. In sum, then, geometrical properties do not seem significantly different to dispositional properties in this respect. Like all dispositional properties, geometrical properties are not typically 'on display' unconditionally.

I conclude, therefore, that on the most obvious interpretations of the Choi-type argument, it does not give the pandispositionalists cause for concern.

6.3) Shoemaker's worry

In the last section, we saw that the initial argument against pandispositionalism could be assuaged. Important questions remain, however. Is it really the case that each and every instance of a certain geometrical property confers the very same disposition or cluster of dispositions? If this is not so, then the pandispositionalist thesis is in trouble. If geometrical properties are *identical* (at least in part) with a certain disposition or cluster of dispositions, as

pandispositionalism maintains, then *all* instances of those geometrical properties must give rise to just those dispositions[48].

Shoemaker, who put forward a pandispositionalist view in 1980 [2003][49] (or what he called a 'causal' theory of properties), conceded that geometrical properties present a *prima facie* problem in that the relationship between shape and function appears not to be one of necessity. He claimed, for example, that whilst knife-shaped pieces of steel have the power to cut wood, knife shaped pieces of butter do not, for they simply disintegrate as soon as they are firmly applied to wood (2003, p. 212). This suggests, therefore, that the property of being knife-shaped is not identical (wholly or even in part) with the power to cut, for if it were, all instances of that property would have to be instances of the power to cut. Shoemaker then suggested that this problem generalises and that 'there is no power which necessarily belongs to all and only the things having this [knife-shape] property' (2003, p. 212; my words in brackets).

6.4) The conditional powers account

Shoemaker was well aware that this conclusion threatens the pandispositionalist view in its standard form. However, rather than giving up on pandispositionalism, Shoemaker offered a modified version of pandispositionalism by introducing the notion of a *conditional power*.

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[48] If this were not the case, thereby falsifying pandispositionalism, it could still be admitted that having a certain shape property in some sense contributes towards having certain dispositions. One approach would be to hold, for example, that the shape property itself provides a partial causal base for the dispositions in question, but is itself categorical. This move would be available on, for example, Prior's dualistic theory of properties (1985).

[49] It is not clear that Shoemaker still holds a pandispositionalist position (see 1998). However, in this thesis I will be focusing on the Shoemaker of 1980 [2003].

According to Shoemaker's modified view, properties like that of being knife-shaped are not clusters of ordinary powers, but, rather, 'clusters of *conditional* powers' (2003: 213). His notion of a conditional power stems from the observation that whilst a knife-shaped object may not have the power to cut wood, it *will* always have the power to cut wood '*conditionally* upon being knife-sized and made of steel' ((2003: 213); my emphasis). Thus, even if a knife-shaped object is made of butter, it can still be said to have the *conditional* power to cut because if it were to undergo a strengthening process the power to cut would come into being. On Shoemaker's modified view, this *conditional* power is what the property of being knife-shaped is, in part, identical with, and it is such that it plays a causal role in bringing about the instantiation of the power to cut wood when certain conditions are satisfied. Thus, Shoemaker believed he had preserved the essence of the pandispositionalism in light of the kind of case discussed.

Having introduced the notion of a conditional power, I will now explore the nature of conditional powers further and argue that Shoemaker's version of pandispositionalism is unattractive for several reasons. This does not mean that pandispositionalism should be rejected, however. I will conclude this chapter by outlining a more promising pandispositionalist explanation of Shoemaker's knife case.

6.5) General worries concerning the conditional powers account

I have to confess that I find Shoemaker's notion of an irreducible conditional power to be puzzling in various respects, and, surprisingly, these oddities have been little discussed in the philosophical literature. Whilst none of the concerns I will raise are knock-down objections, they do reveal why Shoemaker's modified view is unattractive in certain respects. Therefore, before the pandispositionalists accept the conditional powers account, they should, I think, first consider whether an alternative dispositionalist account of geometrical properties can be

offered. To that end, I will conclude this chapter by arguing that pandispositionalism in its standard form is able to deal with the kind of case presented by Shoemaker.

An initial point of criticism is that by canvassing the view that he does, Shoemaker is left with a rather disjointed pandispositionalist theory of properties. Although, according to Shoemaker, properties such as that of being knife-shaped are best cashed out in terms of *conditional* powers, surely not all properties can be cashed out in this way. If an object has a certain mass, for example, it seems has gravitational potentialities *regardless* of what other properties it has. Therefore, Shoemaker's conditional powers account is unlikely to provide a universal account of properties. This is not a knock-down objection of course, but it is well worth pointing out that a version of pandispositionalism which accounts for all properties in terms of 'standard' powers would be more unified and economical in terms of the types of entity it invokes.

In order to scrutinise Shoemaker's view further, I will first try to express more clearly the precise nature of an irreducible conditional power on his account. A striking feature of a conditional power is that when it is instantiated alone, or in the absence of the right kinds of other properties, it does not confer any powers in the ordinary sense. This observation leads to the following kind of question: what, precisely, do conditional powers (i.e., properties in Shoemaker's sense) consist in? Shoemaker's answer is as follows: 'they are powers to produce first-order powers (powers to produce certain sorts of events) if combined with certain other properties' (2003: 212). More precisely, for some conditional power *r*, the instantiation of a certain set Q of other properties '...together with *r* is causally sufficient for having *P* (an ordinary first-order power), while having the properties in Q is not by itself causally sufficient for having *P*' ((2003: 212); my words in brackets). Using the standard dispositional idiom, we might capture Shoemaker's thought by saying that a conditional power is *triggered* by the presence of other properties (which are themselves conditional

powers). This triggering is then 'causally sufficient' (2003: 212) for the bringing about of an ordinary power (which may be considered the manifestation of the conditional power).

One question which may strike one at this point is this: what, precisely, is the relation between properties (considered as conditional powers) and ordinary ('first-order') powers? Ordinary powers, such as the power to cut, are only produced when certain properties group together. Yet, according to Shoemaker's theory, ordinary powers are not *identical* with those groupings of properties. Rather, the properties (i.e., conditional powers) are *causally* sufficient for the first-order powers, and so powers in the ordinary ('first-order') sense must be somehow distinct from the properties which produce them.

To Shoemaker's credit, he is open about this, agreeing as he does with the thought 'that a thing's powers or dispositions are distinct from, because 'grounded in', its intrinsic properties' (2003: 213). On his account, powers in the ordinary sense are no longer at the heart of the account of intrinsic properties because they are in some sense distinct from them. What place, then, do ordinary powers (as opposed to conditional ones) occupy within Shoemaker's metaphysical scheme? Are ordinary powers best thought of as properties of properties? If ordinary powers are distinct from intrinsic properties, yet real in their own right, are they somehow emergent features of reality? I do not wish to claim that a satisfactory account cannot be offered here, but it is far from clear what the conditional powers theorist can say at this point[50]. And these are questions that simply do not arise if one identifies properties with powers in the ordinary sense.

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[50] Indeed, perhaps this is one reason why Shoemaker later appeared to abandon his pandispositionalist position (again, see his 1998).

6.6) Conditional powers and causal roles

The final concern I will raise regarding the conditional powers account concerns the supposed causal efficacy of the conditional power associated with the property of being knife-shaped. Now, realists about causal powers do not all advocate the same theory of causation, but whatever particular theories they hold, they will tend to think of powers as entities which actively bring about changes, even if that activity is not always observable. For example, even if a particle is remaining static in a field equilibrium, the power theorist will think there is nevertheless some activity taking place, such as the exertion of two opposing forces. Let us now consider the contribution made by the property of being knife-shaped in the following case. Suppose a flimsy knife-shaped object (such as butter) is made rigid by being deep frozen and, as a result, the power to cut is brought into being. Can the property of being knife-shaped really be said to be making a causal contribution in this case? On Shoemaker's view, the conditional power associated with being knife-shaped must be making a causal contribution, for the coming into existence of the power to cut is precisely what its manifestation is supposed to be (since conditional powers are '...powers to produce first-order powers' (2003: 212)). It seems to me that a worry is lurking here, however. In what sense can the property of being knife-shaped be said to be causally active in the case described? What is it *doing*? In the case described, it seems sufficient to say that it is simply the deep-freezing process which brings about the change necessary for the new power to cut. The concern is not simply that we cannot *observe* a causal impact other than that relating to the deep-freeze process. In the case of a particle being caught in equilibrium, we are entitled to *infer* the existence of underlying activity in order to explain the situation in question. In the knife case, however, there seems no need to appeal to the underlying causal action of Shoemaker's conditional power in order to causally explain why the object has, in the example outlined, just gained the power to cut. It seems sufficient to merely point out that the butter has just been deep-frozen. Of course, the property of being knife-shaped does play a crucial role in such cases, for an object does not

come to have the power to cut unless it has an appropriate shape. But it is far from clear that this property can be said to exert *causal* power in such cases.

In sum, although I do not take the concerns raised to be knockdown objections to the conditional powers account, they do I think suffice to provide the pandispositionalist with reasons to consider whether an alternative account can be given of geometrical properties. In the next section I will show that there is such an alternative, one which accounts for geometrical properties in terms of standard, 'first-order' powers.

6.7) A better pandispositionalist account of geometrical properties

To recap, Shoemaker's claim was that there is no standard power (or powers) which necessarily belongs to all and only things having a property like that of being knife-shaped. As a result, not all properties are identifiable in terms of a cluster of powers (in the ordinary sense), which is why pandispositionalism in its standard form apparently fails. Now, in response to this kind of thought, Mumford has in one place suggested how one might defend the thought that a geometrical property *always* bestows its bearer with a particular (first-order) power or cluster of powers (2007: 426). Mumford's response is aimed at Unger who claims, as Shoemaker does, that there are no necessary connections between what Unger calls an object's 'Spatial Properties' and an object's 'Propensities' (2006: 88). According to Unger, sphericality, for example, does not necessarily bestow its bearer with the propensity to roll because the spherical object may be extremely flimsy and therefore immediately flatten out when nudged. (Clearly, this case is analogous to Shoemaker's knife-shaped butter case). Mumford replies as follows: 'this is a bad argument. If the particular changes from being spherical to being flat, then naturally it no longer has the power to roll. But while ever it is spherical it will indeed have that aforementioned Propensity' (2007: 426).

Mumford's response seems to amount to this. Unger is making a mistake when he infers from the fact that a spherical object may have difficulty in rolling to the claim that it does not have the power to roll. In doing this, Unger is conflating the distinction between the *manifestation* of the power to roll and the *existence* of the power to roll. On Mumford's view, the flimsiness of the spherical object merely prevents the *manifestation* of the power to roll; it does not prevent the spherical object from having the power to roll. The object's being flimsy, I think one could say, is best thought of as an intrinsic *fink* for the manifestation of the power to roll. A 'fink' is a label Martin uses for a factor which causes a certain power to be lost as soon as it is stimulated, thereby preventing the expected manifestation (see Martin (1994) and the next chapter of this thesis for further discussion).

What about the case of the knife-shaped piece of butter? Shoemaker's assessment of that case was that the piece of butter (at room temperature) does not have the power to cut. Mumford's strategy is applicable to this case also. The response would involve admitting that as soon as the butter disintegrates (when pressed onto bread, for example), it no longer has the power to cut, but pointing out that this is simply because *it is no longer knife-shaped*. This, however, does not imply that the butter does not have the power to cut before disintegration. Furthermore, one might add, if the butter were made rigid, by, say, being deep frozen, the fink would be removed thereby allowing the knife-shaped butter to manifest its power to cut. This, the pandispositionalist may reply, shows that the butter has the power to cut all along, even though the manifestation of that power will typically be finked by the butter's flimsiness. In sum, then, the softness of the butter should be construed only as an intrinsic fink for the manifestation of the power to cut wood, and not as something which affects the existence of the power to cut wood. Thus, there is no obstacle to identifying (in part, at least) all instances of the property of being knife-shaped with the power to cut.

It should be pointed out that appealing to the notion of intrinsic finks in geometrical cases is

not merely an *ad hoc* move, since a variety of non-geometrical cases involving intrinsic finks are also imaginable. Borrowing Martin's concept of an electro-fink, imagine for example a cyborg that, whilst turned on, has sufficient electrical charge running through its body to kill any human being who touches it. Imagine further that at any moment at which the cyborg is touched by a human, it immediately turns itself off, so that it is no longer 'live'. Here we have a case of a benevolent cyborg with an intrinsic fink, but not a fink for its geometrical properties.

6.8) Choi's argument against intrinsic finks

I will conclude this chapter by defending the proposal outlined against a recent argument by Choi (2005), which has been supported by several others[51], the conclusion of which is that only *extrinsically* finkable powers are possible, and not intrinsically finkable ones. According to Choi, putative cases in which there is a disposition which is intrinsically finkish are really just cases in which the disposition in question is not present at all. If this claim is correct, then Shoemaker would, after all, be correct in judging that the property of being knife shaped does not bestow the power to cut in the case discussed. In the course of arguing against Choi's proposal, I will suggest reasons why one ought to accept that intrinsically finkable dispositions do indeed exist.

Choi attempts to justify his conclusion against intrinsically finkish dispositions in the following way. According to Choi, our judgements about whether a particular has a certain disposition are guided by two tests. The primary test is what he calls the 'nomic duplicate test'. This test involves asking whether a nomic duplicate of the particular under consideration

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[51] Bird & Handfield (2008, pp. 291-292) also follow Choi's general strategy. See also Handfield (2008, sect. 2, pp. 301-304) who develops Choi's strategy so that it applies to both intrinsic and extrinsic dispositions.

(i.e., an exact intrinsic duplicate subject to the same laws of nature) has the disposition in question. If it is clear enough that the nomic duplicate would have the disposition in question, then we are inclined to believe that the particular under consideration has that disposition. Unfortunately, Choi does not provide details about how, precisely, we adjudicate which dispositions the nomic duplicates have, but the main point seems to be that when carrying out this test we picture the duplicate in an alternative environment (but one with the same laws) and consider how it would typically behave. Choi gives the following example of the nomic duplicate test in action: '[W]hy are we inclined to believe that an iceberg on a distant planet is disposed to melt if heated? The reason is that it is sufficiently clear that its nomic duplicates on earth have the disposition to melt if heated' (2005: 500).

The secondary test is a simple counterfactual test: there should be inclination to believe that x has disposition D if it is true that 'if x were to undergo the characteristic stimulus of D, it would exhibit the characteristic manifestation of D' (2005: 499). This should not be the primary test, however, since, as Choi admits, this test can be misleading for well known reasons: Martin-type cases involving extrinsic finks are ones in which the dispositions in question are clearly present, yet the simple kind of counterfactual above does not hold because in those cases the dispositions are lost as soon as they are stimulated[52]. The nomic duplicate test, on the other hand, reveals that the disposition in question *is* present, by prompting us to consider how the objects under consideration would behave in very different circumstances. The nomic duplicate test therefore trumps the results of the conditional test (2005: 499-500). However, in cases where our intuitions concerning the nomic duplicate test does not yield definite answers regarding the presence of a certain disposition, Choi suggests we must rely on the results of the counterfactual test (2005: 500).

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[52] See Martin (1994).

Now, Choi goes on to suggest that if we apply this method of testing to putative cases of intrinsically finkish dispositions, we get the result that the dispositions in question are not in fact present. Choi considers a putative case of an intrinsically finkish disposition which he calls the case of 'tricky sturdiness' (2005: 499; this case is based on an example introduced by Lewis (1997: 157)). This is a case in which 'an actual object S has exactly the same intrinsic properties as a fragile glass except that it has the intrinsic disposition to lose, if struck, the microstructure M it shares with a fragile glass' (2005: 499). Thus, when S is struck, it becomes study and so does not break. The important question, then, is whether fragility is ascribable to S before it is struck. Choi arrives at his negative conclusion in the following way. The counterfactual test gives the result that S is not fragile, for it is simply not true that S would break when struck, because of its disposition to become sturdy when struck. Therefore, the only way we can allow that S is fragile is if the nomic duplicate test delivers the converse result. According to Choi, it does not. Any intrinsic duplicate of S would never break because of its disposition to become sturdy when struck, and so could not be said to be fragile.

6.9) Responding to Choi's argument

How might those wishing to accept the possibility of intrinsically finkable dispositions respond? One strategy would be to question the claim that if Choi's adjudication method is used, it clearly follows that there are no intrinsically finkable dispositions. I will not explore this strategy here[53], however. A more direct strategy is to point out that the reasons for thinking there are intrinsically finkable dispositions are so strong, that if Choi's adjudication method really does rule out intrinsically finkable dispositions, then this just shows there is

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[53] See Clarke (2008: 514-516) who, amongst other things, argues that when we apply Choi's test to some cases, our intuitions in fact deliver mixed results on the question whether there are intrinsically finkable dispositions.

something wrong with Choi's method. This, in effect, is to respond to Choi's *modus ponens* with a *modus tollens*.

In a recent paper called 'Superficial Dispositionalism' (forthcoming), Ashwell presents those who oppose intrinsically finkable dispositions (and intrinsically masked dispositions[54]) with several penetrating objections. In one place, Ashwell nicely brings out one of the oddities which results from rejecting the existence of intrinsically finkable dispositions. She asks us to consider the following case:

> An Intrinsic Fink (Genie in a Glass): An intrinsically enchanted glass is such that were it to be struck, its intrinsic enchantment would cause a genie to appear, who would then stop the glass from breaking by changing the microstructure of the glass. The source of the finking is an intrinsic property of the glass, and thus there is an intrinsic fink'. (Forthcoming, p. 15)

Ashwell points out that those who reject intrinsically finkable dispositions are, on the one hand, committed to saying that the glass is not fragile, yet on the other hand, they must accept that the 'fink' had to do something in order to stop the glass from breaking when struck. This seems rather odd. If the glass really was not fragile, why did the fink have to do anything in order to prevent it from breaking? The same question can be asked of the benevolent cyborg that I described earlier. If the cyborg does not really have the disposition to electrocute humans, why does it have to turn itself off in order to prevent humans from frazzling whenever they touch it? The issue here is that of explaining the action of the cyborg. If the cyborg really does not have the power to electrocute, why does it bother to turn itself off? It

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[54] Cases of a masking are much like Bird's antidote cases, both of which differ from finkish cases in that the disposition in question remains present once it has been stimulated, but the manifestation is still prevented. In cases of *intrinsic* masking, the factor responsible for blocking the manifestation will of course be a further property of the particular in question.

seems the only way of making the cyborg's action appear rational (which it clearly is) is to accept that it had the disposition to electrocute when touched[55].

I think there is also another good reason for thinking that we ought to accept the existence of intrinsically finkable dispositions. Take Choi's 'tricky sturdiness' example again. Presumably, a case is imaginable in which the property P of the glass which is responsible for making it become sturdy (when struck) could be removed, whilst leaving all of the glass's other intrinsic properties intact. In such a case, surely Choi would have to accept that the glass would then be fragile, for its features would be no different to any other glass we would be inclined to call fragile. Furthermore, on his account this would be a *new* disposition, one that the glass did not have prior to having property P removed. But then how can Choi explain the presence of this new disposition? Since the glass has not gained any *new* properties, it would seem mysterious that it now has this disposition, unless we accept that it was there is the first place. Perhaps Choi could respond that the glass *has* gained a new property, the negative property of no longer having property P. But then Choi would appear to be committed to the claim that negative properties can in some sense contribute to or even confer new dispositions upon particulars. This, I think most would agree, is deeply problematic. Surely it is the positive

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[55] Ashwell has pointed out, furthermore, that most, if not all, opponents of intrinsically finkable dispositions are unable to simply bite the bullet at this point (Forthcoming pp. 10-11). This is because those who reject intrinsically finkable dispositions, such as Bird, nevertheless accept the existence of *extrinsically* finkable dispositions, and one of the typical arguments in favour of extrinsically finkable dispositions is that such dispositions are required to explain why the action of the fink is necessary. For example, when discussing Lewis's example of the sorcerer's glass, which is made rigid by the sorcerer whenever struck, Bird remarks that 'it is natural to say that the sorcerer is protecting his vase *because it is so fragile*' (2007: 30). Why, then, cannot an analogous explanation be given in *intrinsically* finkish cases? Refraining from doing so would seem an *ad hoc* move.

properties of things which explain their dispositions, such as molecular structural features in the fragility case, rather than the properties *it lacks*.

6.10) Conclusion

I have considered two arguments in favour of the conclusion that geometrical properties cannot be considered as dispositional in nature. I argued that the first of the two arguments can be assuaged without too much difficulty. The second problem, introduced by Shoemaker, is more challenging. In his 1980 [2003] paper, Shoemaker claims that advocates of pandispositionalism (or the 'causal' theory of properties) should retreat to his conditional powers view in order to deal with geometrical properties like that of being knife-shaped. I suggested that the conditional powers view has several unattractive features, however. This prompted me to look for an alternative pandispositionalist account of geometrical properties. The theory proposed was that geometrical properties are clusters of ordinary dispositions, but dispositions which are sometimes susceptible to intrinsic finks (as dispositions generally are). I concluded the chapter by providing reasons why the existence of intrinsically finkable dispositions is much more intuitive than some philosophers, such as Choi, have suggested.

PART II: PANDISPOSITIONALISM AND CAUSATION

Chapter Seven: Simultaneity in Dispositional Interaction?

7.1) Introduction

The aim of this chapter is to question an assumption that is often made in the philosophical literature on dispositions. This assumption is that the concrete stimulation (or 'triggering') of a disposition temporally precedes the manifesting of that disposition. This assumption is sometimes implicit, but is often explicitly stated in discussions about dispositions, as will be demonstrated in the section to follow.

In order to understand this assumption, it is important to consider precisely what the stimulation of a disposition may be thought to consist in. Although 'trigger' and 'stimulation' are familiar terms in discussions about dispositions, little is often said about what precisely is meant by them. I will identify two alternative views about what, precisely, the stimulation of a disposition consists in, each of which has some plausibility, and then I will argue that on either of these views, a case can be made against the claim that the triggering of a disposition always temporally precedes the manifesting of that disposition. This suggests that, at the very least, one should not take the assumption concerning temporal priority to be obviously true, as many seem to do.

This conclusion is by no means of minor importance, since the priority assumption figures in a variety of discussions on the topic of dispositions. As we shall see, the simultaneity conclusion has implications for conditional analyses of dispositions, dispositional accounts of causation, and also the way in which cases involving 'finkish' dispositions are understood.

7.2) The temporal priority assumption

Lewis and Bird are two philosophers who make explicit the assumption described above, that the stimulation of a disposition temporally precedes the manifesting of that disposition. In Lewis, for example, this assumption manifests itself in his reformed conditional analysis of dispositions (1997). In this analysis, time variables t and t' are introduced into the analysans. The stimulus is said to occur at t, and the manifestation event, or 'response', is said to occur if the object (x) reaches t' without losing the property (B) that is the causal base of its disposition. Crucially, for our purposes, t' is explicitly said to be some time 'after' t:

'Something x is disposed at time t to give response r to stimulus s iff, for some intrinsic property B that x has at t, for some time t' after t, if x were to undergo stimulus s at time t and retain property B until t', s and x's having of B would jointly be an x-complete cause of x's giving response r.' (Lewis, 1997: 157)

Whilst Bird does not support Lewis's reductive enterprise concerning dispositions, he does appear to support the thought that disposition stimulation occurs some time before the disposition in question manifests. For example, when discussing cases involving 'finkish' dispositions[56], in which an object loses its disposition before it can manifest that disposition, Bird characterises such cases as ones in which '... the object loses the disposition after the occurrence of the stimulus but before the manifestation can occur...' (Bird, 2007: 25). Clearly, Bird is here assuming the temporal priority of disposition stimulation.

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[56] Incidentally, finkish cases are what Lewis's reformed conditional analysis is designed to accommodate.

7.3) What, precisely, does the stimulation of a disposition consist in?

Goodman once associated the disposition of flexibility (had by *k* at time *t*) with the following conditional: '[I]f *k* had been under suitable pressure at time *t*, then *k* would have bent' (1983: 35). As we saw in earlier chapters, most, if not all philosophers hold there to be an intimate connection between dispositions and conditionals of one kind or another. As we saw above, Lewis holds this connection to be so strong that disposition ascriptions can be analysed in terms of such conditionals[57]. Now, the conditionals in question have the same general structure: that which we call the disposition's stimulus appears in the antecedent and that which we call the manifestation event figures in the consequent. In the case of flexibility, then, Goodman sees the application of pressure to *k* as the stimulus, with the bending of *k* being the manifestation of *k*'s flexibility. Another example of a disposition conditional can be found in C.B. Martin's work. In considering how one might cash out what it is for a wire to be live, the following conditional is suggested: 'if the wire is touched by a conductor then electric current flows from the wire to the conductor' (1994: 2). In this case, then, the stimulus would be classed as the contact of wire and conductor, with the manifestation being the flow of electrical current.

