THE NECESSITY OF NATURAL LAWS

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SUMMARY

In this thesis I advance a theory of law-like regularity in which both regularities and laws of nature spring from the dispositional natures of mind-independent properties. Take property F. F, as part of its dispositional nature, is such that anything which instantiates it also instantiates G. The nature of F therefore ensures the regularity that all Fs are G. It also ensures that a law holds such that all Fs *must* be G. I take laws to be general counterfactual facts which hold in virtue of instantiated properties. The law that all Fs must be G, in other words, is the law that *(∀x) if x were to be F, x would be G*. Furthermore, given that the law holds in virtue of F's dispositional nature, it follows that the law holds in all possible worlds containing F. Laws are necessary, rather than contingent.

I argue for this theory, which I call **Powers**, by comparing it to a representative sample of rival positions and showing that it is the *best explanation* of regularity. There are a number of other positions one could take. Armstrong, for example, thinks properties are categorical entities, and takes the laws to be contingent relations of nomic necessitation between them. One could take properties to be part categorical and part dispositional. One could – as Fales does – take them to be categorical, but have their nomic relations essentially in a Platonic realm. Or one could take them to have both essential and non-essential nomic relations, and so take some laws to be contingent and some necessary. There are also other ways to build a theory of laws from properties. **Powers**, I claim, explains regularity better than them all.

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For my Mum and Dad, and my Sister

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INTRODUCTION

There is regularity all around us. If I throw a ball against a wall, it comes back to me. At whatever angle I throw it, I find it coming back at a particular angle. If I throw it faster, it comes back faster. If I find the ball does not come back to me, I may be surprised. But my surprise will disappear once I discover the regularity which my instance of ball-throwing falls under. Perhaps it is one of the many regularities involving balls thrown in high winds, or perhaps a regularity involving balls which puncture on impact.

If there wasn't regularity, life would be grim. The most simple of plans rely on it. I can only execute my plan to write today, for example, if the building where I work has not moved location overnight, and if the computer I use works in much the same way as usual. Regularities such as *all buildings that are in a certain location one day are not in a different location the next day* and *all computers with a certain physical configuration work in the same way at time t as they do with the same configuration at time t+1* need to hold. If every time I pressed the 'T' key a different letter came up on the screen, and there was also no regularity to this sequence, then plainly I would be unable to write.

Furthermore, it is only because there are certain regularities that I am here to write at all. My development, from sperm and egg through to birth, has been facilitated by the presence of certain regularities in nature concerning both the environment and organisms. Also, it is only because there is regularity that there are sciences concerned with these matters, such as physics, biology, and both organic and inorganic chemistry.

Such regularity calls for an explanation. The purpose of this PhD is to give one.

My aim is not to explain *all* regularities. It is a regularity, for example, that all the coins in my pocket today are silver-coloured. And there is presumably some sort of explanation of this fact which could be offered, involving what I bought recently to use up my non-silver coins, etc. But it is, quite clearly, an *accident* that all my coins are silver today. I didn't purposefully set out to have a pocket of silver coins, and if I hadn't (say) bought that CD yesterday, I wouldn't have all silver coins.

This is in stark contrast to the regularities I am interested in explaining, which are neither influenced by me nor is it the case that I, or anyone, could have done anything to prevent them from obtaining. They are *non-accidental*. More than that, they are regularities we think of as holding *as a matter of law*.

Given this connection between the kind of regularity I am interested in and laws of nature, a natural thought is that the latter explains the former. I share that thought. But then what are laws of nature? My PhD, inasmuch as it seeks an explanation of regularity, is concerned equally with answering this question. And for me it is an ontological, as opposed to a conceptual, question. I am only interested in our concept of lawhood in order to get clearer on the metaphysics. And it is a thoroughly *realist* metaphysics. By this, I mean I take law-statements to be made true by things which are 'out there', as part of the fabric of reality, 'governing' the way the history of the world unfolds, and 'responsible for' certain regularities.

As a result, one theory I won't be spending much time on is the so-called 'Regularity theory', according to which laws *just are* regularities of a certain sort. I admit there is much that could be said about this theory, and that some versions are better than others. I occasionally discuss it briefly when weighing up rival theories, but pressures of space prevent a fuller discussion. Besides, I find the idea that there is nothing *ensuring* regularity very unintuitive. A world where nothing governs the most general regularities is analogous to a clock keeping regular time without a mechanism. Just as we require a mechanism for the clock, so we require a mechanism for law-like regularity.

Often those who espouse a Regularity theory are in the grip of a strict empiricism. One can observe instances of Fs being G, for instance, and so infer that all Fs are G. But one cannot – it might be thought – observe the necessity of any F being a G, and so cannot infer that, as well as the regularity, there is the *nomic necessity* that all Fs are G. But this reliance on the observable is a far more cautious strategy than is necessary. I have not seen the mouse in my house, but I have heard a scurrying sound, seen bits of nibbled food on the floor, and so on, which together are enough for me to infer that there is a mouse in the house. In just the same way, I can infer the nomic necessity of Fs being G – the realist law that all Fs are G – from my observation of many Fs, in a variety of circumstances, all of which are G. I can infer it because the alternative hypothesis, that it is just a coincidence that all Fs are G, is

far less likely. In other words, just as I can use *Inference to the Best Explanation* in everyday life, so I can use it to arrive at substantive claims about the metaphysical nature of the world.

The position I will be defending is one where properties are entities, *universals*, which are dispositional in nature. Because of this dispositionality, any object instantiating a universal will behave in a certain way given that it instantiates certain other universals and is in certain circumstances. I call my position **Powers**, and in the course of this dissertation my case for its being the best explanation of regularity is presented. To show that it is the best explanation, I need to evaluate it against other, prominent realist accounts of laws, in respect of the following: [1] simplicity, both in terms of the number of primitive predicates needed to state the theory and the number of entities or types of entity to which it is committed; [2] explanatory power; and [3] internal and external coherence. Other theories of laws, I shall argue, while not incoherent, fare less well against these three criteria than **Powers**.

Physics today makes some interesting claims. Einstein's Theory of Relativity tells us that time and distance are both, appearances to the contrary, actually relative to a reference frame. But that is nothing compared to the separate claims made about the quantum realm, the realm of the fundamental particles. There is quantum indeterminacy: no fact of the matter, say, about whether this P-particle will decay within timespan t, only a truth about the percentage of P-particles which decay within timespan t. (What's more, the Shroedinger's Cat thought experiment seems to indicate that there is no fact of the matter about whether the particle has decayed or not within timespan t *until it is observed*.) And there is non-locality: observation of one particle can instantaneously make another particle, a great distance away, have a certain property. There are no doubt other – equally strange – claims being made about the nature of our world.

I say nothing about these matters. Indeed, I will generally work with purely deterministic examples, whether they be drawn from everyday or from the textbooks of science; and my examples will take both time and distance to be non-relative properties or relations. This is not because I deny the recent claims made by physicists. Each of the above quantum claims is open to dispute, and has been disputed by other physicists; but I do not know enough about physics to add my voice

to the debate. Moreover, this dissertation does not require that I do so. I outline and defend **Powers** using mainly deterministic examples because these are the easiest to work with and best serve to make my point. But the theory can perfectly well accommodate examples from modern physics such as those above. Indeed, I think that metaphysical positions on the laws of nature, such as **Powers**, are so general that they can accommodate not only current physics but also any future developments in physics. The absence of such examples is due both to the demand for brevity and the extent of my scientific knowledge; it is not a matter of keeping quiet about something which casts doubt on or falsifies my theory.

This brevity requirement not only manifests itself in the lack of examples from current physics, it also leads to the frequent deployment of F, G, and other symbols. We have already seen an example of this four paragraphs ago: a lot more will be forthcoming. But I do try to illustrate what I am saying with one or more real-life examples, and hope I have managed to strike the right balance between the thesis being all symbolism (and so less understandable) and no symbolism (and thus a third extra in length). In this connection I also seek to justify my frequent use of one particular law-form: that all Fs must be G. It has to be said that most of the laws I am interested in are *causal* in nature, not (as this seems to be) *co-instantive*. But using the law and the regularity that all Fs are G to illustrate both my position and the position of others uses far less words than the more complicated case of what is involved in a causal law or regularity. I do not omit causal examples, but the relative abundance of co-instantive examples is purely a matter of economy.

It should also be noted that sometimes I discuss law-forms, where letters such as F and G are used as variables, and sometimes I discuss particular examples of laws where letters stand for specific universals. Sometimes, trusting that the context will make clear the use to which they are being put, I have used the same letters for both tasks. I also use these letters to refer to the *particulars* which instantiate a certain universal. For example, I may talk of Fs, or the F, or an F, or F-things, or F-particles. I refer to the universal itself simply as F.

Powers is a *Necessitarian* position. At a minimum, this means that if a law holds in any possible world, it holds in all possible worlds containing the antecedent of that law (e.g. if it is a law that all Fs are G in the actual world, then it is a law in all possible worlds containing F). When I talk about laws being necessary, or nomic

relations between universals being necessary ones, the necessity I speak of will generally be of this qualified form. When I need to talk about laws being necessary in an unqualified way – i.e. holding in all possible worlds *simpliciter* – then I will state this explicitly. One may say that the identity between George Orwell and Eric Blair is necessary, and mean by this that it holds in all those worlds *containing the referent of both names*. Similarly, one can say the law that all Fs are G is necessary, and mean that it holds in at least all those worlds *containing F*.

Let me now outline what I attempt to do in each chapter, and indicate how this helps with my goal of showing **Powers** to be the best explanation of regularity.

In Chapter One I discuss in some detail Armstrong's influential account, which takes laws to be *contingent* relations of nomic necessitation between universals. In doing so, I outline notions and draw distinctions which play a key role in future discussion: for example, I discuss the concept of a universal, and the distinctions between contingency and necessity, and categorical entities and dispositional entities (§1.1). As perhaps the most thoroughly worked out Contingency theory, I am keen to highlight the weaknesses of Armstrong's account compared to my own. To this end I argue that Armstrong's theory allows for the possibility of all manner of laws we would find counterintuitive (§1.2).

Chapter Two introduces **Powers**. My aim here is to give as much detail as is necessary to begin a comparison with rival theories, and to this end, I set up the **Powers** metaphysics against a background of alternatives, explore the idea that universals are dispositional entities, and introduce the idea of a 'Nomic Network', a network of laws which for **Powers** derives from that dispositionality (§2.1). I then go on to give two more reasons for preferring **Powers** to Armstrong's theory: (a) that it accepts brute fact at a better place, and so is *more explanatory*, and (b) that it can provide truth-makers for uninistantiated laws that Armstrong has difficulty with (§2.2). While I do not consider other Contingency theories of law in any detail, I show that they too suffer from some of the same criticisms I level at Armstrong, and so by undermining his theory I undermine Contingency theories of law in general.

Having argued that **Powers** is a better explanation of regularity than Contingency theories, I move on to show its superiority over Non-Contingency theories. Chapter Three examines two theories which, like **Powers**, are

Necessitarian. The first of these theories (§3.1) is Shoemaker's, the second (§3.2) is Swoyer's. I highlight a number of places where **Powers** diverges from these theories, and argue that it is right to do so.

Chapter Four examines three other theories which allow for essential nomic relations between universals. First there is Fales' account (§4.1). I argue that **Powers** is to be preferred for a number of reasons, not least of which is the fact that it doesn't involve a commitment to Platonism. The second theory considered is what I call the Two-Sided view, adapted from Martin's account of laws (§4.2), and the third is the claim that universals have some essential and some non-essential nomic relations (§4.3). Again, I argue that **Powers** is the better account. Considerations of where brute fact is accepted are again shown to be important in weighing up **Powers** against its rivals.

By the end of Chapter Four I hope to have persuaded the reader of at least two things. First, that the arguments put forward for Necessitarianism by fellow Necessitarians are not compelling, adding plausibility to my claim that it (or some version of it) needs arguing for using inference to the best explanation. Second, that **Powers** has distinct advantages over its main Necessitarian and Non-Necessitarian rivals. This is not enough, as yet, to have shown that on balance **Powers** is the best explanation of regularity, for **Powers** may have difficulties of its own. Chapter Five is designed to fill this gap in my argument. In it, I show that a number of important arguments which can be levelled against either **Powers** or Necessitarianism in general have little or no force. These include a number of regress arguments (§5.1-§5.3) and the claim that all necessary truths are known a priori and so laws of nature cannot be necessary (§5.6). By the end of this chapter, I will have shown that **Powers** is the best explanation of law-like regularity.

The final chapter reinforces that conclusion. The Nomic Network governing a world is set by the dispositional nature of the universals in that world. To get clearer on this idea, I characterise the nature of universals in two ways: first, using *counterfactual conditionals*, and second, using *internal relations* (§6.2). I also look at what kinds of universals are part of the Nomic Network, and tentatively argue for the plausibility of a realism about universals which denies that there are *supervenient* entities. Non-Supervenient Realism is not an essential part of **Powers** itself, but, as I show, at least **Powers** – unlike Armstrong's theory – seems able, without endorsing

supervenient universals, to accommodate the truth of all law-statements which appear to refer to supervenient entities (§6.1, §6.3).

Chapter One

ARMSTRONG'S RELATIONS-BETWEEN-UNIVERSALS ACCOUNT

1.1 *An Outline of Armstrong's Account*

Armstrong's account of laws is built upon a metaphysical picture in which properties and relations are *universals*. It is relations of necessity between universals which govern the world and ensure regularity; and it is because universals have a specific nature that laws are *contingent*. In this section, I first look at what universals are, and what sorts of universals Armstrong takes there to be; I then go on to show how he extends this basic metaphysics to provide a mechanism for law-like regularity.

1.11 *Universals*

What makes it *true* that the paper in my hand is white? Not just the particular piece of paper itself, one might think: it would still be the same piece of paper if I painted over it using watercolours. There also needs to be, as well as the paper, some *feature* of the paper which contributes to its being true that it is white. But even that is not enough. The particular piece of paper and the feature – property – of the paper could both exist and yet it still not be true that the paper is white: if the paper had been dyed yellow and *another* sheet of paper had been bleached white, for instance.

It might then be thought that all we need is the paper to be suitably related to the property. But a relation of instantiation will not be enough. We could have the paper, the property and the instantiation relation and it still not be the case that the paper is white. Positing another relation, which relates the paper, the property and the instantiation relation, obviously won't do either, for we will find ourselves embarked on a regress, and a vicious one at that.

Armstrong's (1997) answer is to take *states of affairs* (such as x is two metres away from y, or x has a mass of m) as ontologically fundamental. Particulars (such as the piece of white paper) and universals (such as whichever property of that paper is lawfully connected to our visual experience of whiteness) are *abstractions* from states

of affairs. What is the universal F (or F-ness)? It is an abstraction from all the F states of affairs: e.g. from *a* is F, *b* is F, *c* is F...[1] What is the particular, *a*? It is an abstraction from all the *a* states of affairs: e.g. from *a* is F, *a* is G, *a* is H, and so on. Though they are abstractions from states of affairs, that is enough to make them real for Armstrong. And since they are abstractions from states of affairs, rather than items whose *sum* is the states of affairs, the aforementioned regress is avoided.

A universal is a 'one over many'. To say that two things, *a* and *b*, each have the universal F is not just to say that *a* has something which is *qualitatively identical* to something *b* has; it is to say that *a* has something *quantitatively identical* to something that *b* has. This means that universals can be in two places or more at the same time. But while this might strike many as very odd, the advocate of universals can always claim that it does so only because one is falsely assuming that the criteria for same object are also those of same universal. Sure, they can say, the same *object* cannot be in two places at once. But *universals* are different.

Armstrong makes several important claims about universals. Let me postpone until §1.14 discussion of Armstrong's contention that universals are non-dispositional entities. Other important points include the following:

Firstly, universals are taken by Armstrong to be *immanent* entities rather than *platonic*. They, and the states of affairs which contain them, are part of the spatiotemporal world: if *a* is F, then F is located where *a* is. This contrasts with the Platonic view, where universals are part of some 'abstract' non-spatiotemporal realm, and states of affairs involve instantiation relations linking objects of the abstract realm to 'concrete' objects (such as fundamental particles) in the spatiotemporal world.

Secondly, Armstrong's realism about properties (and relations) is not an 'abundant' one. He does not take there to be a universal corresponding to *every* predicate of a true sentence. Some universals have many predicates corresponding to them, others have only one or none. If we have not discovered the universal, we will have no predicate to correspond to it; and though we may only have one predicate, it

[1] Universals are therefore state of affairs *types*. While *a* is F is a *token* state of affairs, _is F is a *type* of state of affairs: i.e. one that can have its place-holder occupied by any one of a number of particulars, such as *a*. As a consequence 'being F' is perhaps a more misleading way of referring to the universal than '_is F', or '_being F', since it fails to make perspicuous this 'unsaturatedness' of universals.

is not difficult to conjure up others. Similarly, some predicates have many universals corresponding to them, others have one or none. An example of the former would be 'is a game', and an example of the latter would be 'being phlogisticated' as used in the true sentence 'there is no such property as being phlogisticated'.

Thirdly, Armstrong takes it to be the job of science to tell us what universals there are, making the realism advocated both *scientific* and *a posteriori*. 'Mature' *physics* – physics at the hypothetical end of enquiry – will tell us which fundamental universals exist. Other universals can then be said to exist if they are composed, in certain ways, of these fundamental universals.

Fourthly, despite his endorsement of Scientific Realism, Armstrong offers a priori argument to rule out, or rule in, certain kinds of composite universal. There are no negative or disjunctive universals: though there is F, there is no not-F, nor F-or-G. But if an object has F and also G, it instantiates the universal F & G: conjunctive universals are allowed.

These restrictions are enough to prevent Armstrong taking my utterance of 'this paper is white' to be made true by the state of affairs of the paper being white. There is no such universal as *being white*. One object may have the property of reflecting wavelengths of length α, another the property of reflecting wavelengths of length β, yet in both cases we see a white object. Armstrong cannot then identify being white with one of these wavelength reflecting properties, since not all white things have that one property; and neither can he identify it with the disjunctive universal of reflecting wavelengths of length $\alpha \vee$ reflecting wavelengths of length $\beta \vee$ ..., since he has explicitly ruled out disjunctive properties. What makes my utterance true is the paper being F, where F is one of a number of universals which cause observers, under normal circumstances, to see white.

While ruling out disjunctive and negative universals, Armstrong allows *structural* universals. If an object has a conjunctive universal, that same object has both conjunct universals. But if an object has a structural universal, this is not so. What will be the case is that *parts* of that object have certain universals. Take a molecule of H_2O. That molecule instantiates the structural property *being* H_2O. But it doesn't instantiate the property *being hydrogen* or *being oxygen*. Rather, two *proper parts* of the molecule instantiate the former, and one proper part instantiates

the latter. What is more, these parts bear certain relations to one another concerning their relative spatial position and the way they bond together. All this will be part of what it is to have the structural property *being H_2O*. It is more than a matter of the structural property *depending* for its existence upon relations and properties of those parts. The structural property is to be *identified with* such a pattern of relations between, and properties of, a certain number of parts.

1.12 *Laws of Nature*

As we have seen, Armstrong has an ontology of states of affairs, and universals and particulars are abstractions from these. So where do laws of nature fit in? Armstrong's answer is that laws are also universals. If it is a law that all Fs are G, then there will be a relation of *nomic necessitation* (itself a universal) which holds between F and G.[2] In Armstrong's notation, we have N (F, G). This is itself a universal (and therefore a *type* of state of affairs), since every instance of the law – every F that is G – involves the instantiation of N(F, G) by the particular that is F.

However, while N(F, G) is a universal, instantiated by every particular that is F, it is also, at a higher level, a state of affairs *token*, and therefore a particular, since it involves two second-order *particulars* (the universals F and G) being related by the second-order universal N. There is no contradiction here, given the distinction of order. As a universal, and so a state of affairs type, it is N(_F, _G), where the placeholder is occupied by any first-order particular which instantiates F. As a state of affairs token, and therefore a particular, it is a token of the type _N_, a type instantiated the ordered pair of second-order particulars F and G.

Armstrong sets out the claim that laws of nature *ensure* certain regularities in the following way: if N (F, G) then all Fs are G, *but not vice versa* (1983: 85).[3] This last clause says that the fact that all Fs are G does not entail that it is a law that all Fs

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[2] Armstrong now emphasises *causal* necessitation rather than *nomic* (1997:231). Even co-instantive laws such as all Fs must be G can be thought of as involving causal necessitation, he thinks, since the central 'core' of our causal concept is that of one state of affairs *determining* another, not (even in part) the contiguity of cause and effect. Armstrong's aim is to make the relation of nomic necessitation less mysterious by linking it to the apparently less mysterious relation of causal necessitation. In what follows, however, I will continue to state the necessitation involved in co-instantive laws using 'N' for nomic rather than using 'C' for causal.

[3] Though he realises, as we see in §1.13, that N(F, G) only entails that Fs *in certain circumstances* are G, for ease of exposition he works with the claim that N(F, G) entails all Fs are G.

are G. This seems correct, yet it is denied by the most naive Regularity theory that Armstrong (1983) considers. Even more sophisticated Regularity theories suffer from the inability to explain the regularity that all Fs are G by citing the law that all Fs are G, for if such an account of laws is correct that would be like trying to explain why two objects, *a* and *b*, are red, by citing the redness of *a* and the redness of *b*. Armstrong, in contrast, has the advantage of being able to explain the regularity with the law, for the law and the regularity are distinct entities: the law is a universal involving F and G related by N, whereas the regularity is a number of particular facts about objects which are both F and G coupled with the fact that these objects are all the F-things there are.

In highlighting this entailment between law and regularity, it is clear that Armstrong takes the notation N(F, G) to stand for the law that all Fs are G.[4] However, it is important to see that the notation underdescribes this co-instantive law. Armstrong is presumably taking N(F, G) to be N($\__1$ being F, $\__1$ being G), where F and G are monadic universals and each space having the same subscripted number indicates that the same particular instantiates both F and G. But the possibility also seems open for 'N(F, G)' to refer to N($\__1$ being F, $\__2$ being G), where one particular being F necessitates a numerically distinct particular being G. This is certainly not the law that all Fs are G.

F and G are likely to be complex universals, Armstrong thinks. For example, we could have the law N($\__1$ being H & $\__1$ having R to $\__2$ & $\__2$ being I, $\__1$ being M & $\__2$ being J). This can be abbreviated as N(F, G): it says that when F is instantiated – i.e. when some x is H and related by R to some y which is I – then G is necessitated, where this is the same x being M and the same y being J. It can also be abbreviated as N($\__1$ being F, $\__1$ being G), since the complex particular which instantiates both the antecedent and consequent of the law is the same. If there are no causal components in either F or G, and no indication that the instantiation of F is temporally prior to the instantiation of G, then this law will also be co-instantive, i.e. the law that all Fs *are* G.

There might be laws governing the world right now, we think, which involve properties so far uninstantiated. In other words, we do not think laws come into being

with their first instances. But Armstrong has said there are no uninstantiated universals, so how does he allow that laws can govern a world throughout all of time, and not just as soon as the relevant universals have been instantiated? His answer to this is that past, present and future are equally real, and so all those universals which are instantiated at some point in time can be said to exist at any point in time. As a result, N(F, G) can obtain at time t – and so F and G exist at time t – even though there have been no Fs up to time t.

Armstrong also thinks that laws hold contingently. In saying this he isn't denying that in a world where N(F, G) obtains it is *necessitated* that each F also be G. Rather, what he means is that even if the law N(F, G) holds in the actual world, there are some possible worlds where F and G are instantiated but where N(F, G) is not. For instance, if the law N(*being H_2O & heated for period of time t & in surrounding pressure p, being 100°C*) is actual, then all actual samples of H_2O boil at 100°C if the surrounding pressure is p. However, in some possible worlds both *being H_2O & heated for period of time t & in surrounding pressure p* and *being 100°C* are instantiated and N does not relate them. There are a number of laws incompatible with the actual law, each of which will hold in some possible worlds. In some, say, the law is N(*being H_2O & heated for period of time t & in surrounding pressure p, being 99°C*), in others it is N(*being H_2O & heated for a period of time t & in surrounding pressure p, being 101°C*), and so on.

1.13 *Iron and Oaken Laws*

Armstrong draws a distinction between what he calls 'Iron' and 'Oaken' (or more recently 'Defeasible') laws. An Iron law is one for which there are no interfering factors: i.e. for which there is nothing to prevent the universal on the right of the nomic necessitation relation being instantiated once the universal on the left is. We can always *imagine* that such a factor is nomically possible, of course: but if it *actually isn't*, i.e. if the actual laws do not make room for such a factor, the law is Iron. If, on the other hand, there are actual circumstances in which a law's left-hand state of affairs can be instantiated and yet the right hand not, the law is Oaken. As an

[4] For the sake of simplicity I will also take N(F, G) to be the law that all Fs are G, unless I specify otherwise.

example, take the law that copper expands when heated. If there are nomically possible circumstances in which copper does not expand when heated, the law is Oaken. If there are not, it is Iron.

It is an open question how many laws are Iron. Of course, we could say that all are: that built into the left-hand side of all laws are clauses specifying the absence of each particular interfering factor. Armstrong doesn't do this. He accepts instead that we can have the law N (F, G) and an object which has F but not G. This will be because *another* law obtains, e.g. N(F&H, J). J is incompatible with G, and the object is both F and H, not just F. To illustrate what Armstrong has in mind, take the copper example. It is a law that copper, when heated for a certain period of time (F) expands (G). But suppose there is a defeater of this law. This might be a law that when copper is heated for a certain length of time (F) but is in circumstances C (for example, treated with certain chemicals) (H) it stays the same length as it was before heating (J). Nothing can stay the same length as it was before heating and also expand on heating: i.e. they are incompatible properties. The more specific law defeats the operation of the less specific, and x being F will be an instance of the law that N(F, G), and not N(F&H, J), as long as x is not H and there are no other laws to defeat N(F, G) on this occasion.

This gives us Armstrong's line on laws which hold 'all else being equal' (*ceteris paribus*): a law only holds ceteris paribus if there is actually another, more specific law to defeat it. But the presence of such Oaken laws means that the characterisation made earlier of the relation between laws and regularities is inadequate. Laws do not entail regularities. The most that can be said of the law N(F, G), for example, is that it entails that *for all instantiations of F where interfering conditions are absent, there is the instantiation of G* (1983:149; 1997:230). This is true even if the law is actually Iron. For even if there are, *in the actual world*, no laws to trump a particular law, such laws will still hold in some possible world. And if there are possible worlds where the law obtains and yet the regularity does not, it cannot be said that the law entails – i.e. *logically* entails – the regularity.

1.14 *Categoricalism*

According to the position that Armstrong calls *Dispositionalism*, universals are irreducibly dispositional in nature. If a universal is *in itself* dispositional, it follows that its instantiation, in any possible world, will support certain counterfactuals. If it is of the nature of F that when instantiated by some x the same x also instantiates G, then in all possible worlds containing F it is true that if some x were to be F it would also have G. But this means that there are no worlds where F and G exist and are not nomically related.

As we have seen, Armstrong denies this last claim. There are worlds where F exists and is nomically related to G, and worlds where F exists and is not nomically related to G. This means that universals, for him, are *not* irreducibly dispositional in nature. Armstrong labels this position *Categoricalism*. Universals do not have a dispositional 'essence' or 'nature' to distinguish one from another. Indeed, Armstrong goes further than this. There are no features essential and unique to each universal. Universals are simply quantitatively distinct entities with a primitive particularity, a 'this-ness', which distinguishes one from another (1983:160).

According to Armstrong, the laws of nature support counterfactuals in a world, not the universals which are constituents of the laws. Laws are *categorical* universals and their parts are *categorical* universals. Because of this the way is open for Armstrong to take laws to be contingent. The instantiation in a possible world, PW, of a number of universals (none of which are laws) is not enough to make certain counterfactual claims true in PW; and nothing about Categoricalism rules out N from relating the same universals in different ways in different possible worlds.

It should be noted that Categoricalism does not show us to be speaking falsely when we attribute powers to objects, for talk of powers can be reduced to talk about the laws of nature. For example, suppose I say the acid in this bottle has the power to corrode. What I say isn't false, and yet according to Armstrong, all universals are non-dispositional. So what makes my claim true? It is the states of affairs of the substance in the bottle instantiating certain universals, coupled with the laws these universals are involved in connecting them to other universals, including the universal of corrosion.

This isn't to say that when I talk about the acid's power I am actually asserting that certain laws of nature hold, involving acid and corrosion, and that the bottle contains the acid involved in those laws. Armstrong is most certainly not giving a *semantic* analysis of the attribution of powers and dispositions. What we have, instead, is an analysis of what, in the world, makes our claim true if not, in part, a dispositional entity. What we have is a *truth-maker* for the power claim.

1.15 *Mechanism*

Take again the law that all Fs are G. According to Armstrong, it is a state of affairs – a second-order state of affairs whereby N relates F and G – which supposedly governs the world in such a way as to ensure that *if anything were to instantiate F, it would also instantiate G*, and so explains why all Fs are G. N, F, and G, however, are categorical universals. They do not of their very nature support counterfactuals. But then how can N(F, G), itself a categorical universal, and one with N, F and G as parts, support counterfactuals? That is, how can a number of universals together in a state of affairs do what they cannot do if not part of that state of affairs?

There would be no problem seeing how laws can support counterfactuals if Armstrong accepted that N was a dispositional entity. Furthermore, he could make this move without threatening his other key claims. For example, N would support the counterfactual that, if relating two universals, then whenever there is an instantiation of the first, there is an instantiation of the second; but this does not fix what universals N is related to, and so does not affect the contingency of laws. However, allowing this one universal to be dispositional would lead the following question to be asked: if N is dispositional, then why not accept that *other* kinds of universal are also dispositional? Why is the nomic relation 'special' in this respect? Apart from this, Armstrong seems opposed to the very idea of non-categorical universals, universals which 'point beyond themselves to further effects', as he puts it (e.g. 1997:80). So it is an option he is unlikely to find appealing.

Fortunately for Armstrong, this move towards dispositionality is not forced upon him. The situation, in fact, is as follows. N(F, G) ensures that the next F-thing will be G because if F is instantiated, N(F, G) is also instantiated; and if N(F, G) is instantiated, that which instantiates F also instantiates G. If *a* instantiates F, then it

falls under the law N(F, G). And this will partly determine what *a* is like because *a* is F and F is on the left of the necessitation relation: *a* is F, so N(F, G), since that obtains, will be instantiated by *a* as well, giving us N (*a* is F, *a* is G). All this and not a dispositional universal in sight.

It is instructive to think of the world-history as a jigsaw puzzle when considering Armstrong's mechanism for regularity. F does not itself force G-ness upon whatever instantiates it, as the Dispositionalist would have it. Rather, F cannot be attached to *a* without G also being attached, because F and G are linked by N. It's like two pieces of a jigsaw puzzle connected by a wire: slot in one piece and another falls into place.

1.16 *The Main Points*

Armstrong's account contains six main claims:

> ***Scientific Realism regarding Universals***: the universals that exist are those properties and relations which science makes reference to in its theories at the hypothetical 'end of enquiry'.
>
> ***States of Affairs***: the state of affairs is the fundamental ontological category, with universals and particulars *abstractions* from these.
>
> ***Immanence***: universals are part of the spatiotemporal world, not occupants of some platonic 'abstract realm.' There exist no universals which have not been instantiated at some point in time, whether past, present or future.
>
> ***Categoricalism***: universals are non-dispositional in nature, and therefore unless a universal is the relating of certain others using N (nomic necessitation) – and so is a law of nature – it does not support counterfactuals (by which I mean its existence does not make some counterfactual claims *true*).

Nomic Universal: laws of nature are states of affairs types (universals) in which the universal of nomic necessitation relates other universals.

Contingency: the laws of nature are contingent, and so how a universal is nomically related to others will vary across possible worlds.

Discussion of alternative law accounts will partly involve seeing just which of these claims they embrace and which they deny.

1.2 *Rogue Possibilities*

My aim in this section, now that I have outlined Armstrong's theory, is to show that it has consequences which my own rival account, to be introduced in the next chapter, does not. More specifically, I will argue that the combination of *Categoricalism* and *Contingency* (henceforth *Combination*) lets in certain counterintuitive possibilities, and any theory which cannot rule out such 'rogue' possibilities, as I shall call them, thereby has its plausibility undermined.

The rogue possibilities I shall look at are of two kinds. Those of the first kind involve *single* laws, where pairs of universals are related using the nomic relation. Those of the second involve certain sets of laws governing the behaviour of a particular chemical or physical kind.

As an example of the first kind (let us call this kind *Strange Relata*), take the law that treading on a slug causes someone ten metres away to cough. In the actual world, this is not a law. But universals that help make true our claims that 'someone trod on a slug' and 'someone coughed' and 'x was ten metres away from y' are instantiated in the actual world, and they seem to be distinct universals. Given this, prima facie there is nothing to stop Armstrong allowing that this law is possible. It

does not obtain in this world, it *could* not obtain in this world (if one thinks that what could happen here is set by the actual laws of nature), but there is some possible world where it does obtain.

As an example of the second kind (let us call this kind *Nomic Inversion*), take 'electronhood' and 'protonhood'. In the actual world, electronhood is part of each law of the set EL, and protonhood is part of each law of the set PL. But, again, the universals electronhood and protonhood are distinct entities, and there seems nothing, *prima facie*, to rule out their nomic roles being reversed, so that electronhood is part of each law of PL, and protonhood part of each law of EL. These roles couldn't be reversed in the actual world, of course, but nevertheless they are reversed in some possible world.

I want to deny that such laws, or sets of laws, are possible. Slugs, of the kind we see in the garden, just couldn't be such that treading on them causes someone ten metres away to cough. They have a *nature*, and this precludes certain possibilities. Similarly, electrons just couldn't behave exactly like protons, and vice versa. They too have a nature which rules out this inversion. Metaphysical talk about natures aside, however, these examples are certainly counterintuitive. A theory would be well-advised to accommodate this fact by showing that they are not possibilities after all.

The contingency of laws does not itself commit one to the possibility of all combinations of universals related by N. It is a contingent matter where I am at this very minute: there are lots of other places where I *could* have been. But this contingency of my spatial position does not entail that I could have been *anywhere*, e.g. typing this on Mars. Various options are closed to me through *physical* and *logical necessity*. Something similar might be said of universals. There are various universals which F could be nomically related to, so which universals F is actually related to is a contingent matter. But that doesn't mean that F could be nomically related to *any* universal. For all we know, various laws could be *metaphysically* or *logically* impossible.

Armstrong can therefore rule out *Strange Relata* and *Nomic Inversion* rogue possibilities if he can show them to be ruled out either by metaphysics or by logic. But Armstrong's metaphysical picture does not itself impose any obvious restrictions.

If universals had even a partly dispositional nature, some laws would be ruled out in *any* possible world. But Armstrong accepts *Categoricity*. Similarly, if Armstrong took the laws to be necessary in some sense, then the problem would not arise; but he accepts *Contingency*. In §1.22 I show that other aspects of his metaphysics are of no help. Before that, in §1.21, I show that *Combination* lets in rogue possibilities which cannot be ruled out by logic either. Therefore, I claim, Armstrong's theory is problematic in a way that my account of laws is not.

One might think Armstrong has another way out. He can agree that yes, the examples I present are counterintuitive, and that yes, they aren't really possible. But he can point out that his theory, inasmuch as it lets in such possibilities, merely needs augmenting with more metaphysics to block them. And he can admit that he hasn't yet developed his metaphysical picture to do this, but that it is certainly worth working on in the future. This way, Armstrong's theory of laws is not undermined by rogue possibilities.

I do not take this response to be available to Armstrong, because I cannot see what extra metaphysical details he could come up with to disallow rogue possibilities. In accepting *Combination* I think he leaves himself with no tools for the job. Logic, as we shall see, rules out *some* rogue possibilities. But whatever logic does not rule out cannot be ruled out by Armstrong's metaphysical picture, and I think this is clearly due to the categoricity of universals. Without a dispositional nature universals cannot impose the restrictions necessary to rule out the examples of *Strange Relata* and *Nomic Inversion* that have been introduced. Neither can particulars instantiating universals impose those restrictions, since they have no influence over the ways in which universals are nomically related. What is Armstrong left with? I cannot see that there is anything. He might say there are brute metaphysical principles, such as 'there are no nomic inversions', which rule out rogue possibilities. But such brute principles are deeply unsatisfying. Ideally one wants a metaphysics which *explains* why such laws are impossible; one does not want to be left with what simply looks like the assertion that they are.

1.21 *Rejecting Rogue Possibilities on Logical Grounds*

As I have said, one strategy for supporting *Combination* is to show that examples of *Strange Relata* and *Nomic Inversion* can be ruled out on the grounds that the laws, or the results of the laws being operative, result in some *logical inconsistency*. However, since rogue possibilities, no matter how many there are, damage *Combination*, all such examples will have to be shown inconsistent if this strategy is to succeed. I shall show that this cannot be done, taking the two types of rogue possibility in turn.

1.211 *Strange Relata*

Consider the following example. Buckingham Palace is a structural object, with many rooms, courtyards and suchlike as parts, and various doors, windows, and suchlike as parts of these, and so on. Take the structural universal which Buckingham Palace instantiates at one point in time, and call this *being Buckhouse*. Now take the physical action of sneezing. There may well be some physical characterisation common to all those who sneeze, and this too will be a universal, let us call it *being a sneeze*. Could these two universals be part of the following law: N($\__1$ *being a sneeze*, $\__2$ *being Buckhouse*)? In other words, is there a possible world in which sneezing causes a Buckingham Palace replica to appear out of nowhere?

An initial problem is that the laws of a world (at least on a realist construal) ensure that things are, or behave in, a certain way, and this law doesn't, on its own, fix where *being Buckhouse* will be instantiated relative to the instantiation of *being a sneeze*. At the very least there needs to be another law fixing location, or a location-fixing element needs to be built into the one law. Let us assume, then, that the Buckhouse law is itself enough to fix location.[5]

Can this law be ruled out on logical grounds? No. Of course, if two people close to one another sneezed at the same time, then according to the law as we have it the result would be two replicas of Buckingham Palace appearing at the same time, and furthermore, occupying at least some of the same space. *That* would be logically impossible: two exact replicas cannot occupy part of the same space, because in doing

so they would cease to be exact replicas. However, all this shows is that for the Buckhouse law to hold, certain other laws must also hold. For example, there must be laws to ensure that multiple sneezing in close proximity leads either to one replica appearing or none.

This failure to show inconsistency is only to be expected. A law holding in a world is only logically inconsistent if (a) its holding together with *other laws and states of affairs* of that world entails a contradiction, or (b) the law is itself contradictory, or itself leads to contradictory outcomes. As an example of (b), take N($\__1$ being 5ft long at time t, $\__1$ being 2ft long at t), which itself entails that anything which is 5ft long at time t is 2ft long at t. But lots of examples of *Strange Relata* are not like this. The Buckhouse law is not like this. It is logically inconsistent with the set of *actual* laws, since both together entail the contradiction outlined in the last paragraph. But this does not prevent it from being logically consistent with other sets of laws in other possible worlds. All we have established, therefore, is that for the Buckhouse law to obtain, other non-actual laws will also have to obtain. *Strange Relata* worlds will, most likely, differ from the actual world with regard to a number of its laws.

1.212 *Nomic Inversions*

Consider a possible world where instantiations of *being HCl* behave in all the ways we take instantiations of *being* H_2SO_4 to behave in the actual world, and where instantiations of *being* H_2SO_4 behave as we take instantiations of *being HCl* to behave in the actual world. I can think of two (related) ways one might question the logical consistency of this nomic inversion, and therefore any inversions between chemical kind universals, both of which hinge on the complexity of the universals involved. Neither way is successful.

The first way of challenging logical consistency is this. There are presumably other chemical compounds in the inverted world. Say there is YZ, which has as structural parts the elements Y and Z. In the actual world, YZ reacts with HCl and one result is the compound YCl. So in the inverted world, YZ should react with H_2SO_4 (where samples of these are particulars whose molecules instantiate *being YZ*

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[5] How long it takes for the Palace to appear after sneezing will also need to be fixed by some law, and again, we can either build this into one Buckhouse law or postulate another law.

and *being H_2SO_4* respectively) and one result be the compound YCl. But isn't there something amiss here? How can we get a compound containing Cl from a reaction when none of the reactants contains Cl parts? Surely something cannot be conjured up out of thin air.

I agree that something cannot be conjured up out of thin air *in the actual world*. But such reactions are far from being logically impossible. They are inconsistent with the claim, which we take to be true in the actual world, that the chemical result of a reaction is a product of the surrounding atmosphere and the chemical reactants. But it is not a logically necessary truth that chemical reactions are this way, and so there are logically possible worlds where it is false and where YZ does react with H_2SO_4 to produce YCl.

The second way of challenging logical consistency is as follows. The inverted world presumably also contains atoms of H and Cl which are not part of HCl molecules. Say there is only one inversion, and H and Cl are involved in the same laws as they are in the actual world. Some of those laws will govern how H and Cl are *perceived* by us. This means, however, that H and Cl atoms will appear to us one way when not part of HCl molecules, and when they are they will not appear to us at all. A molecule of HCl appears to be a molecule of H_2SO_4, and vice versa, because those laws are reversed. But we cannot say that a H atom appears as the H_2 part of a H_2SO_4 molecule, and the Cl atom as the SO_4 part of a H_2SO_4 molecule, since the laws involving the universals *being H* and *being Cl* are the same as in the actual world.

Again, however, while this is undoubtedly a strange state of affairs, *inconsistency* has not been shown. The problem, again, is that we are imagining that the inverted world will be unified in the way the actual world is: that the components of a universal will present themselves to us in the same way as they do when they are instantiated by parts of other chemical samples, and that the laws involving the component universals will dictate the laws of those universals which have them as components. But worlds where this is not the case are not ruled out by logic, and we have been given no reason why some of those couldn't be nomically inverted worlds.

It seems clear, given what I have said in this subsection and the last, that many examples of *Strange Relata* and perhaps all examples of *Nomic Inversion* are not ruled out on grounds of logical inconsistency.[6] Armstrong needs to look elsewhere.

1.22 *Rejecting Rogue Possibilities on Metaphysical Grounds*

Armstrong could reject examples of *Nomic Inversion* by postulating a metaphysical principle that the set of laws of any possible world are as unified as they are in the actual world. But there are at least three problems with this response. Firstly, it is ad hoc. If he accepts the contingency of laws, what stops him from accepting less unified worlds where chemicals are sometimes conjured out of thin air, and so on, *apart* from the desire to rule out rogue possibilities? Secondly, the principle, if it holds, should ideally be explained by Armstrong's metaphysics, not just accepted as brute. And thirdly, the principle does not rule out examples of *Strange Relata*, and so rogue possibilities would remain.

Let us now explore the question of whether there are aspects of Armstrong's metaphysical picture which can be marshalled to rule out rogue possibilities: whether there are, in other words, any parts of Armstrong's metaphysics which are *incompatible* with these rogue possibilities. I shall argue that there are not by considering the only two metaphysical claims of his which appear to me to offer even the faintest hope.

1.221 *The Number of a Universal's Parts is Essential*

As I have already indicated, Armstrong takes most universals, if not all, to be complex entities. The (non-mereological) 'parts' of a universal are their constituent universals, and Armstrong thinks the *number* of a universal's parts is *essential* to it. If two objects are both F, they have something which is *strictly identical*: the universal F-ness. And how can that something which is strictly identical between two

[6] One might think that if I had chosen an alkali or non-acid to swap nomic roles with HCl, there *would* be logical grounds to rule the nomic inversion out: HCl is short for hydrochloric *acid*, and how can an acid behave like a non-acid? But this misses the point. True, we call HCl an acid because of part of its nomic role. If it swapped nomic roles with an alkali, we certainly wouldn't call it an acid. It wouldn't be an acid anymore, since to be an acid is to have certain nomic characteristics that are not shared by alkalis. But it would still be HCl. Instantiations of the complex universal *being HCl* would still have the same nomic features as some particular non-acid has in the actual world.

objects nevertheless have differing numbers of parts? Armstrong thinks this is nonsensical.[7]

This will rule out, on metaphysical grounds, any examples of *Strange Relata* and *Nomic Inversion* which involve a universal having a number of parts other than that which it has in the actual world. But even with this restriction, plenty of rogue possibilities remain. The examples of *Strange Relata* I have discussed, as well as others that I have not, can all be construed as involving universals with the same number of parts as they actually have. As for *Nomic Inversion*, if *being HCl* and *being* H_2SO_4 are nomically inverted, we have a situation where HCl certainly *appears* to us to be H_2SO_4. One molecule of HCl will *appear* to have a structure involving two hydrogen, one sulphur and four oxygen atoms. However, this does not show that *being HCl* has a different number of parts in the inverted world; despite appearances to the contrary, it can still have the same number of parts as it has in the actual world.

Armstrong cannot do anything here with the idea that if the *number* of a universal's parts are essential to it, then *those parts themselves* are essential to it. This plausible claim only helps if universals are non-categorical entities: if a complex universal has the same parts essentially, then the laws it is involved in will not vary across possible worlds – given that those parts are dispositional entities – and so rogue possibilities are avoided. Not so if universals are categorical entities. The laws in which any universal is involved must not conflict with the laws in which its constituent universals are involved. But, as we saw in §1.21, this causes no real problem if we assume laws are contingent. For a universal to be involved in a nomic inversion, laws governing the parts of things cannot always govern the wholes. For a universal to be a strange relatum, other strange laws involving that universal may have to be operative. But still nothing rules out worlds containing some or all of the same universals, with the same parts as they have in the actual world, and involved in counterintuitive laws.

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[7] Armstrong (1997:33). Though Armstrong does not take any universal to have essential *nomic* features, he does take them to have non-nomic essential features. One is the number of its parts. Another is its '-adicity' (see, e.g., 1997:168). Remembering how Armstrong takes universals to be states of affairs types will enable us to put the point succinctly. How many 'places' does the state of affairs type have? That is its -adicity. Those universals which are properties have one: e.g. *_being two metres long_*. They are, in other words, *monadic* universals. Those universals which are relations have more than one: e.g. *_being two metres away from_*. They are *polyadic* universals, and the example given is of a *dyadic* relation. Armstrong's claim – which has not gone uncontested – is that a universal cannot have more than one adicity, either within a world or across possible worlds.

1.222 *Universals and Proper Parts*

Armstrong seeks a metaphysical underpinning for facts such as nothing can be both 5m long and 2m long at the same time. What is it about the two states of affairs, *a* is 2m long and *a* is 5m long, which prevents *both* obtaining, and about the two states of affairs, *a* is 2m long and *a* is 5kg, which allows both of these to obtain? His answer involves the recognition that *being 5m long* is a structural universal. As we saw in §1.12, for a particular to instantiate a structural universal that particular's *proper parts* must instantiate monadic universals (i.e. properties) and bear polyadic universals (i.e. relations). If *a* instantiates *being 5m long*, what do its proper parts themselves instantiate? Well, let us imagine that the length of *a* can only be split into five parts. *Being 5m long* then has the following structure:

> [1] ($\__1$ being 1m long & $\__1$ being next to $\__2$ & $\__2$ being 1m long & $\__2$ being next to $\__3$ & ... $\__5$ being 1m long)

Of course, *being 5m long* has far more subdivisions than I have indicated. *Being 5m long* may actually have an *infinite number* of subdivisions: infinite complexity. So the complexity I have uncovered here is by no means the whole story. This does not matter. For it is still true that *being 5m long* has the aforementioned structure; it is just that the parts which will occupy the places indicated by the underscore and subscript are further divisible. And [1] is enough to rule out *a* being both 5m and 2m long. For consider what structure *being 2m long* has:

> [2] ($\__1$ being 1m long & $\__1$ being next to $\__2$ & $\__2$ being 1m long)

[2] is a structural part of [1], and therein lies the inconsistency. *Being 2ft long* is instantiated by a proper part of *a* and so, given that *being 2ft long* is a structural part of *being 5ft long*, it cannot be instantiated by *a*.

How might this help against rogue possibilities? The thought is simple: take the rogue laws and show that they result in the existence, at a time t, of two states of affairs involving the same particular *a* – say, *a* is F and *a* is G – where either of G or F is actually a constituent universal of the other. This, as we have seen, is a metaphysically inconsistent situation according to Armstrong, and so he can rule out any laws for which this is the result.

The problem with this is that many rogue possibilities remain. It can rule out laws such as N($\__1$ being 5ft long at time t, $\__1$ being 2ft long at time t), which we encountered in §1.211, but these are already ruled out by logic. It seems to be of no help against the other *Strange Relata* examples we considered, nor the examples of *Nomic Inversion*. So the problem for Armstrong remains.

1.23 *Denying that the Theory is Undermined*

We have seen that logic and metaphysics cannot rule out all rogue possibilities. But Armstrong could deny that they are a problem. There are a number of ways he might do this. First, he might agree about their undesirability, but take ruling them out on metaphysical grounds to be work for the future. I have already responded to this line of reasoning at the beginning of §1.2: there is good reason to doubt that Armstrong's metaphysics is conducive to ruling out such possibilities. But two other options seem open to him. He can (a) argue that the possibilities are *not* counterintuitive, and so do not pose a danger to his theory, or (b) argue that despite being counterintuitive, they do not really tell against his theory. I will take each in turn.

There is a strong 'Humean' tradition in philosophy according to which there are no necessary connections between distinct existences. Armstrong is following this tradition when he argues for the thesis of *Independence* concerning *first-order* states of affairs. This is the conjunction of the following two claims: (a) no state of affairs or conjunction of them entails the existence of any wholly distinct state of affairs, and (b) no state of affairs or conjunction of them entails the non-existence of any wholly distinct state of affairs (1997:Ch.7).[8] Armstrong's insistence that the laws of nature are contingent, and that universals are categorical entities, can also be seen as following this tradition. So he might simply allow that universals, as distinct entities, are indeed – logic and metaphysics notwithstanding – nomically related in all sorts of strange ways in different possible worlds.

[8] *Independence* obviously fails for orders of states of affairs higher than first. Take second-order states of affairs, i.e. states of affairs about states of affairs. One is that all As are B, another that all Bs are C; plainly, from this it is entailed that all As are C. However, at the first-order level, we have *a* is A, *a* is B. And these do not entail that *a* is C: only their conjunction with all As are B and all Bs are C (or if it is a law that all As are C, their conjunction with N(A, C)) does that.

He might also add that any feeling of counterintuitiveness which the *Strange Relata* and *Nomic Inversion* examples elicit are the result of our imagining the law or laws to be operative alongside other laws and facts which hold or obtain in the actual world. The Buckhouse law strikes us as counterintuitive, for example, because we imagine it holding in a world where there is no law governing what would happen if two people sneezed near each other; and the nomic inversion similarly strikes us as counterintuitive because we imagine it holding in a world where, as in the actual world, the laws governing parts of an object dictate how that object will behave. The feeling of counterintuitiveness, in other words, comes from the thought that their holding in a world is actually logically impossible. Once one considers worlds in which other rogue laws hold, in addition to those under consideration, or where certain facts are at variance with those of the actual world, then one sees that the rogue possibilities are not ruled out by logic and the feeling of counterintuitiveness is excised.

I deny that this is the source of intuitions regarding rogue possibilities. At the very least, it isn't the source of *my* intuitions, and I suspect I am not alone. The feeling of counterintuitiveness arises instead from a simple conviction that the property of sneezing, and the property of being Buckhouse, just don't admit those possibilities; an instantiation of the first cannot bring about an instantiation of the second, because *their nature* precludes this.

If I am right, and the feeling of counterintuitiveness stems, at least for many people, from intuitions about a property's nature, then Armstrong's response above does not succeed in showing *them* that rogue possibilities are admissible. This is enough to make the time taken arguing against Armstrong on the basis of rogue possibilities time well spent. Armstrong cannot reply, either, that anyone who talks of 'natures' precluding certain outcomes is bound to find his theory unattractive. When I say that a universal has a 'nature', I could mean that it is – in itself – such that there are certain laws it could not be involved in. That would give the universal an irreducibly dispositional nature, and so clash with Armstrong's theory. But I need not mean that by 'nature': I may just take a universal's nature to be those features which it has in all possible worlds. In that case, it is perfectly compatible with

Categoricalism that universals have a dispositional nature, since all that means is that it is involved in certain laws in all possible worlds.[9]

One might think, alternatively, that Armstrong could agree that examples of *Strange Relata* and *Nomic Inversion* are counterintuitive, but nevertheless deny that they are enough to undermine his theory. I don't see, however, that this move is available, at least on a minimal construal of what it is to undermine a theory. True, whether a theory is ultimately the best explanation of regularity will depend both on how well it accommodates regularity and related phenomena (e.g. our intuitions regarding what regularities are possible) and whether the phenomena are better accommodated by alternative accounts. But that does not prevent failures to accommodate relevant phenomena from undermining a theory, just as it doesn't prevent successes in accommodating relevant phenomena from counting in a theory's favour. When I say that rogue possibilities undermine Armstrong's theory I simply mean that they are crosses against it: whether the ultimate scorecard has more ticks than crosses is another matter. I think that one of the alternatives, which I shall introduce in Chapter 2, fares better as an explanation of regularity; but justification for that claim must come not only from its ability to handle rogue possibilities, but also its superiority in other respects as well as considerations of overall plausibility.