Now, each of these examples seems to offer a slightly different interpretation of what disposition stimulation consists in. It is noticeable that in the Goodman case, the stimulus involves *action*, i.e. the exertion of pressure, probably by a particular external to *k*. On the other hand, in the wire case, the stimulation event is static: it simply consists of the state of

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[57] Some philosophers in the dispositions literature, such as C.B. Martin, deny that disposition ascriptions entail, or can be reduced to, specific conditionals. However, even Martin has to concede that there is at least some connection between dispositions and conditionals; he writes that ascriptions of dispositions 'are *somehow* linked to (strict or strong) conditional statements' (1994: 2), but that such statements are only 'clumsy and inexact linguistic gestures to dispositions...' (1994: 8).

affairs of the wire and the conductor being in contact[58].

It seems to me that it is more commonplace to view a stimulation event as something that involves activity[59]. However, there do seem to be cases, such as the Martin's, that lend themselves to the latter understanding of stimulation. Perhaps, in the end, we will have to accept a mixed view: some cases involve stimuli of the former kind and others the latter. The details need not concern us here, however. I will show that on either understanding of what disposition stimulation consists in, a case can be made against the thought that the stimulation of a disposition always temporally precedes the manifesting of that disposition.

Before proceeding with the arguments, an important point must be emphasised. The simultaneity claim I will argue for should not be confused with the claim that stimulus and manifestation are *instantaneous*. It should not be denied that stimuli and manifestations may be temporally extended events. The dissolving of a soluble substance in water, for example, clearly takes time. So, to assert that a certain stimulus and manifestation occur simultaneously is to say only that the manifestation does not begin at a point after the stimulus has begun. As the examples of used during this chapter will indicate, it also appears that some, if not all, cases of manifestation are cases in which the stimulus of the disposition and the manifesting of that disposition overlap completely, but this is a further claim.

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[58] This is what Martin would call a 'partnering' state of affairs (2008: 51)

[59] According to the Aristotelian theory of powers, for example, the manifestation of a power, or 'effectivity' (*energia*) comes about as a result of the substance bearing the power (the 'patient') being subjected to the *operation* of another substance's power (see *Physics* book III).

7.4) The first understanding of stimulation: a metaphysical argument against the temporal priority assumption

In this section I will assume the view that stimulation events involve the action of one entity upon another. I will then argue that with certain plausible assumptions in place – most notably, assumptions about the reciprocity of dispositions – a metaphysical argument can be mounted against the temporal priority claim.

In the course of arguing to the overall conclusion, I will argue, in line with C.B. Martin, that there is a certain reciprocal relationship between a disposition and that disposition had by the triggering agent, such that the manifesting of each is dependent upon the manifesting of the other . This kind of claim has already been argued for in chapter four. However, since the reciprocity claim will form the backbone of the argument that follows, it will be worthwhile rehearsing the arguments again during the course of this chapter. Before I begin the argument, note that the principle of reciprocity to be endorsed here is not the same as that argued for by Le Poidevin (1988), which concerns causes and effects. Indeed, if the main claims of this section are correct, then the stimulus – manifestation distinction, as it is being understood in this part of the chapter, should be clearly separated from the cause – effect distinction, for reasons to be explained in the concluding remarks. Again, this observation is not of minor relevance for it is, I think, tempting to think of the cause – effect distinction simply in terms of the distinction between disposition stimulus and disposition manifestation.

Once the general form of the argument has been outlined, I will then elucidate terminology where necessary and make a case for acceptance of the more controversial premises. The relevance of each premise will also be explained[60].

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[60] Premises 2 and 7, for example, may appear unnecessary at first glance, but will be explained in what follows.

1.   Premise: The manifesting of some disposition F of an object *a* cannot occur until it is stimulated (acted upon) by some triggering agent.

2.   Premise: There happens to exist only one triggering agent for *a*'s disposition F; call it *b*.

3.   Premise: If *b* is able to act upon *a* in such a way as to prompt the manifesting of *a*'s disposition F, *b* must have a certain disposition which is bestowed by some property that *b* has; call this disposition G.

4.   Intermediate conclusion 1: Therefore, the manifesting of *a*'s disposition F cannot occur until disposition G of its triggering agent (*b*) is manifesting. (1,2,3)

5.   Premise: The manifesting of *b*'s disposition G cannot occur until G is also stimulated (acted upon) by a triggering agent.

6.   Premise: A triggering agent for *b*'s disposition G is *a* itself.

7.   Premise: *a* happens to be the only triggering agent that exists for *b*'s disposition G.

8.   Premise: If *a* is able to act upon *b* in such a way that the manifesting of *b*'s disposition G is prompted, *a* must have a certain disposition which is bestowed by some property that *a* has.

9.   Premise: The disposition in virtue of which *a* is able to trigger *b*'s disposition G, is disposition F.

10.   Intermediate conclusion 2: Therefore, the manifesting of *b*'s disposition G cannot occur until disposition F of its triggering agent (*a*) is manifesting. (5, 6, 7, 8, 9)

11.   Premise: If the manifesting of *a*'s disposition F cannot occur until *b*'s disposition G manifests, and the manifesting of *b*'s disposition G cannot occur until *a*'s disposition F manifests, then neither *a*'s disposition F nor *b*'s disposition *G* can manifest before the other.

12.   Premise: If neither *a*'s disposition F nor *b*'s disposition G can manifest before the other, then *a*'s disposition F and *b*'s disposition G must manifest simultaneously or not at all.

13.   Conclusion: Therefore, if *a*'s disposition F and *b*'s disposition G are to manifest, they must manifest simultaneously (4, 10, 11, 12).

7.5) Justifying the premises

Premise 1 seems uncontroversial, given our earlier observations about the conditionality of dispositions[61]. Goodman's flexible object does not bend, for example, until pressure is exerted upon it.

Premise 2, which states that there happens to exist only one triggering agent for a's disposition F (which I will call b), is inserted for the sake of simplification. What I am trying to do in the argument is focus our attention on what the relationship between two *particular* entities must be like if one of those entities is to stimulate a certain disposition of the other, in a specific, concrete interaction. This will remain clear if, by 'triggering agent b', we refer to a particular object rather than any one of a number of objects falling under a certain kind. Without this premise, the argument as stated would be invalid, as will become clear as the discussion proceeds (see discussion of premise 7).

Premise 3 states that if b is able to act upon a in such a way as to prompt the manifesting of a's disposition F, b must have a certain disposition which is bestowed by some property that b has; call this disposition G. Recall that on the view of stimuli currently being assumed, stimulation consists in some triggering agent *operating* in a certain way upon the particular with the disposition in question. Premise 3 merely states that if b can behave in this way, then it must have a disposition that is responsible for that behaviour, a disposition bestowed by some property which it has. In the Goodman case, disposition G would correspond to, say, the disposition of a person to exert pressure upon k.

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[61] Note, as we saw in chapter five, some dispositions arguably do not require a trigger in order to manifest, such as the disposition of a particle to decay (see also Molnar, 2003: 85). It should be clear that the above argument is intended to apply only to those dispositions that do require stimulation.

From these initial premises, the first intermediate conclusion follows (4): the manifesting of *a*'s disposition F cannot occur until disposition G of *b* is manifesting. If the manifesting of *a*'s disposition F depends upon its being triggered by the action of a particular triggering agent (*b*), and some disposition G of that triggering agent is responsible for its triggering behaviour, then what the manifesting of *a*'s disposition F depends upon, ultimately, is the manifesting of (*b*'s) disposition G.

Premise 5 states that, as with *a*'s disposition F, the manifestation of *b*'s disposition (G) cannot occur until it is stimulated by some triggering agent. Again, this seems uncontroversial; basic symmetry assumptions imply that there will be a conditional aspect to disposition G, as there is with disposition F.

Once it is acknowledged that a triggering agent will itself need to be acted upon in order for it to provide stimulation, one may worry that the danger of regress is lurking. This kind of regress was discussed earlier in chapter four. The regress begins with the thought that the triggering agent for a particular disposition would itself require a stimulus in order to manifest its disposition; this further stimulus would then require the action of a further triggering agent in order to make its contribution and so on, *ad infinitum*. If this were the case, the original disposition would never get around to manifesting, for it would have to wait for an infinite number of other concrete events.

If our premises thus far were to imply a regress, one or more of them must be faulty, because in reality the dispositions of things are, of course, able to be successfully manifested. Fortunately, our premises thus far do not imply a regress. Such a threat is prevented if it is the case that the triggering agent for *b*'s disposition G (which prompts F) just is object *a* itself. Given that *b* is also the triggering agent for *a*'s disposition F, what would we have, rather than a regress of triggers, is a relationship of *reciprocity*. In earlier chapters, we saw some

examples of dispositional activity which favour the reciprocity view[62]. Consider, for example, the case of a charged particle accelerating through an electro-static field[63]. In such a case, the field is the triggering agent for the particle's disposition to accelerate, in virtue of a certain power that the field has. But what is the triggering agent for the *field's* power? The answer is not that some further agent is required, because a particle's disposition to accelerate can be triggered by a field that is in isolation from any further states of affairs. The agent which prompts the field's power must therefore be the particle itself. This, I have suggested, must be the case generally if the prospect of triggering regresses is to be avoided. This leads us to premise 6, that the triggering agent for *b*'s disposition G will be *a* itself.

Again, premise 7, that *a* happens to be the only triggering agent that exists for *b*'s disposition G, is inserted in order to make the overall argument less complicated. The consequence of this premise, along with premise 2, is that when we speak of the relationship between *a* and *b*, we are speaking of the relationship between two *particular* objects, rather than the relationship between any objects that are each of a certain kind. This preserves the validity of the argument as stated for the following reason. The general conclusion of the argument is that in order for *a* to manifest disposition F, it must manifest simultaneously with the (reciprocal) disposition G of *b*. If premises 2 and 7 were omitted, allowing '*a*' and '*b*' to refer to any one of many dispositional objects of a certain kind, this conclusion could be false. This is because,

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[62] As we saw in previous chapters, C.B. Martin holds that all cases of disposition manifestation involve this kind of reciprocity (1993: 182). Heil has also made similar claims (2003: 198), although he rightly acknowledges that spontaneously manifesting dispositions, such as the disposition of a particle to decay, are the exception.

[63] I will continue to use this example throughout the course of this chapter, for two main reasons. Firstly, it is a scientifically respectable example of dispositional interaction and so there will be no danger of the premises resting on the peculiarities of macroscopic examples. Secondly, the particle case involves a minimal number of elements and so is easier to work with.

for example, a particular cube of salt can obviously manifest its solubility in some water even if a portion of water *elsewhere* manifests its dissolving power at a quite different time.

Premise 8 states that the stimulation of b's disposition G by a will be accounted for in terms of some disposition bestowed by some property that a has. Again, this seems uncontroversial given the tolerant view of dispositions being assumed.

In order to appreciate premise 9, we must consider the following question: will the disposition had by a to prompt b's disposition G be disposition F itself or some further disposition? If the disposition in question is F, then not only is there reciprocity between a and b as triggering agents, but also reciprocity between a's disposition F and b's disposition G. In other words, G will be the disposition in virtue of which b prompts a's disposition F and, likewise, F will be the disposition in virtue of which a prompts b's disposition G. If we deny this reciprocity, and seek an alternative story, the threat of regress once again appears. The alternative story would be that whilst a and b are reciprocal triggering agents, and that b's disposition G is responsible for the triggering of a's disposition F, it would in fact be some further disposition of a, call it H, that is responsible for a's triggering of b's disposition G. But then which disposition would be responsible for triggering a's disposition H? If we deny that dispositions come in reciprocal groups, it can only be that a's disposition H is triggered by some further disposition involved in the story, and so the regress begins.

Consideration of specific cases also indicates that the disposition which is prompted by a further disposition is also the very disposition responsible for the stimulation of that further disposition. Consider, as a concrete example, the case of a charged particle which finds itself in an electro-static force field. As suggested already, it will be some power of the force-field that is responsible for stimulating the particle's disposition to accelerate, a disposition the particle has in virtue of being charged. Now, in virtue of which of the particle's attributes

does the force field prompt the acceleration? The obvious answer is that the force field stimulates the particle's acceleration simply in virtue of the particle being *charged*: had the particle not been charged, it would not have accelerated through the force field. So, whilst the field's power is responsible for the manifestation of the particle's charge, the particle's charge is equally responsible for the exercise of the field's power. I suggest, therefore, that in the particle case, the particle's disposition of being charged and the field's reciprocal disposition to accelerate the particle represent dispositions F and G in our argument. We will see at the beginning of the next section that this interpretation may be objectionable, but before I address these concerns, I will complete the current argument.

We are now led to premise 9. Whilst disposition G of *b* is responsible for *b*'s ability to prompt the action of disposition F of *a*, disposition F of *a* may equally be regarded as being responsible for *a*'s ability to prompt disposition G of *b*. In other words, F and G will be *reciprocal* powers, with the action of each being dependent upon the action of the other.

From premises 5, 6, 7, 8, and 9, it follows that the manifesting of *b*'s disposition G cannot occur until *a*'s disposition F is manifesting. If *a* itself is the triggering agent for *b*'s disposition G, and it is in virtue of *a*'s disposition F that *a* is able to activate *b*'s disposition G, then what the manifesting of disposition G depends upon, ultimately, is the manifesting of *a*'s disposition F. As soon as the reciprocity of dispositional interaction is established, the rest of the argument for simultaneity follows rather quickly.

Premise 11 states that if the manifesting of *a*'s disposition F cannot occur until *b*'s disposition G manifests, and the manifesting of *b*'s disposition G cannot occur until *a*'s disposition F manifests, then neither *a*'s disposition F nor *b*'s disposition *G* can manifest before the other. This seems correct. If there is a mutual dependence between F and G, as has been suggested, then this precludes either power being able to act before the other.

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If neither *a*'s disposition F nor *b*'s disposition G can act before the other, then there would seem to be only two possible outcomes for *a* and *b* where dispositions F and G are concerned: either *a* and *b* manifest their reciprocal dispositions simultaneously, or not at all. This is what premise 12 states.

The overall conclusion we are led to, then, from intermediate conclusions 4 and 10, plus premises 11 and 12, is that if *a*'s disposition F and *b*'s disposition G are to manifest, they must manifest simultaneously.

7.6) Does the metaphysical argument really establish what is intended?

An objection may run along the following lines: all the argument shows is that reciprocal *triggering* dispositions manifest simultaneously, and not, in fact, that the triggering manifestation occurs simultaneously with the manifestation *proper*, i.e. the acceleration of the particle in the case I have focused upon. It may be objected that when appealing to the particle case I assumed that the manifestation of reciprocal dispositions F and G consisted in the acceleration of the particle, yet it was also claimed that dispositions F and G are responsible for the *stimulation* of the particle's charge on the one hand, and the field's power on the other. This latter claim suggests that the manifestation of F and G does not consist in the acceleration, but, rather, is something quite distinct: it is a triggering manifestation which, say, *causes* the acceleration. Therefore, if F and G really are the triggering dispositions, all the conclusion (13) really establishes is that triggering involves the simultaneous contribution of reciprocal triggering powers. But this is not what I was trying to show, since the conclusion I intended to establish was that the manifestation *proper* is simultaneous with the triggering.

In response, it must be emphasised that it would be a mistake to see a dispositional manifestation episode as involving two distinct manifestations: the manifestation of reciprocal

triggering dispositions on one hand and the manifestation *proper* on the other, with the former leading to the latter. As my discussion of the particle case indicates (when discussing premise 9), I take it that the *reciprocal* triggering does just find its manifestation in the manifestation proper. The manifestation proper involves the simultaneous contribution of reciprocal dispositions; it is a *mutual* manifestation, in Martin's words (2008: 50). The key point is that the contribution made by each reciprocal disposition (the particle's charge and the field's power in the acceleration case) may be regarded as the triggering factor for the other. Thus, the claim that triggering does not precede manifestation is, I think, justified. To suppose otherwise is, in effect, to suppose that the operation of more than two dispositions is responsible for any given manifestation episode: two reciprocal triggering dispositions plus whatever dispositions are responsible for the manifestation *proper,* i.e. the dispositions which are triggered by the reciprocal triggering dispositions. This would, however, go over and above what is required to explain the occurrence of manifestations like the acceleration in the particle case. Is there really an event in the particle case that can be identified as the manifestation of reciprocal triggering dispositions, an event distinct from the acceleration event itself? I suggest not; when we consider the particle case, there do not seem to be any events taking place other than the acceleration, which is simply the manifestation of both the force field's disposition to accelerate the particle, and the particle's reciprocal disposition to be accelerated. No more dispositions are needed in the story to account for the acceleration; it is simply a matter of 'reciprocal dispositions mutually manifesting' (Martin, 2008: 50). Indeed, adding a distinct triggering manifestation to the story would just create further mysteries. What, for example, is the mechanism that gets us from the reciprocal triggering manifestation (whatever that is supposed to be) to the manifestation proper?

7.7) The perspectival nature of stimulation

At this point it may be further objected that, if I am right, there is ultimately no need to appeal

to the concept of stimulation or triggering at all when describing manifestation episodes, and so the question I raised in the first place regarding simultaneity is inappropriate. I think this would be unfair, however. To say that the particle's disposition to accelerate requires stimulation is to do justice to the fact that the particle could not have brought about its acceleration by the operation of its charge alone. As we have observed, there is a conditional aspect to the contribution made by the powers involved in a manifestation episode. To speak of stimuli is just to speak of whatever figures in the antecedents of the conditionals associated with each and every disposition. Under the current understanding of what stimulation is, the stimulus will be classed as the operation of a reciprocal power (or perhaps multiple powers in some cases[64]).

However, what our observations about reciprocity teach us is, to repeat the point made in chapter four, that whilst it may be harmless enough to view the contribution made by one of the agents in a manifestation episode to be *the* triggering factor, this must ultimately be a perspectival matter. A manifestation requires the contribution of two (or more) dispositions, and relative to each of these dispositions, the triggering factor for the resultant manifestation will be different. Consider, for example, the case of solubility: if we consider a dissolving event *qua* manifestation of water's dissolving power, the antecedent conditions will involve the presence of the soluble substance, and so that is what will be classed as the triggering

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[64] If some manifestation episodes involve more than two reciprocal partners, then more than one triggering agent will figure in the antecedent of the conditional associated with each disposition involved. For example, the antecedent of the conditional associated with the disposition had by a match to ignite when struck should, if it is accurate, involve reference to, say, oxygen as well as the rough surface upon which matches have to be struck. I will discuss complex mutual manifestations further in chapter eight.

factor. On the other hand, if we consider the dissolving event *qua* manifestation of the substance's solubility, the water will be classed as the triggering agent.

In sum, the argument of this section has revealed a certain symmetry where dispositional stimulation is concerned: the action of each reciprocal disposition involved in a manifestation episode may be classed as a trigger for the manifestation of the other (or others). This is one reason why the stimulus – manifestation distinction should not, on the current understanding of the distinction, be confused with the cause – effect distinction. It seems an undeniable fact about causation that the relationship between a cause and its effect is often not, and perhaps never is, one of symmetry: typically, A is the cause of B without it being the case that B is the cause of A. This difference suggests that the stimulus – manifestation distinction, on our current understanding of it, does not correspond to the cause – effect distinction, and so the question whether *causes* and *effects* may occur simultaneously should be regarded as a further one. We will see later on, however, that if the stimulation – manifestation distinction is understood in the sense now to be discussed, it is arguable that the stimulation – manifestation distinction does indeed correspond to the cause – effect distinction. This issue will be discussed further in the next two chapters.

7.8) The second understanding of stimulation: arguments against the temporal priority assumption

According to the alternative view about triggering which I will now assume, the triggering of a disposition merely consists in the state of affairs of a particular with a certain disposition being contiguous with that which triggers it (or, in Martin's terminology, its 'reciprocal disposition partner').

If this view of triggering is assumed, cases which appear to involve simultaneity are not hard

to come by. Consider, again, the particle case. The instant at which a particle finds itself in a field is the very instant at which it begins to accelerate; it is not as though the particle remains static in the force field for a period of time before it begins to accelerate. Thus, if the trigger in this case is simply the particle's being *in* the field, and the manifestation is the acceleration, this case is one in which a temporal gap is lacking. Goodman's case of flexibility also appears to exhibit this feature. Plausibly, the point at which k meets a resistant substance just is the point at which the bending, i.e. the manifesting of flexibility, begins.

Wesley Salmon is one philosopher who has rightly emphasised the simultaneity involved in interaction (as opposed to causal propagation) (1984: 182). Although he does not characterise interaction in dispositional terms, the examples he uses fit nicely the dispositional model we are now considering. Salmon's main example of the simultaneity of interaction involves a light pulse meeting a red filter. Salmon remarks that 'the light becomes red *at the very time* of its passage through the filter' (1984: 182; italics added). To put this in dispositional terms, one might say that the filter has the disposition to change the colour of light, and this disposition is manifested the instant at which the filter and light make contact, i.e. the instant at which the disposition is triggered.

7.9) A concession

It should be emphasised, however, that the argument here is empirical. One should not, therefore, automatically rule out the possibility of cases in our world in which the manifesting of a disposition does begin after it meets its reciprocal partner[65]. Consider, for example, the case of salt dissolving in water. Although most of us are inclined to say that salt begins to manifest its solubility the instant it is triggered in the sense currently being considered, i.e. the

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[65] And one should certainly not rule out the possibility of such cases in worlds of a different kind to ours.

instant at which it finds itself submerged in the water, when matters are considered from a micro perspective this may not be strictly true. The bonds between the sodium and chloride in any given salt molecule are only broken once the positively charged sodium ion is surrounded by the negative part of a water molecule, and the negative chloride ion is surrounded by the positive part of the water molecule. This 'surrounding' takes time for any given salt molecule (albeit a very small amount of time), especially in cases in which the water is at a low temperature. As indicated, however, the disposition of solubility is one that is ascribed at the macro level of description. Once we focus on the micro level of description, perhaps cases of dissolving are reducible to chains of multiple microscopic manifestations, each of which does indeed occur simultaneously with each stimulation. This is a question I leave open.

In section 7.7 we saw that, on our first understanding of triggering, the trigger – manifestation distinction plausibly does not correspond to the cause – effect distinction. An interesting question is whether, on the current understanding of stimulation, the trigger – manifestation distinction might correspond to the cause – effect distinction. This is a question I will discuss properly during the next two chapters. However, it is worth pointing out at this point that there are *prima facie* reasons for thinking there may be such a correspondence. For example, as with cause and effect, there seems to be an asymmetric relationship between triggering and manifestation: it seems correct to say that contiguity of reciprocal dispositions triggers the manifestation but not vice versa[66].

7.10) Reflecting upon cases of finkish dispositions

Finally, a word about cases involving finkish dispositions. To recall, Bird writes that an

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[66] The question concerning the source of such asymmetry is an interesting one, since according to the account proposed, appealing to *temporal* asymmetry will not be an option in most, if not all, cases. This is a question I will address in chapter nine.

object's disposition is finked when '... the object loses the disposition after the occurrence of the stimulus but before the manifestation can occur...' (Bird, 2007: 25). If that which we call a disposition's stimulus occurs simultaneously with the (beginning of the) manifestation of that disposition, then it must the case that when a fink prevents the manifestation of certain disposition, it does so by changing the disposition(s) in question *prior* to stimulation, or at the very least the instant at which the stimulus is to occur[67]. Reflection upon cases commonly used in discussions on finks suggests that this is indeed the case (contrary to Bird's claim). In Martin's example, the electro-fink 'can provide itself with information as to exactly when a wire connected to it is touched by a conductor' (1994: 2), and when such contact occurs, the fink intervenes to change the wire's properties. Now crucially, Martin says that the fink reacts 'instantaneously, we are supposing' (1994: 3; italic added). Thus, Martin supposes there is no temporal gap between the contact of the reciprocal partners and the fink's intervention. This is not surprising. Martin's aim is to show that the truth of the conditional 'if touched by a conductor, then electrical flows from the wire to the conductor' is neither necessary nor sufficient for the wire having the disposition of being live. It is not necessary, according to Martin, because the wire could be live, yet the fink could make it dead whenever touched, thus falsifying the aforementioned conditional. Now, the reason why Martin supposes that the fink acts 'instantaneously' is, I suggest, that he is well aware that if the fink did not react instantaneously, the current would already have started flowing, thus making the conditional associated with 'is live' true.

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[67] Another possibility is that rather than being lost after the stimulus, the disposition in question is lost before the manifestation process is completed to its full extent. Manifestation processes do, as was suggested earlier, take time; soluble substances clearly do not instantaneously dissolve in water, for example.