1.3 *Conclusion*

An analogy is often employed to illustrate the contingency of laws.[10] Think of a person, for example John. John could have had different properties to those he actually has: he could, say, have written a best-selling novel, or have travelled the world. Universals are just like particulars in this respect. They too could have had different properties: they could have been involved in somewhat different laws. Just as there is a possible world where John does write that best-selling novel, so there is a possible world where F is part of the non-actual law that all Fs are H. We may distinguish John from other people by the properties he has, but this does not mean

[9] I must stress, however, that when I talk about a universal having a 'dispositional nature' I normally mean it in the first, metaphysically rich sense.

[10] See, e.g., Mellor, D.H. and Oliver, A. (1997:30-31).

those properties are essential to John. Similarly, we may distinguish F by the laws it is involved in, but these laws are not thereby essential to it.

This is all very well, but there are also properties we think John could not have had in any possible world. Perhaps we think, with Kripke (1980), that John could not have been born of a different sperm and egg. We are certainly inclined to think that John – a person – could not have been born a fly, or have been manufactured as a teacup, or have been an expensive face cream. In the same way, there are some properties that universals could not have had: laws in which they could not have figured.

We need a way to account for that restriction. As we have seen, it cannot be done on purely logical grounds. The metaphysical picture Armstrong has drawn does not account for the restriction, either; moreover, it is difficult to see how he could amend his metaphysics in any way to account for the restriction convincingly whilst at the same time hanging on to *Combination*. In the next chapter I put forward a metaphysical theory of laws which rules out all rogue possibilities by denying that universals have *any* different nomic relations in different possible worlds. This is stronger than an account ruling out just those possibilities of the kind I have considered here. However, I shall be arguing that it is in fact the best way of restricting what laws are possible.

Chapter Two

UNIVERSALS AS POWERS

Armstrong's mechanism to ensure regularity involves universals being related by the further universal of nomic necessitation. Even if it is not, ultimately, the best way to explain regularity, *universals* seem useful entities on which to build a mechanism. The theory I intend to defend, and which I introduce in this chapter, also uses them. I call this position **Powers**. Unlike Armstrong's account, which takes laws to *be* universals, the **Powers** account takes laws to be facts which hold in virtue of the irreducibly dispositional nature of universals.

I ended the last chapter by claiming that the best way to rule out rogue possibilities was to accept a theory of laws in which all a universal's nomic relations are essential to it. I said this because **Powers**, as I hope to show, is the best explanation of law-like regularity. But I should also point out that there are intuitions motivating my advocacy of **Powers** which also suggest that a universal's nomic relations are essential to it. These intuitions can be brought out with the following example.

Imagine we have two possible worlds which are qualitatively identical up to a certain point in time, each having the *same* properties being instantiated by particulars bearing the *same* relations. In both of these worlds there is a glass of water. In one world, W, the owner of this glass goes over to his Bunsen burner and heats it. He discovers it has a boiling point of 100°C. In the other world, PW, the owner does exactly the same: he moves over to the Bunsen burner and heats the water. In fact, his movements are moment by moment exactly the same as the owner of the glass in W. Moreover, the water has exactly the same molecular composition. Despite that, the situation in PW diverges from that in W: the water there boils at 102°C.

I find this sort of divergence across worlds qualitatively identical up to some point in their history very counterintuitive. Neither am I mistakenly assuming that both worlds are governed by the same laws when I assess the example: laws were not mentioned, and there is no reason to think they have been 'smuggled' into my

deliberations. Rather, my intuition that both W and PW water must share the same boiling point is grounded in the basic intuition that an object's properties dictate how it behaves. In other words, the properties of objects, and the relations between them, fix what laws are operative. And since there can always be qualitatively identical situations obtaining in worlds with the same universals, we are quickly led to the claim that the laws involving a universal are the same across possible worlds.

This is in contrast with Armstrong's account, of course. We might put this by saying that his is a 'top-down' approach, whereas mine is a 'bottom-up'. Perhaps, in the end, all we can say is that some people have intuitions one way, others have intuitions the other, and that being the situation one cannot make too much of them. I have been careful, therefore, not to build my case for **Powers** using such bottom-up intuitions. That does not mean, however, that they have *no* weight when considering the best explanation of regularity: for myself and others who share the intuitions, all things being thereabouts equal the theory which best accommodates them is the one to adopt. It is therefore satisfying to find that the theory which is actually *better* than its rivals is a bottom-up approach.

In this chapter I continue to make my case for that conclusion. My aim in §2.1 is to present a fairly detailed outline of **Powers**, and to make clearer its main metaphysical claims I set it against other accounts of what makes statements about a thing's 'powers' true. In §2.2 I look at two more advantages **Powers** has over Armstrong's theory.

2.1 *The Main Thesis*

2.11 *What is the Ontological Ground for our Power Ascriptions?*

The *dispositions*, the *capacities* and the *powers* of both animate and inanimate objects are frequently mentioned in everyday discourse. I might tell you that John can swim, or that he suffers from hayfever, or that he has 20/20 vision. I might tell you the glass is fragile, or that the metal is magnetised, or that the sugar is soluble. All this is to ascribe dispositions, capacities and tendencies to people or things. It is to say that certain behaviour can be expected of the object in certain circumstances: to ascribe a counterfactual, or counterfactuals, to the object x of the form 'if x were to be in

circumstances C, then x would behave in way B'. But what is it about the object which makes it *true* that it will behave in a certain way in certain circumstances? That is the question I am interested in here, and I intend to look at a number of ways we might account for the truth of such ascriptions using a metaphysics of particulars and universals.

One could deny that any metaphysics is needed to explain why a given counterfactual is true of a particular object. But that doesn't seem very satisfactory, for two reasons. Firstly, lots of different objects might be such that, if they were in circumstances C, then they would behave in way B, and surely there is something about these objects, something they have in common, which explains this. We seek, in other words, a *truth-maker* for the counterfactual truth. Secondly, it is plausible to think that in ascribing a disposition, capacity or power we are not *just* saying that a certain counterfactual holds – we are saying that *there exists something in virtue of which* a certain counterfactual holds. My question, then, is this: what is that something?

There are two fundamental ways of looking at such dispositional talk. One can take Armstrong's line, where dispositional ascriptions are made true by states of affairs involving purely categorical entities. For Armstrong, 'x is soluble' is made true by the conjunction of (a) x having some categorical universal F and (b) purely categorical laws that F is part of which ensure that all objects instantiating F dissolve in water. Alternatively, one can take the statement's truth-maker to involve, in some way, one or more *non-categorical* universals. It is this second option which interests me here. How do we fit such universals into the metaphysical story?

One point to make clear, at the outset, is that I do not see the distinction between powers, dispositions and capacities as marking a distinction between kinds of entity. As I have said, ascription of a power, disposition or capacity to x is ascription (at least in part) of one or more counterfactuals. For example, the *power* of the unsaturated water to dissolve sugar placed in it is a matter of it dissolving sugar *if* sugar is placed in it. The *disposition* of the sugar to dissolve is a matter of it reacting in a certain way *if* placed in the water. And the *capacity* of the water to dissolve the sugar, and of the sugar to be so dissolved, is again a matter of certain counterfactual conditionals being true of the water and sugar. True, when we *ascribe* a disposition, we think of the object so ascribed as the *passive* participant in the reaction – i.e. the

thing being acted upon – whereas in ascribing a power we think of the object as the *active* participant – i.e. the thing acting upon something. But I take this to be a fact about language which needs no reflection in our ontology.

This means there is no need to think that three types of universal are at play here, one for each type of ascription. We can get by with one type – the non-categorical type. I will often refer to this type as 'irreducible power', or just 'power' for short, and as something with a 'dispositional nature'. But all I refer to are universals to be contrasted with categorical universals (those which are not laws) by the way they, of their intrinsic nature, and every part of their being, make certain counterfactuals true of the particulars instantiating them.

How might these non-categorical universals (let us call them powers) fit into our world of universals and particulars? Here are a few options.

> [1] Deny that laws are universals, and accept as categorical all those other universals which Armstrong would call categorical. Powers are universals which exist *as well as* these categorical universals.

That would give us a truth-maker for 'x is soluble', namely that x has a power P (i.e. the power to dissolve in water). But with powers and categorical universals completely unconnected, there is the possibility that two objects could have exactly the same categorical universals but different powers. For example, two sugar cubes exactly alike in all physical respects, with the same microstructure, might be such that only one was soluble. But surely this isn't possible. If we are going to agree with Armstrong on which universals are categorical, at least we should establish some relation between these and powers.

One could take the relation between certain categorical universals and powers to be one of *supervenience*.[1] That is, one could say that the state of affairs of something having (say) microstructural universal M determines its having the power to dissolve in water, but its having this power does not determine its having microstructural universal M. However, this does not really render unmysterious the fact that whenever something has M it has the power of solubility: it seems merely to state it. We are still left wondering what ensures the supervenience of the power on

[1] See §6.11 for discussion of this concept.

the categorical universal. What is it about *these* categorical universals which ensures that there are *these* powers?

One answer would be to amend Armstrong's conception of laws and take them to involve powers as well as categorical universals. The supervenience relation in our solubility example might then be explained by its being a law that $\__1$ having categorical universal M *nomically necessitates* $\__1$ having power of solubility. But one might prefer to do without nomic states of affairs involving N altogether. Here is one way to do that:

> [2] Accept [1], but take powers to be properties of categorical universals, not properties of particulars.[2]

Since objects do not have the same powers as their properties, the truth-maker for 'x is soluble' will involve a different power to that of [1]. The state of affairs of x having the power such that, *if the thing instantiating me were to be placed it water, it would dissolve,* is the truth-maker according to [1]. But the truth-maker according to [2] does not involve that power. The microstructural universal M has a power, and obviously *it* is not the sort of thing such that if it were placed in water, it would dissolve. Rather, the content of the power had by M will be the following: *if the thing instantiating me were to be instantiated by any x, that x would, if it were placed in water, dissolve*. The existence of the state of affairs of x having M with *that* power is enough to ensure the truth of 'x is soluble'.

[2] gives us an explanation of why everything with M is soluble. It is because M has a power which makes it true, of anything instantiating M, that if it were to be placed in water it would dissolve. In the same way, someone might try to explain the fact that everything red is coloured by claiming that *being a colour property* is a property of *being red,* and obviously if the latter is instantiated so is the former. This approach doesn't explain the supervenience of x's powers on some of the x's categorical universals, since powers are not entities instantiated by particulars. But it gives us all we need: an explanation of why every particular with a certain categorical universal has certain counterfactuals true of it, and why a certain dispositional predicate can be truly applied to it.

One might remain unconvinced by this explanation. I have the property, right now, of being thirsty. But I don't always have that property. Similarly, what prevents a universal having one power one minute, another power the next? If a universal having a power is like my being thirsty, then we have still not explained why all particulars which instantiate M are soluble.

The way to rule out universals having different powers at different times involves an argument to the best explanation. It could be the case – some time in the future – that M no longer has a certain power. But this is surely not the best explanation of what we have observed so far. All particulars with M have been soluble. So, if [2] is right, M has had the same power from the time we began observing to the present. The best explanation is then surely, on grounds of simplicity, that M having that power is *not* time-indexed, i.e. there is not a universal of M having power P at time t - t' rather than a universal of M having power P. It is the universal of M having power P which is instantiated by objects, and it is the existence of this universal which ensures that all instantiations of M instantiate P, in the same way the law N(F, G) is said to ensure that all Fs are G.[3]

This argument does nothing to show that categorical universals have the same powers *in all possible worlds* in which they are instantiated. But one might find the idea intuitive. As I have already mentioned, some people find it intuitive to think that two microphysically indistinguishable glasses of water – i.e. containing the same number of parts bearing the same relations to one another and instantiating the same universals – will *both* have the same power to boil in certain circumstances at 100°C, and have that power regardless of which world each is in.

One way to accommodate this intuition is by amending [2] so that the instantiation relation between a categorical universal and its power is a *necessary* one. We can take this in one of at least two ways: first, that the relation holds in all possible worlds containing the relata, and second, that the relation is a special, necessary one. But neither of these is appealing. The first option, given that we want to know *why* a categorical universal has its power necessarily, is distinctly

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[2] Unless explicitly stated, when I talk of particulars I mean first-order particulars. Second-order particulars are *universals*, third-order particulars are universals of universals (second-order universals), and so on.

unilluminating. The second is mysterious and ad hoc. It is mysterious in that it's hard to see how the relation is supposed to work. Is necessary instantiation supposed to be 'stronger' than contingent instantiation, ensuring that its relata are joined in all possible worlds where they are instantiated? And it is ad hoc because the 'necessary instantiation relation' has been postulated just to explain how a universal could have the same powers in all those worlds in which it exists – it doesn't have a use or motivation independent of this.

A better way to go involves dispensing with the idea that there are categorical universals and instead taking the powers of a universal to somehow be part of them. One could do this by taking universals to be *clusters* of powers. Shoemaker (1980) takes this line. An alternative is to deny that for each 'power' there is a distinct entity. Rather,

[3] A universal just *is* an entity with a dispositional nature.

According to [3], the universal is not composed of powers. The universal is, rather, a dispositional entity. And its dispositionality is what makes it bestow (often given the instantiation of certain other universals) certain powers on its object. [3] is the main claim of **Powers**.

On both the cluster view and position [3], the fact that all objects with the same universals necessarily have the same powers is rendered unmysterious. Two objects with the same universals *must* have the same powers, since universals are power-clusters, or dispositional entities, and so *cannot*, in any possible world, bestow powers other than the ones they do. To bestow other powers would be to say that the universal could somehow be other than itself, which is nonsense. A universal *just is* an entity which bestows (often in conjunction with other universals) specific powers on the particular which instantiates it. On the cluster view that entity has powers as ontological parts. According to [3], in contrast, powers are not ontological parts of universals. Of any universal, there are many counterfactual truths made true by its instantiation. But that does not mean it is composed of many entities, 'powers', one for each counterfactual truth.

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[3] Armstrong (1993b) makes essentially the same move when considering why a universal is not nomically related to different universals at different times.

Both the cluster view and [3] also avoid the charge of making an ad hoc postulation. No special, new kind of entity – such as the necessary instantiation relation – has been introduced to account for the necessity between the universals an object instantiates and its powers. Universals and powers have long been postulated to explain a wide range of phenomena. The cluster view and position [3] simply fit the two together, thereby reducing one's ontological commitments. We no longer have both categorical universals and powers (powerful universals). Any of the universals which might have been called 'categorical' are actually dispositional, and so one category of being – the categorical universal – is dispensed with.

There is at least one advantage which position [3] has compared to the cluster view: it has no need to explain the inability of each individual power to be instantiated on its own. Take the universal *having charge c*, instantiated by certain particles. According to the cluster view, this universal will have various powers as parts. But each of these is instantiated when *being charge c* is, and so the question arises: what prevents each of these being instantiated without the others? Having a charge of c will mean that a large number of counterfactuals are true of a particle: e.g. that if it were in circumstances C1, it would B1, that if it were in circumstances C2, it would B2, etc. Given that many of these counterfactuals are very similar, such that together there will be functional relations between circumstances and behaviour, to have just one of these powers instantiated by a particle, but not the others, would be very odd indeed, and as far as we know it does not occur. The problem is that the cluster view seems at a loss to say *why* it does not occur.

It might be claimed, of course, that it is a brute fact. But this seems very unsatisfying. Advocates of the cluster view might reply that explanation has its limits, and one must accept brute fact somewhere. I agree. But given that explanation has been taken this far, to refuse to take the extra small step to [3] seems both unreasonable and unmotivated.

That concludes my tour of some of the metaphysical landscape. Admittedly, not all options have been considered. But I hope to have traced a line from the acceptance of irreducible powers to the acceptance of universals as powers. This last position is the one I will be defending.

It is important to note the following before we move on. In §4.3 I shall outline, and argue against, a view which allows both contingent and necessary laws by taking universals to have dispositional natures and also be related by N to others. **Powers**, in contrast, takes universals to have a much richer dispositional nature: *all* laws involving any one universal are fixed by that universal's dispositional nature. We might put this by saying that universals have a *full* dispositional nature, rather than a *restricted* dispositional nature. Unless I indicate otherwise, when I talk of universals having a dispositional nature I should be taken as meaning this *full* dispositional nature. The same goes for the claim that universals are 'dispositional entities', 'irreducibly dispositional', and so on.

As well as this, in §4.21 I consider a view which takes universals to have both a categorical and a dispositional element. Because they have the latter, they support various counterfactuals of their nature. But that means another qualification is necessary to distinguish these universals from those of my position. I have done this by saying that according to **Powers** *every part of a universal* supports various counterfactuals.

2.12 *Further Metaphysical Details*

There are a number of places where Armstrong and I are in agreement. Firstly, we agree that not all predicates correspond to a universal, nor all universals correspond to a predicate. **Powers** is committed to a realist view of universals *at least* as sparse as Scientific Realism (and on the question of whether that view *is* Scientific Realism, see §6.1). Secondly, we agree that universals are part of the spatiotemporal world rather than a non-spatiotemporal 'Platonic realm'. Because of difficulties with Platonism, I wish to hold on to the doctrine that all existents are part of the spatiotemporal world (Armstrong calls this 'Naturalism') (1997:5).

Thirdly, we both endorse Actualism, whereby nothing exists which is not actual. Armstrong doesn't seem to think we could both agree on this, however, for he takes irreducibly dispositional universals to be incompatible with Actualism. In setting out his allegiance to Actualism, he says:

> According to this view, we should not postulate any particulars except actual particulars, nor any properties and relations (universals) save actual, or categorical, properties and relations. (1983:3)

Armstrong appears to be equating *actual* universals with *categorical* universals, and certainly, if they were the same thing then irreducible dispositions would be ruled out. But they *aren't* the same thing. Irreducibly dispositional universals are taken to be real entities which form part of the fabric of reality – in other words, *actual* entities which are dispositional in nature rather than categorical. Furthermore, there is no reason to think **Powers** is committed to the existence of possible, but non-actual, universals to which actual universals are connected. According to **Powers,** a universal, F, might be such that it bestows on the particular instantiating it the power to do B in circumstances C, where these involve uninstantiated, merely possible universals. But that does not mean, as we shall see in §2.14, that it is committed to the existence of these merely possible universals. I see no reason, therefore, why **Powers** cannot both endorse Actualism and reject *Categoricalism*.

There are also many disagreements between Armstrong and myself. First and foremost, universals are irreducibly dispositional in nature. Secondly, and because of this, the existence of F alone, rather than of N(F, G), is enough to ensure the truth of the law-statement 'All Fs must be G'. Thirdly, this irreducible dispositionality from which all laws are derived also means the laws of nature are not contingent. The following is true of any two universals, F and G: if it is a law in some possible world that all Fs are Gs, then it will be a law in any possible world in which F or G are instantiated. This is because it will be part of the dispositional nature of F that any particular instantiating it also instantiates G (and it will also be part of the dispositional nature of G that anything instantiating F also instantiates it). Essentially the same can be said when the law involved is causal. Fourthly, Armstrong makes the laws of nature both the explanation of regularity and its mechanism. **Powers**, again as a consequence of the irreducible dispositionality of universals, effects a division. Laws of nature are facts which hold in virtue of the existence of certain universals. The mechanism itself is those universals.

It may sound like **Powers** is taking universals, and not laws, to explain regularity. That would be problematic if it were true: laws of nature are paradigmatically *explanatory* postulates. Fortunately, it is not true. All we need to bear in mind is a distinction between the *thing* which is *responsible* for the regularity (i.e. the universal) and the *fact* which *explains* that regularity (i.e. the fact involving

that universal). Things do not explain. If someone asks me why my coffee spilled on the carpet, then the carpet, the edge of the table or the cup itself will not explain anything. The fact that the cup tipped over the edge of the table onto the carpet explains why there is coffee on the carpet. In short, something can only explain if it has propositional structure – such as a proposition, a fact, a state of affairs. And universals on their own do not have such a structure. But it is still just universals which ensure that the regularity obtains. It is they which are 'responsible' for the regularity.

It may be that Armstrong's ontology of states of affairs is the right one to adopt, but I shall take a neutral line on the matter in what follows. When I talk of states of affairs, I am not to be interpreted as taking these either to be ontologically basic or to have constituents which are ontologically basic. This is mainly because the regress argument motivating Armstrong's state-of-affairs ontology (§1.11) is at least questionable. Reinhardt Grossman (1992:55), for example, thinks the regress never gets off the ground. Once we have *a*, F and the exemplification relation, no further relation is needed to explain why *a*, F and the exemplification relation are conjoined. After all, if we have two boards stuck together by glue, no-one is tempted to think that more glue is needed between the first board and the glue, and between the second board and the glue, in order to explain the two boards being stuck together. Once we put the glue between the boards, we see that the boards are stuck together. And once we see *a* and F as analogous to the boards, and the exemplification relation as analogous to the glue, we do not get involved in a regress trying to explain why *a* is F.

Many details of **Powers** remain to be discussed. My primary aim in this chapter is to introduce the position in enough detail for it to be compared and contrasted with rival accounts in Chapters 3-4. Chapters 5-6 concentrate on giving a much fuller description of the connections between universals, laws and counterfactuals according to **Powers**.

2.13 *The Main Points*

Powers does not take universals to just *have* powers. Neither does it take basic universals to be a collection of entities which are powers. Rather, it endorses

No Power Clusters: it is not true that universals supporting many counterfactuals are cluster of powers, with one power supporting each counterfactual. Universals which support many counterfactuals can be single entities; and when they are not, that will be because they have other universals as parts which themselves support many counterfactuals.

Dispositional Entity: universals are *dispositional entities* – entities which, because of their intrinsic nature, are such that they (a) bestow certain powers on the particulars which instantiate them (i.e. they make certain counterfactuals true of the particular) and (b) contribute towards the bestowal of powers on particulars other than those instantiating them, through their being a non-mereological part of some structural universal. Universals have no part which is non-dispositional.

Identity Network: a universal is the universal it is in virtue of the general counterfactual claims which are made true by it. In this way, universals 'support' counterfactuals. But in *specifying* what these counterfactuals are, we involve other universals, and in specifying the counterfactuals which these other universals support, we involve yet more…. In short, we have a network of universals, each what it is in virtue of its place within that network.

Since universals are dispositional entities, we also get

No Nomic Universal: in order to explain a regularity between F-things and G-things, one does not need a nomic relation external to universals F and G which relates them. All one needs are F and G: their having a certain dispositional nature will ensure the regularity.

Laws of Nature: laws are general counterfactual facts. For example, the law that all Fs are G is the fact that *(∀x) if x were to be F, x would be G*.

Necessity: there can be no world where the laws involving particular universals are different. If it is a law that Fs cause Gs in this world, it is a law that Fs cause Gs in any world containing an instance of F or G.

I also accept Armstrong's claim

Immanence: Universals are part of the spatiotemporal world.

as well as a realism about universals which is *at least* as sparse as Scientific Realism.

These claims comprise the core of the **Powers** position, and will be the point of departure for numerous other claims about laws and regularity to be made in future chapters.

2.14 *On Nomic Links between Existent and Non-Existent Universals*

My account involves both *Immanence* and *Identity Network*. But it might be thought that there is a tension between these. If the identity of a universal is a matter of where it sits in a Nomic Network – a network of laws – and so in its nomic links to *all* other universals which are part of that network, what are we to say of a world where some of these universals are never instantiated? Such a world seems quite possible. But now consider a universal in such a world. It is what it is in virtue of its nomic links to all other universals in the network. But then how can it exist in such an impoverished world – a world where it seems to lack some nomic links, given the non-instantiation of certain universals of the network? Isn't the only way to keep both *Immanence* and *Identity Network* to embrace the implausible claim that necessarily all possible universals are at some point instantiated, and so all possible worlds with so much as one universal in common have *all* their universals in common?

The answer to this last question, fortunately, is 'no'. Look, first, at why a universal must be nomically linked to the same universals in all possible worlds. Consider what happens if we deny it and assume instead that F's intrinsic nature is exhausted by its nomic connections to all *actual* universals. As already noted, it seems plausible to think there are possible worlds containing more universals, or less universals, than there are in the actual world. Let us focus on a possible world where F is instantiated along with universals uninstantiated in the actual world. F will be nomically linked to those universals in this possible world, since the Nomic Network of F will involve all universals in that world. But how can F have links to different universals in different possible worlds? The network a universal is part of is determined by its dispositional nature; to have nomic links to different universals in different worlds F would have to be a different dispositional entity in different possible worlds. And this can't be. 'F' picks out the same dispositional entity, F, in all possible worlds, and so, contrary to our assumption, F cannot have its nature exhausted by its nomic links to all actual universals. Rather, F has its nature exhausted by its nomic links to all *nomically possible* universals.

The reason all nomically possible universals do not need to exist for F to have this nature lies with the idea of universals being dispositional entities. F *can* be nomically linked to non-existent universals. All that being nomically linked amounts to here is that *if* the universals were to exist, i.e. be instantiated, and particulars with them related in a certain way to particulars with F, *then* certain behaviour would ensue. And such counterfactuals will be true in virtue of the dispositional nature of F.