8.1) Introduction: distinguishing questions within the philosophy of causation

In the last chapter, I left open the possibility that the trigger / manifestation distinction may be equivalent to the cause / effect distinction, if triggering is understood as consisting in dispositional partners being brought together in the right kind of way. In this chapter I will further explore this possibility, and will outline a plausible dispositional account of causation. Before proceeding, however, I must take a moment to consider precisely what kind of theory of causation I am aiming for. This is important, if misunderstandings and misguided objections are to be avoided.

When philosophers turn to the issue of causation they often ask quite different questions and thereby seek different theories relating to causation. Traditionally, philosophers have asked what our everyday established concept of causation *means*; in other words, they undertake conceptual analysis. This involves formulating a definition of the concept of causation, by formulating necessary and sufficient conditions for its application. According to Ducasse, who sought a conceptual analysis of 'cause', to say that such a definition is correct 'means that that definition can be substituted for the word "cause' in any assertion ... in which the word occurs, *without in the least changing the meaning which the assertion is felt to have*' (1926: 57).

On the other hand, some philosophers recently have sought a physical or what Dowe calls an 'empirical' theory of causation (2000: 3). This involves asking precisely what causation consists in within the physical world we inhabit, i.e. the actual world. This theory, as opposed to the project of conceptual analysis, involves studying the features of our world and describing, in physical terms, what it is about our world that makes it correct to say that

causation occurs within it. This approach involves investigating, as Hume put it, causation in the objects.

As Dowe has highlighted, these are two quite different approaches, even though one may not be able to carry out one task completely independently of the other (2000: 1.3). Conceptual analysis involves *a priori* reflection, and the correct analysis of 'causation' will be necessarily true. On the other hand, physical analysis is an *a posteriori* enterprise, relying as it does upon empirical facts known to us through scientific investigation, most notably physics. In contrast to the conceptual analysis, the empirical theory is likely to be contingently true, in at least two ways. In the first instance, the empirical analysis may be contingently true in the sense that, had things turned out differently, our world may not have involved causation *at all*. Or, even if our world were inevitably a causal world, perhaps causation could have been brought about in a very different way to how it in fact is. Had the elements of the world been very different, perhaps the empirical analysis would look very different.

Our reflections thus far suggest important differences between the two philosophical tasks identified. Because of these differences, Dowe highlights that 'we cannot assume that the best conceptual analysis is also the best empirical analysis' (2000: 12). In fact, in the case of causation, I think we have every reason to expect that the answers to the conceptual and empirical questions will indeed come apart. Thanks to Hume, the source of our everyday concept of causation has, historically, been thought to be reducible, at least in part, to the concept of regularity or the concept of counterfactual dependence (see Lewis, 1973, for discussion). If this is so it seems that many different kinds of possible worlds would class as worlds in which there is causation. This is because a world could contain regularity or involve counterfactual dependencies *for very different reasons*. For example, the regularities in a world could be brute facts about the world, or alternatively, they could be explained by some further underlying mechanisms. If alternative empirical accounts of the causation in a world

are conceivable, then we must accept that there is more than one possible kind of causal world. But if this is so, the conceptual and physical analyses of causation are bound to come apart. This is because the conceptual analysis would have to hold universally, across all possible causal worlds (for it would be in virtue of the meaning of 'causation' that they may be classed as causal worlds), whilst the physical analysis will hold only for one kind of world.

Surprisingly, many philosophers appear to have made the mistake of failing to distinguish the conceptual and empirical approaches to the philosophy of causation, as Dowe has highlighted. This error is manifested most clearly in cases in which, in response to an empirical theory of causation, it is objected that the theory either does not accord perfectly with our everyday use of 'cause', or fails to accommodate possible causal worlds quite different to ours. Yet, if a description of the physical features of causation *in our world* is all that is being offered in the first place, such objections seem to miss the point. Dowe suggests that this error is common place, naming the work of Dieks (1981: 105) and Earman (1976: 24) as two alleged examples. It is important, therefore, to make clear what it is that I am and am not attempting to do in this chapter and the next so that potential misunderstandings are avoided.

8.2) Current aims

What must be made clear, firstly, is that it is not my intention in these current chapters to sketch a *conceptual* analysis of causation. Whether or not a successful conceptual analysis of causation (if there is one) must, in the end, involve dispositional concepts is not a question I will address here[68]. I should say, however, that the prospects for such an analysis are not good, for it is not clear that the concept of a disposition is one which can itself be understood

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[68] As mentioned in the introduction to this thesis, I want to push semantic issues aside and concentrate mainly on the metaphysical issues surrounding the topic of dispositions.

wholly independently of the concept of causation. If it cannot, then such an analysis would be unacceptably circular (see Armstrong (1997: 72) who makes this point).

What I *will* be doing in this and the next chapter is outlining a view about how dispositions interact *in our kind of world* in such a way as to give rise to what we call causal effects. In doing this, it will become clear that there is more than one sense in which dispositions could give rise to causation, and so my project here is by no means of minor importance. It is important to note, however, that in offering this dispositional account of causation, I am not offering an account of causation across possible worlds. Like Dowe, I am merely seeking an account of causation-in-our-kind-of-world, which is one, I shall assume, which is full of irreducible dispositions. I will remain neutral on the issue of whether causation could arise in a significantly different way in other worlds. For example, in line with the observations of the last chapter, I will maintain that causal effects (i.e. disposition manifestations) can occur simultaneously with their causes (disposition partnerings), but this should not, I think, be understood as a necessary feature of a causal world. There may, for all I say, be worlds in which no instances of causation involve simultaneity. Nor should I be interpreted as claiming that all possible worlds in which there is causation are dispositional worlds. Lawless worlds in which events occur for no reason whatsoever are often thought to be metaphysically (even if, perhaps, not physically) possible. The events in such a world would not be susceptible to dispositional explanation. Yet, if such a world happened to be full of regularities, perhaps some would have the intuition that it would be right to say such a world involves causation. This, again, is not a question I will address.

Finally, an important difference between Dowe's approach and mine must be highlighted. Dowe calls his this-worldly account of causation an 'empirical' account. This is because he appeals to current science in order to identify the physical features of causation in our world. Specifically, as we will we see, Dowe's account relies heavily on the concept, introduced by

physicists, of a conserved quantity (such as momentum or mass-energy, for example). In contrast, I will not rely on the specific details of current physics. The possibility I am exploring in this thesis is merely that all natural properties (whatever they are) are irreducibly dispositional in nature. This is of course a metaphysical issue and so the dispositional account of causation to be outlined is best thought of as one identifying some of the metaphysical features of causation in a world of dispositions. Dowe's physical theory, in contrast, remains neutral on the metaphysical question whether the world contains 'hidden powers' (2000: 113-114) and instead focuses on the details of current physics.

That said, as with the conceptual and physical approaches, the distinction between the metaphysical and physical approach is not clean cut. The dispositional theory will also rely heavily upon empirical observation, such as the observation that in some cases (at least), the partnering of certain dispositions occurs simultaneously with the manifesting of those dispositions. However, since my account will not concern the specific nature of the properties discussed in fundamental physics, my theory will operate at a more abstract level than Dowe's conserved quantity account.

To summarise, I have distinguished three kinds of theory regarding causation: the conceptual analysis of 'causation', the physical account of causation in our world, and the metaphysical account of causation in our world. The dispositional account falls, first and foremost, into the metaphysical category, although, as with the physical account, there is always the possibility that the conceptual and metaphysical theories might coincide. However, for reasons suggested above, this seems unlikely, since our everyday concept of causation appears to be very broad. In fact, the conceptual analysis of causation must hold universally, across all possible causal worlds. It is highly likely, therefore, that the metaphysical account (i.e. the dispositional account in this case) will apply only to a proper subset of the totality of possible causal worlds. Furthermore, it seems that the Dowe-type physical analyses will apply to only a

proper subset of the set of worlds to which a metaphysical account will apply. Since a metaphysical theory operates at a higher level of abstraction, more than one kind of physical theory will be consistent with it. For example, the dispositional account of causation could still be true of a world in which the specific fundamental properties were not, for example, conserved quantities. All that would be required is that those properties were irreducibly dispositional. In sum, then, it is likely that the three kinds of approach to causation discussed are distinguishable by (amongst other things) their degree of generality.

8.3) Towards a dispositional account of causation: the basic stimulus – manifestation model

Harré and Madden (1975), Cartwright (1989) and Molnar (2003), amongst others, have recently suggested that an account of causation should fall out of realism about irreducibly dispositional properties. One obvious attraction of a dispositional account of causation is that it would see the causal relation as intrinsic to the pairs of events or states of affairs that instantiate it[69]. This is because it would view the dispositional natures of causes as being responsible for the effects that are brought about. An example of a leading 'intrinsic' view of causation, held by Dowe (2000), Fair (1979) and Salmon (1984), is the 'process' theory of causation. Process theories have also recently been referred to as 'biff' theories of causation[70] (Handfield et al. 2008: 150). According to process theories, causes and effects are connected by some concrete physical process; causing is physical producing. Humeans, in contrast, deny that the causal relation is local and intrinsic. Humeans typically think that the question whether a token A causes a token B is determined by the spatiotemporal distribution of other

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[69] During this thesis I will remain agnostic on the question whether the relata of causation are best seen as events or, say states of affairs. I will, however, sometimes refer to causes and effects as events for convenience.

[70] It is unclear where the term 'biff' originated, although it has often been attributed to Armstrong.

token As and Bs elsewhere in the world, or in close possible worlds (see, for example, Hume 1739/40 [1978] & Lewis 1973). A dispositional account of causation would therefore be opposed to the Humean outlook.

As we saw in previous chapters, typically, in order for a disposition manifestation to arise, it is necessary that the disposition finds itself in appropriate circumstances. The manifestation of solubility is dissolving, but this only occurs *if* the soluble substance is in a solvent. Not all dispositions are of this nature, however. Some dispositions, as we saw, can manifest spontaneously, like the disposition to radio-actively decay. During this chapter I will focus only on dispositions that do not manifest spontaneously, which includes most of the dispositions we speak of.

Recently, it has been suggested that the stimulus – manifestation distinction, which is applicable where non-spontaneous dispositions are concerned, corresponds to the cause – effect distinction (Bird, 2008*a*, currently unpublished). On this view, the most natural way of viewing causation is to see it as a matter of dispositions being stimulated, and then manifested:

DISPOSITION
STIMULATION ————CAUSES——→ MANIFESTATION
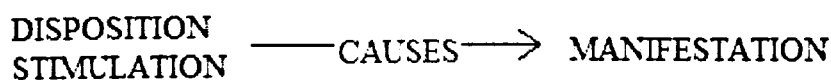
Figure 8.1

Now, in the last chapter, two theories about disposition stimulation were outlined. According to the first account, stimulation consisted in the operation of a powerful agent upon the particular with the disposition in question. According to the second view, stimulation consists in reciprocal disposition partners being 'partnered', i.e. finding themselves in the right kind of

spatio-temporal relationship[71]. In that chapter I came to several conclusions, two of which are particularly relevant for the task of constructing a dispositional model of causation. Firstly, it was suggested that if stimulation is understood in the first sense, then the trigger-manifestation should not be thought to correspond to the cause – effect distinction, because of the reciprocity involved in dispositional interaction. The relation between a cause and an effect is typically asymmetric, yet this seems not to be the case with stimulations and manifestations, if stimulation is understood in the first sense. This is because, on that understanding of stimulation, there is symmetry: the action of each reciprocal disposition involved in a manifestation episode may be classed as a stimulus for the action of the other (or others).

So, if the above model of causation is to be sustained, disposition stimulation must be understood in the second sense according to which a concrete stimulation consists in the state of affairs of reciprocal disposition being partnered, i.e., being in contact. It may also be recalled that in the last chapter I concluded that, if this second understanding of stimulation is accepted, many (if not all) actual cases of interaction are ones in which the trigger and the manifestation may be said to occur simultaneously. Thus, if the above dispositional model of causation is to be accepted, it must be accepted that cases of causation may involve simultaneity. Whether all cases of causation (in our world) involve simultaneity is a question I will ultimately leave open.

8.4) Simultaneous causation

Whilst the acceptance of simultaneous causation does not sit well with the way some

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[71] For example, a hammer must be in contact with a vase in order to manifest its destructive power. Likewise, a live wire must touch the flesh in order to manifest its power to shock.

philosophers have thought about causation, many prominent metaphysicians share the thought that cases of simultaneous causation are pervasive, such as Brand (1980), Taylor (1966: 35-39), Molnar (2003: 192-194), and Salmon (1984: 182). The concept of simultaneous causation is not new, therefore. As we saw in the last chapter, Salmon, for example, appeals to a case in which a white light pulse passes through a red filter in order to justify his simultaneity claim with respect to causal interaction. The interaction of the light pulse and the filter seems to involve simultaneity because 'the light becomes red at the very time of its passage through the filter ... interaction exhibits the relation of simultaneity' (1984: 182). Salmon does not describe this case in dispositional terms, but it can easily enough be construed as involving two reciprocal partners, with the change in the light being the mutual manifestation of dispositions involved[72]. In the chapter to follow, I will relate Salmon's process theory of causation to the dispositional model in greater detail.

I will now modify the initial model presented in order to convey the 'partnering' view of stimulation and also the simultaneity claim. It may also be recalled from the arguments of previous chapters that manifestations are best thought of as *mutual* manifestations. Putting these observations together, we have something like the following model (figure 8.2):

DISPOSITION   MUTUAL
PARTNERING ———CAUSES——> MANIFESTATION
      └— POSSIBLY SIMULTANEOUS —┘
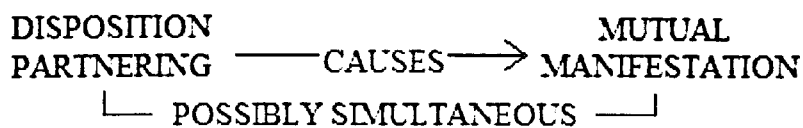
Figure 8.2

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[72] It should be noted that not all putative cases of simultaneous causation put forward by 'simultaneity' theorists are genuine cases of simultaneous causation. Mellor, for example, has argued convincingly against many putative cases of simultaneous causation (1995, 17.2). We can agree with much of what Mellor says here, and view many putative cases of simultaneous causation as in fact involving *chains* of temporally distinct causal interactions. However, if the proposed model is correct, many (if not all) cases involving a single mutual manifestation will involve simultaneous causation.

8.5) Justifying the model under consideration

We observed earlier that in order for salt's solubility to be activated, the salt must be *in* water. In general, reciprocal dispositions must be in a certain spatiotemporal relation in order for them to manifest, and the relationship is typically one of contiguity. For example, a hammer must be in contact with a vase in order to manifest its destructive power. A live wire must touch the flesh in order to manifest its power to shock. Hugh Mellor, amongst others, holds that *all* causation involves contiguity (1995: 61). This is not to deny there can be action at a distance, just that there cannot be *unmediated* action at a distance. If Mellor is not correct, and some special dispositions do mutually manifest, unmediated, at a distance, then the spatiotemporal condition will vary depending on which dispositions are involved. For the purposes of simplicity, however, I will assume the spatiotemporal condition is the contiguity condition.

The contiguity condition is plausibly one of two necessary conditions on the mutual manifestation of reciprocal dispositions. The second necessary condition is the absence of interfering factors, such as Martin's 'finks' (1994) or Bird's 'antidotes'[73] (1998). These two necessary conditions, the spatiotemporal condition and lack-of-interference condition, are plausibly jointly sufficient for the mutual manifestation of reciprocal disposition partners. To return to the charged particle case, for example, the acceleration (at a certain rate) of the particle through the field seems to occur if and only if i) the particle is *in* the field, and ii) the particle is not prevented from doing so by a fink or antidote, e.g. the generation of another nearby field.

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[73] Bird, for example, thinks the conditionals entailed by dispositions must involve a clause that rule out the presence of interfering factors: 'if *x* has the disposition D(S,M) then, if *x* were subjected to S <u>and</u> <u>finks and antidotes to D(S,M) are absent,</u> *x* would manifest M' (2007: 60).

According to the basic causal model proposed, the first of these conditions, but not the second, may be regarded as revealing to us the causes of mutual manifestations. Is this the correct result? I think it is, given that the second condition involves the *absence* of, say, finks and antidotes. Although some philosophers allow that absences can be causes (e.g. Schaffer, 2004), the majority of metaphysicians find absence causation mysterious and untenable. Furthermore, given that I am attempting to frame causation in terms of dispositional interaction, I ought only to appeal to absences if they can be said to have dispositional properties. Such a claim seems highly implausible, however.

An important question which may be raised at this point concerns the nature of the causal relata. An important point to emphasise is that even though the model is a dispositional model, the causal relata should not be thought of as mere dispositions. It is not merely free-floating dispositional properties themselves that are the causes of mutual manifestations. Rather, it is particulars-bearing-certain-dispositions that are responsible for concrete effects. When one receives a black eye, one does not blame a free floating disposition for the incident, but, rather, the angry person with the disposition to hurt you. Likewise, the mutual manifestation of the angry person's disposition to hurt me and my fragile nature is not a free floating entity. Rather, this manifestation is a further a disposition-had-by-me[74] – the disposition, say, of my eye to appear a certain way and feel tender to the touch. Thus, rather than speaking merely of reciprocal dispositions as causing a manifestation, I will speak of dispositional *partners*, in order to respect the thought that it is particulars-with-certain-dispositions which are the causal agents, rather than pure dispositions themselves. Taking this into consideration, our model may be modified as follows (figure 8.3):

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[74] Recall that, on the pandispositionalist picture, manifestation states are just as dispositional as the states which bring them about.

CONTACT OF RECIPROCAL   MUTUAL
DISPOSITIONAL PARTNERS ———CAUSES——→ MANIFESTATION
└——— POSSIBLY SIMULTANEOUS ——┘
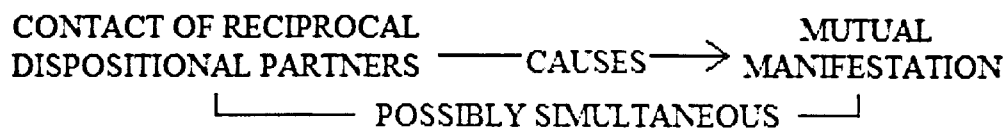
Figure 8.3

8.6) An argument against the dispositional model: Martin's identity claim

Much of what Martin says about manifestation episodes is consistent with what has been said so far. For example, Martin is sympathetic towards the possibility that the partnering – or 'coming together' - of reciprocal dispositions occurs contemporaneously with their mutual manifestation. In fact, Martin suggests that this is invariably the case: '[N]o time gap or spatial gap is needed - not one happening before the other' (2008, 46).

It turns out, however, that Martin wishes to reject the thought that the relationship between partnering and manifesting is that of cause and effect. Martin would therefore reject the proposed model. Martin appears to largely base this rejection on the observation that causes and effects must in some way be distinct. If it is allowed that causes and effects occur contemporaneously, then according to Martin 'it is hard to see them as separate, distinct existences' (1996: 136); '[T]here cannot be simultaneity [between cause and effect] because the cause is supposed to happen at a different time from the effect as *part* of their distinctness.' (2008: 46; words in brackets added). With this in mind Martin concludes that the relation between reciprocal dispositional partnerings and their mutual manifestation is one of *identity*: 'You should not think of disposition partners jointly *causing* the manifestation. Instead, the coming together of the disposition partners *is* the mutual manifestation' (2008: 51). Martin then attempts to illustrate his view with an analogy:

'[T]his partnering-manifestation identity is seen most clearly with cases such as the following. You have two triangle-shaped slips of paper that, when placed together appropriately, form a

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square. It is not that the partnering of the triangles *causes* the manifestation of the square, but rather that the partnering *is* the manifestation.' (2008: 51).

8.7) Replying to Martin

Are Martin's comments in favour of the identity view conclusive? I do not think so. I should, however, begin by conceding that causes and effects must be distinct. Indeed , it is a central platitude of causation that causes and effects must be distinct in some sense. Mellor (1995), Menzies (1996), Armstrong (1999), and others have all attempted to identify platitudes about causation, and they all cite a 'distinctness' platitude. It is primarily the distinctness principle that distinguishes the causal relation from many other important metaphysical relations, such as identity, part-whole and non-mereological compositional relations. Philosophers with very different views on causation seem to agree on a distinctness principle of one kind or another. Indeed, one of the central debates in the causation literature – concerning whether causes and effects are necessarily connected – is based on the prior assumption that causes and effects are in some sense distinct. Armstrong, for example, shows acceptance of this principle when he writes: 'there can be no logical links between distinct existences such as cause and effect'. (1996: 95). Martin's distinctness claim seems justified, therefore.

The important question is, however, whether the mere cotemporaneity of partnering and manifesting states of affairs (or events) is sufficient to indicate that they cannot be in any way distinct. If this is not the case, then Martin's argument entirely loses its force. It seems to me that this is indeed the point at which Martin's argument falls down. Why should the fact that two states of affairs (or events) occur simultaneously rule out their being different states of affairs (or events)? For example, I and my dance partner might jump simultaneously during a routine but surely does not mean that my jump and her jump are identical. It would be rather uncharitable to assume that Martin would dispute that fact, however. Clearly, Martin's worry

must be that the partnerings and manifestings involve the very same entities (i.e. the reciprocal partners), and so as well as occurring simultaneously, they must occur at the same location. It is far from clear that this should be a problem either, however. The state of affairs of my cue ball being white and the state of affairs of my cue ball being spherical have the same spatio-temporal location, and yet surely the realist about properties would not accept that my cue ball's whiteness and my cue ball's roundness are identical[75]. Without further argumentation from Martin, therefore, his claims are unpersuasive.

A further observation also casts significant doubt on Martin's view that reciprocal partnering is identical with mutual manifestation. My argument rests on Bird's observation that disposition manifestations can often be *antidoted* (1998). A certain disposition manifestation is antidoted if the disposition is 'stimulated', or in Martin's terminology 'partnered', yet because of some additional interfering factor, the expected manifestation is prevented. Bird's example, which was originally Mellor's (1974), involves the prevention of a nuclear disaster thanks to antidoting boron rods (1998: 232). In fact, cases of antidoting are quite pervasive, especially in medical practice, such as when the fatal consequences of the ingestion of arsenic is blocked by the presence also of dimercaprol (Bird, 1998: 228). With these observations in place, it seems clear that the relation between dispositional partnerings and manifestations cannot generally be one of identity. This is because of the possibility of reciprocal dispositions being partnered (i.e. brought together) and yet, because of an antidote, not manifested. If reciprocal disposition partnerings really were identical with their mutual manifestation, there would be no such cases of antidoting. If A (i.e. partnering) is identical with B (i.e. manifestation), then, necessarily, B exists if A exists.

A proponent of the identity view may reply that I have not showed that *all* dispositions can be antidoted. If there is a class of dispositions the manifestations of which cannot possibly be

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[75] I am grateful to Stephen Mumford for emphasising this important point to me.

antidoted, the identity thesis could still be true of that class. The appropriate response to this, however, is that, firstly, Martin's identity thesis seems to be intended as a general truth. At the very least, antidote cases show that the identity thesis cannot be asserted universally. Secondly, and more importantly, if the identity thesis is not true in many cases, what reason do we have to suppose that it is ever true? The proponent of the identity thesis can at best claim that some special disposition partnerings may be identical with their manifestations, whilst accepting that many others are not. This leaves proponents of the identity thesis with a view that is worryingly disjointed and *ad hoc*.

As was mentioned above, Martin also tries to convince us of identity view by proposing a case, allegedly involving identity, which, according to Martin, is analogous to the partnering – manifestation case. The problem here is that the case he mentions is in fact disanalogous to ordinary cases of mutual manifestation. In the case of two triangles 'manifesting' a square, the resultant 'manifestation' is a static entity, i.e. a square. It does indeed seem reasonable to deny that causation is taking place in such a case because the relation between the 'partnered' triangles and square seems to be one of composition; the triangles compose the square. In contrast, in the solubility case that Martin discusses, the manifestation is the dissolving *event*. Dissolving, in contrast to being square, is plausibly an active process in which change is brought about over a period of time. This is what distinguishes it from the static square case, which does not involve activity or change taking place over a period of time.

Given that Martin's proposed analogy is not a genuine analogy, his identity thesis remains difficult to grasp. Indeed, rather than the model proposed in this chapter being counterintuitive, I have suggested that mutual manifestation episodes are obvious candidates when it comes to locating causation in the world.

8.8) Is there a limit on the number of dispositional partners that can be involved in a mutual manifestation episode?