One might object that a 'nomic link' is a relation, and that relations cannot obtain between existent and non-existent relata. But even if this is true – and I question the claim in §6.221 – one can rephrase what has been said to avoid commitment to relations between existent and non-existent relata. Instead of saying that F is nomically linked to (non-existent) G, one could say that F supports general counterfactuals which involve G, or that F supports general counterfactuals involving universals which themselves support general counterfactuals which involve G, and so on. To say that F is nomically linked, or nomically related, or nomically connected, to G then becomes a matter of our being able to trace a line from the general counterfactuals which F supports through to G. If one is against talk of relations

obtaining between the existent and non-existent, then take all my talk of nomic relations here, and in the future, as a convenient shorthand:

> **'F is *nomically related / linked / connected* to G'** is true if and only if (1) a line can be traced from F to G so that either (a) F and G are both involved in at least one general counterfactual that F supports or (b) a line of general counterfactuals eventually results in a counterfactual which involves G (for example, we first have counterfactual CF1 supported by F, then counterfactual CF2 supported by a universal in CF1, then counterfactual CF3 supported by a universal in CF2, and CF3 involves G); or (2) a line can be traced from G to F in a similar fashion.

Armstrong could accept a variation of this, where F and G are nomically linked if there is a line which can be traced through true general counterfactuals, or through the entities which according to him support such counterfactuals, the laws of nature. For instance, if there is the law N(F&U, G), N(G&H, I) and N(J, I), then there is a nomic link between U and F, G, H, I and J; and if those are laws, there are general counterfactual facts *(∀x) if x were to be F&U, x would be G*, *(∀x) if x were to be G&H, x would be I* and *(∀x) if x were to be J, x would be I*, and thus there is also a nomic link from U to J. But since Armstrong's laws do not contain non-existent universals, the only way he would have nomic links between existent and non-existent universals is if he accepted certain laws involving *determinable* universals; these would support various general counterfactuals about determinates, including those which are uninstantiated. More on this in §2.22 and §6.14.

For there to be a 'Nomic Network', at a minimum, is for there to be laws of nature, and for these to be interlinked by common elements. Armstrong will therefore agree that there is a Nomic Network. But there is a crucial difference between Armstrong's network and the **Powers** network. For Armstrong, what network F is part of depends, in part, on contingent facts about what laws it is part of. In other possible worlds, F will be part of different laws, and so different networks. For **Powers**, however, F's network is essential to it: it has to belong to that network (i.e. be both nomically linked to those universals and in those specific ways), and it can belong to no other network. This is because the the network it is part of springs from its very nature.

2.15 *The Concept of Lawhood*

Any theory of laws will need to accommodate those key claims which make up our concept of lawhood. The claims I have in mind are the following:

(a) Laws have modal force.

(b) Laws support counterfactuals.

(c) Laws enable prediction, and are confirmed empirically.

(d) Laws explain certain regularities.

The truth of each of these seems to follow very naturally from **Powers**. Take (a). Laws have *modal force* because they hold in virtue of the dispositional nature of universals. Given this dispositional nature, it is a fact that if certain universals are instantiated, certain other universals *must* also be.

Take (b). Laws support counterfactuals because if it is a law that all Fs are G, for example, and a law because of the dispositional nature of F and G, then various counterfactual statements are also true about particular objects and what would happen if they were to be F. The law that all Fs are G, according to **Powers**, is the *general* counterfactual fact that *(∀x) if x were to be F, then x would be G*. And from that fact a great number of *particular* counterfactual facts are entailed.

Now take (c). If we know that it is a law that all Fs must be G, we can *predict* that the next F-thing will be G. This is because F and G are universals with stable powers, a stability which is itself explained by F and G's irreducible dispositionality. The law is *confirmed* – in the sense that its truth is made that bit more likely – every time we observe an F which is a G. One may reply here that what is really confirmed is the *regularity* that all Fs are G, not the law. But a regularity of this sort would be a huge 'cosmic coincidence', crying out for an explanation. That is why the more Fs we observe (in varied circumstances) which are G, the more likely the hypothesis that all Fs *must* be G becomes.

I have already indicated how **Powers** accommodates (d). The law that all Fs must be G explains the regularity that all Fs are G because the law is no more than a *fact* which holds in virtue of the dispositional nature of F and G. If it is a fact that all Fs must be G, then clearly we understand why there is the regularity that all Fs are G.

It is the law – rather than F itself – which *explains* the regularity, because to give an explanation is to *reply* to a 'why' or a 'how' question, and therefore to offer something with propositional form.

There is a fifth criterion for lawhood that is arguably less central, but which I think is worth consideration here. It is this:

(e) Laws are compatible with the possibility of 'miracles'.

Miracles, I take it, are the work of God. A non-believer may think that (e) is false and so does not have to be accommodated, but ideally **Powers** will be acceptable to both the theist and nontheist. At first glance, however, it seems that (e) cannot be squared with **Powers**. Universals are dispositional entities, and laws hold in virtue of these. This suggests that in order for a law to be broken, the dispositional nature of some universals must change, at least momentarily. And that can't happen. If it is a law that *(∀x) if x were to instantiate F, it would instantiate G*, then for that law to be broken, it must be the case, at the moment of breaking, that F no longer has a nature such that if it were instantiated by any x, that x would also instantiate G. But F cannot have anything but the dispositional nature it does have. Therefore laws which hold in virtue of that nature cannot change, or be 'broken'. God could not make the next F-thing not be G: anything that is not G is not an F-thing.

Fortunately, **Powers** has a way out of this problem. It has two stages. The first of these is to bring God, or at least His will, within the Nomic Network. Say God wills the next F-thing not to be G. This willing is itself a property of God, so can be taken as a (non-physical) universal. It is then open for us to revise what the actual dispositional nature of F consists of. It is not simply that if it were instantiated by any x, that x would also instantiate G; it is more complicated than that: if it were instantiated by any x, that x would also instantiate G *unless* at that moment there is an instantiation of willing-otherwise. This is not just any willing-otherwise: my willing otherwise will not do. The willing-otherwise will have to be instantiated by something with those attributes we take God to have. The law-statement 'All Fs must be G' can then be taken as implicitly including a ceteris paribus clause allowing for such an intervention.

The second stage follows the realisation that miracles cannot be defined as the *breaking* of laws, since all I have shown so far is how bringing the properties of God

within the Nomic Network *changes* what the laws are. My suggestion is that we understand the term 'miracle' as meaning something which occurs when God simply *intervenes* to change the way things would otherwise have been. If God had not intervened, the next F-thing would have been G. But given that He did, it wasn't a G. That, I think, is definition enough for 'miracles' as they are catalogued in religious texts.

There may be other claims which people have taken as criteria for lawhood. But those I have looked at are arguably the most central, and by showing **Powers** is able to accommodate them I have added to its plausibility as a theory of laws.

2.16 *A Note on Ontological Commitment*

I have talked, and will talk a lot more, about laws being general counterfactual facts. But I should make clear what I take myself to be saying when I make this claim, for I do not want to be seen as multiplying entities beyond necessity.

Philosophers' talk of facts can be divided into two types. Sometimes facts are equated with states of affairs in the world, whose constituents are universals being instantiated by particulars. But at other times, talk of facts is not intended to imply such ontological commitment. To say that 'it is a fact that *a* is F', on this second construal of facts, commits us only to maintaining that *a* is F and that '*a* is F' is true. It does not commit us to maintaining that there is an entity which is that fact.

It is this second kind of talk that I am employing when I talk of counterfactual facts, and which enables me to avoid commitment to counterfactual states of affairs. When I say that laws are general counterfactual facts, I do not mean that laws are states of affairs. Armstrong takes laws to be (second-order) states of affairs: real items in the world. But **Powers** does not take this line. There are universals, these are dispositional entities, and it is this dispositionality which ensures certain regularities. There are not, in addition, *entities* which are the laws and which also ensure regularities.

I have said that laws are facts which hold in virtue of instantiated universals. But in saying this, I mean only the following: that there are possible *law-statements* made true by instantiated universals. And these law-statements have general counterfactual form, or are equivalent in meaning to statements with such form.

To say it is a law that all Fs are G, then, is to say that there is a possible law-statement 'All Fs must be G' which is true. To say that laws are general counterfactual facts is to say that what each possible law-statement states can also be stated using a universally quantified counterfactual. In this way I have, in my ontology, states of affairs and the universals and particulars which make up states of affairs. I also have statements. Whatever they are, it is clear that they exist.[4] And whatever possibility consists in, it is clear that there are possibilities, and possible statements. But I avoid commitment to extra entities, counterfactual states of affairs, which depend on universals for their existence.

2.2 *Benefits of* ***Powers*** *compared to Armstrong's account*

Enough has been said about **Powers** to allow some of its advantages over other accounts to be understood. In this section I will focus on its advantages over Armstrong's account. It is obvious how **Powers** avoids commitment to rogue possibilities: universals have the same nomic relations in all possible worlds. But here are two other advantages it has over Armstrong's account.

2.21 *Brute Fact & The Explanation of Regularity*

To explain regularity, **Powers** invokes laws of nature. To explain these, it invokes universals and their dispositional natures. To explain why universals have the dispositional natures they do, it can point to the fact that their dispositional natures make them the universals they are. To explain why their dispositional natures make them the universals they are, one can only point to the fact that F, say, just *is* dispositional entity P, and so for F to have the dispositional nature it has is a consequence of what it is for there to be an identity between F and P. And to ask at this point 'why are F and P identical?' is to ask a question for which no answer seems forthcoming or indeed required. To make a universal and its dispositionality a matter

[4] I pass conveniently over the question of how statements are to be construed. For example, I would hope not to have to endorse the existence of *propositions* in order to account for the truth of these law-statements. A fully fleshed-out Naturalism will have to deal with this problem, but as my aim here is more limited, I think I can – with Armstrong (1997:131) – leave the details for another time.

of *identity* is to take explanation of regularity to a point where we require no more information to understand why. The regress of explanation that was embarked upon is halted.

Armstrong has to accept brute fact at a less satisfying point. To explain regularity, he invokes laws of nature. These are complex universals involving universals related by N. But take a specific law, such as N (F, G). Can he explain why the universals F and G are related by N? Unfortunately not. He can't say that the intrinsic nature of F and G is responsible, since universals are categorical entities incapable of ensuring they are nomically related to others, even contingently. And he certainly can't appeal to a further relation, a triadic one, which relates F, G, and N; or a couple of further dyadic relations which join F to N and N to G. For that would then invite the response 'why are the original universals *plus* the further relational universals connected?' and one would be involved in an infinite vicious regress. Infinite because there is no place at which a further why-question of the same form could not be asked. And vicious because at no point in this series of why-questions will we acquire what we want – a satisfactory answer as to why F and G are related by N.

I think it's reasonable to expect an explanation of why N relates F and G in this world. I also think it's intuitively satisfying to be able to point to the universals F and G when looking for an explanation. With F and G as categorical entities, however, it's hard to see how pointing to them could help explain the law N(F, G).

Accepting brute fact with the law, however, does not damage Armstrong's position as much as one would wish. Certainly, I think the following principle of theory construction holds: all else being equal, the theory about phenomena P that explains the most before admitting bruteness is to be preferred. But some brute facts are more damaging than others. The most damaging are those concerning *regularities*. A regularity is a *molecular* fact, to use Armstrong's terminology. Take the regularity that all Fs are G. This is a set of atomic states of affairs such as *a* is F and G, *b* is F and G and so on, coupled with the fact that the particulars in the set are all the Fs there are. Now the fact that *all* these Fs are also G is something which intuitively needs an explanation. But the facts Armstrong is taking as brute – his laws – are not of that kind. They are *atomic*. They say that two things – F and G – are related by the universal N. And it does not seem quite so important that we have an

explanation of why such an atomic states of affairs obtains. Still, not being quite so important is not the same as being of no importance at all.

Armstrong cannot brush this issue aside by saying that admitting brute fact here is just what one would expect if the laws were contingent. Most contingent facts have an explanation. It is contingent that I am typing today; in some possible world, we assume, I did something else instead. But there is still a reason why I am typing today: I felt compelled by the looming deadline to get on with my work. Contingent laws are different to facts such as these. There is no point in time at which a law comes to govern, so no event or state of affairs prior to that time which can be used to explain it. But the unavailability of non-eternal, temporally located facts does not mean that there will be no way of explaining why F and G are N-related. If laws are temporally located, and simply obtain eternally, then perhaps other eternal facts can explain them.

Armstrong, however, is short on options. He can't invoke further relations, since that begins a regress. He wouldn't be happy, I presume, to invoke God's will as an explanation. And a third option, whereby something about F and G ensures they are N-related, is unavailable to him because it would give universals a dispositional nature (contra *Categoricalism*) and so make at least some nomic relations between universals necessary (contra *Contingency*). No other options seem forthcoming, and so Armstrong has to accept brute fact with the law. But his acceptance of bruteness here is not forced on him by the contingency of laws: there is, after all, always God's will. Therefore, it is not begging the question to hold the point at which bruteness is accepted against a Contingency theory of laws.

2.22 *Truth-makers for Uninstantiated Laws*

We come now to what *is* a significant advantage for **Powers** over Armstrong's position. Tooley (1977:669, 685) raises two possible kinds of situation where we would be inclined to say a law is operative. The difficulty for Armstrong is that there are no instances of this law, and given *Immanence* and *Categoricalism* all laws must be instantiated.

Here are the examples Armstrong himself presents (1983:117-118) to illustrate these two kinds of situation:

First, imagine a world containing just ten types of fundamental particle. There are 55 laws governing the behaviour of pairs of particles (including pairs of the same type). In this world, 54 of these laws are known. But there is such a lack of unity to the laws that it is impossible to work out the remaining one, and so the 55th law, about the interaction of B-type and J-type particles, isn't known. Furthermore, it isn't that there are such interactions but that they haven't been observed: as it happens, no B-type particle has ever been, or ever will be, close enough to a J-type particle to interact with it. Still, in such a situation we'd think there was a law governing such interactions, even if we had no idea what it was. Call this example *Fundamental Particle*.

Second, suppose we have a sequence of complex structural properties (P, Q, R...) which form a scale of some sort. The conjunction of P, Q and R, instantiated by a particular, leads to the instantiation of a simple emergent property E. The conjunction of Q, R and S leads to the instantiation of simple emergent property F, and the conjunction of R, S and T to simple emergent property G. We would have good reason, then, to believe that the conjunction of S, T and U would lead to the instantiation of another simple emergent property. But the conjunction of S, T and U is never instantiated. Therefore, no law is instantiated. But we think there is a fact of the matter about what would be produced if S, T and U were conjoined – a fact presumably underpinned by a law of nature. Call this example *Emergent Property*.

There are two ways for Armstrong to respond. Firstly, he can try and construe the 'law' as not, in fact, a law, but a counterfactual fact about what the antecedent of this putative law would be nomically related to *if* it were to exist, a counterfactual fact which holds in virtue of certain instantiated laws. Secondly, he can question the intuitions leading us to think these laws obtain. In §2.221 and §2.222 I show that neither strategy is successful.

Tooley takes these kinds of example to show both the inadequacy of Armstrong's account *and* the need for at least some uninstantiated universals. I take them to show the first part, but not the second. **Powers** has the resources to find truth-makers for uninstantiated laws without accepting the existence of uninstantiated universals. Take *Emergent Property*. S&T&U is not instantiated, but its constituents are; and it is part of the dispositional nature of S that particulars instantiating both it and T and U produce an instantiation of the simple emergent property F. This is

enough, according to **Powers**, for the law governing S&T&U to be operative. Or take *Fundamental Particle*. There is no universal of B being distance D apart from J (i.e. the distance required to interact); but there are the universals B and J, as well as the relational spatial universal needed for both types of particle to be interacting. All one needs for the B-J interaction law to hold, however, is one of the particle-type universals. It is part of the nature of universal B, for example, that when instantiated by a particular bearing the spatial relation R to a particular with universal J, that whole states of affairs token necessitates behaviour of type Y.

2.221 *Armstrong and Fundamental Particle*

Armstrong often puts matters in terms of truth and truth-makers. There seems to be a general counterfactual fact in the *Fundamental Particle* case: a fact about what would happen if any x were B and in a certain proximity to any y that is J. Facts are not true or false; facts obtain. However, there is, or could be, a *statement* of that fact, and these sorts of things are either true or false. So what makes a token of one of these, corresponding to our counterfactual fact, true?

The truth-maker cannot be a law governing B-type and J-type particles. The antecedent universal of that law would need to be something like $\__1$ *is a B-type particle* & $\__1$ *is related by R to* $\__2$ & $\__2$ *is a J-type particle*, and by hypothesis this is never instantiated, and so cannot have the external nomic relation, N, to a particular consequent universal. Neither can the truth-maker be an instantiated *higher-order* law. These types of particles behave in quite idiosyncratic ways; there just seems to be no higher order law that all (or even some) types of particle obey and from which the behaviour of B-type and J-type particles is ensured.

Armstrong, however, thinks all is not lost:

> May we not say that if the B-R-J universal existed, as it does not, then there would be a (necessitating or probabilifying) relation holding between it and some further universal? What would be the truth-makers for this counterfactual? Well, there do exist B-type particles, and J-type particles. Furthermore, the relation R is, presumably, elsewhere instantiated. The unknown consequent may be uninstantiated. But surely at least the constituent universals of the consequent universal will be instantiated? So there will exist a class of universals to act as truth-makers. (1983:119-120)

I think this 'Tooley-without-tears' solution, as Armstrong calls it, is no solution at all. How can the universals which would have been constituents of a B-J

interaction law, *if it had existed*, act as the truth-makers for anything if these universals are purely non-dispositional entities? Because they have a non-dispositional nature nothing about the constituent universals *themselves* can fix what would have happened if the antecedent universal had been instantiated. To say otherwise not only clashes with *Categoricalism*, it also lets in a curious overdetermination. Does Armstrong really want to say that both laws *and* their constituents are responsible for the way particulars of various kinds behave?

An alternative strategy would be to say that since all the constituent universals are instantiated, it is open to us to hypothesise, as an *inference to the best explanation*, that the B-J interaction law *does* obtain. But that won't do either. Universals have to be instantiated to exist, and laws (for Armstrong) are universals. So even if all the constituents of the law are instantiated, the law is not instantiated unless all those constituents have been part of that state of affairs which is the law (1983:119-120).

There initially appears some room to manoeuvre here. It would not be enough to count a universal as existing just as long as its constituents are instantiated. That would let in the B-J interaction law, but it would also let in countless others: many combinations of universals can be placed into the form N(F, G), and the majority of these we would not want to count as laws. But couldn't one say that only those universals needed to explain regularity and satisfy our search for truth-makers should be admitted? Some uninstantiated universals – laws – would then exist, but at least their constituent universals would all be instantiated.

The trouble with this move is that it requires the acceptance of Platonism. We are lured into thinking that this is not the case by the requirement that all constituents be instantiated. But the B-J interaction law isn't instantiated. Neither is it the sum of its parts, existing where those parts do: a law is a state of affairs, not a mereological whole. Where, then, can the B-J interaction law 'be'? The only possible home is the Platonic realm.

2.222 *Armstrong and Emergent Property*

Armstrong is not going to find the truth-maker for a determinate *Emergent Property* counterfactual, either. We have S, T and U instantiated separately. But the conjunction S&T&U is never instantiated, and so neither is the simple emergent

property (let us call it F). Being simple, F has no instantiated constituents. So even if Armstrong could use instantiated universals as the truth-maker for 'if any x were to be S&T&U, then x would be F', which we have already established he can't, it would not do him any good here since not all the appropriate universals or constituents thereof exist. And because F is a simple universal, there will be no higher-order law making the aforementioned counterfactual true.

Instead, Armstrong tries a different strategy (and one he could also employ against *Fundamental Particle*): namely, try and cast doubt on our intuition that there is a *definite* truth about what would result given S&T&U. There *are* laws, he thinks, to act as truth-makers. It just happens that these laws do not determine a particular, determinate outcome, and so they are only truth-makers for indeterminate counterfactual truths. To the extent that we think there is a determinate fact of the matter in these cases, our intuitions are simply misguided.

The laws which Armstrong uses as truth-makers are higher-order. For *Fundamental Particle*, it will be a law governing interactions between two particles that, given two types of interaction, whatever first-order law governs the first will be quite different in form from the law governing the second. For *Emergent Property*, it is the law that, from a range of properties, objects instantiating certain conjunctions of these have, as a matter of law, certain different simple emergent properties. These are very general laws involving universals such as *being a simple emergent property* and *being a conjunctive property*; and the fact that known laws lead us to think there is an uninstantiated B-J law, or emergent property law, indicates that if very general laws of this form are allowed, they are indeed instantiated in the worlds being considered. However, these laws cannot fix which simple property will emerge given the instantiation of S&T&U, nor exactly how the B-type and J-type particles will interact. They only ensure that *some* simple emergent property will be instantiated or that the types of particles will behave in *some* way which is 'quite different' from other types of particle interaction. They are not, in other words, the truth-makers for determinate counterfactual truths.

The case for indeterminacy proceeds as follows: give an example where we would be inclined to admit it, and argue that if we admit it there we have no reason not to admit it with the Tooley examples.

Suppose we have an irreducibly probabilistic law such that if P, there is a 50% probability of Q occurring and a 50% chance of R occurring. Now imagine a particular, *a*, at time t. It does not have P at t, but it could have had. We could, it seems, have truly said of *a* that if it had been P at t, either Q or R would have occurred. And because of the law's irreducibility, we wouldn't have been justified in claiming that Q or R in particular would have occurred. But someone might nevertheless claim that there *is* a fact of the matter about which of Q or R would have occurred even if the law is irreducibly probabilistic; we are just in the unfortunate position of not knowing which one that would be.

Armstrong says, and I agree with him, that in this situation we would be inclined to say that no, there isn't a fact of the matter. It is neither true that if *a* had been P at t, Q would have occurred, or that if *a* had been P at t, R would have occurred. But he also thinks, and here I disagree, that we should view Tooley's examples in the same way. Just as there is no determinate fact of the matter about what would have occurred had *a* been P at t, *even with a law governing such occurrences,* so there is no determinate fact of the matter about how B-type and J-type particles would have behaved, or which simple property would have emerged, *although there is some higher-order law governing what would happen.* Just as the probabilistic law is enough to ensure that if *a* had been P at t it would have been either Q or R, but not enough to ensure it would be one in particular, so the higher-order laws I have mentioned are enough to ensure there is *some* sort of B-J interaction, or that *some* simple property emerges, but not enough to ensure there is any way *in particular* the particles would interact or that any *particular* property would have emerged.

Armstrong accepts that we do intuitively take there to be a *definite* way B-type and J-type particles would interact, and a *definite* simple property which would emerge (1983:124). We are inclined to accept indeterminacy in the probabilistic case, but not in the Tooley cases. He therefore needs to give us a reason for doubting the intuition. It is this: he claims our intuition is linked to the Platonic idea that particulars are contingent entities but universals are necessary. Given the Platonic idea, all possible universals exist and have definite nomic relations between them. The B-J interaction universal, for example, will exist. And it will have a nomic relation to some possible universal of specific behaviour of B-type and J-type

particles in interaction. But this Platonic idea is suspect, and, if our intuition regarding the Tooley examples is rooted in it, the intuition is also suspect.

I agree that this picture of universals as necessary beings is suspect. But it is far from clear to me that it grounds our intuition. For one thing, the intuition being considered is possessed by philosopher and non-philosopher alike, and it seems questionable whether many of the latter have thoughts, either consciously or subconsciously, about the nature of properties. For another, it seems far more likely that the intuition is grounded by the simple conviction that *regular behaviour is governed by determinate law*. Perhaps there is another influence: the fact that all *other* particle interactions, or instantiations of conjunctive properties from a particular scale, are governed by determinate laws. Surely if *most* universals of a particular kind (e.g. conjunctions of properties forming a certain scale, possible two-particle interaction universals) are governed by determinate laws, then we have reason to think that *all* are. Armstrong can point to the instantiated/uninstantiated distinction to argue against determinate laws in all cases. But that does not cast doubt on our intuitions in a non-question-begging way.

In conclusion: Armstrong cannot accommodate *Fundamental Particle* and *Emergent Property*. Nor has he succeeded in casting doubt on our intuitions about such cases.

2.3 *Other Contingency Theories of Law*

I have given reasons why **Powers** should be preferred to Armstrong's account. But for **Powers** to be the best explanation of law-like regularity, it needs to be preferable to *all* Contingency theories of law, and of course I have not shown this. Indeed, I do not have the space to show this. My strategy has been to take the *best* Contingency theory, show that **Powers** is a better explanation of regularity, and by showing this, I have argued for the claim that **Powers** is a better explanation than all Contingency theories.

To make this claim even more plausible, however, let me very briefly outline three key rival Contingency theories and indicate why I think they fare no better than

Armstrong's account. These are the accounts of Carroll (1987), Tooley (1977) and Mellor (1990).

Carroll takes there to be laws about what *must* happen in certain circumstances, and he takes those laws to be real features of the world. But he thinks they cannot be analysed further. This is to say that questions such as 'why must all Fs be G?', where it is a law that all Fs are G, have no answer. I think a theory of laws should be able to answer such questions, and to that extent it leaves laws excessively mysterious entities.

Tooley answers such questions the same way as Armstrong: by taking laws to be relations between universals. But Tooley – and Dretske (1977) – accepts a Platonic Realism about universals, albeit one which does not accept all logically possible universals. And there are well-known reasons for avoiding Platonism. Put briefly, there is the problem of how universals (or indeed anything) can exist outside of space and time, and the question of how we can have *epistemic access* to these non-spatiotemporal entities occupying a 'Platonic realm'. I think these are good reasons for avoiding Platonism.

Mellor also accepts uninstantiated universals, and therefore Platonism. His account uses both universals and objective chances: for it to be a law that all Fs are G, for example, there will not be a relation N between F and G, but an objective chance universal, *having a 100% chance of being a G*, which all particulars that are F instantiate. But this account cannot say why all particulars with F also have the objective chance universal (and so also G) if the chance universal is a property of particulars, and I think this is a regularity which needs explaining.

Two of the points I raised against Armstrong transfer easily to these accounts. All three seem to be subject to the problem of rogue possibilities, and to accept brute fact at an earlier point than **Powers**. By accepting Platonism the second and third account may have no problem with the *Fundamental Particle* and *Emergent Property* examples, but Platonism is far too high a price to pay, I think, given that there is an alternative – **Powers** – which solves the problem without claiming that universals are non-spatiotemporal entities existing in some non-spatiotemporal realm. If none of these accounts bring any major benefits to outweigh these disadvantages – and I have

been unable to find any – I think we can conclude that, in making my case against Armstrong, I have made a case against Contingency theories in general.