During the current discussion of causation, I have spoken of disposition manifestations as being *mutual* manifestations, involving the joint contribution of reciprocal dispositions. In the case of a dissolving manifestation episode, it seems that the partnering of *two* distinct dispositions is responsible for the resultant dissolving event (i.e. the effect), i.e., the solubility of the salt and the dissolving power of water.

In chapter five, I discussed reasons for thinking that any number of reciprocal powers (i.e. more than two) could be responsible for a mutual manifestation. I will now explore this point a little further. Consider, again, the manifestation of a match's disposition to ignite. Whilst it is natural to think of the dispositional nature of the match as being responsible for the ignition, there are in fact at least two other factors that contribute to the ignition. Firstly, the match will only ignite if struck on a suitably rough surface. The property of roughness will, for the pandispositionalists, be essentially dispositional in nature, and so the rough surface should therefore count as a reciprocal disposition partner. Secondly, the presence of oxygen is also a contributory factor. Oxygen's ability to aid the bringing about of the ignition is naturally explained by certain of its properties, and, again, for the pandispositionalists these properties will all be dispositional in nature. It seems oxygen must also count as a reciprocal dispositional partner, therefore, and so more than two reciprocal partners are involved in the ignition case.

Famously, Mackie (1980: 62) pointed out that there is rarely (if ever) a single causal factor which is wholly responsible for a certain effect. In other words, there is rarely (if ever) a single factor that is necessary and sufficient for a certain effect. In the ignition case there are many causal factors, and none of these factors, taken individually, are necessary and sufficient

for the effect. Taken on their own, the factors merely satisfy what Mackie calls INUS conditions ('insufficient but non-redundant parts of an unnecessary but sufficient condition') for the effect under consideration (1980: 62). One of the conclusions to draw from this observation is that although we often think of an effect as being caused by a single entity, this is rarely (if ever) the case. To put Mackie's conclusion in dispositionalist terms, we may say that the complete cause for a certain effect, i.e. a manifestation, will involve multiple reciprocal disposition partners. More specifically, according to the view proposed, it is the event or state of affairs of those (multiple) dispositional partners making contact, i.e. being partnered, that is the complete cause of the mutual manifestation.

Are there any obvious reasons for thinking there is a limit on the number of disposition partners that can issue in a mutual manifestation? I cannot think of any. The ignition of a match is relatively straightforward interaction, yet even that involves more than two disposition partners. Effects of greater complexity will presumably involve many, many disposition partners. If one is a physicalist, for example, one is likely to think of the manifestation of mental properties as involving the interaction of many neurons, all of which may be considered dispositional partners for each other.

8.9) Comparing the concept of mutual manifestation and Molnar's concept of polygeny

Molnar is another dispositionalist who has emphasised that the medium sized events we typically think of as effects actually come about as the result of the exercise of *many* dispositions, or as he calls them 'powers'. Molnar puts the point by saying that effects are *polygenic* (2003: 194). This is a term borrowed from genetics, in which a trait is said to be polygenic if it is determined 'by many genes at different loci, with small additive effects' (2003: 194). Molnar illustrates his account of polygeny with an example first introduced by J. S. Mill (1893, book III, ch. VI.) The example is one in which two draft horses are connected

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to a barge with a rope, and pull the barge along the river. The horses are on opposite sides of the canal, each facing diagonally away from the canal. The velocities of each horse combine in such a way that the barge moves in a straight line. This, according to Molnar, is the polygenic effect of the contribution made by each horse.

The terminology I have used in discussing dispositions and causation can also, it seems, be straightforwardly applied to Mill's case. This suggests that Molnar's view of causal effects as being polygenic bears much similarity to the claim that effects are the *mutual* manifestation of multiple dispositions. Whilst Molnar sees the boat's movement as the polygenic effect of the joint contribution of the powers involved, the boat's movement may be understood, in the terminology I have been using, as the *mutual* manifestation of the dispositions involved, such as the dispositions of the horses to pull, the power of the rope to resist snapping, and the disposition of the boat to be pulled etc.. Furthermore, it should be acknowledged that any number of horses could be added to the story, thereby making the movement of the boat the upshot of many, many dispositional partners at work, with the presence of each horse making a difference to the overall effect. Again, this is another reason for thinking there is no limit on the number of dispositions that can figure in a mutual manifestation. Although, for example, the case of a particle accelerating through a force field seems to involve the contribution of just two powers, this is a simplified case. As mentioned already, many manifestations, such as those taking place in the brain, are much more complex.

It must also be acknowledged that the nature of a mutual manifestation will vary depending upon the kinds of reciprocal disposition (as well as the number) that a given disposition is partnered with. Martin offers a nice example of this in one place (2008: 90 [see also Martin, 1997]). Water has the 'tendency to absorb thermal energy to the point of creating steam' when partnered with a burning substance. However, the effect of this disposition when water is partnered with burning wood is very different to when water is partnered with oil burning on

water. In the wood case, the fire is extinguished, yet in the oil case the rate of combustion increases (for a more detailed description of these cases see Martin). Martin summarises thus:

'In one case, the disposition involved in the reaction ... helps for the mutual manifestation to extinguish the fire, whereas in the other it contributes to the mutual manifestation of exacerbating the fire. One disposition manifests itself in two wholly different ways given different reciprocal partners' (2008: 90).

8.10) A worry for the proposed model of causation

Before proceeding to the next chapter, in which I will relate the dispositional model to prominent process theories of causation, I must acknowledge an obvious worry that our causal model faces as it stands. The worry is that, as things stand, the proposed model is too restrictive. In everyday discourse it would be natural to say, for example, that the dropping of the vase by the clumsy servant causes the breakage. Yet according to our account thus far, this is not correct, because the dropping occurs before the 'partnering' of the moving vase and the hard floor. On our model, it is this 'partnering' which must be classed as the cause of the breakage. This may not fit in well with our natural way of viewing such cases, however. Indeed, even some dispositionalists have suggested that it is in fact the suitable dropping of a vase that may be classed as a trigger of the vase's fragility[76] (e.g. Prior, 1985: 95). I find this suggestion implausible, however, because if being dropped were the 'trigger' for the vase's fragility, then surely the vase would often break *before* it hits the floor, yet this is not the case. Nevertheless, I think we must accept that it would be natural to say of the dropping that it is in

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[76] Those who think that disposition ascriptions entail conditionals of a certain sort, like Prior (1985: 95), often suggest that 'is fragile' entails 'if suitably dropped, then breaks'. The antecedent of the conditional is then thought to correspond to the disposition's stimulus.

some sense a cause of the subsequent breakage, and so some account of this way of talking is needed.

What is needed, then, is a dispositional theory which accommodates and accounts in some way for our ordinary, everyday causal statements. In developing such an account, I will draw upon a prominent 'biff' theory of causation, namely Salmon's 'process' theory. Some of Salmon's observations will help us to understand the difference between cases of causation corresponding to the dispositional model proposed thus far (see figure 8.3) and the kinds of cases, like the vase case outlined, which do not. This will lead us to develop our dispositional model further, to accommodate such relations. The other main purpose of the next chapter will be to point out that process theories of causation have much in common with the kind of dispositional account I am proposing, and can themselves be straightforwardly construed in dispositional terms.

Chapter Nine: Towards a Dispositional Account of Causation (Part 2)

9.1) Salmon on interaction / production

In order to describe the causal structure of the world, Salmon, a key pioneer of the process theory of causation, makes some important distinctions. Salmon distinguishes between *conjunctive* forks and *interactive* causal forks. Following Reichenbach, Salmon defines a conjunctive fork as a case in which a common cause gives rise to two or more effects, and those effects are statistically screened off from one another: '[T]o screen off *means* to make statistically irrelevant' (1993: 160). In other words, where there is a conjunctive fork, the existence of each of the effects of the common cause does not affect the probability of the other effect; the effects are statistically independent. In contrast, an interactive fork involves effects (of a common cause) which are *not* statistically screened off from each other; the existence of one of the effects bears upon the probability of the other(s)[77].

Although Salmon follows Reichenbach (1956) in describing causal forks in terms of statistical relations, he does not think causality can be adequately explained in terms of statistical relations. Salmon did have some sympathy for the statistical account early on in his thinking (see 1978: 694), but in his 1984 book he writes 'I now think that the statistical characterisation is inadvisable' (1984: 171).

In explaining why effects of a common cause are screened off in some cases and not in others, Salmon develops a view that places great weight upon the notion of a causal *process*. Roughly, Salmon defines a process as a persisting entity that displays consistency of structure over a period of time. Salmon's processes are assimilated to Russell's causal lines (1984: 140); Russell writes:

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[77] Salmon speaks also of *perfect* forks, but for our purposes we need not discuss this kind of fork.

'A causal line may always be regarded as the persistence of something – a person, a table, a photon, or what not. Throughout a given causal line, there may be constancy of quality, constancy of structure, or a gradual change of either, but not sudden changes of any considerable magnitude' (1948: 459).

This characterisation of a process will suffice for current purposes, but I will further discuss the distinguishing features of genuine processes towards the end of this chapter.

Now, with the notion of a process in play, Salmon goes on to explain the statistical differences between cases of conjunctive forks and interactive forks. In the case of conjunctive forks, Salmon's claim, roughly, is that the effects are statistically 'screened off' from each other because the effects in conjunctive forks are each related to their common cause by *distinct* and separate causal processes. A concrete example of conjunctive fork, provided by Salmon, is one in which two students each copy from a paper in a fraternity file. The fraternity file may be considered a common cause of the two plagiarism cases. However, in this case, 'there is no physical interaction between the process by which one of the papers is produced and that by which the other is produced' (1993: 161). Because of this, the two students had no idea that the other was also copying from the fraternity file. The result of this is that the two copying processes occur completely independently and so the existence of each effect has no bearing upon the other. This is a pity, according to Salmon, for 'if either student had been aware that the other was using that source, the unhappy coincidence might have been avoided' (1993: 161)!

In contrast, the effects involved in an interactive fork are produced by processes that have interacted. Viewing processes as Russellian causal lines, we might say that the causal lines that lead to the effects have overlapped. The interaction of the two processes has a lasting influence on each, which is why the resultant effects are statistically related. Salmon's

example of such a case in one in which a pool player plays a skilful cannon, which involves making two pool balls collide in such a way that they travel into separate pockets. The point at which the balls collide represents the interaction of two processes, i.e. the causal lines of each pool ball. This interaction, i.e. collision, has a lasting influence upon the balls' behaviour; they each move away in a direction such that they enter their respective pockets. Because of the interaction, each effect has a bearing upon the other; the entering of the cue ball into its pocket is a sign that the 8-ball will enter its pocket, given the nature of the shot attempted. This is why the effects involved in an interactive fork are not statistically irrelevant to one another.

What Salmon has done, then, is to allow the concept of a process, and the concept of overlapping processes, to play a central role in accounting for different causal forks and the statistical relations involved. This is in opposition to those, like Reichenbach, who explain causal forks purely in terms of statistical relations. Since processes are concrete, they provide the kinds of intrinsic, concrete causal connections that anti-Humeans about causation tend to seek. Now, importantly, the dispositional model proposed earlier (see figure 8.3) sits well with Salmon's account of the interaction that occurs in interactive forking, for reasons I will begin to highlight in this chapter.

Salmon refers to the causation involved in such interaction as *production.* In line with the allowance of simultaneity on our dispositional model, Salmon also claims that interaction 'exhibits the relation of simultaneity' (1984: 182). Salmon's example of interaction, mentioned in chapter seven, involves the intersection of a white light pulse and a red filter, and in this case it seems 'the light becomes red at the very time of its passage through the filter'. (1984: 182). Salmon sees the light pulse and the red filter as distinct 'processes' (or causal lines, in Russell's terminology) that intersect or overlap. Now, using the dispositional terminology of Martin, introduced earlier, such cases would be described as involving the

collision of distinct reciprocal disposition partners. This is merely a terminological difference, however. Overall, Salmon's remarks on *production* sit well with our proposed dispositional model.

9.2) Accounting for different cases of causation: the concept of propagation

I suggested earlier that in everyday language it would be natural to say, for example, that the dropping of a vase is the cause of its breakage. Now, despite Salmon's observations about the simultaneity of causal interaction, he too acknowledges that everyday causal statements typically concern events that are spatiotemporally distant:

'[I]n everyday life, when we talk about cause-effect relations, we think typically (though not necessarily invariably) think of situations in which one event (which we call the cause) is linked to another event (which we call the effect) by means of a causal process' (1984: 178).

Since processes in Salmon's sense are spatiotemporally extended, such effects may be spatiotemporally distant from what we might think of as the cause.

Acknowledging these cases, Salmon proceeds to give an account of causal *propagation* (1984: 139), which covers these cases in which one event may be said to have causal influence on a spatiotemporally distant event by virtue of a connecting process. In other words, cases of propagation are those whereby causal relations are said to hold between events occurring at different parts of a causal chain (which are connected by an intervening process or processes). As has been suggested, the causal situations we typically speak of involve propagation, such as when we say that the dropping of the vase by the clumsy servant causes the vase's breakage. In this case, the causal connection will be the 'process' corresponding to the persisting vase.

According to Salmon, the two events which stand in propagatory causal relations are themselves to be thought of as 'an interaction between two (or more) intersecting processes' (1984: 178). In other words, in propagatory cases the cause and effect events will themselves involve productive causation. In our dispositional terminology, this is to say that the causes and effects we typically refer to are in fact *mutual manifestation* events (or states of affairs). Salmon supports this claim with an example. He remarks that it would be natural to say

'...that the window was broken by boys playing baseball. In this situation, there is the collision of a bat with ball (an interactive fork), the motion of the ball through space (a causal process), and a collision of the ball with the window (an interactive fork)' (1984: 178).

In this case, the collision of the ball with bat (the cause) and the collision of the ball with the window (the effect) are events that obviously involve interaction themselves. The vase case just mentioned also seems to fit this structure. The dropping of the vase (the cause) is itself plausibly an interaction, i.e. one involving the mutual manifestation of the servant's clumsiness and the vase's slippiness. The effect of the vase breaking is also a mutual manifestation – of the vase's fragility and the hardness of the floor. The propagatory connection in this case is the 'process' of the vase falling. Such observations may offer an explanation as to why the idea of simultaneous causation has often not been taken seriously enough: we typically think of the causal relation as holding between mutual manifestation events that occur at different times, and perhaps this disguises the fact that the mutual manifestations themselves (which may occur simultaneously) involve *causal* interaction[78].

In sum, Salmon provides two different concepts of causation. One is the concept of processes causally interacting (when they overlap or 'intersect'), which, in our terminology, involves the mutual manifestation of the dispositional partners involved. This corresponds to Salmon's

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[78] The reason for this in philosophical circles is, I suspect, the stricture Hume left us with according to which all causes precede their effects.

concept of *production,* which he takes to be a fundamental causal concept. The other
fundamental concept of causation is *propagation*. Cases involving propagation are cases in
which an occurrence at one place and time has an influence upon what happens at another
place and time in virtue of a connecting 'process' (or 'processes').

Now, as is clear by now, the dispositional model proposed (see figure 8.3) corresponds to
Salmon's *productive* causation, which can involve simultaneity and occurs when processes
collide – or in our terminology, when dispositional partners come together. Using Salmon's
notion of propagation, I am in a position to modify the dispositional model in such a way as to
accommodate these propagatory causal relations. From now on I will asterisk the causes and
effects of interaction to distinguish them from the causes and effects of propagation. t0, t1, t2
etc. represent different times:
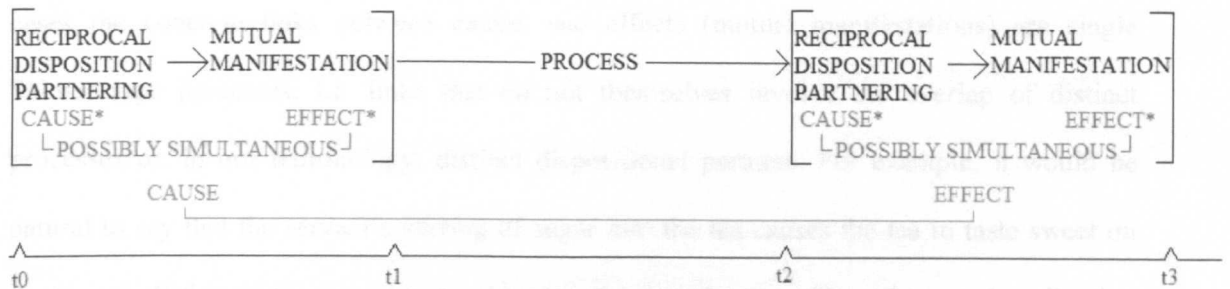
Figure 9.1

9.3) Modifying Salmon's account of propagation: causal connections as further mutual manifestations

There may be one reservation that the pandispositionalists may have concerning the above
model (figure 9.1). In the baseball case discussed by Salmon, the movement of the ball
through the air, which links the hitting of the baseball to the smashing of the window, is not
classed by Salmon as an interaction, but as a single process, or causal line. Translating
Salmon's terminology to ours, this means that the ball's movement is not classed as a mutual

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manifestation of distinct dispositional partners. And applying the vase case to Salmon's model, it seems the falling of the vase would not itself be classed as a mutual manifestation.

I think the pandispositionalists may disagree on this point. The movement of a ball or vase involves change, and we might expect such change to be characterised in terms of reciprocal dispositions manifesting. The vase's falling, for example, could plausibly be regarded as the manifestation of the Earth's attractive gravitational pull together with the vase's mass. Likewise, the movement of the ball could plausibly be regarded as the mutual manifestation of the kinetic energy transferred to the ball, gravitational pull, air resistance etc. Thus, the pandispositionalists may wish to allow that in the propagatory case, the concrete link between causes and effects can itself be just a further mutual manifestation of reciprocal dispositions.

To be fair to Salmon, however, the pandispositionalists should agree that in some propagatory cases the concrete links between causes and effects (mutual manifestations) are single Salmon-type processes, i.e. links that do not themselves involve the overlap of distinct processes or, in our terminology, distinct dispositional partners. For example, it would be natural to say that the servant's stirring of sugar into the tea causes the tea to taste sweet on the tongue. If this particular servant makes very hot tea, the tea will not be tasted until a few minutes have passed. The link between the cause (the stirring) and the effect (the tasting) in this case must, therefore, simply be the persisting sugared tea. This does not seem to be a mutual manifestation state of affairs, although the dissolving process itself would of course be a mutual manifestation. Once the dissolving process is completed, however, what we are left with is merely a persisting dispositional *state*. As such, the causal link in this case would seem more like a single Salmon-type process, rather than multiple processes which are intersecting, or mutually manifesting.

Taking this into consideration, we may distinguish two main cases of propagation. In one case

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the spatiotemporally distant causes and effects are related by a further mutual manifestation event (i.e. overlapping processes), and in the second case the causes and effects are related by a persisting dispositional state (i.e. a single process). Our model becomes as follows (again, the productive causes and effects involved in mutual manifestations are asterisked in the model, which distinguishes them from the causes and effects of propagation):

Figure 9.2
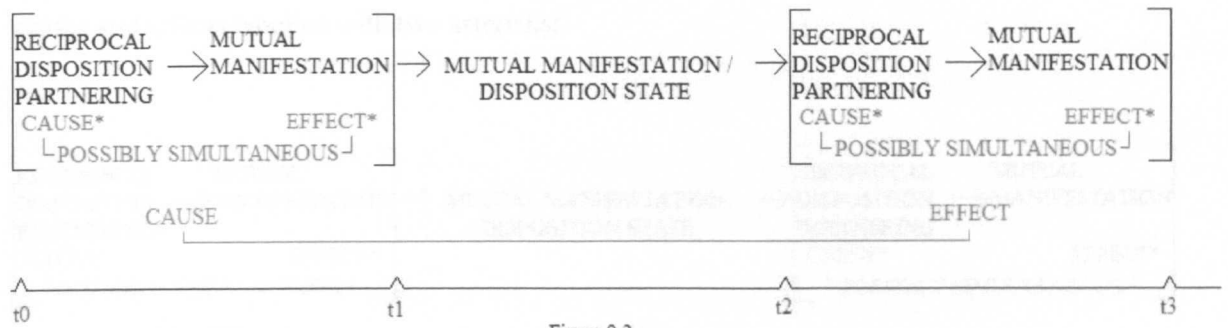
A more complex case would be one in which distant causes and effects were linked by a chain of both mutual manifestations and persisting dispositional states of affairs. Representing these complex cases would of course require a larger model.

9.4) Minor modification two: immediate causal relations

It may also be noted that it would be natural in ordinary discourse to say of events *directly* linked in a causal chain that they stand to each other as cause and effect. For example, it would seem correct to say of the event of the ball travelling through the air that it is the effect of the ball being struck by the bat. Likewise, it would seem right to say of the state of affairs of salt being dissolved in water, which exists as soon as the dissolving process is complete, that it is the effect of the dissolving process.

If we are to take account of this observation, we might also add to our model a third kind of

causal relation, which relates events or states of affairs that are *adjacent* in a causal chain. One might call this causal relation the *immediate* causal relation. Such a relation will be different to the causal relations involved in mutual manifestation, because adjacent events in a causal chain (such as the event of the ball being struck and the event of the ball travelling through the air) may be distinct mutual manifestations. If such a relation were to be incorporated into our model, the model may be modified as follows, with the immediate causes and effects labelled with two asterisks:
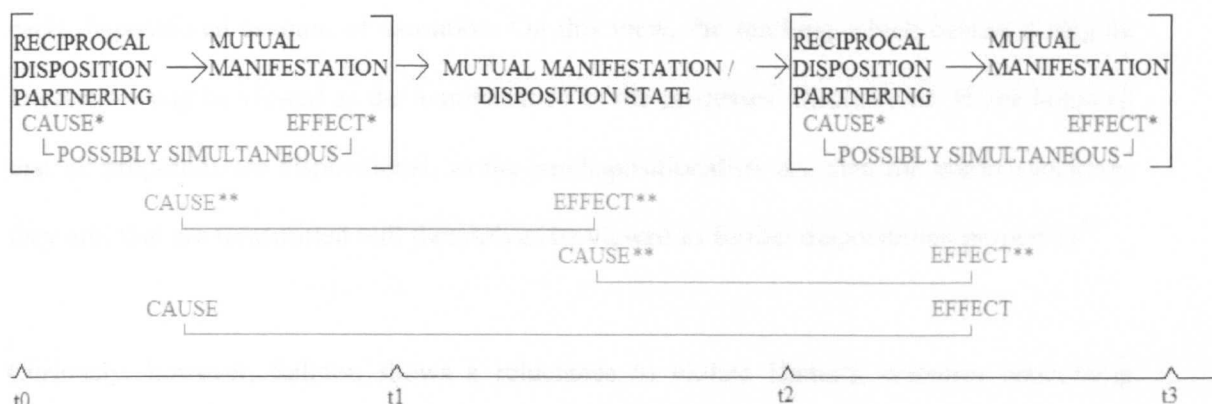
Figure 9.3

9.5) Distinguishing causal processes and pseudo processes in dispositional terms

A key question which arises for process theorists is this: what is the difference between a genuine causal process and a pseudo process, an example of a pseudo process being the movement of a shadow or a spot of light on a wall (Salmon, 1984: 141-142)? During this section I will suggest that the (slightly different) answers put forward by two prominent process theorists to this question can be straightforwardly construed in pandispositionalist terms. This will provide yet another reason to suppose that a dispositional model of causation could be straightforwardly adopted by those who favour process theories, and vice versa.

Salmon's answer to the above question has an overtly dispositional flavour. According to

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Salmon, genuine causal processes, unlike pseudo processes, have '[T]he *ability* to transmit a mark onto other processes that they interact with' (1984: 145; my italics). In another place Salmon speaks of the 'capability' to transmit a mark (1984: 140). According to Salmon, causal processes manifest these capabilities when they *intersect* (1994, 298-299), which is what is involved in an *interactive* fork. This part of Salmon's account corresponds to our claim that dispositions manifest when dispositional partners come into contact.

Salmon's use of terms like 'ability' and 'capability' suggests that Salmon's theory was an early dispositional account of causation. On this view, the marking which occurs during an interaction may be viewed as the manifestation of the processes' dispositions. If one holds all that all properties are dispositional, as the pandispositionalists do, then the marks (whatever they are) that are transmitted will themselves be viewed as further dispositional properties[79].

Curiously, however, Salmon shows a reluctance to violate Hume's strictures concerning causal 'powers'. There appears to be inconsistency in his view, therefore. On one hand Salmon requires the concept of an intrinsic capability in order to characterise causal processes, yet on the other hand he seems reluctant to accept an ontology of dispositional properties. This reluctance is expressed when he writes:

'[A]bility to transmit a mark can be viewed as a particularly important species of constant conjunction – the sort of thing Hume recognized as observable and admissible. It is a matter of

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[79] This is a point which Popper emphasised some time ago. Although we think of the properties of fragility and solubility as being the paradigmatically dispositional properties, the manifestations of these properties are equally dispositional: '[T]hus, 'broken', like 'dissolved', describes dispositions to behave in a certain regular or lawlike manner. In general, the dispositional character of any universal property will become clear if we consider what tests we should undertake if we are in doubt whether or not the property is present in some particular case' (1959: 424-425).

performing certain kinds of experiments. If we place a red filter in a light beam near its source, we can observe that the mark – redness – appears at all places to which the beam is subsequently propagated' (1984: 147).

It is difficult to grasp from these brief comments precisely what Salmon's view of dispositions is, but his wish to ground disposition concepts in the realm of the observable is reminiscent of the reductive programmes attempted by the logical empiricists (e.g. Carnap, 1936). Yet, in clarifying his position in a later article, Salmon highlights that the 'propensities' he appeals to are objective features of causal processes, and are not reducible to, for example, relative frequencies (1988). It seems, therefore, that his account ultimately relies on a robust concept of dispositions (or 'propensity'), a thoroughly modal concept. Because of this modal aspect of Salmon's theory, commentators like Dowe have concluded 'that Salmon has not demonstrated that his theory avoids non-Humean hidden powers' (2000: 87).

Salmon's reluctance to duly acknowledge his anti-Humean commitments may stem from the fact that in the philosophical climate of the 1970's, in which is thinking about causation began, dispositional properties were, in Mellor's words, as 'shameful in many eyes as pregnant spinsters used to be' (1974: 157). For those who do embrace pandispositionalism, however, it is clear that when the Salmon-type view is given a 'propensity' reading, it is not at all shameful. Salmon's processes may be seen as persisting dispositional states of affairs, which manifest their dispositions when they 'intersect' – or, in Martin's terminology, are 'partnered' - with others. Specifically, on the Salmon-type view, the manifestation of causal processes' dispositions consists in the imparting of certain marks or signals, such as when a red light filter leaves a red 'mark' on the white light that passes through it. Viewing causal processes in dispositional terms, Salmon's 'mark criterion' could be interpreted as the criterion for what counts as genuinely dispositional activity.

9.6) Understanding alternative process theories in dispositional terms

Other process theorists have disagreed with Salmon on how causal processes and interactions are best characterised. Perhaps taking note of some of Salmon's prognostications regarding some of the specific properties involved in causal interaction (1984: 170), Dowe, a recent proponent of the process theory, proposes a view which sees all and only causal interaction as involving the exchange of conserved quantities, like energy and momentum (2000: ch. V). Any property that appears in a conservation law may be considered a conserved quantity, and Dowe comments that 'we have good reason to believe that mass-energy, linear momentum, and charge are conserved quantities' (2000: 91). Dowe claims that if we restrict the process theory to his conserved quantity account, we can avoid several of the problems facing Salmon's account[80]. One advantage that Dowe claims his theory to have is that, unlike the mark-transmission account, it avoids appealing to the dispositional notion of propensity. This aspect of Salmon's view, to recall, never seemed to sit well with Salmon's Humean inclinations. Dowe's account, in contrast, appeals only to the concept of conserved quantity exchange. Does this mean that Dowe's theory is in opposition to pandispositionalism? I do not think so. Firstly, Dowe accepts that causation may be probabilistic, and he expects that 'the probabilistic element in the theory must enter as a propensity' (2000: 113). Secondly, and more importantly, the thorough-going dispositionalists *will* think that Dowe's conserved quantity account involves appealing to dispositional properties, if only covertly. The conserved quantities Dowe speaks of include mass-energy, momentum and charge, and the pandispositionalists will happily see Dowe's conserved quantities as dispositional entities. Indeed, it may be pointed out by the pandispositionalists that the way conserved quantities are typically characterised does have an overtly dispositional flavour. The concepts of charge and energy, are typically characterised in terms of what things with those properties are able to *do*. And, as is the case with all dispositional properties, something that has a certain charge does

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[80] Unfortunately, I do not have the room to discuss many of the problems raised by Dowe in this thesis.

not display that property at all times. Charge is manifested and revealed to us only when it behaves in a certain way in certain circumstances. The same goes for energy. We learn as school children about *potential* energy, for example, which only reveals itself when certain situations are realised.

For Dowe, then, causal interaction consists in the exchange of conserved quantities. If this is correct, and if interaction is to be viewed in terms of disposition manifestation, we would have to construe manifestations as the *exchange* of dispositional properties (i.e. charge, momentum etc.). There is no obvious reason why the pandispositionalists should find such a picture objectionable, however. Mumford, for example, has recently suggested that on the dispositionalist view, causation is best seen as the passing around of dispositions (2009). Such a view does not seem implausible when everyday interactions are considered. To use one of Mumford's examples, when a hot object and a colder object are brought together, the result is that the cold object becomes hotter. Viewed in dispositional terms, the manifestation in this case is simply the passing of heat from one object to another, with heat itself considered as a disposition.

Before concluding this chapter, two further important issues arising from our model must be briefly addressed. The first issue concerns causal asymmetry and the second concerns the question how the often discussed distinction between *transeunt* and *immanent* causation (first introduced by W.E. Johnson (1964 [1924])) relates to our dispositional model. I will now discuss each of these issues in turn.

9.7) The challenge of accounting for causal asymmetry

It is thought to be a feature of most or all causation in our world that it has a direction. To say that causation typically has a direction is to say, minimally, that if *a* causes *b* then typically *b*

does not cause *a*. If all instances of causation are of this nature then the causal relation is asymmetrical. If most but not all causation is of this nature we may say that the causal relation is non-symmetrical.

Some metaphysicians have claimed that if closed temporal loops are possible, then it could be true that some A causes B and also that B causes A (see Dowe on causal loops (2001)). If this is so, then the causal relation is non-symmetrical. I will not enter this debate, however. What is important for current purposes is that most if not all causation in our world does have a direction. Since the dispositional view of causation outlined is intended to apply to all cases of interaction, some account must be given of the typical directedness from causes to effects. If this cannot be done, then Martin's identity view may score a mini victory; on his view there just is no directedness since the relation between partnering and manifestation is one of *identity*, which is a symmetrical relation.

So, for the dispositional account of causation to remain plausible, it ought to be the case, generally, that reciprocal dispositional partnerings cause their mutual manifestations, but not vice versa, and we ought to be able to provide some metaphysical account of this asymmetry. One problem may be, however, that given my earlier arguments regarding simultaneity in dispositional interaction, we are automatically precluded from appealing to the traditional account of causal asymmetry: the temporal account. Those who hold that all effects occur after their causes have the option of rooting causal asymmetry in the direction of time (see, for e.g., Black 1956 for the view that causal order is temporal order). If one takes this line, one can simply say that A causes B and not vice versa because B occurs after A. According to my account, however, reciprocal disposition partnerings and their mutual manifestations may occur simultaneously, and so I am not entitled to base a general account of causal asymmetry on temporal precedence.

The challenge, then, is to provide the metaphysical source of the direction of causation without invoking temporal concepts. The prospect of this challenge should not dispose us to give up on our allowance of simultaneous causation, however. Many causal theorists have used non-temporal concepts in their accounts of the direction of causation. For example, Lewis (1979) grounds causal asymmetry in counterfactual dependence (which is itself grounded in the asymmetry of overdetermination). Those holding manipulability theories of causation tend to ground the direction of causation in the asymmetry of the means-end relation (e.g. Collingwood, 1940). And in Hausman's recent influential book on causal asymmetries (1998), for example, his account of causal asymmetry is based on the 'independence' principle which involves the concept of causal connection, a concept that he takes to be primitive.

It has to be said that it does seems intuitive to say that the contiguity of reciprocal dispositional partners causes their mutual manifestation, but not vice versa. An indication that this is so is that it would be very natural to *explain* the fact that reciprocal dispositions mutually manifest by the fact that the reciprocal dispositions were put into contact (and not vice versa). This supports the idea that reciprocal disposition partnering causes the manifestation and not vice versa, for it seems a general feature of causes that they explain their effects. Unfortunately, however, we cannot base the account of causal asymmetry on the asymmetry of explanation. Although asymmetric explanatory relations may be symptoms of causal asymmetry, they surely do not provide the source of causal asymmetry.

It should be acknowledged that there seems to be an initial prospect for grounding the directedness from reciprocal disposition partnering to their manifestations in the means-end relation. It would seem natural to say that putting reciprocal dispositions into contact is a means for us, as agents, to get them to mutually manifest, but not vice versa. Putting certain reciprocal disposition partners into contact is our way of manipulating the world in such a

way as to bring about certain mutual manifestation, which is why the partnering is to be classed as the cause of the manifestation, and not vice versa.

Unfortunately, as is well known, the concept of manipulation is very much tied to human enterprises. Cashing out causal asymmetry (or indeed causation itself), in terms of such concepts seems to render it human dependent or mind dependent. This consequence is untenable for those with realist inclinations about causation, such as those seeking to connect causation with disposition manifestations, manifestations which are mind-independent (see, for example, Molnar, 2003: 12.1, who advocates a thoroughly realist approach). As such, appealing to means-end relations in this way will not be attractive to pandispositionalists. It is perhaps worth noting that Aristotle did seem to think that means-end features are mind-independent features of the world: teleological causation was one of the four varieties he thought he could locate in the world. Again, however, the teleological conception of causation, enchanting as it is, is taken seriously by few contemporary metaphysicians.

9.8) Grounding causal asymmetry in dispositional directedness: a brief suggestion

Given that we should not appeal to the direction of time or means-end relations in accounting for causal asymmetry (or non-symmetry), a promising strategy would, I think, be to turn to the metaphysics of dispositional properties, which was discussed in the first half of this thesis. All dispositionalists seem to agree that there is some sort of fundamental directedness from a dispositional property towards its manifestation. Perhaps, then, *causal* asymmetry is rooted in the fundamental directedness amongst dispositional properties at the second-order level.

As we saw in chapter two, talk of dispositional directedness has a metaphorical flavour and so it is often not easy to grasp precisely what Molnar, for example, means when he says a disposition is directed towards its manifestation. Recall, however, that in chapter two of this thesis, a promising account of 'directedness' was put forward, one which views properties as

universals and sees second-order internal relations between those universals as the source of dispositional directedness. This kind of view comes closest to that of Bird. I will not delve further into this view here, but simply highlight that this fundamental second-order manifestation relation is thought to be asymmetric[81]. There may be some hope, therefore, of the pandispositionalist grounding the asymmetric nature of *instances* of dispositional interaction in terms of the asymmetries at the second-order level of universals. The natural view that this may lead us to is that instances of causation (involving events or states of affairs) are the first-order instantiations of the second-order manifestation relations (between universals). In fact, a structurally similar view has been put forward by Armstrong, who explains nomicity in terms of a second-order natural necessitation relation (N), and then suggests '... that singular causation *is identical with* the instantiation of some strong law [the N relation]' (1997: 218). The key difference between the approach suggested here and that of Armstrong's is, of course, that Armstrong's second-order 'N' relations are ultimately contingent.

Unfortunately, I will have to leave this interesting issue at this point. My aim in this section has merely been to suggest that even though a general account of causal asymmetry cannot be formulated which relies on the concept of temporal priority, this should not force us to abandon theories involving simultaneous causation. Furthermore, if we accept a suitable metaphysics of dispositionality, there is hope that we will have the resources with which to account for the causal asymmetry that holds between partnered dispositions and the mutual manifestations they produce.

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[81] Bird writes: 'the fundamental properties are structured by the *asymmetric* non-irreflexive relation between a power and its essential manifestation property' (2007a: sect 4.1 (my italics)).

9.9) The distinction between transeunt causation and immanent causation

It must be emphasised that the mutual manifestation model developed may not serve as a fully general model for dispositional activity. In chapter five I acknowledged the existence of what Molnar calls 'spontaneously manifesting' dispositions. These are typically probabilistic dispositions, such as the disposition to radioactively decay. At any given time, such dispositions merely have a certain probability of manifesting, and they can manifest without having to be partnered with a reciprocal dispositional entity, i.e. without being stimulated. When an atom radio-actively decays, for example, it seems to do so entirely of its own accord. Given that this is so, this kind of dispositional activity obviously does not fit in with the mutual manifestation causal model.

Given that the dispositional theory of causation presented potentially does not serve as a universal model of dispositional activity, the model may look less attractive. If we accept that the manifesting of radio-active decay involves causation, then we have a case of causation that is not captured by the mutual manifestation model. What must be pointed out, however, is that this is not surprising, because a distinction has already been made in the causation literature which, arguably, corresponds to the distinction between 'spontaneous' dispositional activity, and 'reciprocal' dispositional activity. This is the distinction, introduced by W.E. Johnson (1964 [1924] part III), between *transeunt* and *immanent* causality.

Transeunt causality is said, roughly speaking, to involve one particular acting upon another particular, whereas immanent causality is confined to a single particular. Armstrong marks this distinction in a rough and ready way by saying that *transeunt* causality is 'going across' causality, whereas *immanent* causality is 'remaining within' causality (1997: 73). It seems fair to say that the kinds of causal processes typically discussed in philosophical and scientific discourse fall under the category of *transeunt* causality. We tend to think of causality

involving distinct particulars, with one particular bringing about a change in another. This kind of causality is embodied by Hume's billiard ball case, a case which he took to be a paradigmatic example of causality. The billiard ball case is one in which the cause (the movement of the first billiard ball) seems entirely distinct from the effect (the movement of the second billiard ball), and so whatever the cause-effect relation amounts to in such cases, it seems one that 'goes across' from one particular to another.

In dispositional terms, *transeunt* cases will be ones involving the interaction of reciprocal disposition partners (and also propagatory cases). As I have suggested, this is best put in terms of mutual manifestation. The 'going across', as Armstrong puts it, is the cooperation of distinct dispositional partners in bringing about a certain mutual manifestation, i.e., the effect. Thus, the theory of causation I have sketched is may be seen as a dispositional account of *transeunt* causation.

Immanent causality, in contrast, is the more controversial variety of causality, as Armstrong acknowledges in one place (1997: 73). Immanent causality is so called because it involves effects that have no external causes. In other words, the causes and effects of immanent causality will involve the one and same particular. Armstrong provides two putative examples of immanent causation, one involving the persistence of a simple particular, such as an electron, and one involving an atom's spontaneous radioactive emission (1997: 73). In the pandispositionalists' eyes, the latter case involves a 'spontaneous' disposition, and so Armstrong has clearly suggested which side of the transeunt – immanent divide this kind of activity will lie.

It should be noted, however, that one may wish to deny that radioactive decay, or the persistence of simple particulars, should be seen as involving causality at all. Ellis, for

example, thinks that radioactive decay is uncaused and so calls the disposition at work in such a case a *stochastic* disposition (2001: 129). Ellis writes:

'... [I]f radioactive decay is to occur, it is a necessary condition that radium atoms exist. But events of radioactive decay are not caused by the existence of such atoms. Nor, as far as we know, are they caused by anything else' (2001: 129).

If this is correct then the mutual manifestation model of causation proposed may, after all, be a complete account of causation. Whether or not this is so is a question to be settled elsewhere. At the very least, the account sketched in this chapter may be classed as a dispositional account of transeunt causation.

9.10) Summary

As has been indicated in several places, the process theory of causation can, it seems, straightforwardly be understood in dispositional terms. Using Salmon's process theory as a platform, I have in this chapter sketched a dispositional model which accommodates 'propagatory' causation as well as 'interactive' or 'productive' causation.

Chapter Ten: Causation and Realisation

10.1) Introduction: Properties in the special sciences

A fundamental question in the metaphysics of science is whether there are any genuine natural properties besides those figuring in a completed physical theory. There are reasons for thinking that there are such properties. For example, there are many special sciences which appear to tell us about objective features of the world. Yet the properties that figure in the special sciences – such as chemistry, biology, psychology and geology, for instance – seem very different to those properties which figure in physical theory. Take chemistry, for example. Whilst it seems, at present, that the laws of chemistry can in principle be derived from the laws of quantum electrodynamics, this can only be achieved if certain information describing suitable *chemical* conditions is first fed into the equations (for further discussion see Gell-Mann, 1994). The prospects of explaining chemical properties away using only concepts found in physics appear dim. The state of play is much the same in psychology; it is notoriously difficult to capture the properties discussed in psychology using only the concepts used by the physicists. Indeed, this is precisely why psychology is taken to be an independent discipline. And such disciplines cannot easily be dismissed by metaphysicians or indeed the physicists, since the special sciences have all had significant predictive success. Thus, even if special-science properties are not fundamental, they must be accounted for in some way, rather than simply disregarded.

10.2) The levels-of-being account

Once it is acknowledged that the special sciences have their own sets of laws involving very different kinds of properties, there is a temptation to suppose that reality consists of distinct autonomous levels of being each of which instantiates very different kinds of properties and

has its own independent laws. This would not be to deny that there could be any relations at all between the various levels, however. Few metaphysicians would want to deny, for example, that mental properties (whatever they are) supervene upon physical properties, even if mental properties are not reducible to those investigated by the physicists[82]. The important question for a levels theorist to answer, however, would be this: what is the source of such supervenience? As Heil points out, some B can supervene on some A for a number of reasons. Supervenience would hold, for example, 'if As were Bs, if As were wholly made up of Bs, if As were caused by Bs, or if As and Bs both had a common cause' (2003: 37). The typical answer to the supervenience question by the levels-theorist is that physical properties *cause* mental properties (see, for e.g., Searle, 1983, 1992). Such causation is typically referred to as 'bottom-up' causation. The causal relation is perhaps the most obvious source of supervenience for the levels theorist to appeal to. As we saw in recent chapters, it is a platitude about causation that causes and effects are in some way distinct, and so by appealing to the causal relation the levels theorist can maintain that mental properties really do exist distinct from the physical properties. Yet, on the other hand, the causal relation is intimate enough to support the supervenience claim; invariably, a change in a given cause will make a difference to the kind of effect that is brought about, which is just what supervenience, broadly speaking, requires.

The problem is, however, that the 'levels' view, for all its initial plausibility, faces serious problems, some of which I will discuss in the next section. This is reflected by the fact that there are relatively few advocates of the 'levels' view in current analytic metaphysics. Rejecting the levels view does bring its own challenges, however. Like the levels theorist, the opponent of the levels view must accommodate the fact that most, if not all, special science properties supervene in some way upon the basic properties investigated in physics, whilst at

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[82] This supervenience appears evident in much of the work carried out in neuroscience. Interfering with a particular part of the brain invariably brings about certain changes in mental state.

the same time allowing special science properties to be legitimate (in some sense) in their own right. It is far from clear how this latter task can be carried out, if the layers view of reality is abandoned.

The purpose of this chapter is to make some initial speculations about how the dispositional model of causation sketched earlier may help us deal with this challenge. The challenge, to recap, will be to show, in a way that does not invoke distinct levels of being, how it is that the special science properties can be real in their own right even though they supervene in some way upon the basic physical properties. Before discussing this challenge, however, I must show why the levels view of reality that I have alluded to is thought to be unattractive.

10.3) An argument against the levels-of-being view: the causal relevance of 'higher-level' properties

I want to begin by briefly highlighting that the levels thesis cannot simply be attacked on the grounds that it, by itself, entails that physicalism is false. This may be tempting given that the levels theorist allows that reality involves properties other than those identified by physical science. This would, however, be unfair, which perhaps suggests that the term 'physical science' is unfortunate. Surely, for example, we would not wish to deny that what chemists or, say, geologists investigate is not physical, just because the properties they speak of are different to those investigated by the 'physicist'. It is not incoherent, therefore, for the levels theorist to present her thesis as the claim that reality is entirely physical, but consists of various physical layers each of which instantiates its own kinds of irreducible *physical* properties. As such, the layers theory should not be rejected on the grounds that it automatically commits us to non-physical realms of being.

John Heil is one of many opponents to the levels view, and much of his recent book (2003) is

concerned with rejecting the levels view and to offer an alternative picture. Discussion of one of the arguments put forward by Heil, which is arguably the most pressing objection, should suffice to show that an advocate of the 'levels' theorists must accept some implausible claims in order to maintain their view.

One of the problems that Heil puts forward for the levels view is a version of Kim's infamous 'exclusion' argument (see, for e.g., Kim, 1998, ch 2). Heil's argument rests on some plausible assumptions regarding causation together with the observation, identified already, that even the levels theorist must allow that properties typically depend in some way on properties at other levels. This relation is often called the relation of 'realisation', but given that there are different theories about what realisation consists in, this label is not very informative. Fortunately, however, I think Heil's argument is valid even if the realisation relation is construed in a rather minimal way, namely, in terms of a weak notion of supervenience, which I will define as follows:

Property F realises Property G in our world (*w*) *iff* if *x* is F in *w*, then, necessarily, *x* is G in *w*.

The next implicit assumption rests on a principle that is central to the pandispositionalist outlook, namely, the Eleatic principle. According to this principle, if a putative property instance is genuine, then it must be able to make some causal impact on the world (or, more precisely, the possessor of the property must be able to make a distinctive kind of causal impact on the world, in virtue of having that property). The motivation behind this principle is of course based, in part, on the thought that if a property instance could not make a causal impact upon us or the world, then we would have no reason to think such a property existed.

With these two implicit assumptions in place, Heil poses a question that presents a challenge for those who hold that certain properties exist on distinct levels of reality. Suppose that

property F is the property of being in a certain neurological state (existing on the 'biochemical' level, say), and property G is the property of being in pain (existing on 'mental' level). Suppose further that property F realises property G, and that you happen to instantiate F (and so G). Now a question: '[W]hen you head for the medicine cabinet to find aspirin, are you driven by the feeling of pain, or by ... its neurological realizer?' (2003: 32). The worry here, for those who hold there is a distinct class of mental properties, is that it seems an adequate causal explanation of the movement towards the cabinet need only appeal to neuronal activity. This thought can be extended generally. Although, for example, it is natural to say that being in love with an uninterested woman causes depression, the neuroscientist's explanation will have a different flavour. Indeed, the potential causal contribution of any mental property would seem to be preempted by the realising properties that neuroscientists deal with. If there is no need to grant causal efficacy to mental properties, then such properties seem to fail the Eleatic test. This leaves two options for the levels theorist: either deny that the realising properties do any causing, or accept that both the mental properties *and* their realisers cause the same effects.

The first of these options is unattractive, for neuroscience has had considerable success in [causally] explaining our behaviour in terms of neuronal activity. Furthermore, since mental properties are ascribed in everyday circumstances, they are typically thought to be less fundamental than the more scientifically respectable neuronal properties. It is tempting, therefore, to see causal explanations involving neuronal properties as being primary.

The second option outlined involves accepting that both the neuronal properties and the mental properties cause the movement towards the medicine cabinet. The problem here, however, is that this would involve accepting that causal overdetermination is a pervasive feature of the world. The concept of causal overdetermination is far from incoherent, but philosophers are often sceptical of metaphysical schemes which are committed to pervasive

overdetermination. The reasons for such scepticism are often not clearly stated, however. Martin, for example, dismisses the levels view, in part, because he thinks 'it invokes the obvious problem of apparent 'overdetermination' occurring at each and every level '(2008: 36), but Martin does not explain, in detail, why overdetermination is obviously a problem. One reason could be that we do not often experience cases of genuine causal overdetermination in everyday life. It is therefore natural, perhaps, for us to think of causes as being *wholly* responsible for their effect. Indeed, it is perhaps partly because of this intuition that causal statements have been thought by many to be closely related to counterfactuals of a certain sort. According to some philosophers, the thought that A causes B involves the thought that had A not occurred, then B would not have occurred[83]. Yet if cases of overdetermination are pervasive, this would not seem right. In cases of overdetermination, a cause is *not* wholly responsible for its effect, for there is some other cause that is also sufficient for that effect.

This is not a knock-down argument, however. If the advocate of the levels view were to accept pervasive causal overdetermination, she might simply reply "so much the worse for our common intuitions about causation". There may be two other reasons for being reluctant to accept causal overdetermination, however. The first, and perhaps most compelling, reason for worrying about causal overdetermination in the levels picture is that it is not merely an accident that there is overdetermination. Given that higher level properties *supervene* on their lower level realisers, it follows that it *must* (in our world at least) be the case that an effect of any higher level property is also caused by the lower-level properties. This is a very strong claim indeed. Although philosophers do typically accept the possibility of causal overdetermination, the cases they have in mind are ones in which it was a contingent fact that a certain effect was overdetermined. The paradigmatic example is one in which an

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[83] Lewis, as we saw in earlier chapters, thought that the concept of causation can be analysed in terms of counterfactual dependence (see his 1973).

unfortunate man is killed by two simultaneous gun-shot wounds each of which was sufficient for his death (see Lewis, 1973). It is thought, however, that the overdetermination in such cases is an accident, because had things been slightly different, one of the killers might have been late, in which case the death would have been caused by a single shot. On the levels picture, however, causal overdetermination is typically not an accident; given the supervening nature of higher-level properties, it is *necessary* that an effect of a higher-level property is overdetermined by virtue of the lower-level properties. On this view, the world has evolved in such a way that the world is very busy indeed, in the sense that most causal effects *must* be overdetermined.