2.4 *Conclusion*

I have tried to do two things in this chapter. First, introduce **Powers**, the position regarding laws that I wish to defend. Second, highlight two of its advantages over Armstrong's influential account. I argued that **Powers** accepts brute fact later, and at a more intuitively satisfying point; and that it is able to accommodate various possible uninstantiated laws which Armstrong's account cannot.

These are advantages **Powers** has over the Regularity theory as well. The Regularity theory has to take the highest-level regularities (and so certain laws) as brute. And Tooley-type examples are also problematic for it. On the most naive Regularity theory, there is no regularity to be identified as the law. And even a more sophisticated version, such as that of Lewis (1973:72-77), which could let in uninstantiated laws in order to get the systematisation of world facts with the best combination of strength and simplicity, would be unable to accommodate either *Fundamental Particle* (since the law is 'quite idiosyncratic', and so would not be part of the simplest, strongest set of laws) or *Emergent Property* (since there is no difference to strength and simplicity whether one uninstantiated emergent property or another is the consequent of the S&T&U law).

Having argued that **Powers** is better than Contingency theories in certain important respects, the next two chapters compare it to a number of other key accounts. By the end of Chapter 4 I will have looked at a representative sample of positions on the metaphysics of laws and argued that **Powers** has distinct advantages over them all.

Chapter Three

SIMILAR NECESSITARIAN ACCOUNTS

Armstrong is a Contingency theorist. He believes that if it is a law that all Fs are G, there are possible worlds where F exists and the law does not obtain. The Necessitarian denies this. If it is a law of nature that all Fs are G, then in every possible world containing F that law obtains.[1] **Powers** is therefore a Necessitarian position. But there is much scope for disagreement amongst advocates of this broad claim, and this chapter looks at the positions of two other Necessitarian philosophers, Shoemaker and Swoyer. Like **Powers**, both take, or have taken, properties or universals to be irreducibly dispositional entities. But there are differences of metaphysical detail and of motivation which will become apparent in due course.

3.1 *Shoemaker's Causal Theory*

3.11 *Basic Outline*

Shoemaker makes no mention of whether he takes properties to be universals. I shall assume here that he does. But his characterisation of properties is very similar to my characterisation of universals. He says:

> Just as powers can be thought of as functions from circumstances to causal effects, so the properties on which powers depend can be thought of as functions from properties to powers (or, better, as functions from sets of properties to sets of powers). One might even say that properties are second-order powers: they are powers to produce first-order powers (powers to produce certain sorts of events) if combined with certain other properties. But the formulation I shall mainly employ is this: what makes a property the property it is, what determines its identity, is its potential for contributing to the causal powers of the things that have it. (1980:212)

Shoemaker thinks the powers of properties are *conditional*. This idea is made clear by his example of a knife. A knife has the power to cut through certain objects in

[1] One might be tempted to state it thus: if it is a law that all Fs are G in some possible world, then there are no worlds containing non-G Fs. This would be a mistake, however. If the law that all Fs are G is defeasible, there will be some worlds where the law holds and yet where there are non-G Fs.

virtue of the properties it instantiates, such as *being knife-shaped*, *being knife-sized* and *being made of steel*. But none of these is sufficient to bestow on the object instantiating it the power to cut. *Being knife-shaped* is useful, but a knife-shaped piece of marzipan – as the decoration on a survivalist's birthday cake – will not cut anything. *Being made of steel* is not enough either, since plenty of steel objects, for instance a steel spoon, do not cut. And lots of things instantiate *being knife-sized* without having the power to cut: the bottle of water beside me, to name just one. But objects which instantiate *all* of these properties do have the power to cut. Therefore, each property has the conditional power such that if it were to be instantiated, along with the other two properties, by any x, then x would have the power to cut.

He should not, by his characterisation of properties as clusters of conditional powers, be taken as ruling out properties bestowing some powers unconditionally. Some properties of fundamental particles, such as *having charge c* or *having mass m*, would seem to be like this. If particle x has charge c, for example, one may think that alone ensures that x behaves in certain ways in certain circumstances (and so bestows certain powers on x); the charge property, in other words, does not only bestow those powers *on condition that* x has certain other properties. One might put this by saying that properties are clusters of unconditional powers *and* conditional powers. Shoemaker instead says that he will "count powers *simpliciter* as a special case of conditional powers" (1980:213). Presumably the charge property then still counts as bestowing conditional powers, but the condition is one which is satisfied if the object with the charge property has *any* set of properties.

Shoemaker once took the identity of a property, F, to be determined only by *forward-looking* causal features: i.e. by what causal powers F bestows on x in conjunction with certain other properties. But he later realised that *backward-looking* causal features – i.e. what causes F to be instantiated by x – would have to be part of F's identity conditions as well (1980:232). This revision was made in response to an example by Richard Boyd where we have an imagined world in which X is a compound of A and B, Y a compound of C and D, and yet both X and Y behave exactly alike in all possible circumstances. This would mean, if one only counted forward-looking causal features, that the properties *being made of X* and *being made of Y* are identical. Making both forward-looking and backward-looking features important to a property's identity enables Shoemaker to avoid this unpalatable

consequence. The instantiation of *being made of X* is caused by an event bringing together A and B, whereas the instantiation of *being made of Y* is caused by an event bringing together C and D: therefore they are not identical properties.

At various places Shoemaker seems to be claiming an identity between properties and clusters of (both forward-looking and backward-looking) conditional powers. In the last quote, for example, he says at one point "properties *are* second-order powers" (my italics). But Shoemaker now explicitly denies an identity. In his only other paper on this subject, he claims:

> I would want to reject the formulation of the causal theory which says that a property *is* a cluster of conditional powers... The formulation of the causal theory I now favour is one that is in no way reductionist... It says that the causal features of a property, both forward-looking and backward-looking, are essential to it. And it says that properties having the same causal features are identical. (1998:64)

Shoemaker has swapped talk of properties being *identical* to clusters of conditional powers for talk of a property's conditional powers being *essential* to it. The idea is that a property has certain powers 'essentially' if and only if it has those powers in all possible worlds in which it is instantiated. This allows him to remain neutral on the question of whether powers are irreducible or reducible to nomic relations between categorical properties. As he says:

> I should observe that there is nothing to prevent a proponent of this view from saying that ordinary properties are not themselves dispositions, but are instead the 'categorical bases', the having of which bestows on things the dispositions they have. (1998:65)

But one cannot help wondering why, given that he wants to remain neutral on the matter of what it is for a property to have conditional powers essentially, he is so keen to deny *identity* between properties and clusters of conditional powers. His only problem with such an identity appears to be that the reduction of properties to such clusters is 'a cheat':

> We must make use of the notion of a property in explaining the notion of a conditional power, so there is no question here of reducing properties to some more fundamental sort of entity. (1998:64)

But this seems to me no argument against the *ontological* identity between properties and clusters of conditional powers. Certainly I need to refer to properties in cashing out the notion of a conditional power. A conditional power of property F is that, given the instantiation of certain other *properties* by any x, x has the power, in circumstances C (themselves ultimately cashed out in terms of states of affairs – which have *properties* as constituents), to B (again states of affairs). But that only establishes, if anything, that we must *talk* of properties when *explaining* what it is to be a conditional power. Establishing that properties aren't clusters of conditional powers is surely a completely different matter.

We now have the basics of Shoemaker's account. He takes a property, F, to bestow various conditional powers on the objects instantiating it; and F is such that there is no possible world where it does not bestow those conditional powers (hence F bestowing those powers is essential to it). From this we get Necessitarianism, at least about causal laws.

3.12 *Motivation*

Shoemaker's main argument for his account focuses on various sceptical worries. If the causal potentialities of a property are logically independent of it, he says, then several situations appear to be possible, each of which affects our knowledge of what properties something has. Such independence lets in the possibility that:

> (a) some properties may not bestow onto a particular, either alone or in conjunction with others, *any* causal powers.
>
> (b) one could have distinct properties which nevertheless bestow the same conditional powers.
>
> (c) the causal powers a property bestows could *change* over time.

Shoemaker thinks the epistemological consequences of (a)-(c), and so of denying that a property's powers are essential to its identity, are dramatic. If (a) is possible, how can overall resemblance between objects be judged? Two objects could appear completely identical and yet differ in most of their properties. If (b) is possible, then not only can we not judge overall similarity, we cannot be sure two objects share *any* properties. And if (c) is possible, how can we ever be justified in thinking a property

term picks out the same property each time we use it? Indeed, if (b) and (c) are possibilities then property-terms are unable to pick out particular properties. Shoemaker concludes that the only way to avoid these sceptical worries is to accept his Causal theory of properties.

However, the sceptical consequences of (a)-(c) are not quite as dramatic as Shoemaker suggests, and so I would deny that the conclusion he draws is merited. For instance:

As regards (a), one could define resemblance in terms of shared causal powers, not shared properties; in this way, how much two objects resemble one another would not be affected by their causally impotent properties.

As regards (b), one could admit the epistemic possibility of there being distinct properties which bestow the same conditional powers. Perhaps some of our property terms pick out one entity, others pick out several; and to say we have an instance of the property F in the latter case is simply to say that one of a group of entities with the same causal potentialities has been instantiated. But we should not be too bothered by this. It might restrict our knowledge of properties – we wouldn't know which of the entities with the same powers had been instantiated – but we would know that *one* of them had been, and that is all we really need to know for practical purposes.

As regards (c), one can object to properties which change their causal potentialities across time by pointing out that *laws of nature* do not change over time. The causal potentialities that properties have fix the causal laws; and if the latter cannot change, neither can the former. Of course, it is always epistemically possible that there are no laws, or that the laws are indexed to particular times, making way for change across time. But the *best explanation* of the regularity so far observed is that this is not the case, and that the same laws hold at all times.

Shoemaker (1998) presents another argument for his position. It is a 'burden of proof' argument, and goes something like this: (a) the way 'necessity' is used in everyday speech, and defined in dictionaries, causal necessity is the paradigm of necessity; (b) resistance to thinking of causal necessity as full-blooded necessity – i.e.

as holding in all possible worlds[2] – comes from thinking that truths of the latter kind are knowable a priori; and (c), Kripke has shown there are *a posteriori* necessary truths, so anyone claiming that causal necessity is not full-blooded necessity must give another reason, other than knowability a priori, for thinking so. The burden of proof has shifted from those who accord causal necessity the status of full-blooded necessity to to those who do not.

I am quite willing to accept that Kripke has shown that there are *a posteriori* necessary truths. If both terms flanking the identity sign are 'rigid designators', meaning that each refers to the same kind or object in each possible world, then pure water = H_2O is one such truth. There is an identity in the actual world, so both terms refer to the *same* kind; and if they are rigid designators, both terms pick out that kind in *all possible* worlds. So the identity statement is necessarily true: but, since empirical science *discovered* the identity, it is a posteriori, rather than an a priori.

However, I do not see how focusing on pre-theoretical everyday speech, or on dictionary definitions, can get Shoemaker very far, since it's not clear to me that we do ordinarily think of causal necessity in the full-blooded way needed for the burden of proof to be reversed. We often talk about how the glass *had to* smash once it had fallen onto the concrete floor, and that the glass falling *necessarily* led to the glass smashing. But do we mean here that given those exact antecedent circumstances in *any possible world,* the consequent – the glass smashing – would occur?[3] Well, *I* might mean that when I talk about the glass. But I don't know that this is what *everybody* means when they talk about the glass. Pushed to say exactly what they mean by necessity in such causal examples, some people might deny it was full-blooded necessity, reasoning that they can *imagine* the glass not smashing in the same antecedent circumstances.

This gives us two reasons why Shoemaker's argument doesn't succeed in reversing the burden of proof. First, he gives us no reason to think causal necessity was ever just construed in the one way. Second, resistance to thinking of causal necessity as full-blooded necessity is not just rooted in the idea that necessary truths are known a priori. It also stems from the idea that imaginability is a guide to

[2] Or rather, as holding in at least all those worlds containing the antecedent circumstances (e.g. A) of the causal truth (e.g. A causes B). See the Introduction about this qualification.

possibility. Shoemaker could say that Kripke's identity statement casts doubt on this, since we can imagine a world where water is not H_2O even though that is impossible. But it is one thing to demonstrate that imaginability isn't an infallible guide to possibility (which I just did), another to demonstrate that it is no guide to possibility at all, and it is the latter which Shoemaker needs here.

Both of Shoemaker's arguments have been shown to be unsuccessful. The sceptical problems Shoemaker cites are either exaggerated or, in the case of (c), non-existent; and the burden of proof has not been placed with the Contingency theorists, since, for one thing, pre-theoretical causal discourse is not committed to Necessitarianism. This is disappointing, since they are arguments which might have been marshalled in support of my own account. As we shall see, Swoyer also presents an argument which I could have used and would have used had it succeeded in its aim. But before we move on to Swoyer's account and its motivation, let me look at how Shoemaker's account differs from my own.

3.13 *Shoemaker's Causal Theory and* ***Powers***

Powers undoubtedly owes much to Shoemaker, especially to the first version of the Causal theory outlined in Shoemaker (1980). However, there are differences. I have assumed that Shoemaker's properties are universals, but even if they are it is not clear whether he would follow **Powers** by taking all universals (properties *and* relations) to have essential conditional powers. Speculation aside, however, here are three points at which Shoemaker's account (either version) and **Powers** diverge. Where appropriate I will also discuss why the divergence is to **Powers**' advantage.

First, Shoemaker started off by taking properties to be clusters of conditional powers and now takes the weaker view that properties have their conditional powers essentially and is neutral on what the having of those powers amounts to. **Powers,** in contrast to both of these, takes universals to be dispositional entities which support various counterfactuals because of their intrinsic nature. I think this is an improvement on both the power-cluster view and the more neutral view. It is better than the cluster view because no question arises about why the conditional powers are not individually instantiated (see §2.11). And it is better than the ontologically

[3] Assuming that the process of glass smashing is deterministic, of course.

neutral view because that view, unlike **Powers**, fails to answer the question of why properties have their conditional powers essentially. Surely, one might think, there is some explanation as to why properties have the same powers in all possible worlds.

Second, Shoemaker focuses on *causal* features of a property. The essential features of a property are what conditional *causal* powers it bestows (the forward-looking causal features), as well as what *causes* its instantiation (the backward-looking causal features). With **Powers**, on the other hand, the focus is on *nomic* powers. This more inclusive line seems to me to be an advantage. Quite possibly there are more laws than there are causal laws. Co-instantive laws of the form 'All Fs must be G' are not causal, and I see no reason to rule them out a priori. But the causal laws, for Shoemaker, are fixed by the essential powers of properties, and I cannot see why co-instantive laws should not also be thought fixed by the essential powers of properties. Remember, of course, that in attributing a power to F all I am saying is that there is a counterfactual truth which F makes true, in this co-instantive case the counterfactual truth that *(∀x) if x were to instantiate F, then x would also instantiate G*.[4]

Third, Shoemaker (1998) claims that the power-cluster view he once propounded, by taking properties to *be* clusters of conditional powers, seeks a reduction of one to the other. Though he has now abandoned the power-cluster view, it will be instructive to point out here an important difference between this view and **Powers**: namely, that the latter is *not* reductionist.

What makes an identity statement a *reductive* analysis? Take the ordinary identity statement 'pure water = H_2O'. Here we are saying that any sample of pure water is just composed of H_2O molecules. We have identified an entity at one level of description (i.e. pure water) with an entity, or entities, at another, and more basic, level (i.e. H_2O). This is not an *elimination* of pure water: it's not been shown that pure water does not exist. Rather, pure water just *is* H_2O. And, given that the latter

[4] Some may find my talk of 'powers' here inappropriate, taking powers to be essentially powers to *cause* some specific outcome. That is absent in the coinstantial case: the two *states of affairs* that are x being F and x being G come into being simultaneously; yet arguably for A to cause B, A must begin at a point in time earlier than B. I take a more minimal view of powers, however, according to which for x to have a power is for there to be a certain counterfactual truth involving it and for that truth to be made true by either x or a non-relational property of x. If one thinks the only powers are causal powers, simply take my talk of non-causal powers to be talk of certain non-causal counterfactual truths.

is a more basic description of the kind which both terms designate, it is deemed a *reduction*.

The identity of properties and power-clusters is analogous to this. Take 'property F = power-cluster a, b, c...' F is held to be *composed* of other, more fundamental entities, called powers, just as the pure water molecule is composed of hydrogen and oxygen atoms.

Powers, in contrast, does not take all properties to be composed of powers. Each property – or rather, each universal – with no other properties as structural or conjunctive parts does not have powers as parts. It is just *one* entity, an entity which is irreducibly dispositional. It will support various counterfactuals about what would happen if it were instantiated (along with others) in certain circumstances. But we do not have to think of each of these counterfactuals as needing individual support. We do not need a power for each counterfactual.

This means that, unlike Shoemaker's cluster view, **Powers** is not an ontologically reductive account. For take the identity statement 'property F = dispositional entity D'. We have here two terms which designate the same entity. But it is not clear that one description is more *basic* than the other. 'Dispositional entity D' does not – as 'H_2O' most certainly does – describe the entity in terms of more fundamental *constituents*. The identity involved seems more like that between the Morning Star and the Evening Star than that between pure water and H_2O. We would not say that one of 'The Morning Star' or 'The Evening Star' was the more basic description, yet both denote the same thing, the planet Venus.

That concludes my look at Shoemaker's Causal theory. I have outlined both versions of his theory, the arguments which motivate it and the points of difference between it and **Powers**. I have also tried to show that, on balance, **Powers** is the better explanation of regularity, and now turn to do the same regarding Swoyer's Necessitarian position.

3.2 *Swoyer's Account*

3.21 *Basic Outline*

Swoyer has only written one paper (1982) on the laws of nature. Like Shoemaker, he uses the idea of conditional powers to characterise properties, taking a property's powers to be essential to it. Unlike Shoemaker, he does not restrict his account to causal powers, nor does he remain neutral about ontology: the laws of nature hold in virtue of the intrinsic nature of the properties involved.

To capture this intrinsic nature, Swoyer refers to the 'circle' of properties. Each property is "what it is in virtue of its lawful relations to other properties, while these are what they are in virtue of their further nomic relations, including the ones to the original property" (1982:214). Note the last part of this claim: both its forward-looking and backward-looking nomic features are essential to a property, part of what makes it the property it is. The property of *being a hydrogen molecule*, for example, is essentially such that in instantiation it bestows certain powers, conditional or otherwise, on its object; but it is also essentially a property which is instantiated during certain chemical reactions. Characterising the nature of properties in this way is compatible with either the **Powers** claim that simple properties are single dispositional entities or the Shoemaker claim that they are power-clusters, and Swoyer does not indicate his allegiance one way or the other.

We have, according to Swoyer, properties with nomic natures, and it is these properties which determine the laws of nature. The nomic nature of a property is not simply to be reduced to what properties it is nomically related to in all possible worlds. It is because a property has a certain nomic nature that it has those nomic relations in all possible worlds. The nomic relation "is not some third entity over and above the two properties themselves" (1982:217); rather, for F and G to be nomically related, and the relation to obtain between them, it is enough that the dispositionality of F and G ensures that all Fs, in all possible worlds, are G. The nomic relation is 'internal' to the properties themselves.[5]

[5] More on the internal / external relation distinction in §6.22.

These are the basic details of Swoyer's account. Since we have already discussed conditional powers (in §3.11) and the idea of a 'circle' of properties (recall *Identity Network* in §2.13), we need not elaborate further. It will come as no surprise that I agree with all the above positive claims about properties. There are areas on which I disagree with Swoyer, however. I do not find the arguments he presents for his view of laws persuasive. I also take issue with him on the scope of the dispositionality claim and the way he argues that laws are necessary. The next two subsections will look at these areas of disagreement.

3.22 *Motivation*

Swoyer starts off with a couple of quick points to persuade us that a Necessitarian theory such as his is superior to a Contingency theory such as Armstrong's. First, he criticises the Contingency theorist for introducing coincidence at the level of laws:

> …they offer us a second-order Humean picture, according to which it is simply a brute fact that given properties happen to stand in the l-relation to each other; different laws could hold in different possible worlds, and it is just a cosmic coincidence that a given law holds in certain worlds but not others. (1982:210)

Second, he argues

> …to regard the relation of nomic implication in this way [i.e. as contingent] is to relinquish the view that there is something *about* the very natures of [the properties] themselves that accounts for their lawful connection. I think this view both intuitive and the best reason for accepting a property theory in the first place. (1982:211)

I do not think either point does the work Swoyer expects it to. The first is unpersuasive because it is not clear the term 'coincidence' is appropriate. Would one say that the obtaining of N(F, G) was a coincidence? I think not. A coincidence involves more than one state of affairs. It is a coincidence that I went for the bus at exactly the same time the bus was arriving. My getting three aces in a row was a coincidence. But the obtaining of one atomic state of affairs, N(F, G), surely cannot be a coincidence, and so there is no coincidence at the level of laws. It is, however, *inexplicable*. If this is what Swoyer is getting at, then I agree with him that this is a problem for the Contingency theorist. But still, we saw in §2.21 that it is not a huge

problem. Bruteness at the level of laws is a black mark against the Contingency theory, but not a fatal one, and certainly not one which couldn't be outweighed by other considerations.

Much the same can be said against Swoyer's second point. I also find intuitive the idea that an object behaves the way it does because its properties have a certain nature, but this is unlikely to cut much ice with my Contingency theory opponent. They might even say the following: 'I too find this idea about properties having natures quite intuitive. But the contingency of laws I find far more intuitive. Therefore, because I cannot have both, I sacrifice the former'. In other words, they weigh both intuitions and affirm only the heaviest. They'll probably try to 'explain away' the lighter. But the point is, they can share Swoyer's intuition and *still* opt for the contingent property theory in the end. They can do this even if they find Swoyer's claim *more* intuitive than the contingency of laws, just as long as *overall* they think a Contingency theory is the best explanation of regularity.

We have seen that these two points of Swoyer's have only limited force, but he follows them up with an argument which appears to pack more of a punch. In the next two subsections I will look in some detail at this argument and show why, unfortunately, it is ultimately unsuccessful.

3.221 *The Electron Argument Stated*

Recall Shoemaker's epistemological argument for his Causal theory, which focused on various alleged consequences of a property's powers not being essential to it (§3.12). The argument I am about to present also focuses on an alleged consequence of not accepting some form of Necessitarianism. It is, however, different in two key respects. First, it is metaphysical, not epistemological: it talks about the way worlds can be rather than what we can know about them. Second, whereas Shoemaker confines his examples to the actual world, Swoyer looks across possible ones.

Swoyer's argument is this (let's call it *The Electron Argument*). The negative charge of an electron, in the actual world, is e. If this is a contingent feature of electrons, there is a possible world, *PW1*, where electrons have a negative charge ee ($\neq$ e). What's more, there would seem to be a world, *PW2*, where these particles exist alongside those particles which are electrons in the actual world. Are particles of both types, those with e and those with ee, electrons in *PW2*? Most people would

deny that particles of both types are electrons in *PW2*, believing that all electrons in a world must *at least* have the same charge. But this creates a strange situation in which whether something is an electron or not depends, not on that thing itself, but on what other things are in the world alongside it. And this surely cannot be right: whether something has the property of *being an electron* depends on whether it has certain *intrinsic* properties, not also on whether it shares the world with a certain other type of particle, members of which are also electrons in some possible world. We should therefore deny that e is a contingent feature of electrons, and since there is no reason to think that electrons are privileged in this respect, and since bestowing e is a power of the property of electronhood, we should take all a property's powers to be non-contingently held (1982:215).

Swoyer does not discuss responses the Contingency theorist might make, but it is worth pursuing the matter a little here, since it appears, at first glance, that the problems facing each response only reinforce his Necessitarian conclusion. Here are three possible responses, each followed by an argument or two against it.

(a) Particles of both types are electrons in PW2.

The Contingency theorist might take this line on the grounds that particles of each type are electrons in some possible world. But then consider PW3, which contains particles of those types plus particles of many other types, each of which is an electron in some possible world. Are we to say that particles of all these types are electrons? I would think not. If the properties of an electron are contingent, then it seems PW3 might be a possible world containing particles of many types, *all* of which are electrons because all are electrons in some possible world. But the properties of protons will be contingent also, so it appears we might also say of PW3 – assuming there is no metaphysical or logical restriction on what properties types of particle can have (recall §1.2) – that all PW3's particles are protons, despite them having very different characteristics, because particles of each of these types are protons in some possible world. Clearly, however, it cannot be that all the particles in PW3 (or even those of the two types in PW2) are *both* electrons *and* protons. So one cannot take particles of both types in PW2 to be electrons.

(b) Particles of neither type are electrons in PW2.

In taking this line, the Contingency theorist would have to accept that the existence of particles with ee prevented the particles with e from being electrons. But firstly, we intuitively want to say that the identity of basic kinds is *not* settled this way. Secondly, how would this work? As realists about properties, we would have to say that the property of *being an electron* was a complex property involving a *disjunction* of all the possible types which could be the non-relational properties of electrons (each type being, say, a specific charge, mass and spin) together with a set of conditionals indicating, for each type, that if this is instantiated, no other types from the disjunction are. But this is a radical departure from how we ordinarily see the property of electronhood.

(c) Particles of only one type – those that would count as electrons in the actual world – are electrons in PW2.

The problem with this is that it seems like nothing but actual-world chauvinism. Why should the mere fact that the particles with e in PW2 have the non-relational characteristics of actual world electrons (assuming, of course, that all the particles with e have certain other non-relational properties in common) be enough to make those particles electrons in PW2? Why isn't the fact that particles with ee in PW2 have the non-relational features of PW1 electrons of equal weight?

Even if we accept that actuality does matter, this will not help with a slightly modified example involving three possible worlds rather than two possible worlds and the actual world. In PW4 electrons are of non-relational type e1, in PW5 they are of non-relational type e2, and in PW6 particles of both these types exist. Furthermore, there are no particles of the non-relational type of actual world electrons. Which are the electrons in PW6? The problem is essentially the same here as it was in Swoyer's example – except there is no way one can appeal to the actual to answer the question.

3.222 *The Electron Argument Refuted*

There are at least two ways contingency of laws can be maintained in the face of Swoyer's argument. First, *being an electron* can be construed in such a way that it does not have to be instantiated by whatever has mass m, charge e and spin s, and so PW1 and PW2 are not ruled out. Second, *being an electron* can be taken to be the conjunctive property *having a mass m, charge e and spin s* (let's assume these are all

the non-relational features that make something an electron), but the charge of an electron is not taken to be fixed by a law of nature. I will take these two in turn.