A further reason for being reluctant to accept pervasive overdetermination, and one which is related to the last point, is that it is considered good practice, both in science and metaphysics, to choose the most elegant theory when faced with competing explanations. Thus, when constructing metaphysical systems, philosophers try to explain phenomena in the simplest manner (by, for example, appealing to as few primitive concepts as possible). In physics, where we have competing laws, we opt for the simplest ones. I will not try to justify such principles here, but merely note that a theory positing pervasive non-accidental causal overdetermination would not seem a very elegant theory. Those who have a theory in which only one state of affairs (or event) is typically responsible a given effect will have a more economical view, suggesting the levels theorists may be guilty of a kind of metaphysical 'double counting'.

10.4) Further problems for the levels view

Before considering Heil's alternative to the levels view, it is worth mentioning what seems to me to be another puzzling aspect of the levels view. What account can the levels theorist give of the *particulars* that instantiate properties at various levels of being? Presumably, on the

levels view, a particular can simultaneously instantiate properties at various levels of being. I, as a living human being, would presumably instantiate physical properties, chemical properties, biological properties and psychological properties, all of which exist at different levels of being on this view. But what about *me*? Do I exist on different levels of being also? There would seem to be two options here. Either particulars instantiating various properties simultaneously exist at each level of being, or they exist at a single level of being from which they can somehow instantiate properties existing on different levels. Neither option is easy to make sense of, however. If particulars exist at a single level being, then the levels theorist is left with a worryingly disjointed account: all particulars exist on a single level of being, but the properties they instantiate do not. The question will then arise how a particular existing apart from the levels at which its properties exist can somehow instantiate those properties. It is far from clear how such an explanation would go. Alternatively, it could be claimed that particulars simultaneously exist at distinct levels of being. This option seems even more problematic, however. How can one and the same particular exist at distinct levels of being? Is it that humans are made up of multiple particulars, each of which exist at distinct levels of being and instantiates certain kinds of properties? As well as being highly counterintuitive, such a position would give rise to further, puzzling questions. What is it that makes certain particulars part of the cluster of particulars that constitutes me? If the relation is contingent, then we would have the odd consequence that it would be possible for the psychological, chemical and biological beings currently associated with me to be swapped with those of another. If, on the other hand, the relation is necessary, then what would be the source of the necessity?

The situation is not made a great deal better by claiming that particulars just are clusters of properties – i.e., by accepting a bundle theory of substance. If particulars just are clusters of property instances (or tropes), and we accept that in some cases different members of the cluster exist at different levels of being, then it seems we must invoke bundling relations that

somehow transcend different categories of being. How such relations are possible is far from clear. Many metaphysicians think that bundling (or 'comprescence') relations are troublesome enough (see, for example, Armstrong, 1989: ch 4), without this added complication.

Although none of the objections discussed constitute knock-down arguments against the levels view, I have, I hope, indicated enough unattractive consequences to motivate the search for an alternative account. I will now examine Heil's own alternative view, which is a reductionist position and one that is intended to avoid the problems associated with the levels view. I will then argue that Heil's view faces problems of its own, and this will prompt me to sketch an alternative account of 'higher level' properties in dispositionalist terms. My contention will be that this new account has the resources to avoid many of the problems facing Heil's reductionism and also the levels view, thereby giving it initial credibility.

10.5) Heil's rejection of 'higher-level' properties, and a worry concerning Heil's view

Predictably, Heil develops an account of 'higher-level' entities that does not commit him to distinct levels of being. On Heil's account, there is just one ontological level, and entities that appear to exist at a higher level of being are nothing more than certain arrangements of fundamental physical entities (whatever they may turn out to be). On this view, whilst there are 'higher-level' predicates, there are no genuine higher-level properties. Heil's view therefore falls under the category of ontological reductionism. It is not difficult to see how Heil's position avoids the Kim-type exclusion problem. Since there really are no higher-level properties, there is no question of having to accept either that there are properties which fail the Eleatic test or that causal overdetermination is pervasive.

An obvious initial problem facing Heil's position concerns the status of the special sciences. If there are no genuine properties corresponding to higher level predicates, many of which

appear in theories associated with the special sciences, is the legitimacy of the special sciences undermined? Aware of the backlash that would occur if Heil were to simply dismiss the special sciences in this way, Heil's answer to this question is a resounding 'no'. According to Heil, higher-level predicates can meaningfully and truly apply to subjects. He does not see himself as denying that, for example, some things are trees, that some things are fragile and that some people experience pain. His claim is merely that not all fragile things have an *identical* property in common (2003: 44). Objects to which a certain higher-level predicate truly applies do not all share exactly similar properties, but, rather, 'similar-but-not-precisely similar properties' (2003: 27).

For example, on Heil's view things are red in virtue of being made up of certain kinds of basic entity arranged in a certain way. But not all red things are made up of the same kinds of arrangements of the same kinds of basic entity. However, objects like tomatoes, pillar boxes and redheads (2003: 27) can be similar enough to each other to warrant those objects being called red. On the pandispositionalist picture, this would be to say that such objects have similar but not exactly similar dispositions. Crucially, Heil claims that such similarities are objective features of the world, and are not merely 'manufactured' by us (2003: 49). This is one reason why Heil claims not to be an anti-realist about redness, for example.

Whilst Heil's position represents one possible way of avoiding the exclusion problem, whilst allowing the special sciences to retain their respectability, it does I think face some serious objections. For example, whilst we must agree with Heil that not all red things instantiate an identical shade of colour, an interesting question remains. Could objects made of very different kinds of basic entities have the same [determinate] colour? Could a certain tomato and a certain pillar box bear an exactly similar shade of red? The danger for Heil is that if this is allowed, it seems that very different arrangements of basic entities could give rise to exactly similar properties i.e. determinate shades of red. But given the diversity of the elements

involved, it would on Heil's view be somewhat mysterious how they shared the same determinate colour. The only obvious way of explaining this similarity would be to say that the objects shared the same multiply realisable property – namely, the property of being that determinate shade of red. (see Harbecke (2006), who criticizes Heil on similar grounds). But that would be to make that shade of red a genuine property in its own right.

In response, then, Heil must simply deny the possibility of cases involving multiple realisation. Heil does this later in his book when he claims that objects which are structurally different will never, for example, share the same degree of fragility: '[T]ry changing a fragile object qualitatively (i.e. structurally), without altering it dispositionally. The object might remain fragile, but become fragile in a different way' (2003: 116 (my words in brackets)). Is this satisfactory? The reason I find the structure of Heil's argument worrying is that surely it is an open question whether two objects which are composed of very different elements and have very different internal structures could nevertheless be fragile to the same degree. Certainly, cases of multiple realisability do not appear inconceivable, and so it is far from clear that such cases can be ruled out *a priori*. Yet, because of the reductionist view to which Heil has committed by this stage, cases of multiple realisation are indeed automatically ruled out for him, which is why he must declare that there are no cases of multiple realisation. But this is to betray the fact that the question concerning multiple realisability is most obviously an empirical one.

In addition to the concern just outlined, there may yet be positive reasons for thinking that substances which are very different at the micro-level do actually have indiscernible macro-features, such as determinate colour properties. Paint manufacturers have been able to produce hundreds, if not thousands of paint shades, many of which seem to reproduce the shades of colour we find in nature – even though paints are made up of very different, synthetic substances. To use another example, advanced computers and monitors have been

made which map the colour spectrum and discriminate thousands of shades of colour. Indeed, such computers are apparently able to present different determinate shades which even the human eye is not able to discriminate. It seems reasonable to assume, therefore, that at least some of the determinate shades produced by such computers exactly resemble some determinate colour shades in nature. Yet, the hardware of such computers is presumably composed in a very different way to the things in nature which bear the same colours. In explaining why such diverse substances share the same features, the obvious thing to say is simply that they instantiate the same, multiply realisable property, but this is something Heil cannot do.

My aim has not been to provide a knockdown objection to Heil's alternative to the 'levels' view. However, I have identified a potential source of difficulty, and for that reason I will now sketch an alternative picture, which invokes the dispositional model of causation formulated in previous chapters. I will not attempt to defend what follows in great detail, and for that reason the following sections may be considered speculative. Nevertheless, I hope to indicate how the view outlined has at least initial promise to overcome the problems associated with the 'levels of reality' view and Heil-type hard-nosed reductionism. I will also suggest why the view outlined may be superior to a recent influential account of realisation – namely Shoemaker's 'subset' account (2007). Hopefully, this will show, at the very least, that the view sketched is one worthy of future exploration.

10.6) An alternative account of 'higher-level' properties: realisation as manifestation

To summarise at this point, if the pandispositionalists are to accommodate 'higher-level' special science properties, they must do so in a way that does not invoke distinct levels of being and in a way that allows those properties to be causally efficacious in their own right. At the same time, an account must be offered which shows how and why higher-level

properties supervene upon their lower-level realisers. In other words, an account of the realisation relation must be offered.

One option would be to simply say that the realisation relation is a primitive law-making relation that holds between properties, much like Armstrong's N relation discussed in previous chapters. This is the kind of view that Heil attributes to Chalmers (see Chalmers, 1996). Appealing to relations which are contingent and *sui generis* must surely be a last resort, however. Armstrong's primitive N relation, for example, has been heavily criticised on the grounds that positing it is an *ad hoc* move, given that we do not have an independent grasp of the nature of such a relation (see Mellor (1991) and Lewis (1997 [1983])). It seems, therefore, that an alternative account of realisation, which uses concepts with which we are already familiar, would be preferable.

I propose that the concepts which should be employed by the pandispositionalist to account for realisation, ones with which we already have some familiarity, are the concepts of manifestation and causation. Roughly, I propose that realisation relations, which hold between properties of different kinds (e.g. chemical, biological, psychological kinds), may be understood as cases of manifestation relations. Given that, as we saw in previous chapters, cases of manifestation are plausibly cases of causation, realisation may be seen as a kind of causal relation. However, unlike the bottom-up (or top-down) causation appealed to by levels theorists (e.g. Searle, 1983), this kind of causation should not be thought to be objectionable, for reasons to be discussed.

More precisely, my proposal is to view 'higher-level' properties as manifestations of reciprocal partners with more basic dispositions. 'Higher-level' properties are just as dispositional as the entities that manifest them, but their dispositional characteristics will typically be more complex, as manifestation states usually are. If the pandispositionalists

adopt this kind of view, they have an initial response to the Heil-type worry concerning the *sui generis* nature of the realisation relation. The response is that the realisation relation is not, after all, *sui generis*. Rather, it is a species of manifestation relation, which is already part of the pandispositionalists' picture.

Before showing how the 'manifestation' account can deal with the other problems raised earlier, I should say more about what the manifestation account of realisation involves, drawing upon material of previous chapters.

During the chapters on causation, I argued that disposition manifestations occur when reciprocal dispositional partners are brought into contact in a certain way. More precisely, the first causal relatum is the state of affairs (or event) of entities with certain reciprocal dispositions being in a certain spatiotemporal relationship (a 'partnering' state of affairs, we might say). The [mutual] manifestation, which is the effect, is the state of affairs of some or all of the particulars involved gaining dispositions that were not a part of the 'partnering' state of affairs. For example, the manifestation of a particle's charge (when placed in the field) is acceleration. This property is not a part of the 'partnering' state of affairs that produces the acceleration, however. The partnering state of affairs merely involves the particle being *in* the field.

I also argued that in some, if not all, cases of manifestation, the causation involved is simultaneous. Hence, we should expect that cases of realisation, which are cases manifestation, may also occur simultaneously. As we will see, this feature helps to make the account of realisation proposed more palatable than traditional accounts which have invoked the notion of causation.

The first point to emphasise in defending this pandispositionalist proposal is that in taking

'higher-level' properties to be distinct from the 'partnering' states of affairs that manifest them (which has to be the case, for a causal account to work), one is not automatically committed to the view that 'higher-level' properties exist on a higher-level of being. The 'levels' claim is a further step, which is taken when one holds that, for example, higher-level mental properties of a fundamentally different kind to the properties that realise them. Indeed, Searle is typically interpreted as taking this step when he says that consciousness is ontologically irreducible (see, for e.g., Searle 1992: 116). This further step is one which I will not recommend taking, for the following reason amongst others.

Once one takes the aforementioned step, the idea of bottom-up causal relations becomes rather mysterious, for the relata exist on different levels of being, and this means the causal relation here becomes a cross-categorical relation. The question may then be asked how it is that an entity in one realm of being can cause changes in a different realm of being. This question was famously asked in response to Descartes, who held that mental states are distinct from physical states, and also that physical states are able to interact with mental states (see Descartes, 1641 [1997]). In the end, Descartes could not find adequate answer, and had to leave the interaction between mind and body a mystery. Scepticism about 'bottom-up' causation in this context may, it seems, be one of Descartes' interactionist legacies.

10.7) Applying the manifestation model to mental state realisation

On my suggested version of realisation, in contrast, manifestations may be seen as being just as physical as the 'partnering' state of affairs that produces them, and so traditional interactionist problems can be avoided. Consider, for example, mental states. According to most (if not all) physicalists, mental states / properties are nothing over-and-above the state of certain neurons firing. We can happily accept this, on the manifestation account proposed. We need not claim, for example, that the state of neurons firing *causes* a distinct mental property

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(*a la* Searle). On my view, the mental property may be seen as nothing more than the disposition or cluster of dispositions embedded within the state of affairs of the neurons firing, which is manifested in virtue of the neurons involved being partnered in a certain way. All our causal claim amounts to, on the manifestation account proposed, is the claim that the mere collection of the neurons involved is not itself sufficient for the mental property. Evidence shows that for the mental property to exist, those neurons must be firing i.e. *manifesting their power*. The result of neurons firing is that new powers are brought into being, as is typically the case with manifestation episodes, and it is these new powers with which the mental property in question may be identified. The important point to note here is that the state of affairs of neurons firing is *dynamic*, which is why it is plausible to say that there is a causal aspect to realisation.

In sum, the realisation of a mental property may be modeled in the following way:

PARTNERING OF
RECIPROCAL ——CAUSES / MANIFESTS——>
NEURONS

(REALISING STATE
OF AFFAIRS)

STATE OF
AFFAIRS OF
NEURONS FIRING

(REALISED STATE OF
AFFAIRS INVOLVING
NEW POWERS (= MENTAL
PROPERTY))
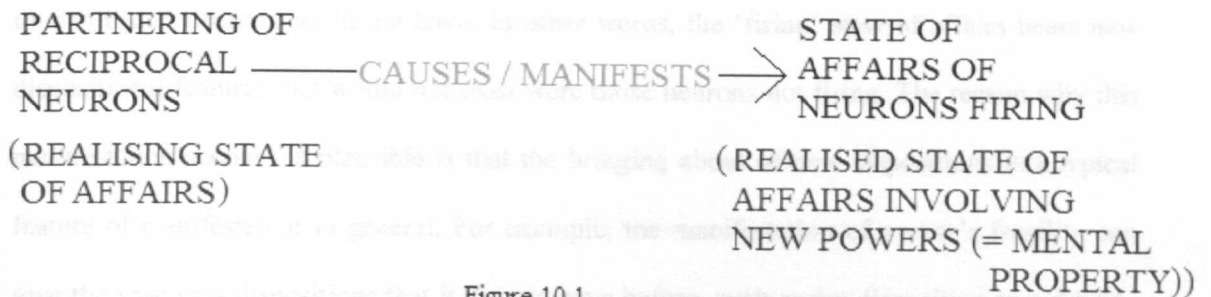
Figure 10.1

A note about expression is appropriate at this point. One may be tempted to say that the mental property is identical with the state of affairs of neurons firing (i.e. the manifestation state of affairs). Shoemaker seems to make a move along these lines when canvassing his account of realisation (2007: ch 2). I find this infelicitous for two reasons, however, and so prefer to identify the mental property with the cluster of dispositions embedded within the manifestation state of affairs. The first reason is that states of affairs are typically thought to

involve particulars, whereas according to the version of pandispositionalism outlined in this thesis, properties are not particulars, but, rather, *universals*. It would therefore be a category mistake, on this view, to identify a property with a state of affairs (a component of which is a particular). Properties are surely only identifiable with other properties, and so mental properties should be identified with the dispositions that are the properties involved in the manifestation state of affairs. There is also another, and perhaps more important, reason for preferring this formulation to one which identifies the mental property with the neuronal state of affairs. The reason is that we may not wish to rule the possibility of 'higher-level' properties, such as mental properties, obtaining in particulars of very different kinds[84].

To summarise, then, on the account proposed there is no obstacle to regarding mental attributes as distinct properties in their own right. On such a view, mental properties are something-over-and-above their neuronal realisers, but this to say nothing more than that the state of affairs of neurons firing bears features (i.e. dispositions) that a mere collection of unmanifested neurons could not have. In other words, the 'firing' state of affairs bears new dispositional features that would not exist were those neurons not firing. The reason why this manifestation account is plausible is that the bringing about of new dispositions is a typical feature of manifestation in general. For example, the manifestation of a vase's fragility can give the vase new dispositions that it did not have before, such as the disposition to cut flesh. With this in mind it is no longer surprising that mental properties, for example, come about. The only difference between the vase case and the mental case is that in the mental case, the manifested dispositional features will be more complex; mental properties are arguably the most complex states of all.

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[84] Many working in artificial intelligence predict, for example, that we will eventually be able to create silicon beings with dispositions as complex as ours

It should be clear, then, that the manifestation account does not require us to invoke distinct levels of being. If we are happy to accept that the manifestation of fragility or of a particle's charge exists on the same level of being as that which produces the manifestation, then we should be happy to accept that what are often called 'higher-level' properties (for misleading reasons) exist on the same level of being as the states of affairs that cause them. Just as the manifestation of fragility – i.e. breakage – is merely a further physical state of affairs, the manifestation of the neurons' dispositions may be viewed in a similar way. For this reason, it is perhaps better to replace talk of 'higher-level' properties with talk of more complex, *manifested* properties. Talk of 'bottom-up' causation may also be misleading, because the causation involved in the mental case need not be considered to be any different to the kind of causation involved in any other manifestation episode. Like many cases of manifestation, it is merely a case of reciprocal dispositional partners bringing about new dispositions.

Before applying my model of realisation to non-mental cases, first a brief word about simultaneity. In chapters seven and eight it was argued that dispositions may manifest simultaneously. I take this conclusion to be an advantage when it comes to accounting for realisation in terms of manifestation. Mental properties, it seems, come and go very quickly. Yet, if it took time for the realisers of mental properties to cause those mental properties, there would be temporal delay involved in the production each and every thought we had. Since causation is traditionally thought to involve temporal delay (*pace* Hume), this is perhaps another reason why 'bottom-up' causation has traditionally been thought to be counterintuitive. But on the account under consideration, the causation involved may be simultaneous: it is not as though the cogs must literally go around before thoughts are formed!

10.8) Non-mental property realisation

The account of realisation outlined is also applicable to cases of 'higher-level' properties that

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are less complex than mental properties. Indeed, it is applicable to all 'special science' properties as well as the macro-properties we encounter in everyday life. As another example of a 'higher-level' property, I will focus on the property of solidity, or, in other words, the structural stability we find in everyday, medium-sized dry objects. The property of solidity may be regarded as a 'higher-level' property since it is unlikely, given what we currently know, that such a property will ever figure in the fundamental laws of physics[85].

For an everyday medium-sized object to persist for any amount of time, its parts must form a stable structure. But what is it that maintains the elements of an object in a certain structure? Or in other words, what is it that holds the micro-elements of an object together in such a way that enables the object to persist? If many scientific claims are to be believed, structural stability comes about as a result of bonding between the elements of the structure. Atomic or molecular units bond as a result of attractive forces. Ionic bonding, for example, comes about when atoms are charged in such a way that an attractive electro-static force is generated between them. Note that realism about forces is very much congenial to the pandispositionalists, since forces lend themselves to dispositional characterisation[86].

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[85] Note that Searle (1992) also discusses the case of solidity. His account of solidity bears much similarity to mine. The main difference is that Searle classes solidity as a kind of emergent property. I find this claim misleading precisely because it encourages the levels picture I am opposing. The term 'emergence' has, for example, a close association with the work of Alexander who clearly advocates the levels picture. In speaking of 'higher-level' properties, Alexander writes: '[T]he higher quality emerges from the lower level of existence and has its roots therein, but it emerges therefrom, and it does not belong to that level, but constitutes its possessor a new order of existent with its special laws of behaviour' (1920: 46) It should be emphasised that nothing I say about solidity suggests it exists on its own level of being.

[86] As we have seen throughout this thesis, pandispositionalism offers a thoroughly scientific realist view of the world.

Now, Ellis and Lierse (1994) saw the importance that bonding plays in an account of structural features. They remark that bonds between atomic and molecular units, seen as 'causal links' (1994: 28), are needed to explain the stability of, for example, 'a crystal structure, its cleavage planes, and so on' (1994: 28). Given that such bonds appear dispositional in nature, Ellis and Lierse take this to show that the property of having a certain crystalline structure cannot be explained without appealing to dispositions. If one is a categoricalist and does not take seriously the existence of these kinds of 'causal links', it is far from clear how one can explain the stability of micro-structures. Ellis and Lierse rightly point out that such causal links could not exist in a Hume world (see Hume, 1975, 1978), thereby, I think, highlighting a problem facing the Humean that has been much overlooked. For the Humean, a micro-structure would consist merely of point-sized qualities arranged in a certain way. On this picture, there would be no further way of explaining why those micro-structures, and indeed any structures at all, are generally maintained over time. In Hume's world, the fact that the structural arrangements of discrete elements are often stably maintained will presumably be brute and unexplainable, along with many other facts, such as the constant conjunctions of causes and effects.

What the pandispositionalist must appeal to, then, in accounting for the realisation of solidity are the 'causal links' that Ellis and Lierse refer to. Specifically, these causal links will consist in the (mutual) manifestation of reciprocal bonding dispositions had by an object's microscopic elements. Once the elements are partnered in a certain way, the solidity of the object is realised, by virtue of the bonding manifestations. But, importantly, the solidity is not something over-and-above the overall manifestation state of affairs (involving the bonding of *all* the object's micro-elements). Rather, the solidity *is* the manifestation state. Note also that, for the pandispositionalists, solidity will itself be an equally dispositional property. It will consist in the disposition to resist penetration, for example. Overall, the situation may be modelled in the following way (figure 10.2). The similarities this model has to the model of
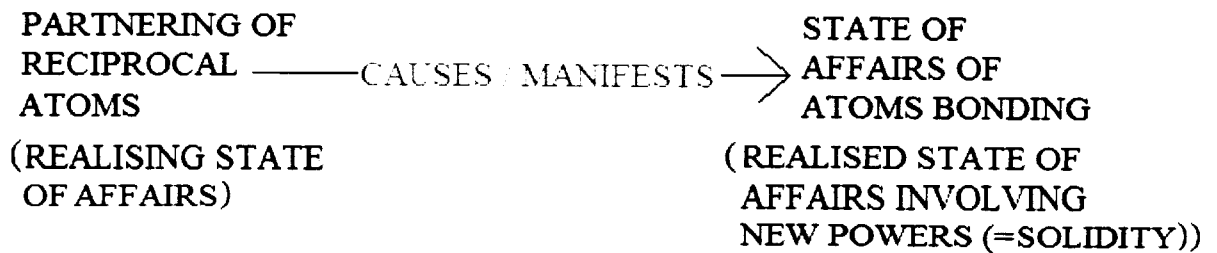
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the mental case (above) should be clear:

PARTNERING OF   STATE OF
RECIPROCAL ———CAUSES MANIFESTS——> AFFAIRS OF
ATOMS   ATOMS BONDING
(REALISING STATE   (REALISED STATE OF
OF AFFAIRS)   AFFAIRS INVOLVING
                                                    NEW POWERS (=SOLIDITY))

Figure 10.2

10.9) Solving the causal exclusion problem

On the account proposed, 'higher-level' properties have causal power in their own right –
powers that are produced by the realisers of that property. On the view outlined, the realising
state of affairs is distinct from the resultant manifestation state of affairs which bears the
complex realised property. Indeed, this has to be the case, if the realising state of affairs is to
be understood as the cause of the manifested state of affairs (recall the distinctness platitude
of causation discussed in chapter eight). The manifestation state of affairs may of course
involve the same particulars as the realising state of affairs, but the properties involved will be
different, which is why the states of affairs may be considered to be distinct. Now, because a
'higher-level' property is not part of the realising state of affairs that causes it, the causal
exclusion problem is much easier to deal with than it is for those who maintain a non-causal
account of realisation, for reasons I will now explain.

On some accounts of realisation, for example, the 'higher-level' property is nothing over and
above its realiser and so does not have power in its own right. But if we take the Eleatic test
seriously, we are then left wondering in what sense the 'higher-level' property is a property in
its own right. A similar worry arises for those who hold that higher-level properties are
distinct, but are best thought of as second-order properties of the realisers. This view has been

proposed by adherents to functionalism who hold that a mental property, for example, is the property of having a property that plays a particular causal (i.e. functional) role (see, for example, Prior, 1985: ch 7). On this view, since it is the realiser of the mental property (i.e. the first-order physical property) that plays the causal role, mental properties are robbed of their causal efficacy. Hence, in order to accept this view, one must give up on the Eleatic principle. Whilst some philosophers, such as Kim, have taken this route, the pandispositionalists clearly cannot, because the Eleatic principle is at the heart of pandispositionalism.

Fortunately, the manifestation account of realisation straightforwardly overcomes the causal exclusion problem. According to the account of realisation proposed, 'higher-level' (or, better, 'more complex') properties do bear dispositional features that are not had by the 'partnering' state of affairs that manifest (i.e. realise) them. Thus, 'higher-level' properties will always have their own distinctive causal features.

When, for example, it is asked whether a particular physical volitional action is caused by a mental property or its realiser, the answer, on the view outlined, will be the mental property. This is possible because the mental property will be seen to consist of a distinct disposition, or a cluster of dispositions, that is caused by the realising 'partnering' state of affairs. The realising state of affairs may of course be said to be a cause the volitional action insofar as it leads to what directly causes the action (i.e. the mental property), but this is only causation in the indirect, mediated sense: it is the powers associated with the mental property that will be directly responsible for physical volitional action. There is therefore no question of overdetermination.

A further question that suggests itself is this: on the account outlined, can a mental state, for example, be said to cause another mental state? The answer is that it can, but only in the

indirect, mediated sense, and so again there is no threat of overdetermination. Mental properties are manifested by realising states of affairs which involve the partnering of certain reciprocal disposition partners. This means that in order for a mental property to bring about a further mental property, it must cause the realising state of affairs to obtain. Thus, there is no question of overdetermination here, for it is only the realising state of affairs that is directly responsible for the manifestation of the 'higher-level' mental property.

10.10) The manifestation account and Shoemaker's 'subset' account compared

In recent times, the most influential account of realisation has arguably been the 'subset' account, which has been chiefly developed by Shoemaker (2007)[87]. The account outlined in this chapter has much in common with the subset account, but crucially I think that the account proposed improves upon the subset account in at least one important respect. During the remainder of this section I will briefly trace out the similarities between the two accounts before suggesting where the proposed account fares better.

Shoemaker's subset account is, like the account proposed in this chapter, attractive in several respects. Unlike Heil's strongly reductionist picture, the subset account does not simply rule out the possibility of multiple realisation and so allows that 'higher-level' predicates could correspond to properties that are genuine and distinct in their own right. But unlike many functionalist accounts, the subset account respects the thought, proposed by the Eleatic principle, that if there are genuine realised properties, they ought to be such that they can make a distinctive causal difference to the world. Shoemaker is also sensitive to the fundamental worries surrounding the 'levels of being' view, and attempts to formulate the sub-set account without invoking distinct levels of being.

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[87] In the preface to his book (2007), Shoemaker points out that the emergence of the subset account is partly thanks to Michael Watkins.

Shoemaker's subset account is also similar to the view of realisation proposed in this chapter insofar as the concept of causal power plays a central role. Shoemaker's initial definition of property realisation shows what an important role a property's causal profile must play, and also why the account is described as the 'subset' account. Note that in this definition, the term 'causal features' is used instead of 'causal powers' or 'dispositions':

'Property P has property Q as a realiser just in case 1) the forward-looking causal features of property P are a subset of the forward-looking features of property Q, and 2) the backward-looking causal features of P have as a subset the backward-looking features of Q' (2007: 12).

On this account, then, properties are associated with clusters of causal features, and a property realiser is said to be one that shares a (proper) subset of its forward-looking causal features (or 'causal powers') with the realised property. Thus, on this account, the causal powers of the realised property are not to be thought of as being anything over-and-above the causal powers of the property realiser, and so it is clear that this account is not one that invokes distinct levels of being. Yet, crucially, this does not mean that the instantiation of a realised property may not be thought to be a genuine property in its own right, for if the causal powers of the realised property are a *proper* subset of those of its realiser, the realised property cannot be said to be identical to its realiser because the forward-looking causal profile of the realised property will differ from that of its realiser. Finally, since, the realised property is defined in terms of a cluster of 'causal features', accepting the existence of realised properties does not contravene the Eleatic principle.

Although Shoemaker's subset account has several favourable features, as I have just tried to make clear, it seems to me to be deficient in a certain respect, which is one reason why I think the account of realisation outlined in this chapter is to be preferred. In short, Shoemaker's sub-set account seems to me to fail to do justice to the *dynamic* nature of realisation. On

Shoemaker's account, a realised property is simply said to be identifiable with a subset of the causal powers of the realiser, and there is no indication that certain powers of the realiser need to be active (i.e. manifesting) in order for the realised property to come about. As has been made clear in this chapter, it seems to me that an important aspect of realisation is that it involves *activity*, such as neuron firing in the mental case, and atomic bonding in the solidity case.

If we are to be charitable, perhaps it should be acknowledged that when Shoemaker speaks of clusters of 'causal features', he might just mean 'clusters of *manifesting* causal powers'. This point is of sufficient importance that it must be made explicit, however, especially since the distinction between a causal power and the manifestation of a causal power is a significant one in the dispositions literature. On the account proposed in this chapter, the observation regarding the dynamic nature of realisation is indeed made explicit; in fact, it is given a central place as I think it should. Whether the account proposed in this chapter succeeds in all respects where realisation is concerned is a question to be considered in further detail elsewhere. In this chapter, my aim has merely been to suggest that the dispositionalist account of realisation proposed is at least a view worthy of serious consideration due to the amount of initial challenges surrounding realisation that it appears to be able to deal with.

11.1) Introduction: an alleged irony in the development of dispositionalism

Those with anti-Humean intuitions have often been attracted to thoroughgoing realism about dispositions because they have thought that it is an automatic consequence of this view that causal effects occur *necessarily*. Brian Ellis is one philosopher who appears to think that causal necessity falls out of his realism about dispositions[88]. At one point, Ellis makes this explicit when he writes: '... for all *x*, *necessarily*, if *x* has p, and *x* is in circumstances of the kind C, then *x* will display an effect of the kind E. (Ellis 2001: 286; my emphasis)

At the same time, in earlier debates other realists about dispositions, such as Martin (1994) and Bird (1998), were fighting a battle with anti-realists such as Lewis (1997) who argue that disposition ascriptions can be reduced to certain kinds of counterfactual conditionals. In response to the Lewis-type reductivists, Martin (1994) and Bird (1998) have argued that their conditional analyses cannot deal with cases in which the manifestation of a disposition is interfered with. One example of such a case, as we saw in chapters six and seven, has been called the 'finkish' case. These are cases where a particular does have a disposition, yet the correlative Lewis-type conditional is false because the disposition is lost as soon as it is triggered (thus preventing the expected manifestation from coming about).

Schrenk (forthcoming) and Anjum & Mumford (forthcoming) have recently presented arguments, which, if successful, would I think reveal a certain irony in the way that the dispositionalist project has developed. By appealing to interference cases in order to fend off the anti-realist reductivists, dispositionalists such as Martin and Bird have unwittingly

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[88] Armstrong is another who seems to take it for granted that realism about dispositions automatically yields causal necessity (see Armstrong, 2004: 131)

revealed, according to Schrenk and Anjum & Mumford, that disposition manifestations do not in fact occur necessarily. Anjum & Mumford remark: '...a set of causes, even though they may succeed in producing an effect, cannot necessitate it since the effect could have been counteracted by some additional power' (forthcoming: 1). If this argument is successful, it suggests that those with 'necessity' intuitions about causation cannot straightforwardly preserve these intuitions by simply declaring themselves to be realists about dispositions.

After briefly describing how their conclusion is reached, I will agree with Schrenk and Anjum & Mumford that interference cases do show that, even with irreducible dispositions in play, a *naïve* anti-Humean account of causal necessity is false. However, the conclusion that on the dispositionalist picture causation cannot involve anything like necessity is too strong. As long as it is admitted that a disposition manifestation is necessitated only when the right background conditions obtain, it can be accepted that a disposition manifestation can be interfered with whilst allowing that when a disposition does successfully manifest, the manifestation occurs necessarily. This chapter can therefore be seen as a defence of Ellis's necessitarian view of disposition manifestation (2001). That said, it does remain unclear exactly how this 'necessity-given-the-right-background-circumstances' is to be cashed out. I will, however, suggest that this problem reflects a difficulty of formulation, not a difficulty with the concept of causal necessity itself. Indeed, I will argue that if we formulate disposition conditionals in an appropriate way, the pandispositionalists (and dispositionalists in general) should be happy to accept that such conditionals are strict.

11.2) The naïve anti-Humean view of causal necessity

I will take the naïve anti-Humean view of causation to be one in which the description of a putative causal necessity involves triggering conditions that are too *narrow*, in the sense that they do not include all of the circumstances relevant for the success of the triggering. An

example of a naïve description of putative causal necessity is as follows: '*necessarily*, for all *x*, if *x* is a match, **and x is struck**, then *x* will ignite'. The emboldened proviso clause is in place to acknowledge the obvious fact that not all matches ignite. A match's disposition of flammability first has to be triggered in order for the match to ignite, and that is why a proviso clause is needed. Unfortunately, the proviso clause in this naïve formulation is very narrow, and so there are obvious counterexamples to be found. As Anjum and Mumford correctly highlight, many different factors could prevent a struck match from lighting: 'had all of C_I, ... C_n occurred but also some interfering condition I been present, such as a gust of wind, then E might not have occurred' (forthcoming: 7). The moral of the story is that if our causal conditional does not involve a proviso clause that excludes interfering circumstances, such as a gust of wind, then we should indeed reject the claim that the conditional holds necessarily. However, during this chapter I will suggest that if we formulate causal conditionals with suitably *thick* provisos, we can prevent possibilities involving interferences from falling under the antecedents, thereby making such conditionals strict. I will now begin to address the question of how a suitably thick proviso clause can be formulated.

11.3) Proviso clauses are trivial?

As we saw, Ellis writes: 'for all *x*, *necessarily*, if *x* has p, and *x* is in circumstances of the kind C, then *x* will display an effect of the kind E. (Ellis 2001: 286; my emphasis). The 'in circumstances of the kind C' clause represents the kind of proviso I have been considering. The important question, however, is this: when we come to describe those circumstances that are ideal for a particular disposition's manifestation, how are we to make those circumstances explicit?

An initial danger is that when we attempt to make the ideal circumstances explicit in our proviso, there will be a temptation to render the conditional trivial. For example, the

circumstances relevant to the successful manifestation of a match's disposition to ignite include the match being struck and the match being dry. But that is not the end of the story. If there is a lack of oxygen, a dry match that is struck will not ignite, so the presence of oxygen needs to be included in the proviso. But this is still not the end of the story. A dry match that is struck in the presence of oxygen does not necessarily ignite, because, for example, the match could be attached to a fink-machine that instantly drenches the match whenever it is struck. The circumstances that issue in the proviso clause must therefore be ones in that lack finks. Now, as the story concerning the ideal circumstances becomes more and more complicated, it may be tempting to simply say the following: what we mean to refer to by 'ideal circumstances' are those circumstances in which the match successfully ignites. Our causal conditional would then become something like this: 'for all x, necessarily, if x is a match, and x is in circumstances in which it successfully ignites, then x ignites'. This will not do, however. This kind of proviso clause makes the conditional analytically true and so such a conditional cannot be used to reflect a causal necessity in the world[89].

11.4) Formulating non-trivial provisos

The obvious way of keeping the proviso clause informative is to carefully describe the particular circumstances that are ideal for the match's ignition. The proviso clause could therefore involve a sequence of definite descriptions that pick out the states of affairs that constitute the ideal conditions. For example, the proviso clause might be something like: '... and the match is struck, the match is dry, oxygen is present, the match is in a non-windy environment...'. There may be several problems awaiting this proposal, however.

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[89] The problem of formulating proviso, or *ceteris paribus,* clauses in a way that does not bring triviality is well known. See for example Martin (1994).

Problem one

The first, relatively minor objection expresses an epistemological worry. There will be many cases in which we simply do not know which circumstances are causally relevant for the successful manifestation of a certain disposition, and even if we think we do have the requisite knowledge, how can we be sure that there is not some additional factor that somehow aids the bringing about of a manifestation? If we are limited in this way, it would seem impossible for us to formulate an adequate non-trivial proviso clause when attempting to express a causal necessity in the world.

Problem two

The second and more serious problem relates directly to Anjum & Mumford's comments about the possibility of interfering factors. As well as describing the states of affairs that are causally relevant for the successful manifestation of a disposition, it seems our proviso clause must also do justice to the idea that in order for the manifestation to take place, interfering states of affairs must be *absent*. Even if the proviso clause could describe every state of affairs that allowed a disposition to successfully manifest, the resultant causal conditional could not hold of necessity if those states of affairs were compatible with, for example, an interfering fink or antidote being present. If there is a case in which all the states of affairs described in the proviso clause are present, but where there is also an interfering fink machine, then the consequent of our causal conditional would come out false. So unless the proviso clause can also rule out the presence of certain circumstances, such as finkish circumstances, our conditionals will clearly not hold of necessity.

In section 11.6) I will consider some possible ways of modifying the proviso in order to exclude interfering states of affairs.

11.5) Response to problem one: ostensive reference

Problem one expressed an epistemological worry. If in our proviso clause we must pick out all the ideal background conditions by describing them, then it will be very difficult to formulate adequate provisos since we rarely have the knowledge required to describe in detail all the circumstances which are relevant for the success of a certain effect. Fortunately, however, we do have linguistic tools that allow us to pick out states of affairs without having to provide definite descriptions of those states of affairs. We can instead pick out those states of affairs *demonstratively*. That is, we can use ostensive terms like 'this' and 'that' to linguistically point to the relevant states of affairs. This allows others who are present to grasp what a subject is referring to, without the subject having to provide a definite description of the states of affairs they wish to pick out.

The content of a statement involving an ostensive term is determined by the context in which it is asserted. That is, the meaning of such statements is determined by factors external to the speech act itself. Metaphysicians like Bird (1998) and Schrenk (2007) have highlighted that 'externalist' semantics can be of great value when it comes to constructing non-trivial conditionals with complicated proviso clauses[90]. In response to the worry that a proviso clause might not capture all the relevant conditions, it may be pointed out that when expressing causal necessity, we can simply allow ourselves to use demonstrative tools to pick out *all* the background conditions against which a certain disposition's manifestation successfully takes place. If we are to use externalist semantics, however, specific non-trivial causal conditionals cannot be expressed from the metaphysician's armchair. But given that investigating the causal structure of the world has always been an *a posteriori* matter, this constraint may not come as a surprise.

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[90] They both introduce this insight in the context of a discussion about the conditional analysis of dispositions.

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11.6) Problem two: an unsuccessful response and a better response

Problem two: an unsuccessful response

Problem two seems a more substantial problem than the one addressed in the last section. Even if the proviso clause can capture *all* the ideal background conditions that enable a certain manifestation to come about, how can the proviso clause exclude the interfering states of affairs that, even in conjunction with the *favourable* conditions, would make it not the case that the disposition manifests? For not only must the antecedent of our conditional capture possibilities involving favourable circumstances, it must also capture only those possibilities that involve the ideal circumstances and that *lack* interfering factors. If the antecedent does not do this, possibilities will fall under the antecedent that involve interfering circumstances, thereby making the consequent come out false at some possible worlds. This would mean that the conditional would not be strict.

What the necessitarian needs, then, is a fine-tuned conditional, the antecedent of which involves only possibilities lacking interfering states of affairs. A simple way of modifying our causal conditional would be to include in the proviso clause a description of, for example, the absence of certain finkish states of affairs. The proviso clause would then be something like '... and the match is dry... oxygen is present... *no ignition finks are present*'[91]. This may appear reasonable, but its appeal to *negative* states of affairs may be seen to be a problem. As was suggested earlier, our proviso clause is in place to pick out the kinds of things in the world that are causally relevant for the successful manifestation of a certain disposition. Are there really negative states of affairs, as some philosophers call them, out there in the world and which are causally relevant in this way? Many philosophers find this counterintuitive (see

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[91] This seems to be the kind of route that Bird would take. He suggests disposition conditionals may deal with interference cases in the following way: 'if x has the disposition D(S,M) then, if x were subjected to S and finks and antidotes to D(S,M) are absent, x would manifest M' (2007: 60).

for example Armstrong (2004: ch 5), who believes there is just one, positive realm of existence: the spatiotemporal realm). Since an absence seems to amount merely to a *lack* of existence, i.e., nothing at all, this suggests that the absence of an ignition-fink is ultimately on ontological par, so to speak, with the lack of anything else. But given this is so, it is hard to see how the absence of an ignition fink can be any more causally relevant to a given effect than the absence of, say, a talking donkey. This suggests that a proviso which appeals only to *positive* states of affairs – i.e. ones with the power to make a causal impact on the world – would be much more illuminating.

A better response to problem two

To recap, we need the antecedent of our causal conditional to take us to possible worlds that instantiate the kinds of favourable background circumstances in which a certain disposition successfully manifests, but we also want those worlds to be ones that do not contain any unfavourable, interfering circumstances. Let us call the time at which a certain disposition is actually successfully stimulated, time *t*. Now, an important question to ask at this point is this: what relationship do such possible worlds bear to our world at time *t* (the time at which our disposition is stimulated)? Well, included amongst the worlds that instantiate the favourable background conditions at some time, and that also lack interfering states of affairs at that time, will be those worlds that are duplicates of the actual world at *t*. The duplication relation can be thought of as cross-world relation similar to the 'same1' relation that Putnam appeals to in constructing his infamous twin-earth thought experiment (1981, ch. 1).

Now, if a possible world at some time instantiates all the favourable conditions instantiated in the actual world at *t*, but also includes some unfavourable, interfering states of affairs, then that possible world will not be a duplicate (at that time) of the actual world at *t*. It follows, therefore, that if our proviso clause can ensure that only worlds that are duplicates of the actual world (at *t*) fall under the antecedent of the conditional, then unfavourable, interfering

states of affairs will automatically be ruled out. This is because worlds involving interfering states of affairs are not duplicates of the actual world at t, since the actual world is one in which the disposition in question goes on to successfully manifest.

It may be objected that such a proviso clause could only ensure that our conditional involves worlds that are duplicates of ours at t *in terms of the favourable circumstances they instantiate*, but that those same worlds could be ones that also instantiate interfering states of affairs. As such, the concept of duplication may not help. The response here is that whilst it is true that a possible world can be a duplicate of ours *in certain respects*, we can also appeal to the concept of *perfect* duplication. If a possible world is a duplicate of ours in this sense, then additional interfering states of affairs cannot be part of that world. For if a world instantiates a type of state of affairs that another does not, then those worlds are not perfect duplicates.

In order for our conditional to apply to worlds that are *perfect* duplicates of ours at the time t at which the disposition stimulation actually occurs, then the proviso clause must involve reference to the *global* time-slice at t^{92}. Bringing these considerations together with earlier considerations, the formulation of causal necessity becomes roughly as follows:

If some actual particular x with property P is triggered by its reciprocal partner(s) at t, and x's disposition D thereby manifests, then:

Necessarily, for all y, if y is the counter-part of x in a global time-slice that is a perfect duplicate of the actual global time slice at t, then y will thereby manifest disposition D^{93}.

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[92] The physicists' concept of a backwards light cone, or the Armstrongian concept of a (global) totality state of affairs (2004, ch. 6) could also be used to express the point here.

[93] It has been suggested to me that perhaps disposition predicates could be analysed using a conditional similar to this, which invokes the concept of duplication. This is a question I will not address. My claim

The proviso in this conditional, I suggest, automatically ensures that y is considered only in circumstances lacking interfering states of affairs and it does so by appealing only to positive, causally relevant states of affairs. I will now begin to show why the pandispositionalists (and dispositionalists in general) should welcome the necessity of this reformulated conditional, considering possible objections in doing so.

11.7) Is the proposed conditional really non-trivial?

An initial objection to the conditional formulated in the last section might be that its proviso renders it trivial. And as we saw earlier, if the conditional is trivial, then rather than teaching us about causal necessities out there in the world, the conditional would become trivial(!) and completely uninformative. The response here is that whilst the proviso clause may seem to bring triviality at first glance, it far from does so.

The triviality objection may run like this. The proviso clause makes it the case that the antecedent takes us only to possible worlds that instantiate the same global state of affairs type as that in which x finds itself at time t (in the actual world). But if these possibilities involve the same types of states of affairs, why should it be surprising that y, as a counter-part of x, causally reacts in the same manner as x? For after all, y has the same properties as x, and is related in the same way to the other objects in its respective world. Given the intrinsic indiscernibility of the situations considered, one might feel that the truth of the conditional is completely uninteresting.

This objection is unfair, however. In fact, our formulation is far from trivial, because

is merely that the truth of conditionals of this form should be seen as a consequence of pandispositionalism (and realism about dispositions in general).

accepting the necessity of the conditional entails rejecting Hume's view of properties and causation (see 1739 [1978]). For Humeans like Lewis (see 2009), even if two objects have the same properties and are located in the same kinds of circumstances, it *is* metaphysically possible for the two objects to behave in completely different ways. In other words, the Humean picture involves the quidditistic view of properties (Black, 2000) on which the essence of a property has nothing to do with how objects with those properties happen to causally behave. In contrast, holding the above conditional to be necessarily true entails the rejection of quidditism, since the conditional asserts that objects with identical properties, in causal situations of the same type, *must* causally react in the same fashion.

Given the central commitments of pandispositionalism, the pandispositionalists (and dispositionalists in general) should welcome the necessity of this reformulated conditional. The central claim of dispositionalism, to re-cap, is that the essences of all natural, intrinsic properties consist in the dispositions they bestow upon their possessors. That is, the identities of properties are determined by the causal abilities they bestow. Now, as has been suggested, accepting the necessity of our conditional entails that it is impossible for two objects with identical properties, in circumstances of exactly the same type, to be disposed to causally react in different ways. As such, acceptance of such necessity supports the core thesis of pandispositionalism. On the other hand, if the pandispositionalists were to allow that it is possible for two objects with identical properties, in circumstances of the same type, to causally react in different ways, it would no longer be clear in what sense a property could any longer be said to be tied to certain causal features (rather than others) essentially.

11.8) What if we live in a 'chancy' world?

There is an important worry that remains to be addressed concerning the formulation of dispositional necessity. Many dispositionalists accept, in line with current physics, that there

may be chancy or 'probabilistic' dispositions. Probabilistic dispositions, by their very nature, are not guaranteed to manifest, even when in ideal circumstances. Instead, such dispositions merely make a certain manifestation probable to a certain degree. The disposition to radio-actively decay is an example, and in earlier chapters we called such a disposition a 'spontaneously manifesting' disposition. Cases involving these dispositions seem to provide obvious counterexamples to necessitarianism, for such dispositions are not guaranteed to manifest, even when in ideal circumstances

Now, there does seem to be a response available to those who wish to allow that some fundamental dispositional properties are 'chancy', whilst claiming that dispositions bring some kind of *de re* necessity to the world. The response would be that if dispositions are chancy, then what they do, in ideal circumstances, is make a certain manifestation probable to a certain degree – and they do so *necessarily*. Given that dispositions always make the same kinds of contributions to a world (for the nature of their contributions determine their identity), a certain chancy disposition will always probabilify a certain manifestation to the same degree, whenever active. As such, the pandispositionalists can claim that spontaneous dispositions necessitate objective *probabilities*-of-certain-manifestations, rather than *guaranteeing* that a certain event is brought about in appropriate circumstances.