According to the first option, *being an electron* is a property which bears a nomic relation to each of the properties which are part of complex property p. *Being an electron*, for example, is nomically related to *having a mass m*, such that anything which instantiates the first instantiates the second. This relation does not depend on the nature of relata, and so laws can be contingent. There will be worlds like PW1, which contain *being an electron* nomically related to *having charge ee*. And there will be worlds like PW2, containing particles with charge e and particles with charge ee. But there will be a definite answer as to which of these charge properties, if either, is instantiated by particles instantiating *being an electron*. If there is a law relating *being an electron* to *having charge e*, then particles with charge e (and certain other properties settled by law) will be electrons. If the law instead relates *being an electron* to *having charge ee*, then particles with charge ee (again, amongst other properties) will be electrons. And if there are no laws in PW2 connecting *being an electron* to certain properties, there just are no electrons, despite there being particles which behave just like them. Furthermore, particles with both charges cannot be electrons in PW2. *Being an electron* would have to be nomically related, in PW2, to both *having charge e* and *having charge ee*, and this is impossible because it would lead to particles having incompatible properties at the same time.

The second way a Contingency theorist can tackle Swoyer's argument is by identifying *being an electron* with the conjunctive property of *having mass m*, *charge e* and *spin s* (Swoyer calls this complex property 'p'). Of course, *The Electron Argument* cannot even get started if *being an electron* is identical to *this* conjunctive property. Identity is transitive. If *being an electron* is identical to complex property p in the actual world, then in any world containing *being an electron*, it will be identical to complex property p. This means that there is no possible world where electrons have a different charge. There is no PW1, or PW2, and therefore no argument for Necessitarianism based on them. There is also no contingency regarding an electron's charge, mass and spin properties either.

This lack of contingency need not refute the claim that laws are contingent, however, since if one takes laws to be N-relations between properties, one can say that there is no N-relation between *being an electron* and *having charge e*, only a *is a*

conjunctive part of relation. The identification of *being an electron* with p doesn't affect the claim that the laws involving *being an electron* and its constituent properties are contingent. For example, it might be a law in one world that when an electron is related by R to a Y-particle, that electron is repelled, and a law in another world that when an electron is R to a Y-particle, it is attracted. Contingency would be ruled out if the constituent properties were *dispositional* entities, but one can say that appearances are deceptive. Armstrong, for example, will say that we are led to think of them as dispositional, since we pick them out, or refer to them, only via their causal contribution to objects in instantiation (e.g. the way those objects affect our measuring instruments). But he will claim, quite rightly, that this does not show they are dispositional entities: their causal contribution could still be (and for Armstrong it is) a matter of the laws they are involved in, laws involving purely categorical universals.

I conclude that Swoyer's argument is no threat to a Contingency theory. *Being an electron* can either be distinct from p or identical to p, and neither construal threatens the claim that the laws of nature are contingent. If they are distinct, there is no problem about which particles in PW2 are the electrons, nor is there the unwelcome result that particles of both types are electrons in PW2. And if they are identical, Swoyer's argument just doesn't get off the ground. An electron's charge isn't a contingent feature, and so there is no PW1 where electrons have a different charge. But the charge of an electron needn't be thought of as law-governed, and so the charge being *essentially* e needn't threaten the contingency of laws.

3.23 *Swoyer's Account and* ***Powers***

Swoyer, like Shoemaker, talks of properties rather than universals, and again I shall simply assume he takes the properties involved in laws to be universals. But Swoyer does say something about the nature of properties, since he claims there exist no uninstantiated properties. That, together with what I said about him in §3.21, shows we are broadly in agreement on the question of laws. But there are points at which our views diverge, and here I will focus on two that I find especially important.

3.231 *Universals and Dispositionality*

Powers takes universals – properties *and* relations – to be dispositional in nature. But Swoyer, like Shoemaker, says nothing about his account extending to relations. What's more, Armstrong claims that Swoyer has told him in personal communication that he does not even want to extend his 'Dispositionalist account' to all *properties* (1997:76).

Without a list of just what sorts of properties Swoyer wants to exclude, it is hard to know just what is motivating him here.[6] On the face of it, there are no existing properties – i.e. universals – which could not be construed as dispositional. And I think the onus is on those who restrict dispositionality in this way to justify their decision.

Perhaps Swoyer thinks we just *don't need* all universals to be dispositional. For instance, take the law that it takes five minutes for a sample of substance F to boil in circumstances C. Now we have the state of affairs of a sample of F being heated, the state of affairs of that sample boiling, and the temporal relation *is five minutes away from* between them. We can take it to be part of that relation's nature that it is instantiated between a heating of an F sample and its boiling, just as it is of the nature of F that particulars with it that are heated for five minutes in C will boil. But this dispositionality of temporal relations is *surplus to requirements*. F's dispositional nature alone is enough to ensure that in all worlds containing F, any particular instantiating it will boil in five minutes in C. The same for spatial relations. One might say that a conditional power of spatial relation R is that if instantiated between two particulars, *a* and *b*, where *a* has the set of properties P and

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[6] Perhaps Swoyer is thinking specifically of spatial and temporal properties when he says not all properties are dispositional (cf. Ellis, B. and Lierse, C. (1994)). He could then provide the following rationale for a restriction: facts about x having a spatial or temporal property are *fixed* by facts about x, y... bearing one or more spatial or temporal relations, and only properties not determined in this way are dispositional.

In reply to this, I would argue (because of Occam's Razor) that we should either accept spatial and temporal *properties*, or spatial and temporal *relations*, as mind-independent universals, but not both. We can then take claims about those entities we are rejecting to be made true by facts involving those we are accepting (e.g. '*a* has the property of being five inches away from water' is made true by *a* bearing the five metres away from relation to *b* and *b* being water). Once we decide whether we want to keep properties or relations (and I would go for the latter), *then* we can address the question of whether universals of these kinds are dispositional. One could argue against the mind-independent reality of other 'supervenient' properties in the same way (see §6.1).

b set PP, then *a* and *b* will behave in way B (e.g. two magnets, coming to be a certain distance apart, will move away from each other). But plainly as long as the monadic properties of *a* and *b* are dispositional, the fact that once they are spatially related by R they will behave in way B is fixed. Laws of nature will still be as the Necessitarian says they are, even without spatial and temporal relations being dispositional entities. Therefore, Swoyer might think, we shouldn't suppose they are dispositional.

The problem with this line of thought is that it assumes dispositionality is something to be avoided wherever possible. The message is: admit it where we have to, but be sparing. And that message strikes me as somewhat misguided. Irreducible dispositionality is not something to be minimised, like fatty food or alcohol intake. It is not that categorical universals are somehow better for one's theory, such that the more you have the better your theory is. Once irreducible dispositionality is introduced into one's ontology, it is surely simpler to introduce it wholesale, as the nature of all universals, than to say that some universals are dispositional and others non-dispositional. Better, that is, to have one type of universal (the dispositional) than two (the dispositional and the categorical).

There is another problem with splitting universals this way and for the above reason: arbitrariness. The Necessitarian wants to ensure, for example, that a specific quantity of F boils in four minutes in circumstances C *in all possible worlds*. But they could ensure this by taking *either* 'being F' *or* 'being five minutes away from' to refer to a dispositional universal, and there appears to be no reason to prefer one over the other. A choice either way is arbitrary.

I conclude, therefore, that the default position is unrestricted dispositionality. That means that until a good argument for restriction is on the table, we should assume all universals are dispositional in nature. I cannot rule out such an argument appearing, but in light of the above I do not think it likely.

3.232 *From Universals to the Necessity of Laws*

If it is a law that all Fs are G in some possible world, the Necessitarian is committed (at the very least) to saying it is a law in all worlds containing F. Swoyer, however, takes the stronger Necessitarian line that if it is a law that all Fs are G in some possible world, it is a law in all possible worlds. So instead of all laws holding in

those worlds which contain the universals nomically related, we have the claim that all possible laws hold in all possible worlds.

Though this is not a conclusion I am hostile towards, I do not endorse the way Swoyer argues for it. In Swoyer's notation, LGF (I have capitalised these letters for consistency) is the *L*aw that all *G*s are *F*. And on the question of how this law can hold in worlds where G and F do not exist, he says the following:

> there is a straightforward answer in cases where G and F exist in the actual world, for if LGF is necessary, '$\neg \exists$ x (Gx & $\neg$ Fx)' must be true in every possible world. And since what *can* happen *does* happen in some possible world, the truth of this sentence in each one can only be explained by the fact that G and F are such that it could not possibly be true. Thus LGF holds in worlds without G and F because of the *nature* of properties in the actual world. (1982:217)

To explain this argument we need to be clear about what Swoyer takes laws to be. They are not nomic relations between universals (not even relations which hold in virtue of the nature of those universals). LGF is not like Armstrong's N(F, G). Rather, LGF is supposed to be shorthand for

(a) The existence of G and F is possible ($\Diamond$ (G exists & F exists)), *and*

(b) necessarily, anything instantiating G instantiates F ($\Box \forall$x (Gx $\rightarrow$ Fx)).

In other words, to say that it is a law that all Fs are G is to claim the truth of (a) and (b) (1982:216).

With this clear, we can see what Swoyer's argument amounts to. For LGF to hold in a possible world we can say all that is required is that (a) and (b) be true *in it*. Now consider a world, PW, without F and G. As Swoyer shows, $\neg \exists$ x (Gx & $\neg$ Fx) is true in PW, and in all possible worlds. But $\neg \exists$ x (Gx & $\neg$ Fx) is equivalent to $\forall$x (Gx $\rightarrow$ Fx). Therefore, it will be true in PW that $\Box\forall$x (Gx $\rightarrow$ Fx), since from the perspective of PW $\forall$x (Gx $\rightarrow$ Fx) is true there and in all other possible worlds. But $\Diamond$(G exists & F exists) is also true in PW, since from the perspective of that world there are possible worlds containing G and worlds containing F. Therefore LGF can be said to hold in PW, even though it does not contain G and F.

I disagree with Swoyer's claim about what laws are. Laws are supposed to govern behaviour, and to explain regularity. But LGF is simply the fact that (a) G

and F are possible and (b) in all possible worlds all Gs are F; (a) is just the fact that something is possible, and (b) is just a *regularity*, one within each world and across all possible worlds. It is not then clear how LGF *governs* the behaviour of objects or *explains* regularity. The state of affairs *a* is G&F doesn't *govern* the world, since it doesn't ensure that *a* is G&F, it *is a* is G&F. A state of affairs cannot govern itself. But then how can a *conjunction* of such states of affairs, covering all possible worlds, plus the state of affairs that these objects are all the Gs that exist in any possible world, govern the world either? Yet that is the regularity given in (b) which, together with (a), makes up the law LGF according to Swoyer.

Similarly, (b) says that all Gs are F in the actual world, in PW, in PW2, and so on, for all possible worlds. But how can the regularity that all Gs are F in the actual world be explained by LGF, if LGF amounts to little more than this across-world regularity fact? The fact that all Gs are F in the actual world is contained in this across-world regularity fact, it is a part of it. If I asked why *a* was G&F and you said 'because *a* is G&F and *b* is G&F', you wouldn't see this as an explanation at all. But then how can a much larger conjunction of the same kind, together with the extra fact that these are all the *possible* G-things there are, be an explanation of why all Gs are F in one particular possible world? One may say that it is this extra fact – that these are *all* the possible G-things there are – which makes the explanatory difference. But it's not clear why. It's not clear why a regularity across all possible worlds should explain the regularity in one possible world. If you ask me why this iron bar expands on heating, and I say that *all* iron bars that are heated (across the whole of time) expand, this does not seem to explain why *this* iron bar expanded.

Of course, it might be explanatory to cite a higher-order law, such as that all *metals* expand on heating. But firstly, we think that LGF should be able to explain why all Gs are F (and why *a* is G&F). The fact that something else can explain it does not show that LGF can. Secondly, claiming that LGF cannot explain the regularity but that it only matters that some law explains each regularity is a non-starter. The highest-level regularities cannot be explained in this way, since there are no higher-level regularities under which they fall. This is a familiar criticism of the Regularity theory: that the highest-level regularities have no explanation and have to be taken as brute. Swoyer is not a Regularity theorist. He can point to the

dispositional natures of properties to explain those highest-level regularities. But it is odd that he can't also explain those regularities using laws of nature.

Because of the above, I reject Swoyer's characterisation of laws of nature while at the same time accepting his claim that properties have intrinsic nomic natures. For me, the laws of a world are facts which obtain in virtue of that world's instantiated universals. These facts are *general* and involve a *counterfactual* element. The law that all Gs are F, for example, has no part which is the general fact that $\forall x\ (Gx \rightarrow Fx)$. It is, rather, the general counterfactual fact that *every x is such that, if it were to be G, it would be F*. This is not just a regularity fact, since it tells us how things *would be* if they *were to be* G. And this enables it to have both the governing and explanatory role we expect from laws. It governs the world in the sense that its obtaining ensures that anything which is G is also F. And because it ensures this, and because it is not in part the regularity that all Gs are F, there seems no problem with saying that it explains *why* all Gs are F.

Much more will be said about this conception of laws, especially in Chapter 6. For now I mention it only to highlight an important difference between **Powers** and Swoyer's account. I am open to the idea that the necessity of a law is 'unrestricted'. But it is important to see that for someone taking properties to have their nomic relations essentially, there at least *appears* to be an alternative: namely, identify laws with properties in a nomic relation and then say that *in worlds containing the antecedent property* the law obtains. This alternative is explicitly endorsed by Bigelow, Ellis and Lierse (1992). Armstrong even mistakenly attributes it to Swoyer (1983:166).

Let me end by briefly setting out how I would be led to endorse the claim that laws hold in all possible worlds. I think that laws can obtain which involve all uninstantiated universals (see §6.31). The truth-maker for such a law's statement is any instantiated universal which the universals of the law are connected to in the Nomic Network. In other words, if all Fs are G is a law then its obtaining in a possible world is conditional, *not* on the instantiation of the antecedent (or consequent) of that law, but on the instantiation of a universal to which the universals of the law are nomically related. The law holds, in other words, in all possible worlds containing universals from the same Nomic Network. If there are no other Nomic Networks governing other possible worlds, then laws hold in all possible

worlds. But if there are other networks (involving, of course, completely different universals), and these networks govern other possible worlds, there will be no laws which hold in all possible worlds. This is quite a different route to necessity from Swoyer, and one rooted in a different conception of what laws are. For further discussion on whether there are other possible Nomic Networks, see §6.32.

3.3 *Conclusion*

We have seen how my characterisation of the dispositional nature of universals owes much to the positions of Shoemaker and Swoyer. But there are clearly differences. For example, I take all universals – whether properties or relations – to be irreducibly dispositional. Unlike Shoemaker, I focus on nomic powers rather than causal, allowing that causal nature may not exhaust nomic nature. And unlike Swoyer, I take laws to be general counterfactual facts which hold in virtue of instantiated universals.

I have also criticised those arguments of both Shoemaker and Swoyer which were supposed to provide strong grounds for Necessitarianism. In the end, I believe there are no devastating objections to the relations-between-universals Contingency theory, and that to see whether it wins out over Necessitarianism requires a long, balanced assessment of the relative merits and demerits of the main varieties of each position.

I believe that the best explanation of law-like regularity is **Powers**, a Necessitarian account, and this is what I am endeavouring to establish in this thesis. In Chapters 1 and 2 I highlighted ways in which **Powers** has an advantage over Armstrong's realist account, and other realist Contingency theories. In Chapter 5 I criticise arguments against Necessitarianism in general and **Powers** in particular. But all of this can only show, at most, that *some* version of Necessitarianism is the best explanation of regularity. In order to show that **Powers** is the best theory, I need to compare it to other Necessitarian accounts. That has been the aim of this chapter and will also be the aim of the next.

Chapter Four

OTHER NECESSITARIAN ACCOUNTS

In this chapter I look at the view of another Necessitarian, Evan Fales, whose account is less similar to **Powers** than either Shoemaker's or Swoyer's. I also look at two other positions on laws. I defined Necessitarianism as, at a minimum, involving the following claim: if it is a law that all Fs are G in some possible world, it is a law in all worlds containing F. Only one of the two positions I shall examine, in which universals have both a categorical and a dispositional side, fits that description – and then only in one version. The other position, in which universals have only *some* of their nomic relations in all worlds where they exist, can perhaps be described as a *partial* Necessitarianism. But I include it here because I think a person who accepts that some of F's nomic relations are essential to it is closer in outlook to the Necessitarian than the Contingency theorist.

4.1 *Fales' Platonic Account*

4.11 *Basic Outline*

Like **Powers**, Fales talks explicitly of universals rather than properties. But there is an important difference between Fales' Necessitarianism and that of Shoemaker, Swoyer and myself: Fales takes universals to be categorical entities. He often talks of 'causal powers', but it is clear that these are to be reduced to the *causal relations* which categorical universals have to others. For instance, he says:

> ... a universal is a 'core' around which a set of powers – causal relations, really – cluster... Each universal is identified via the set of causal powers it confers. This set – the set of causal relations which obtain between it and other universals – is essential to it. It would not be that very universal if these relations did not obtain. (1990:220)

Take a causal law: F causes G. For Fales, this law will be a categorical relation, the causal relation, holding between two categorical universals F and G, where these will presumably be event or state-of-affairs universals. One might say that an F has the

causal power to produce a G, and say it truly. But what you say is not made true by universal F being irreducibly dispositional, or being partly composed of an irreducible power. Rather, the power-claim is made true by a wholly categorical state of affairs involving F, G and the causal relation holding between them. In other words, Fales' use of 'causal powers' and 'dispositions' is just like that of Armstrong.

Unlike Armstrong, however, Fales takes a universal's causal relations to be essential to it. There is no possible world in which a universal could lack those relations, nor any possible world in which it could have others. But the combination of universals being categorical and their causal relations being essential to them has an interesting outcome. It seems highly plausible that in many possible worlds not all the universals to which F is causally related will be instantiated. But then how, in those worlds, can F be nomically related to them? As categorical entities, universals – those which are not laws – do not themselves support counterfactuals, so existent universals cannot be said to be nomically related in non-existent universals in the way set out in §2.14. Instead, those categorical universals to which F is nomically related need to exist in order that there can be causal laws involving F and those universals. But to allow that universals can exist but be uninstantiated is to renounce *Immanent* Realism about universals in favour of a *Platonic* Realism.

Fales accepts some form of Platonism, but it is a sparse one. Recall how Armstrong accepts Scientific Realism concerning universals – we need only admit into our ontology those universals that a completed science, whatever that might be like, would endorse. Given that he also endorses *Immanence*, Armstrong must assume that only instantiated universals will be needed by completed science. Fales, on the other hand, need not make this assumption. His Platonic realm can be populated by those instantiated and uninstantiated universals which are needed for the truth of completed science claims, but not also overpopulated with all logically possible universals. The realism about universals is parsimonious rather than promiscuous. As he says at one point:

> Parsimonious Platonism... posits only those uninstantiated universals (if any) required to round out the system of natural laws. (1983:142, fn.27)

Platonism is the outcome of Categoricalism and the claim that a universal's causal relations are essential to it.

4.13 *Motivation*

Armstrong thinks his laws are able to support counterfactuals. If it is a law that N(F, G), for instance, that supports the counterfactual claim that if *a* were to have been F, it would be G. In evaluating the truth of the counterfactual, we look at possible worlds where *a* is an F and see if it is a G. Not all worlds where *a* is F – only those *nearest* to the actual world but where *a* is F. These will be ones where the laws are as near to ours as they can be. There is nothing about *a*'s being F which prevents N(F, G) obtaining, so the possible worlds we are interested in will contain both states of affairs. And clearly in those worlds where both states of affairs obtain, *a* is F and G. Therefore we can say the counterfactual claim that if *a* were to be F it would be G is true, and that its truth is supported by the law N(F, G).

According to Fales, however, only the sort of laws the Necessitarian puts forward can support counterfactuals. Armstrong's laws are inadequate because holding the laws fixed as much as possible when evaluating the truth of counterfactuals is a mere *stipulation* and without objective warrant. Only Necessitarian laws can remove that element of stipulation. As he puts it:

> ...'holding fixed' is something *we* do, not the world; alternatively put, the world's doing it constitutes the presence of an objective necessity. (1983:126)

If the laws of nature are contingent, Fales says, there will invariably be this element of convention. But if the laws are necessary, there is no need for us to 'hold them fixed' when evaluating counterfactuals. *All* possible worlds *containing F* will then contain the same laws, and whether 'if *a* were to be an F, it would be a G' is true or not will depend on other possible worlds in general, not on a certain subset of possible worlds that we *choose* to focus on.

Let me put Fales' point another way. Laws are supposed to support counterfactuals. But if N(F, G) contingently holds in the actual world, then it ensures that all actual Fs are G. But how does this law guarantee the truth of 'if *a* were to be an F, it would be G'? The world where *a* is F is not the actual world, and what guarantee have we that the world where *a* is F will be a world where N(F, G) holds? Armstrong can only stipulate that the worlds of interest are those where N(F, G)

holds. But that seems to amount to the stipulation that N(F, G) supports the aforementioned counterfactual *only in those worlds where a is F and N(F, G) holds*. The Necessitarian, however, can say that if it is a law that all Fs are G, that law will support the counterfactual without qualification.

Armstrong's response, however, is to claim that despite there being an element of convention in the way the Contingency theorist evaluates counterfactuals, contingent laws are not rendered useless for counterfactual support. This is because

> The way the world works, its laws must have overwhelming importance for creatures in the world. Biologically speaking, the main reason for the existence of conditional reasoning is its role in planning. And in planning, the laws of the world, so far as we know them, must be assumed to be unchanged. This, I think, is the reason why, in a possible-world treatment of counterfactuals, resemblance in laws is taken as a major respect of resemblance. (1983:146)

There is a good reason why the Contingency theorist chooses those worlds with the same laws as ours. It is not because we are imagining what could be the case in *the actual world*, and so the actual laws should be held fixed; the Contingency theorist, after all, thinks that the actual world could have had different laws. The real reason concerns the use of counterfactuals in planning. Somebody tells me that if *a* were to be an F, it would be a G. This might then lead me to try and make *a* into an F in the hope that it will also be G. If I succeed, and the counterfactual they uttered was true, then I will expect *a* to be both F and G. For example, someone tells me that if the wood is coated with creosote it will be water-resistant. I coat my fence with creosote. If the counterfactual is true, then I expect my fence to be water-resistant. What could happen in worlds with different laws (worlds where creosote absorbs water, for instance) is of no practical consequence to me, and as a result forms no part of my evaluation of the counterfactual.

Fales' argument for Necessitarianism fails to deliver because Armstrong can accept, consistent with his account, that by holding the laws fixed in the evaluation of counterfactuals a counterfactual's truth-value is not a wholly objective matter. Armstrong can still say *why* we would hold such laws fixed. He can also, instead of taking counterfactual claims to be objectively true or false, take counterfactual talk to be 'second-grade discourse' and interpret truth in this domain as warranted

assertability. He can then take N(F, G) to support 'if *a* were to be F, it would be G' if, given the law, we would be warranted in asserting it.

4.13 *Fales' Account and* ***Powers***

There are a number of differences between Fales' account and **Powers**. Fales talks of the causal network; to make room for non-causal laws, I talk of the Nomic Network. Fales is a Categoricalist; I am a Dispositionalist. Fales accepts Platonic Realism about universals, whereas I endorse Immanent Realism.

According to Fales, universals have their causal relations to others within the network essentially. Unlike **Powers**, however, he thinks there are exceptions to this. Spatial universals, temporal universals, and the causal relation are all exempt. In the next two subsections I look at his arguments for this restriction, and in so doing advance my case for no restriction. In the third subsection I look at another difference involving the claim that universals are Platonic entities.

4.131 *Spatial and Temporal Universals*

Fales' argument for denying that spatial and temporal universals (e.g. the relations *is two miles away from* and *is five minutes from*) have causal essences hinges on intuitions concerning what is possible. First, he says, a physical world with a different Nomic Network from ours is *logically possible*. Second, it is a *logical* (or at least *metaphysical*) *necessity* that all physical worlds are spatiotemporal. Third, spatial and temporal universals are part of the Nomic Network, since they are constituents of causal laws. As he puts it:

> Spatial properties such as length and distance influence the causal interactions of material objects. Were it not so, we could not detect and measure these qualities as they are exemplified by material objects. We can measure them because they differentially affect our measuring instruments and sense organs. (1990:247)

If we allow these three claims, spatial and temporal universals cannot have causal essences.

This argument relies on the assumption that if p is logically possible it holds in some possible world. We have the actual world, which is governed by a Nomic Network of universals NN, and we have a logically possible world, which is

governed by a different network NN2. Spatial and temporal universals will be part of each network, Fales thinks, since both worlds are spatiotemporal. The two networks, therefore, have certain universals in common. But if we assume that universals have their nomic relations essentially, then NN and NN2 having *any* universals in common entails that they have *all* universals (and their specific relations to one another) in common, and NN=NN2. This means there is no logically possible spatiotemporal world governed by different laws to the actual world. However, if spatial and temporal universals don't have have their nomic relations essentially, we can still hang onto the claim that there is a logically possible spatiotemporal world with different laws to ours. Therefore, Fales says, since there clearly is such a logically possible world, we should take spatial and temporal universals not to have their nomic relations essentially (1990:246).

I argued in connection with Swoyer (§3.231) that the default position is that all universals have their nomic relations essentially. I do not, however, think Fales' argument justifies the exclusion of spatial and temporal universals. Here are just two ways (both, I think, with some *prima facie* plausibility) in which Fales' proposed exclusion can be averted.

First, one can deny his premise that there is a possible physical world governed by a Nomic Network different from ours. I think the plausibility of this premise rests on the claim that there are possible worlds (let us call them Alien worlds) which contain totally different universals (apart from those that are spatial and temporal) to those of the actual world. But one can hold onto this claim without accepting the possibility of worlds with different networks. One can take there to be one Nomic Network for all possible worlds, one which contains all possible universals including the spatial and temporal. The difference between the actual world and the Alien world is then simply that in each world different universals from the same network are instantiated. If there is just this one possible Nomic Network, it follows that spatial and temporal universals will have their nomic relations essentially.

Second, one may claim that the argument's second premise is ambiguous. One might agree that all physical worlds are spatiotemporal but take worlds to be spatiotemporal if they are describable in spatial and temporal terms and *not* simply when they contain the spatial and temporal universals of the actual world. This

would allow there to be possible spatiotemporal worlds governed by different Nomic Networks. Each non-actual network would have its own 'space-like' and 'time-like' universals – universals structuring a world such that spatial and temporal concepts are applicable to it – and so no network need contain any universals of another.

My aim here is not to argue for either of these options. All I need to do is highlight ways in which the conclusion of Fales' argument can be resisted. Fales' argument is not enough to justify the exclusion of spatial and temporal universals; he also needs to say why neither of these options is as attractive.

I do not see how he would do this. The only other justification he makes for excluding spatial and temporal universals (which he calls locational universals) is this:

> Locational universals can exist independently of the existence of causal connection; the corollary of this is that, by themselves, they are radically 'incomplete' as regards causal efficacy. A set of universals which, when instantiated, has causal consequences, must contain locational universals, but it must also contain non-locational universals. (1990:249)

But even if he is right that such universals occupy 'a special place in the scheme of things' (1990:249), that doesn't show they have no causal essence. It is not even clear what Fales means when he says that locational universals are 'incomplete' as regards causal efficacy. As Fales' last sentence indicates, causal laws contain both locational and non-locational universals, so why doesn't he take the latter to also be 'incomplete'?

Fales' reply might be that only locational universals are 'incomplete' because there are possible worlds with locational universals and without non-locational universals, but not vice versa. But this will not help him: the possibility of such 'empty worlds' – worlds where non-locational universals are uninstantiated – does not prevent locational universals from having a causal essence. Take an empty world, EW. Although EW does not contain non-locational universals, that does not stop there being facts in EW about what would happen if such universals *were* instantiated. That is because EW, quite plausibly, is governed by a Nomic Network containing uninstantiated non-locational universals as well as locational universals. But then if there is such a network, the fact that there are empty worlds does not give us any reason to deny locational universals a causal essence.

Fales might try again, and say that locational universals are 'incomplete' because two empty worlds might be governed by different Nomic Networks, and locational universals cannot both be part of different networks and essentially part of one particular network. As we have already seen, however, there are plausible alternatives he has not ruled out. Firstly, one can deny that the two empty worlds are governed by different Nomic Networks, and claim instead that there is only one network containing all possible universals. Secondly, one can say that each empty world contains different 'space-like' and 'time-like' universals and therefore both the actual world's spatiotemporal universals and the 'space-like' and 'time-like' universals of other possible worlds can be part of a particular Nomic Network essentially. Fales does not argue against either of these options, and therefore he has not shown that locational universals have no causal essence.

4.132 *The Causal Relation*

The causal relation, insofar as it holds all other universals of a network together, is obviously part of that network. But again, Fales wants to say that it is special in some way. It has to be: he cannot hold that there are different possible Nomic Networks if the causal relation is essentially related to universals in any one network, for that would lead to there being just one causal network.

Fales' answer is this. Universals in a network have what Fales calls 'causal essences': i.e. they are causally related to the same universals in all worlds in which they exist. But the causal relation is the exception to this. To have a causal essence, the causal relation would have to have its own causal relations to other universals: in other words, instantiation of the causal relation would itself have to cause, either alone or in conjunction with other universals, the instantiation of certain types of event. Fales says, quite reasonably, that we have no reason to think this is the case (1990:250).

I think this points to an advantage **Powers** has over Fales' account. In making the causal relation a different kind of universal from all others in a network, Fales' account has become (structurally, at least) more complex than if it had endorsed the claim that *all* universals in a network have essential nomic natures. **Powers** does endorse that claim, and so to that extent is simpler.

To see this, look at what makes true certain causal claims for each position. For Fales, if an F causes a G that will be in virtue of universals F and G being connected by C, the causal relation. The claim that Fs cause Gs is *made true* by a nomic state of affairs involving F and G related by C. For **Powers**, however, the causal relation is founded upon the universals themselves. An F will cause a G in virtue of F being a dispositional entity such that whatever has it will cause an instantiation of G, and the claim that Fs cause Gs is *made true* by F. For much the same reason it is also made true by G. **Powers** has no need for a separate entity, C, which is something over and above F and G. And if there is no C, there is no problem with all universals in the Nomic Network having their nomic relations essentially. The Nomic Network is a collection of facts about these universals, but, though there are facts about what instantiations of universals cause, there is no causal relation universal.

It should be stressed that **Powers** wouldn't have a problem with the causal relation even if it were a universal. Fales takes the causal essence of a universal to be determined by what instantiations of it *cause* and what instantiations of it *are caused by*. But **Powers** takes the dispositionality of a universal to be given by its role in the laws of nature. This is an important difference which would enable the latter to accommodate C within the Nomic Network without claiming that it is special. Fales denies that C has a causal essence, since instantiations of it do not cause anything. But if there was a universal C, **Powers** would take it to have a nomic essence: namely, to be essentially such that, whatever ordered pairs of universals it holds between, an instantiation of the antecedent universal will result (perhaps *all else being equal*) in an instantiation of the consequent. Though Fales is right that C doesn't cause anything, it still plays a role in the causing of one thing by another. It is this role which exhausts the nature of C, and which **Powers** could take to be its essence.

4.133 *Brute Fact and Nomic Networks*

Because of Fales' Platonism, if he accepts the possibility of different Nomic Networks he accepts the possibility of different Platonic realms. For each set whose members are those possible worlds governed by the same laws, there will correspond a different possible Platonic realm containing a different Nomic Network. If this is correct, Fales' account seems to be at a disadvantage compared to **Powers**.

The disadvantage concerns the point at which brute fact is admitted. The question is: why do all the Platonic realms contain networks with distinct sets of universals (bar C and spatial and temporal universals)? One might think that Fales can explain this regularity by pointing out that universals not common to possible networks have a causal essence, and so it is essential that they are related in the way they are. But this is not an explanation. The causal essence of F is defined as those causal relations it has in all possible worlds. The explanation of why it has those causal relations in all possible worlds is that there is just one possible Platonic realm which contains F. But if that is so, one cannot then explain why there is only one Platonic realm containing F by saying that F has its causal relations essentially. That would be to go in a circle, explaining p with q and then q with p. Something is amiss.

Fales has to accept it as a brute fact that all possible Platonic realms contain Nomic Networks with different universals. But this is a regularity, and *cosmic coincidences* such as this cry out for an explanation.

Powers does not have to admit brute fact at this point. Of course, it doesn't accept possible Platonic realms, so doesn't suffer from an inability to answer a question about them. It faces the prior question about why F has the same nomic relations in all possible worlds. Fales' answer involves Platonic realms, mine involves the fact that universals are dispositional entities. But the subsequent question addressed to Fales asks why there is a certain regularity involving Platonic realms. This is a regularity which seems to require an explanation, but for which none is available. The subsequent question addressed to me – why is F the same dispositional entity in all possible worlds? – is one which I am unable to explain, but also for which no explanation seems necessary. Note also that if **Powers** *did* accept Platonism, it would be able to explain the Platonic realm regularity by citing the dispositional natures of universals: because of this nature, they cannot be part of different Nomic Networks, and so assuming there is one Platonic realm for each possible Nomic Network, there will only be one realm for each universal. This reply, however, relies on universals being irreducibly dispositional, and so is unavailable to Fales.

4.2 *The Two-Sided View*

Armstrong and Fales take properties to be categorical, whereas **Powers** takes them to be irreducibly dispositional. Martin (1993b) has an alternative: properties are both categorical *and* dispositional. But there is another important difference to the other accounts. Martin does not take properties to be universals, he takes them to be *tropes*. An object's F-ness is, on this view, a *particular* abstract entity, one which no other object has. Other objects can only have other distinct *particular* entities in virtue of which they are called F. In contrast, to say that two objects are both F, if properties are universals, is to say that they share something *strictly identical*.

I shall not look at trope theory in any detail in this thesis.[1] It has benefits – and problems – of its own, but ultimately I do not believe it superior to the universals view. It also has a distinct drawback in dealing with lawhood, as Armstrong has pointed out (1997:84). For it is relatively clear why each thing that is F should be G if we posit a relation of necessitation between universals F and G; it is harder to see why each thing that is F should be G if each instance of F is *a different entity*. The trope theorist is left positing a brute 'like necessitates like' principle.

Let us, then, explore the idea that *universals*, rather than *tropes*, are both dispositional and categorical. At least two things might be meant by this. First, that the universal *in itself* has two components, or 'sides' (let us call this *Two Bits*). Second, that the universal can be described in either categorical or dispositional terms, but is not in itself either categorical or dispositional (let us call this *Two Aspects*). When Armstrong adapts Martin's view using universals, he seems to have the first of these in mind. Mumford (1998) writes with what seems like the second option in mind and takes himself to be at least influenced by Martin's view. I will consider each option in turn, arguing that **Powers** is preferable to both.

[1] For discussion of trope theory in the literature, see, e.g., Ch. 6 of Armstrong (1989d), Bacon (1995), Campbell (1990), Daly (1994b) and Martin (1980).

4.21 *Two Bits*

According to *Two Bits*, universals have both a categorical bit (a *C*-bit) and a dispositional bit (a *D*-bit). But this cannot be *all* universals. Both *C* and *D*-bits qualify as universals – because they are both (a) parts of universals and (b) ones which can run through many – and we clearly do not want to say that they have their own *C* and *D*-bits, since that would get us into a regress. The *Two Bits* claim must be this:

> ***Two Bits***: those universals *which are not categorical or dispositional bits (C or D-bits) of other universals* have both a *C* and a *D*-bit.

Armstrong (1997:251) offers an argument against this view. If universals have two radically different constituents, one dispositional and one categorical, these must also bear a connecting relation to one another to be united. Take the two constituents of specific universal F: *d* (for dispositional) and *c* (for categorical). If the connecting relation is *necessary*, then it is an inexplicable necessity: it *just so happens* that in all worlds containing *c* it is related to *d*. If the relation is *contingent*, however, then F has *d* in some worlds and other dispositional entities in others, and laws are contingent. But then it would be better to accept a Contingency theory of laws – like Armstrong's – which does not carry with it the extra ontological baggage that *Two Bits* does.

I think Armstrong is mistaken. If the connecting relation is necessary, that might be explained by the fact that *d*, as well as bestowing various powers on the particulars instantiating it, is also such that it supports the following general counterfactual: *any x is such that, if x were to be d, it would be c*. If the connecting relation is contingent, on the other hand, it is just not true that it leads to laws being contingent. If F is identified with *c*, laws are contingent. But *Two Bits* takes F to be identified with a unity of *c* and *d*, not *c* alone. Because of this, the contingency of the relation connecting *c* and *d* does not make the law that all Fs are G contingent. It only follows that there are possible worlds where *c* is connected to different dispositional bits, and worlds where *d* is connected to different categorical bits. Those other conjoinings aren't F: they are different universals with either *c* or *d* in common. Therefore it will still be true that all possible worlds with F are worlds

where it is a law that all Fs are G. In short: the modal status of the connecting relation between *c* and *d* does not affect F's being a unity of *c* and *d*, and it is F's being this which gives us the law.

The only real difficulty I have with *Two Bits* is that it introduces types of entity beyond necessity. Universals, according to **Powers**, are purely dispositional. But *Two Bits* makes them dispositional *and* categorical, and that is clearly an increase in one's ontological commitments. If **Powers** can otherwise explain the phenomena as well as *Two Bits* – and it is the aim of this dissertation to show that it can – then on grounds of ontological economy it is to be preferred. I should perhaps add that if **Powers** couldn't explain the phenomena as well, and some element of categoricity was necessary, *Two Bits* would be my fall-back position. It gives us a Necessitarian view of laws along with irreducible dispositionality, and with universals both dispositional and categorical most of what I want to say about laws would be unaffected. It also has a distinct explanatory advantage over *Two Aspects*, as we shall see.

4.22 *Two Aspects*

Mumford (1998) takes properties to be capable of both a categorical and a dispositional *description*. What I present here, as *Two Aspects*, is basically the same view with two modifications: (a) properties are taken to be universals rather than tropes, and (b) the account extends to all properties.

Mumford puts his position in terms of how we ascribe properties to objects. We may say 'x has C', where we are describing x in terms of the shape or structure feature that it has. Or we may say 'x has D', where we are describing some way x is disposed to behave. But C and D can still refer to the same property. For example, if I say 'x has an interlocking lattice structure of type S' then I am ascribing categorically a property to x, and if I say 'x is soluble' then I am ascribing dispositionally a property to x, but the property in both cases can be the same: the property I pick out using both descriptions is such that x has a certain structure and x is soluble.

Extending this to *Two Aspects*, we can say that each mind-independent universal has both a categorical and a dispositional aspect, where this amounts to the

fact that it can be ascribed to an object using both categorical terms (invariably shape or structural terms) and dispositional terms (such as 'being elastic', 'being malleable').

The categoricity or dispositionality, then, resides with our description of the universal, not with the universal itself. A useful analogy (as Heil notes, 1998a:184) is the ambiguous drawing. Take the duck / rabbit example. We can describe the illustration as either that of a duck or a rabbit, but clearly these are just two ways of describing the *same* set of lines on the page. If we describe it as a duck, that is because our mind is focused on the duck-aspect. If we describe it as a rabbit, our mind is focused on the rabbit-aspect. Similarly, if we describe x as soluble, we are attending to the functional role of one of its universals; if we describe it structurally, we are attending to the way a universal gives it its shape or structure. But the universal is simply something with a certain functional role or which, in instantiation, makes that which instantiates it have a certain structure.

Mumford's account does not extend to the properties of fundamental particles, since he thinks we may only be able to ascribe them using dispositional terms. But I think it can be extended. Of course, we perceive fundamental particles only via their effects, and thus cannot describe their properties in a non-dispositional way. But one could hold that *if* those particles could be observed directly, their properties could be described in both ways. For this reason, *Two Aspects* applies to all universals.

We end up with a position like this:

> ***Two Aspects***: universals are neither categorical or dispositional in themselves. Rather, categorical or dispositional *terms* are used to refer to them. Each universal can be described using terms of both kinds.

The problem with *Two Aspects* is not that it is less ontologically parsimonious than **Powers**. It isn't: universals are taken to have categorical and dispositional *descriptions*, not categorical and dispositional *components*. The problem with *Two Aspects* isn't that universals can't be described in both ways. I am quite happy to allow that saying 'x is square' can be describing a universal of x in a categorical way *and* describing a universal of x which is in fact a dispositional entity. We just have a

universal that, of its nature, supports certain counterfactuals, including ones about how objects having it would appear to us (i.e. as *square*). The real problem for *Two Aspects* lies with its lack of explanatory power.

Powers can explain why Fs *must be* G: it is because F and G have certain dispositional natures which ensure that Fs are G. Armstrong can also explain it: it is because the relation, N, holds between F and G. But with universals neither categorical nor dispositional in themselves, it's hard to see how *Two Aspects* can give an explanation of why Fs must be G.

One could introduce laws of nature as something ontologically extra in this picture. But this is problematic for at least two reasons. First, a major motivation for the Two-Sided view is that it promises to explain regularity without invoking laws as an ontological addition. Second, there is a tension between laws and the claim that universals are capable of categorical and dispositional ascription but are neither categorical nor dispositional in themselves. If the laws are contingent relations-between-universals, then *Two Aspects* is faced with the problem of giving substance to its contention that universals are not in themselves categorical, given that in most other respects the account is now the same as Armstrong's. And if the laws are necessary, that will have to be a brute fact: *Two Aspects* cannot, after all, explain it by citing the irreducibly dispositional nature of universals, since they aren't dispositional entities.

The reason I find *Two Aspects* unsatisfactory, then, concerns the point at which it admits brute fact. It claims that each universal fulfils a certain causal role, but when we ask questions of the form 'why does universal F fulfil causal role C?' it has no answer. I think we need an answer, and so I reject this account of universals

4.3 *Contingent and Necessary Nomic Relations*

There are those who take the laws of nature to be *contingent* and those who take them to be *necessary*. But there is an obvious middle position in which *some* laws are necessary (holding in at least all worlds containing the antecedent) and *the rest* contingent. Indeed, some philosophers (e.g. Daly 1995b:Ch.10) have accepted that some laws *may* be necessary, claiming that the *majority*, at least, are contingent.

In §4.31 and §4.32 I will look at two ways of proceeding with this mixed view. The metaphysical apparatus I shall draw on is already fairly familiar. There are particulars, and there are universals. Insofar as there are contingent laws, some external nomic relations are called for; and as I take irreducible dispositionality to be the best way of accounting for necessary laws, I will take the necessary laws here as fixed by the irreducible nature of the universals involved. One could dispense with external nomic relations between universals, and instead take universals to contingently instantiate certain irreducible powers. But I do not see that this alternative offers any more hope for the middle position, or that it bypasses the kinds of objections I shall be presenting, so I will put it to one side.

Before I consider these two positions, however, let me briefly consider the motivation for such a view. In §1.3 I claimed that the Contingency theorist draws an analogy between particulars and universals, claiming that, just as we think particulars could have had certain properties, so universals could have figured in different laws. But there are also properties we generally think certain particulars could not have had. I, for instance, could not have been a teacup. We might put it this way: being human is an essential property of mine. In the same way, the Contingency theorist might say there are certain laws, L, which F could not be part of. If so, it seems that F is involved in certain laws essentially – laws which it could not be involved with as well as L. And if F is involved in certain laws essentially, then we have our necessary laws. Though this analogy does not constitute an *argument* for the mixed view of laws, our having such intuitions regarding particulars at least makes understandable the extension to universals.

Less understandable would be the use of *imaginability* to get us to a mixed view. Those who take there to be contingent laws often do so because they can imagine the antecedent of the law without the consequent, and take that to show (at least *prima facie*) that there is a possible world where there is the antecedent but not the consequent. For instance, John can imagine water boiling at 150°C at normal atmospheric pressure and so he thinks that in some possible world water boils at 150°C in those circumstances. But if a law is judged necessary only if we *cannot* imagine it not holding, what empirical laws are going to be shown necessary? If we can imagine water boiling at 150°C, and not just something which looks like water together with something which looks like a thermometer placed in it and reading

150°C, then it seems we can imagine water boiling at 1000°C, 10000°C, and so on. It also seems we can imagine light travelling faster than the speed of light, sound travelling in a zigzag pattern rather a wave pattern, objects appearing out of nowhere, and all manner of odd events. It's not clear to me that there are any laws which will turn out to be necessary using the method of imaginability. Correspondingly, someone basing their claim that certain laws are contingent *solely* on the principle that imaginability is a guide to possibility would be unlikely to choose a mixed view of laws.

I pointed out in §1.2 that even if N(F, G) is contingent, that needn't mean that across all possible worlds F is N-related to all possible universals. But neither do I think we can accept as brute the fact that some combinations are impossible. Given that, we need an explanation in terms of logical consistency or the metaphysical nature of the world. Armstrong, of course, wouldn't try to rule out some combinations by taking some laws to be necessary. But it is an option for those who do not claim that all laws are contingent. If, for example, it is necessary that electrons behave in certain ways W, there will be many other ways WW – each of this set being incompatible with one or more of W – in which electrons cannot behave. Drawing the analogy with particulars again, we can similarly say that if there are no logical reasons to rule out my being a teacup in some possible world, there might at least be a metaphysical reason, i.e. my essential property of *being human*.

Just as I argued, in connection with Armstrong, that we needed to know *why* certain universals cannot be nomically related, so I think we need to know *why* some laws are necessary and some contingent. Answering this why-question involves uncovering a metaphysical structure to explain the situation, and it is to that task that I now turn.

4.31 *The Variable Account*

With a 'cluster concept', we are given a number of features which are said to be characteristic of a certain term. Objects falling under that term need not have all those features, or even some privileged few; all they need is to have a certain *proportion* of those features, with some possibly weighted as more important than

others. This idea can be used for ontology as well as semantics, giving us our first middle position option:

> ***Variable***: Given two possible worlds, *PW1 and PW2*, a universal, F, in *PW1* may have *some* (but not *all*) different nomic relations to that of universal FF in *PW2*, and yet it still be the case that F = FF. What is necessary is that F and FF have a number of nomic relations which are characteristic of the one universal.

What is it to have a nomic relation in common? Well, if it is a law that all Fs are G then F is nomically related to G. If it is a law that FFs are G, FF is nomically related to G. Both F and FF, then, are nomically related to G. So both share a nomic relation.

Variable needs to be supplemented with a metaphysical picture showing how F can have a proportion of nomic relations from characteristic list L in all possible worlds in which it exists. The fact that it always has this proportion, as I have said, should not be brute. What *ensures* that it has a proportion from L in all possible worlds in which it exists?

Two candidates present themselves. First, we can say that F has a *power* to instantiate a variety of nomic relations according to a certain algorithm. This power will not be reducible to facts about categorical universals, and will either be *exemplified* by F or partly constitute it. Second, we can say that F has an *essence* which ensures a certain proportion of specific nomic relations. This essence cannot be reducible to facts about what happens in all possible worlds containing F. An essence of something cannot just be *exemplified* by it, either – an essence constitutes it, is its intrinsic nature. Both these candidates, it seems to me, are problematic.

Take the *power* option. If something has a power, then it makes sense to ask *when* that power was exercised. So was this power of F exercised directly after F came into being? Surely not: from the moment it is instantiated, we take it to be nomically tied to many kinds of behaviour. So was the power exercised at the moment of first instantiation? Again, surely not. That would mean there was no room for F to have the power independently of its being exercised, but I would think the ability to be possessed yet not exercised, or not always, is a defining characteristic

of a power. If these two exhaust the possibilities, there are no powers of the sort being proposed.

The *essence* option is also problematic. We can understand essences by examining the idea of *internal relations* (§6.22). In all worlds in which there is a red patch and an orange patch, there is the relation of *is darker than* which obtains between them. But why does it obtain in all possible worlds containing the two relata? We can *explain* this by referring to the *essence* of the relata. The red patch has an essence which ensures that, if it is instantiated in a world with an orange patch, it bears the *is darker than* relation to it. The orange patch has an essence ensuring that, in all worlds containing a red patch, it bears the *is lighter than* relation to it.

So far so good. *Essences* are *natures*, and they explain why certain regularities (e.g. all red patches are darker than orange patches) hold across possible worlds. But the essences of *Variable* are required to do much more. The essence of F ensures that it bears various contingent nomic relations. These are real, *external relations*. Each of these is external because the nomic relation does not hold between the relata in all worlds containing those relata: all the essence ensures is that a *proportion* of nomic relations from list L hold. In the last paragraph I characterised an essence as that which ensures the holding of one or more *internal* relations; now we are being asked to accept that essences can also ensure that *external* relations hold. This non-standard essence is of a kind which only seems to be posited to explain how universals can be as *Variable* says they are. It is not an essence which seems to have any general application. Its introduction here is therefore ad hoc.

The fact that this essence is unusual brings with it explanatory consequences. All contingent accounts of law are unable to explain why F, in some world, has the nomic relations it does. But by positing an *essence* of F, we might think, we should be able to shed some light on the matter. However, *Variable*'s essences, unlike those of **Powers**, are not up to this sort of job. The essence of F cannot explain what makes F, in some particular possible world, have *those* nomic relations rather than some other permissible combination from L. Because F has the same essence no matter which permissible combination of nomic relations it has, the essence cannot explain F's having those relations. At most, these essences can explain why F has the set of nomic relations it has rather than some *impermissible* set.

The advocate of *Variable* might say we shouldn't expect any more than this, since these essences, after all, are not characterisable in terms of internal relations. But even if this is true, and such 'essences' are legitimate theoretical postulates, the point about their being ad hoc remains. Another point, which I raised in connection with the Contingency theory, is also worth mentioning at this juncture: a theory which takes it as brute, say, that F is nomically related to G, is at a disadvantage compared to a theory (such as **Powers**) which does not, since intuitively we expect there to be a reason for that relation holding.

4.32 *The Fixed Account*

Another way of fleshing out a middle position does rather better than *Variable*. It is neither incoherent nor does it ask us to give well-known metaphysical items (i.e. essences) new magical powers (i.e. attaching a universal via external nomic relations to others). Indeed, it proves remarkably resilient to attack. Here it is:

> ***Fixed***: In all possible worlds containing F, it will have nomic relations. F will have *some* of these relations in all such worlds, others will vary across worlds.

As with the statement of *Variable*, various metaphysical decisions still need to be made. But unlike *Variable*, I will only look at one way of doing this – the way I think is most explanatory. We are naturally inclined to think there is a reason why F has specific nomic relations, call them S, in all possible worlds where it exists. It would be something of a strange across-world coincidence otherwise. And we have an explanation of this if we take S to be founded on the *partially* irreducibly dispositional nature of F (see the end of §2.11). Some facts about what would happen in various circumstances involving an instantiation of F are consequently made true by F itself, and others by the existence of *external* nomic relations between F and others (a la Armstrong).

One might claim that *Fixed* is disadvantaged inasmuch as it entails a metaphysics more complex than **Powers**. It *is* more complex: it has both irreducible dispositionality *and* external nomic relations. But it cannot be criticised purely on the grounds that it is more complex; it has to be on the grounds that it is more complex *than necessary*. All theories of law develop in an attempt both to explain

regularity and hopefully accommodate certain modal intuitions. And since *Fixed* is accommodating different intuitions to those underlying either **Powers** or Armstrong's position, the amount of ontological material it needs might well differ. In this case, in fact, I do not see how *Fixed* could have made some laws necessary and others contingent without either having the ontology it does or without taking the modal status of laws to be a matter of brute fact.

There is a sceptical possibility to which *Fixed* falls prey that is very similar to one already raised in connection with Shoemaker (§3.12). Here is a description of a universal in two worlds that *Fixed* takes to be possible:

> *PW1* : F has the nomic relations numbers 1 to 6 in virtue of its nature. It also, as a matter of contingent fact, has the nomic relations 15 to 18.
>
> *PW2* : FF has the nomic relations numbers 15 to 18 in virtue of its nature. It also, as a matter of contingent fact, has the nomic relations 1 to 6.

F is not identical to FF. They are distinct universals, with distinct natures. But F has, in *PW1*, exactly the same nomic relations as FF in *PW2*. In that case, don't we intuitively want to say that F and FF are in fact the same universal? That is, don't we think that two universals with the same nomic relations are in fact the same universal?