The question of whether and in what sense dispositions give rise to objective probabilities-of-certain-manifestations is not one I can pursue further here, unfortunately. I will merely suggest that if the pandispositionalists wish to maintain this kind of view, the conditional in question could be adjusted in the following way:

If some actual particular x with property P is situated in a certain state of affairs at t, and manifestation M is thereby probabilified to degree P, then:

Necessarily, for all y, if y is the counter-part of x in some global time-slice that is a perfect duplicate of the actual global time slice at t, then manifestation M will thereby be probabilified to degree P.

If may be, of course, that some causal situations involve a number of both chancy and non-chancy dispositions. If this is the case, then probability calculus will be required to establish the degree to which a certain manifestation is (necessarily) probabilified.

11.9) A final worry: uncaused occurrences

There may be yet another reason to doubt the necessity of our reformulated conditionals. If some current physics is to be believed, it is physically possible for certain entities to pop into existence without being caused to do so. If this is so, it would seem a possibility that at the time at which a disposition manifestation is expected to occur, or be probabilified to a certain degree, an uncaused interferer could pop into existence and somehow prevent the expected manifestation (or probabilification of manifestation).

Two points should be highlighted here. Firstly, we could straightforwardly preserve the necessity of our conditional by modifying the proviso in such a way as to ensure that only possible worlds involving *caused* occurrences fall under the antecedent of the conditional. However, it should be highlighted that it is not obvious that this modification is required. We do not experience things popping into existence in everyday life, nor in the majority of the sciences. Our acceptance of the physical possibility of uncaused occurrences is instead based on the authority of theoretical physics. Physics, as we know, is continually revised in light of new advancements and discoveries. We therefore should remain open to the possibility that an underlying explanation will be found for why apparently 'uncaused' entities pop into existence. If one is a pandispositionalist, one will no doubt suspect that such an explanation

would involve reference to underlying *dispositional* activity.

11.10) A final comment: pandispositionalism and induction

To conclude, I should acknowledge a consequence of the way in which I have expressed causal necessity, a consequence that may disappoint some anti-Humeans. According to the view recommended, if x and y have the same properties and are in circumstances of the same global type, then given an ontology of irreducible dispositions we may predict that those objects will react in the same fashion. But of what use is this? Objects with the same intrinsic properties will probably never be located in circumstances of an identical type, and so even if there is causal necessity, it can have no practical value. What scientists want and need to do is to predict how objects with certain properties will react in *different* circumstances. Given that I have conceded, in line with Schrenk and Mumford & Anjum, that the manifestation of a disposition can always be interfered with, then it seems we must always be open to the possibility that new combinations of surrounding states of affairs will be ones in which there are interferers waiting to prevent the manifestations we expect. If so, then our manifestation predictions are very much fallible, and it may seem that induction is in no better shape on the pandispositionalist view as it is on any other. This may make the anti-Humeans very uneasy, for it has been thought by many to be a key motivation for holding a necessitarian view that it provides the resources for solving the problem of induction (see, for example, Armstrong 1983: 104).

The appropriate response is that forming accurate causal predictions is indeed not a straightforward business, and the existence of causal necessity does not automatically make it easier. Any anti-Humeans who thought that the existence of *de re* necessary connections would enable us to justifiably assert crude causal generalisations were being naïve from the start. For example, to think that something like the general statement 'all struck matches

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ignite' stands a chance of being true is to fail to acknowledge the complex nature of the world that science tells us about. Scientists know all too well that disposition manifestations can be interfered with in many ways. Pharmacists are aware, for example, that the effects of certain pills in mainstream causal situations may be radically different to the curing effects displayed in a controlled laboratory environment. This is the central problem facing medical scientists. A pill's curing power may fail to be triggered successfully when placed into 'worldly' situations due to any number of unknown interfering factors. There may even be unknown factors which cause the pill to manifest detrimental causal powers. Thus, the only generalisations that the existence of causal necessity allows us to assert with confidence are those involving very specific provisos. Indeed, in order to ensure that the conditional formulated earlier (section 11.6) could be said to hold necessarily on the pandispositionalist picture, I had to make its proviso clause as specific as it could be, by appealing to perfect world-duplication.

All this said, inductive enterprises are no doubt in a better state on the pandispositionalist picture than they are on the Humean picture. According to pandispositionalism, we know that if something has a certain property, it will always be disposed to behave in a certain way. What we cannot often predict is how the different dispositional partners will combine to affect the particulars involved. However, given that the pandispositionalists' world has much more stability than Hume's world, as we come to learn how different dispositional partners combine, we will come to know more about what will interfere with what in future circumstances. In fact, as we come to know more about how dispositional partners combine, our inductive practices will become more and more like deductive practices (if pandispositionalism is true). As such pandispositionalism, as presented in this chapter, certainly does not result in inductive scepticism, but by the same token, we must guard against having naive faith in the truth of crude causal generalisations, given our current state of scientific knowledge.

Summary of Conclusions

I will now conclude the thesis by briefly summarising the main claim(s) argued for in each chapter:

i) There are three versions of pandispositionalism in the philosophical literature: dispositional monism, the 'two-sided' view and the identity view. The identity view faces fatal objections, whereas dispositional monism and the 'two-sided' view both have initial promise.

ii) Irreducibly dispositional properties are best understood as universals which are internally related. The precise nature of these internal relations will vary depending on whether one is a dispositional monist or a two-sided theorist.

iii) Dispositional structures may be modeled using an adapted version of graph-theory. It is necessary that power structures are strongly asymmetric and also that each element of the structure has an outgoing manifestation relation.

iv) In a structure of *fundamental* dispositions, each element must be single-track. Also, a power graph must be constructed in a way which accurately reflects the fact that manifestations are typically *mutual* manifestations of reciprocal dispositions working together.

v) There should be no limit on the amount of reciprocal dispositions that could be involved in a mutual manifestation. In other words, mutual manifestation relationships have varying adicity. Also, some power structures may involve spontaneously manifesting dispositions (a fact that our graph theoretic framework must reflect), and some dispositions is a structure may themselves be unmanifestable (such as conserved quantities).

vi) There is no obvious reason why geometrical properties cannot be construed in dispositional terms. The main reason that these properties have been thought by some to be troublesome is that the manifestations of geometrical properties are often intrinsically finked.

vii) The manifesting of a disposition may occur simultaneously with the stimulation of that disposition. On one particular understanding of stimulation, manifestations and stimulations are *always* cotemporaneous. Also, on that understanding, there is a sense in which the identification of stimuli is a perspectival matter.

viii) Reciprocal dispositional partnerings and mutual manifestations may be understood as causes and effects (respectively). These are causes and effects in the *productive* sense. Thus, (following the claims of chapter seven) causes and effects may occur simultaneously.

xi) Cases of causal propagation may be understood as cases in which spatiotemporally distinct mutual manifestations are connected by a mediating mutual manifestation or persisting dispositional state. The dispositional account of causation has much in common with 'process' theories of causation and may be understood as a version of the process theory.

x) If one is pandispositionalist, one has the option of accounting for property realisation (such as mental realisation) in terms of manifestation. This kind of theory has several advantages over rival theories of realisation.

xi) Contrary to some recent claims, there is an important sense in which disposition manifestation events (or the chances of a manifestation, in indeterministic cases) occur necessarily.

References

Alexander, S., (1920), Space, Time, and Deity (2 vols.), London: Macmillan

Anjum, R., & Mumford, S., (Forthcoming), 'A Powerful Theory of Causation', in *The Metaphysics of* Powers, ed. Marmodoro, A., London: Routledge

Aristotle, (2006), *Metaphysics (Book θ)*, Makin, S. (trans. & commentary), Clarendon Aristotle Series, Oxford: Oxford University Press.

Armstrong, D. M., (1983), *What is a Law of Nature*, Cambridge: CUP

Armstrong, D.M., (1989), *Universals: An Opinionated Introduction*, Westview Press

Armstrong, D. M. *et al.*, (1996), *Dispositions: A Debate*, ed. Crane, T., Routledge

Armstrong, D. M., (1998), *A World of States of Affairs*, Cambridge: CUP

Armstrong, D.M., (1999), 'The Open Door: Counterfactual Versus Singularist Theories of Causation', in *Causation and Laws of Nature*, ed. Sankey, H., 175-85, Dordrecht: Kluwer

Armstrong, D.M., (2004), *Truth and Truthmakers*, CUP

Armstrong, D.M., (2005), 'Four Disputes About Properties', *Synthese* 144: 309-20

Armstrong, D.M., (2007), 'What's Wrong with Quidditism?' (presentation handout)

Armstrong, D.M., (2008), 'Realism About Totalities' (presentation handout)

Ashwell, L., (Forthcoming), 'Superficial Dispositionalism', Australasian *Journal of Philosophy* (currently accessible online via the AJP website)

Barker, S., (2009), 'Dispositional monism, relational constitution and quiddities', *Analysis* 69, pp. 242-250

Beebee, H., (2002), 'Contingent Laws Rule: Reply to Bird', *Analysis*, 62: 252-255

Bird, A., (1998), 'Dispositions and Antidotes', *The Philosophical Quarterly* 48, 227-234

Bird, A., (2001), 'Necessarily, Salt Dissolves in Water', *Analysis*, 61: 267-274

Bird, A., (2002), 'On Whether Some Laws are Necessary' *Analysis* 62: 257-70

Bird, A., (2007), *Nature's Metaphysics: Laws and Properties*, Oxford: OUP

Bird, A., (2007a), 'The Regress of Pure Powers?' *Philosophical Quarterly*, 57: 513-34

Bird, A., (2008), 'Dispositions, Rules, and Finks', *Philosophical Studies*, 140, 285–98.

Bird, A., (2008a, unpublished), 'Outline of a Dispositional Account of Causation' [presented at 'Powers' conference in Oxford, July 2008].

Black, M., (1956), 'Why Cannot an Effect Precede its Cause', *Analysis* 16, pp. 49-58.

Black, R., (2000), 'Against Quidditism', *Australasian Journal of Philosophy*, 78: 87-104

Blackburn, S., (1990), 'Filling in Space', *Analysis* 50, 62--65

Bohm, D., (1952), 'A suggested interpretation of quantum theory in terms of "hidden variables"', parts I and II, *Physical Review* 85: 166-193

Bostock, S., (2008), 'In Defense of Pan-dispositionalism', *Metaphysica*, vol. 9. no. 2, pp 139-157

Bradley, F.H., (1893) 'Appearance and Reality', London, Oxford University Press, 1893

Brand, M., (1980), 'Simultaneous Causation' in *Time and Cause: Essays Presented to Richard Taylor*, ed. Van Inwagen, P., D. Reidel Publishing

Carnap, R., (1936), 'Testability and Meaning I', *Philosophy of Science* 3, 419-471

Cartwright, N., (1989), *Nature's Capacities and Their Measurement*, Oxford: OUP

Cartwright, N. (1999), *The Dappled World*, Cambridge: CUP

Chalmers, D., (1996), *The Conscious Mind: In Search of a Fundamental Theory*, New York: OUP

Choi, S., (2005), 'Do Categorical Ascriptions Entail Counterfactual Conditionals?', *Philosophical Quarterly*, Vol. 55, pp. 495-503

Clarke, R., (2008) 'Intrinsic Finks', *Philosophical Quarterly*, vol. 58, no. 232, pp. 512-518

Collingwood, R. G. (1940), *An Essay on Metaphysics*. Oxford: Clarendon Press

Dennett, D., (1988), 'Quining Qualia', in *Consciousness in Contemporary Science*, ed. A.J. Marcel and E. Bisiach (Oxford: Clarendon)

Descartes, R., (1997), *Key Philosophical Writings*, Wordsworth Editions

Dieks, D., (1981), 'A Note on Causation and the Flow of Energy', *Erkenntnis* 16:103-108

Dipert, R., (1997), 'The Mathematical Structure of the World', *Journal of Philosophy* 94, pp. 329-358

Dowe, P, (2000), *Physical Causation*, Cambridge, CUP

Dowe, P., (2001), 'Causal Loops and the Independence of Causal Facts", *Philosophy of Science* 68: pp. 89-97

Ducasse, C., (1926), 'On the Nature and the Observability of the Causal Relation', *Journal of Philosophy* 23: 57-68

Earman, J., (1976), 'Causation: A Matter of Life and Death', *The Journal of Philosophy*, 73: 5-25

Ellis, B., (2001), *Scientific Essentialism*, Cambridge: CUP

Ellis, B., (2002), *The Philosophy of Nature: A Guide to the New Essentialism*, McGill-Queen's University Press

Ellis, B., (2005), 'Universals, the Essential Problem and Categorical Properties', *Ratio* 18

Ellis, B & Lierse, C, (1994) 'Dispositional Essentialism', *Australasian Journal of Philosophy*, 72: 1, pp. 27-44

Esfeld, M. & Lam,V., (2008), 'Moderate Structural Realism about Space-Time', *Synthese: An International Journal for Epistemology, Methodology and Philosophy of Science*, 160: 27-46

Fair, D., (1979),'Causation and the Flow of Energy', *Erkenntnis* 14, 219-50

French, S,. & Ladyman, J., (2003), 'Remodeling Structural Realism: Quantum Physics and the Metaphysics of Structure', *Synthese*, 36, pp. 31-66

Gell-Mann, M., (1994), *The Quark and the Jaguar: Adventures in the Simple and the Complex*, Henry Holt & Company

Gillett, C., (2007), 'Understanding the New Reductionism: The Metaphysics of Science and Compositional Reduction', *Journal of Philosophy*, pp. 193-216

Goodman, N., (1983), *Fact, Fiction, and Forecast*. Cambridge, MA: Harvard UP

Handfield, T., (2008), 'Unfinkable Dispositions', *Synthese*, 160, 297–308

Handfield, T., Korb, K., Oppy, G., Twardy, C., (2008) 'The Metaphysics of Causal Models: Where's the *Biff?*', *Erkenntnis* 68: 149–68.

Harbecke, J., (2006), 'Levels of Being Being There?' in *John Heil: Symposium on his Ontological Point of View*, ed. Esfeld, M., Ontos Verlag.

Harré, R., (1970), 'Powers', *British Journal for the Philosophy of Science*, 21: 81-101

Harré, R. & Madden, E. (1975) *Causal Powers: A Theory of Natural Necessity*, Blackwell

Harré, R., (2001), 'Active powers and powerful actors', *Philosophy*, 76 (suppl.): 91-109

Hausman, D., (1998), *Causal Asymmetries*, Cambridge: Cambridge University Press.

Heil, J., (1998), *Philosophy of Mind: A Contemporary Introduction*, London: Routledge

Heil, J. & Martin, M., (1999), 'The Ontological Turn', *Midwest Studies in Philosophy*, 23: 34 - 60

Heil, J., (2003), *From an Ontological Point of View*, Oxford: OUP

Holton, R., (1999), 'Dispositions All The Way Round', *Analysis*, 59: 9-14

Hume, D, (1975), *Enquiries Concerning Human Understanding and Concerning the Principles of Morals*, 3rd ed. Ed. Selby-Bigge &Niddich, Oxford: OUP

Hume, D, (1978), *A Treatise of Human Nature*, 2nd ed, Ed. Selby-Bigge &Niddich, Oxford: OUP

Joachim, H., (1906), *The Nature of Truth; An Essay*. Oxford: Clarendon Press.

Johnson, W.E., (1964 [1924]), *Logic: Part III*, New York, Dover Publications

Kant, I., (1778, [2004]), *Metaphysical Foundations of Natural Science*, ed. & trans. Fried, M., Cambridge: CUP

Kim, J, (1998) *Mind in a Physical World*, Cambridge: Bradford/ MIT

Kim, J., (1999), 'Making Sense of Emergence', *Philosophical Studies*, xcv: 2-44

Kim, J. (2005), *Physicalism or Something Near Enough*, Princeton University Press

Kripke, S., (1980), *Naming and Necessity*, Oxford: Blackwell

Langton, R., & Lewis, D., (1998), 'Defining 'intrinsic'', *Philosophy and Phenomenological Research* 58, pp. 333--345.

Le Poidevin, R., (1988), 'The Principle of Reciprocity and a Proof of the Non-Simultaneity of Cause and Effect', *Ratio* 1: 152-162.

Lewis, D, (1973), 'Causation', *Journal of Philosophy* 70: 556-567

Lewis, D., (1979), 'Counterfactual Dependence and Time's Arrow', Nous 13, 455-76.

Lewis, D, (1986) *On the Plurality of Worlds*, Oxford, Blackwell

Lewis, D., (1997), 'New Work for a Theory of Universals' (1983), in *Properties*, eds. Mellor, D.H., & Oliver, A., OUP

Lewis, D., (1997), 'Finkish Dispositions', *Philosophical Quarterly*, 47: 143-58.

Lewis, D, (2004), 'Void and Object' in *Causation and Counterfactuals*, eds. Collins, J., Hall, N., & Paul, L.A, MIT Press

Lewis, D., (2009), 'Ramseyan Humility' in *Conceptual Analysis and Philosophical Naturalism*, eds. Braddon-Mitchell, D., & Nola, R., Mit Press.

Lowe, E.J., (1996), 'Why is There Anything at All? *Proceedings of the Aristotelian Society*, pp. 111-120

Lowe, E.J., (2002), *A Survey of Metaphysics*, OUP.

Lowe. E.J., (2006), *The Four Category Ontology: A Metaphysical Foundation for Natural Science*, Oxford: OUP

Mackie. J.L., (1980), *The Cement of the Universe*, Oxford: Clarendon Press

Martin, C.B., & Pfeifer, K., (1986), 'Intentionality and the Non-Psychological', *Philosophy and Phenomenological Research*, 46, 531-554

Martin, C.B., (1993), 'Power for Realists', in J. Bacon, K. Campbell, and L. Reinhardt (eds), *Ontology, Causality, and Mind*. Cambridge: CUP: 75-86

Martin, C.B., (1994), 'Dispositions and Conditionals', *Philosophical Quarterly*, 44: 1-8

Martin, C.B. *et al.*, (1996), *Dispositions: A Debate*, ed. Crane, T., Routledge

Martin, C. B. (1997), 'On The Need for Properties: the Road to Pythagoreanism and Back', *Synthese* 112, 193-231

Martin, C.B., (2008), *The Mind in Nature*, Oxford: OUP

McKitrick, J., (2003), 'A Case for Extrinsic Dispositions' *Australasian Journal of Philosophy* 81 (2):155 – 174

McKitrick J.,Manifestations as Effects' (handout, 2008 ,Powers' conference, Oxford)

Meinong, A., (1904), 'Über Gegenstandstheorie', in *Untersuchungen zur Gegenstandstheorie und1Psychologie, Leipzig*: Barth.

Mellor, D.H. (2000), 'The Semantics and Ontology of Dispositions', *Mind* 109, 757-80

Mellor, D.H., (1995), *The Facts of Causation*, Routledge: London and New York

Mellor, D.H., (1991) *Matters of Metaphysics*, Cambridge, CUP

Mellor, D.H., (1974), 'In Defence of Dispositions', *Philosophical Review*, 83, 157-81

Menzies, P., (1996), 'Probabilistic Causation and the Pre-Emption Problem', *Mind* 105: 85-117

Mill, J. S., (1893), *A System of Logic*, London: Longmans, Green, & Co.

Moore, G.E., (1919), 'External and Internal Relations', *Proceedings of the Aristotelian Society* 20, pp 40-62

Molnar, G., (2003) *Powers: A Study in Metaphysics*, ed. Mumford, S., Oxford: OUP

Mumford, S., (1998), *Dispositions*, OUP

Mumford, S., (1999) 'Intentionality and the Physical: a New Theory of Disposition Ascription, *The Philosophical Quarterly* 49, pp. 215 – 225.

Mumford, S., (2004), *Laws in Nature*, Routledge

Mumford, S., (2005), 'Kinds, Essences, Powers', *Ratio* 18 (4), 420 - 436

Mumford, S., (2006), 'Filled in Space', in *Dispositions and Causal Powers*, eds. Gnassounou, B., & Kistler, M., Ashgate Publishing

Mumford, S., (2007), *David Armstrong*, Acumen Publishing Limited.

Mumford, S., (2007), 'Review of Unger: *All the Power in the World*', *Journal of Philosophy*, 104 (8)

Mumford, S., (2007, unpublished), 'Polygeny and Pleiotropy: getting causes from powers'

Mumford, S., (2009), 'Passing Powers Around', *The Monist*, special issue.

Nagel, T., (1974), 'What Is It Like To Be a Bat?' *Philosophical Review* 83: 435-50

Place, U. T. (1996), 'Intentionality as the Mark of the Dispositional', *Dialectica* 50, 91-120

Place, U.T., (1999), 'Intentionality and the Physical: a Reply to Mumford' *The Philosophical Quarterly* 49, pp. 225-231 .

Popper, K., (1959), *The Logic of Scientific Discovery*, revd. Imp. 1980, London, Hutchinson

Prior, E., (1982), 'The Dispositional / Categorical Distinction'. *Analysis*, 42: 93-6

Prior, E., (1985), *Dispositions*, Aberdeen: Aberdeen University Press

Psillos, S., (2001), 'Salt Does Dissolve in Water, but Not Necessarily', *Analysis*, 62: 255-257

Putnam, H., (1981), *Reason, Truth and Knowledge*, Cambridge

Reichenbach, H., (1956), *The Direction of Time*, University of California Press.

Robinson, H., (1982), *Matter and Sense*, Cambridge: CUP

Russell, B., (1910), *Philosophical Essays*, London: Longmans, Green

Russell, B., (1948), *Human Knowledge*, New York: Simon and Schuster

Ryle, G. (1963), *The Concept of Mind*, Harmondsworth: Penguin

Salmon, W., (1978), 'Why ask, 'Why?'?', *Proceedings of the American Philosophical Association* 51, 683-705.

Salmon, W., (1984), 'Scientific Explanation and the Causal Structure of the World', Princeton University Press.

Salmon, W., (1988), 'Dynamic Rationality: Propensity, Probability and Credence', in *Probability and Causality: Essays in Honor of Wesley C. Salmon*, ed. Fetzer, J., Dordrecht

Salmon, W., (1993) 'Causality: Production and Propagation' in *Causation*, eds. Sosa, E., & Tooley, M., Oxford: OUP, originally appeared in *Proceedings of the 1980 Biennial Meeting of the Philosophy of Science Association*, vol.2.

Salmon, W., (1994), 'Causality without Counterfactuals', *Philosophy of Science* 61, 297-312

Schaffer, J., (2004), 'Causes Need Not Be Physically Connected to Their Effects: The Case for Negative Causation' in *Contemporary Debates in Philosophy of Science* (2004), ed. Hitchcock, C., pp. 197-216, Malden MA: Blackwell Publishing.

Schrenk, M., (2007), 'Hic Rhodos, hic Salta...' in *Debating Dispositions*, eds. Damschen, Schnepf & Stueber, De Gruyter

Schrenk, M.., (forthcoming), 'The Powerlessness of Necessity', *Nous*

Searle, J., (1983), *Intentionality: An Essay in the Philosophy of Mind*, Cambridge: CUP

Searle, J, (1992), *The Rediscovery of the Mind*, Cambridge, MIT Press

Shoemaker, S., (1979), 'Identity, Properties, and Causality', *Midwest Studies in Philosophy*, 4, 321-42, reprinted in 2003, *Identity, Cause and Mind: Philosophical Essays*, CUP

Shoemaker, S., (1980), 'Causality and Properties' in *Time and Cause: Essays Presented to Richard Taylor*, ed. Van Inwagen, P., D. Reidel Publishing reprinted in (2003), *Identity, Cause and Mind: Philosophical Essays*, CUP

Shoemaker, S., (1998), 'Causation and Metaphysical Necessity', *Pacific Philosophical Quarterly* 79, pp. 59-77

Shoemaker, S., (2007), *Physical Realization*, Oxford: OUP.

Stevens, P.S., (1974), *Real Patterns*, London: Penguin

Strawson, P., (1959), *Individuals*, London: University Paperbacks

Strawson, G., (2008), 'The Identity of the Categorical and Dispositional, *Analysis*, vol. 68, 4.

Swinburne, R., (1980), 'Properties, Causation, and Projectibility: Reply to Shoemaker' in *Applications of Inductive Logic*, eds. Cohen, L.J., & Hesse, M., Oxford: OUP

Swoyer, C, (1982), 'The Nature of Natural Law, *Australasian Journal of Philosophy*, 60, 203-23

Taylor, R., (1966), *Action and Purpose*, Prentice-Hall Englewood Cliffs., N.J.

Unger, P., (2006), *All the Power in the World*, Oxford: OUP

Weissman, D., (1978), 'Dispositions as Geometrical-Structural Properties', *Review of Metaphysics*, 32: 275-297

Woodward, J., (2005) *Making things Happen: A Theory of Causal Explanation*. Oxford: Oxford University Press