Things get worse. Not only does *Fixed* allow there to be two distinct universals having the same nomic relations but occupying *different* possible worlds, it also allows there to be two distinct universals with the same nomic relations and occupying the *same* possible world. And that means samples of a substance *here*, in *this* possible world, could in fact be samples of *two* substances (that is, particulars instantiating one universal and particulars instantiating another). Of course, we sometimes find that samples we thought were of the same substance are actually of two distinct substances. Mistaking gold and fool's gold is an obvious example of this. But what showed us these were different substances were precisely differences in nomic relations that were eventually detected. *Fixed* opens up the possibility of two different universals being instantiated and our never being able to distinguish them, even in principle.

Shoemaker takes this sort of sceptical possibility to support the claim that a universal's nomic relations are essential to it: i.e. he draws a metaphysical conclusion from epistemological premises. I have already argued that I do not find this move compelling. But even if one resists it, the principle *same nomic relations, same universal* might be thought intuitively plausible. *Fixed* sprang from the urge to accommodate the thought that the same universal could have *different* nomic relations in *different* worlds; as it so happens, the unwelcome by-product of the metaphysical story accommodating this claim is that different universals might have the *same* nomic relations in the *same* possible world.

This does not strike me as an attractive consequence. But someone may object that the *same nomic relations, same universal* principle is not quite right, offering instead *same essential nomic relations, same universal*. If they find this alternative more intuitively plausible, there is little I can say to convince them otherwise. Alternatively, someone may accept the principle I have suggested and merely claim that, *on the whole*, *Fixed* is in no worse shape than the main alternatives. They can even take comfort from the fact that Armstrong's account also allows just this sort of sceptical possibility.

Powers does have an advantage here: according to it, if F and FF are dispositional entities with the same nomic relations, they are the *same* dispositional entity. This means it *doesn't* face the aforementioned sceptical possibility. This fact is nowhere near enough to show that **Powers** is the best account of laws, as I have said; but that does not mean it carries no weight at all.

A second advantage of **Powers** over *Fixed* is that the latter (and *Variable*) suffers from the same problem as Armstrong regarding the *Fundamental Particle* and *Elementary Property* cases examined in §2.22. Though the universals of *Fixed* are not categorical, the truth-maker for a contingent law is an external relation between universals, and intuitively we want to accept worlds where such laws hold but where one of the relata is uninstantiated. This difficulty can be by-passed by accepting Platonism, but that, of course, is a problematic doctrine in itself, and one to which **Powers** is not committed.

We have seen, then, how **Powers** has at least two advantages over *Fixed*. Furthermore, it is hard to see what advantages *Fixed* would have over **Powers**. Its

metaphysics takes from both the Contingency theorist and the Necessitarian, but, while it may inherit some of the former's problems, I don't know of any virtues it inherits that are not also shared by **Powers**. Therefore, I think **Powers** comes out the better theory.

4.4 *Conclusion*

In this chapter I have looked at a number of positions. First, I looked at Fales' account, which unlike **Powers** does not take the nomic relation to be grounded in the nature of the relata. Second, I looked at the Two-Sided account, which differs from **Powers** by taking universals to have either two components – a dispositional side and a categorical side – or to be neither categorical nor dispositional in themselves, only capable of being described in categorical and dispositional terms. Third, I looked at a mixed account of laws which takes either some proportion of a universal's characteristic nomic relations or some privileged set of its nomic relations to be essential to it. **Powers**, in contrast to this view, takes all a universal's nomic relations to be essential to it.

Both Fales' account and the mixed account of laws need to endorse Platonism regarding universals. Fales has to because of his insistence that laws are necessary relations-between-universals and yet universals are categorical entities. And the mixed account of laws has to because a contingent law may hold even if some of the universals involved in that law are uninstantiated. **Powers**, on the other hand, takes laws to be general counterfactual facts obtaining in virtue of the *irreducibly dispositional* nature of universals, and so does not need to endorse the existence of uninstantiated universals. This I take to be a distinct advantage.

In these first four chapters I have been concerned to build a case for **Powers** being the best explanation of law-like regularity. This has meant weighing the position against a number of key rival accounts, and showing that, on balance, it fares better. But while **Powers** may have distinct advantages over its rivals on a number of fronts, it may also suffer from problems which ultimately render it untenable. Because of this, the next chapter looks at important objections to Necessitarianism in general and irreducibly dispositional universals in particular. My aim is to show that

these objections are either without force or can be successfully rebutted. In showing this, the case for **Powers** being the best explanation of law-like regularity will have been strengthened.

Chapter Five

OBJECTIONS TO *POWERS*

The account I am proposing, **Powers**, faces a number of criticisms. These range from the charge of incoherency to that of simply being at a disadvantage when compared to some other particular account. And these criticisms do not all come from Non-Necessitarian philosophers. Non-Necessitarians are concerned to argue against Necessitarianism in general, but Necessitarians are interested in advancing their version above all others. My aim here is to answer these criticisms of Necessitarianism, and of accounts most like **Powers** in particular. In doing so, I also hope to clear up some of the misunderstandings about **Powers** which may still be lingering in the mind of the reader. I will give each major criticism / argument a section of its own. There are eight sections in all.

5.1 *The Ontological Regress*

Armstrong offers the following argument against the claim that universals *are* powers:

> If a property *is* nothing but its capacity to enter into nomic relations to further properties, the same must be said of these further properties, and so on indefinitely unless we return in a circle to the original property or properties. No property is anything in itself, but only in its relations to other properties as given by the laws of nature. But how can a system of things, each logically nothing in itself independently of the system, be made into something by incorporation in the system? (1983:162)

He also has another stab at making the same point when considering how to get out of the difficulty the *Emergent Property* case raises:

> A truly radical attempt to overcome the problem of linking categorical universals with powers would be to reduce all universals to powers [...] I believe, however, that such an attempt is involved in vicious regress. The power is constituted the power it is by the *sort* of actualizations it gives rise to in suitable *sorts* of circumstance. But what are these sorts of actualization and sorts of circumstance? They themselves can be nothing but powers, and so again they can only be constituted by the sorts of actualization which they give rise to in suitable circumstances. The power to produce A is nothing but the power to produce the power to produce B... and so on. Nor will the situation be relieved by bringing the powers around in a circle. (1983:123)

I have no argument with what I think Armstrong is saying here. *If* universals are taken to be powers, and powers are construed as 'nothing but' what will happen in certain circumstances, then we get ourselves in a vicious regress (or circle). *If* powers are 'nothing in themselves', as Armstrong says, then to say that x has a power P is to say merely that certain counterfactuals are true of x. These counterfactuals, in turn, will involve other universals – and therefore powers – in their antecedent and consequent clause, and these powers will also be 'nothing in themselves'. To say that any particular, x, has these further powers is, again, to say that certain counterfactuals are true of x. And so on. We never get, from this procedure, to a stage where the powers are *something* in themselves, and since that is what we are trying to get, the regress is vicious.

One might, however, deny that powers are 'nothing in themselves'. One might say that powers are simply *entities* that support counterfactuals. To say that x has power P is to say that it instantiates a property – and this is a mind-independent entity – which makes certain counterfactuals true of x. If powers are like this, there is no question of an *ontological* regress. The regress would at most be a *characterisation* regress: namely, that the nature of P has an infinite complexity because by its nature it supports certain counterfactuals, and the powers in those counterfactuals by their nature support further counterfactuals, and so on ad infinitum. One can take universals to be clusters of conditional powers (as Shoemaker does) or one can take universals to be dispositional entities (as I do). But either way the regress will be no threat to the *existence* of universals.

Armstrong says that bringing the powers around in a circle is no use. But I think the nature of a universal is not linear in the way an infinite regress dictates, but is circular. More specifically, what we have is a *network* of universals. We have a number of universals that are each nomically related to the others through the counterfactuals they support. That number may be infinite – there may, for example, be a continuum of values for temperature universals. But there is no problem, on the face of it, with the idea that a universal may have a nature which involves certain other universals, even all universals. The nature of a bride is such that to be one there must be a groom, and vice versa, but that does not raise questions about the existence of brides and grooms. The same for the Nomic Network as the marriage network.

Perhaps it did not occur to those advancing the ontological regress argument that powers could be irreducibly dispositional entities. When talking of solubility, one often comes across the idea that it must have a 'categorical base' – i.e. there must be some non-dispositional property that x has in virtue of which it is soluble. One might generalise from this to all dispositions and powers. But it is important to see that this is just *one* way of construing matters. It is Armstrong's way. Universals, for him, are categorical entities, and x is soluble if it has a categorical base which, because of the laws of nature, makes x dissolve when put in water. But there are other ways. And one of these is that of **Powers**, where universals are dispositional entities, and it is true that x is soluble if it has a universal (or universals) that, because of its (or their) intrinsic *dispositional nature*, ensures x dissolves when put in water.

5.2 *The Power Regress*

Alexander Rosenberg (1984), in his discussion of Shoemaker's account, thinks he detects another regress problem. A property is a cluster of causal powers. But causal powers are properties too. So these causal powers must also be clusters of causal powers. But then these latter causal powers, as properties, will themselves be clusters of causal powers... and so on. We have a regress of powers.

There are, however, two ways one might prevent this regress from starting. First, one might take the claim to be that properties *which are not themselves causal powers constituting some property* are clusters of causal powers. Second, one may modify the claim slightly, so that properties are *either* clusters of causal powers or single causal powers. In this way the causal powers constituting a property need not themselves be composed of causal powers; it is enough that they are single causal powers. Since it makes a claim about *all* properties, rather than some subset, the second option seems preferable.

Powers does not take properties to be power-clusters in the way Shoemaker does. Properties – as universals – are powers only inasmuch as they support, of their intrinsic nature, various counterfactuals. This makes them *powerful* entities. One might also, equating single or sets of counterfactuals with 'powers', call universals power-clusters if one wished. But still, with this as the metaphysical situation there

is no threat of a power regress. The regress starts because the powers, as properties, have to have powers themselves. But there is no analogous claim that counterfactuals supported by a universal must themselves support counterfactuals.

5.3 *The Epistemic Regress*

There is another regress argument which needs consideration, one very similar in form to the ontological regress argument but concerned, not with the universal itself, but with our *knowledge* of it. In what follows, I shall take knowing F to consist in an ability to *identify*, or *recognise*, F. But it seems clear that if we cannot know F in this minimal sense, we cannot know it in a more substantial sense, e.g. where knowing F is knowing all the nomic relations F enters into.

Rosenberg raises an epistemic problem for Shoemaker's power-cluster account as follows:

> We may be confident that there are properties, because we are confident that there are laws, but we cannot be confident that any of our predicates expresses a property, or which property it expresses, until we have knowledge of *all* the laws of nature. (1984:82)

Swinburne, also in discussion of Shoemaker's account, goes one step further:

> It seems to me that not merely is Shoemaker's strong thesis inadequately supported by argument, but that it must be false [...] For if he is right, we could never come to know or even have a reasonable belief about what properties objects have – and often we do have reasonable beliefs about this. (1980:316)

Rosenberg is saying that Shoemaker's account entails that knowledge of any property requires knowledge of all the laws of nature. Swinburne is saying something even stronger: that Shoemaker's account entails that we cannot *ever* have knowledge of *any* property. Why?

> ... if properties are nothing but potentialities to contribute to powers, one could only justifiably attribute such properties to objects if one had observed their effects. And so on ad infinitum. The regress is vicious. (1980:317)

The basic idea is this. Properties, on Shoemaker's first account, are clusters of conditional powers. To be able to identify any property of an object, we need to be able to know that the object has certain powers, given its other properties. But take any one of these powers. How do we know the object has it? Well, we know it has it if, in certain circumstances, the object behaves in a certain way. However, that is not the problem solved. For these circumstances (and behaviour) are a matter of the instantiation of certain properties and relations. If we are to know the object has the power, we must recognise these properties. But these are just clusters of conditional powers, so to know that they are instantiated we will need to know that the objects instantiating them have certain powers (again, given what other properties they have). But again, to know that they have these powers, we will need to recognise certain other properties and relations.

Shoemaker also acknowledges that a property's *backward-looking* features, i.e. what causes its instantiation, are essential to it. But the problem is no different if we focus on these. It is instantiations of other properties which cause x to be F, and to know these other properties have been instantiated we need to know their cause, bringing in other properties, and so on.

Even if we accept that there is a Nomic Network of properties, rather than an infinite linear regress, there is still no reason to think I can know any one of the properties in that network. Take a network-cum-circle of three properties, F, G and H. I only know F if I know G, I only know G if I know H, and I only know H if I know F. It doesn't seem, in that case, that I can know any of the three properties; and the case we are considering is only different in terms of the number of properties involved. Rosenberg thinks knowledge of all the laws will get us knowledge of the properties. It would. But knowledge of laws depends on our already recognising at least some properties. If we cannot get to know what properties there are, we cannot begin to establish what laws there are.

This regress argument, unlike that of the previous section, isn't restricted to Shoemaker's conception of properties. It also applies to **Powers**. Universals are dispositional entities which support various counterfactuals, some (perhaps most) of which are conditional. To recognise an instance of F, then, we need to know that the object instantiating it, given the other universals it instantiates (that's the *conditional* bit), would, if it were in circumstances C, exhibit behaviour B (that's the

counterfactual bit). But both C and B involve universals, and we must recognise these if we are to recognise F (not to mention the object's other universals which determine what powers F bestows). F also supports counterfactuals about in what circumstances F would be instantiated. But again, those circumstances involve the instantiation of other universals we need to recognise if we are to recognise F. Endorsing a network view will not solve the problem of how we can know any one of these universals.

How, then, does one respond to this argument? There are at least two independent strategies. First, one can point out that if the regress is successful, it also affects contingent accounts of laws positing mind-independent universals. Second, one can attempt to show that some universals are known directly, not through the way those particulars instantiating them behave. This is what Evan Fales does. Let me now take each response in turn.

5.31 *Armstrong's Account and the Epistemic Regress*

I do not think the epistemic regress depends for its existence on the claim that universals have their nomic relations essentially. Someone taking universals to have their nomic relations contingently can still fall foul of it. What allows the regress to take hold is the claim that universals are *mind-independent entities*: entities which do not depend on our conceptual faculty for their existence.

To see this, let us remind ourselves how the regress gets started. We want to know that F has been instantiated by x. But to know that, we need to know that certain counterfactuals hold about x. These counterfactuals bring in more universals, which themselves can only be known if we know certain counterfactuals which are supported by them, and so on.

Now consider Armstrong's account, where universals are categorical entities with contingent nomic relations to others. If F is a categorical universal, how do we know it is instantiated by x? Well, F is an element of the mind-independent reality, and so plausibly can only be known to be instantiated by the causal effects that x

being F has on our senses.[1] Laws of nature involving F support counterfactuals about what brain-excitation universals would be instantiated given certain circumstances and the instantiation of F by x. So to know that x has F, we need to know that one of these brain-excitation universals has been instantiated. But this brain-excitation universal is also an element of the mind-independent reality. And to know it has been instantiated, don't we also need to know that universals have been instantiated which are nomically connected to it?

One may think the answer to this is no. No regress is embarked upon because the brain excitation universal is known without our having to know universals to which it is nomically connected. This seems plausible if the brain-excitation universal presents itself *phenomenally*: as, say, part of some visual experience. But if this is a way out for Armstrong, it is also a way out for the Necessitarian. They too can say that some universals – those which present themselves as elements of phenomenal experience – are known directly.

In the next subsection I explore how this would be done. The important point for now is that if this response does not work, the Necessitarian can take some comfort from the fact that he does not suffer alone. This is a small comfort, of course: if an account really does entail that knowledge of universals is impossible, that account is surely untenable.

5.32 *Fales' Solution: Epistemically Direct Universals*

If some universals were known to us *directly*, without having to know the universals involved in some of the counterfactuals they support, we would be able to build knowledge of non-direct universals from this. The only obvious candidates for such epistemically direct universals are the universals of phenomenal experience. Perception is law-governed: we have as antecedent some event in the world, and as consequent some perceptual event 'in the head'. If the perceptual event can be known directly, the regress is halted.

[1] Perhaps via some intermediary: i.e. x is F is part of the cause of some other state which affects our senses. For example, we know that electrons are in the chamber, not because *they* affect our senses, but because they are causally responsible for another state of affairs which does.

Evan Fales has suggested such phenomenal universals be used in this way. But if Fales is right about what sorts of properties these are, it is a move which will be resisted by many. Here is how he puts it:

> ...phenomenal properties – qualia – are ineliminable. Advocates of functionalist versions of materialism characteristically eliminate the sensuous content of experience in favour of belief-states and the like. Belief-states are in turn identified in terms of their causal roles. It will be seen that this eliminativist strategy, implausible as it may be in any case, is not admissible on our assumptions. For if we are not directly acquainted with any properties, and mental states are themselves identified in terms of causal powers, then the epistemological regress [...] cannot be halted, and becomes vicious. (1990:224)

The problem, then, is this. We can avoid the regress if we accept that sense-experience universals are known directly. But these phenomenal properties are qualia. So we avoid the regress by accepting something that a lot of philosophers find highly suspect.

Fales doesn't find irreducible qualia particularly objectionable. They are at least, he says, part of the causal structure of the world. But they are plainly not *physical* entities. They are not going to appeal to someone who thinks the world consists of no more than particulars having *physical* properties and bearing *physical* (e.g. bonding) and spatiotemporal relations to one another. That person, of course, is the Physicalist. I think of myself as one. Am I mistaken? Is the choice between accepting irreducible qualia and denying a realism about universals? Such realism seems to spark off the regress, since whatever one then takes laws to be (even regularities) they will involve universals.

I confess that if the choice was between irreducible qualia and Property Nominalism, I would accept qualia at the expense of Physicalism. Realism about universals is, I think, more plausible, and better justified, than Physicalism. But I would like to keep hold of both. In the next subsection, however, I will argue that this unacceptable epistemic regress can be halted without irreducible qualia.

5.321 *Physicalism and Qualia*

Let me outline one possible Physicalist attempt to reduce qualia. I do not have the space to attend to all the questions it brings up. But my aim here is not to show that qualia *are* this way, simply that looking at them in this way has promise and would

allow us to hang on to both Physicalism and realism about universals. If in the end I have to accept irreducible qualia, then so be it. Physicalism and **Powers** are not inextricably linked.

Say I look at a flower. Light from the flower hits my retina and there is some complex causal activity which results in my having a *phenomenal experience* of that flower and its surroundings. When we have this experience, there is brain activity. This involves the firing of neurones in specific configurations. So – perhaps – one might think that this token phenomenal experience of the flower is actually identical to a token brain-state. More accurately, this token phenomenal experience is identical to a token brain-*event*.

This doesn't account for the most striking feature of phenomenal experience: namely, its *subjectivity*, the *what-it-feels-like*. This can be explained without invoking irreducible qualia if one takes this phenomenon to be a matter of the way the brain-event is *presented* to me. There are no irreducible qualia as properties of the brain-event. There is just the brain-event presented to me in a certain way. This is a different way to that in which the same brain-event would be presented to someone else if they were able to look into my brain at that moment. They would see it as a token configuration of neurones firing. But the difference is not one of *what* is presented to both myself and this observer, only *how* it is presented. It being a brain-event of *mine*, it is presented to me in a different way to how it would be to someone else. This is only the case because the brain-event is presented to me as a phenomenal experience. I could be conscious while my skull is cut open and, using mirrors, watch the doctor excite part of my brain electrically. *That* brain-event may well be presented to me in the same way it is presented to the doctor: i.e. as an excitation of neurones.

Types of brain-event are universals. Using this claim, we might then say that the epistemic regress is halted if some types of brain-event (those which are types of phenomenal experience) can be known directly. However, the regress cannot be halted this way. Multiple realisation is generally accepted in the philosophy of mind. Many types of brain-event can realise a particular type of phenomenal experience, and so many types of brain-event can present themselves in the *same* way. If the brain-event's mode of presentation will not tell me of which type it is an instance, I cannot directly recognise any one of these brain-event types.

While we cannot have direct knowledge of brain-event types, we certainly seem to have direct knowledge of their *presentations*. There seems, at least for the most part, no mistaking the phenomenal experience we are having. And we might then wonder if direct knowledge of these presentations is enough to halt the regress. I think it is. Presentations are not universals in themselves. We have the brain-event universals, and each instantiation of one of these types is identical to a token phenomenal experience; the brain-event universals – beecause of multiple realisation – are not themselves identical to *types* of phenomenal experience. But even though the presentations are not universals, and so not part of the *nomic* network, that does not mean they are not part of the network of universals and presentations by which universals are known.

I think the following is enough to get us knowledge of universals. We have a certain type of phenomenal experience: let's call it *flower*. Now *flower* is known directly, since it is the way a certain group of types of brain-state (universals) are presented to me. Of any token *flower*, I do not know which member of this group is being presented. For knowledge of universals, however, it is enough that the member is one of a group which presents itself to me as *flower*, even though I could not *recognise* it as the brain-state being presented to me on any particular occasion. I know, for instance, that universals X (universals instantiated by a specific type of flower) are causally responsible for *flower* experiences. When I have those experiences, I recognise instances of the universals in X. I know, for example, that F is instantiated by the object I am looking at, since F, in part, is known as the universal causally responsible for a specific part of *flower* (the shape of a petal, for example). Using correlations between elements of my phenomenal experience I can develop a further understanding of the nature of those universals in the world which are causally connected with my experience.

Though there are many details to fill in, something like the above account seems along the right lines. Any empirically-minded philosopher who takes us to have knowledge of mind-independent universals – whether Physicalist or believer in qualia – will have to take us from sensory experience to knowledge of universals, and the way I have outlined above, causally tying parts of our experience to the identification of a universal, seems essentially the way to do it. I tentatively

conclude, then, that **Powers** and Physicalism do mix. The regress can be halted without the introduction of non-physical qualia.

5.322 *Do Modes of Presentation exist?*

I have said that knowledge of a universal is grounded in direct knowledge of 'something else'. But isn't that 'something else' a *thing*? Haven't I conceded that these presentations *exist* as something over and above the brain-state universals they are presentations of? If I have, then (since I will have admitted non-physical entities) the above is not the Physicalist solution it appears to be. But I do not think I have conceded this.

The ontological situation, as I see it, is this. There exist certain universals. Brain-state universals, for example, exist. But the ways in which instantiations of such universals are presented to me do not exist as well. These presentations are repeatable, and so *if they did exist* they would be universals. But being a good Physicalist I want to resist the claim that they exist. There are certain brain-state universals, and there are certain ways these can present themselves to me. For me to have a phenomenal experience, we only need me, my *physical* make-up, and my embodiment in a *physical* world. We do not need to reify the presentation, making it an entity distinct from the brain-state. Indeed, on a token level, I think the phenomenal experience *is identical to* the brain-state. It just doesn't appear that way because of my unique relation to the brain-state: i.e. because it is a brain-state of *mine* that I am aware of.

One might put it this way. There are brain-state universals and ways these are presented to me. These presentations are not universals, but there are *facts* about how these brain-state universals present themselves to me. These are facts which hold in virtue of the physical situation. And these presentation facts, just like those general counterfactual facts involving all universals, are not extra entities in the world: they are not states of affairs involving particulars and universals (§2.16). The phenomenal-experience fact that P 'holds' because there is a true statement 'P', and the truth-maker for this true statement is certain states of affairs which do exist. We will say more on the question of what does and does not exist in Chapter 6.

5.4 *Armstrong's 'Difficulties'*

Armstrong has presented what he thinks are a couple of 'difficulties' for the idea that all universals are dispositional entities (what he calls 'Dispositionalism'). Neither is able to successfully undermine Dispositionalism. Here is Armstrong:

> The *first* difficulty springs from the fact that a disposition as conceived of by a Dispositionalist is like a congealed hypothetical fact or state of affairs: 'If this object is suitably struck, then it is caused (or there is a certain objective probability of it being caused) to shatter. [...] That is all there is to a particular disposition. Consider, then, the critical case where the disposition is not manifested. *The object still has within itself, essentially, a reference to the manifestation that did not occur.* It points to a thing that does not exist. [...]
>
> ...how can a state of affairs of a particular's having a property enfold within itself a relation (of any sort) to a further first-order state of affairs, the manifestation, which very often does not exist? We have here a Meinongian metaphysics, in which actual things are in some way related to non-existent things. (1997:79)

There is a problem with the way Armstrong makes his point using an *object* with an unmanifested disposition. He claims the object 'points to a thing that does not exist', and so we get a 'Meinongian metaphysics' with actual things related to non-existent things. But he has not said anything to force this conclusion on us. Though the object has never shattered, its being fragile does not entail that it has a relation to a non-existent object, its shattering. Rather, we can say it is fragile because it has a micro-structural universal which is nomically related to the universal of shattering when suitably struck (however we cash this out). Both these universals are likely to be instantiated, and so existent. The first certainly will be, since it is a property of the object. But the second might also be: though the object we are focusing on has never been shattered when suitably struck, other objects may well have been, and certainly will have been if the world in which the object exists is anything like the actual world. The fact that the object is fragile but never breaks does not, therefore, force the Dispositionalist to accept relations between existent and non-existent entities.

Of course, though the example is a bad one, the point can still be made. There is no reason to suppose that there *must* be some shattering-when-suitably-struck event. There are possible worlds where, as a matter of contingent fact, nothing shatters. They may be very different to this world, but nothing seems to rule them out. And don't the objects we would call fragile there have micro-structural properties which 'point to' the uninstantiated shattering event-type?

Armstrong presumably thinks this is problematic. But according to **Powers** the micro-structural property 'points to' the shattering only in the sense that it has a nature which makes it true that anything instantiating it which is suitably struck will break. That is all there is to the property 'pointing to', or being nomically related to, the breaking-when-suitably-struck universal. There is nothing 'spooky' going on here, no strange relations bridging the existent and the non-existent. Because of this, I do not see that it is problematic to have existent universals 'pointing to' non-existent universals. It would be if the nomic relation was an entity separate from, and over and above, its relata, as Armstrong takes it to be. You cannot have an entity bridging two relata, one of which is non-existent, just as you cannot have a bridge which is only connected on one side. But **Powers**, as I have already pointed out, does not take the nomic relation to be a separate existent universal.

The second supposed difficulty Armstrong points to concerns the very idea that all universals are purely dispositional in nature. In his own words:

> Suppose that a thing acts and as a result some further thing gains a new property. [...] the new property will itself be purely dispositional. If and when this new property has its effects, these too will be a matter of gaining, losing or sustaining purely dispositional properties. [...]
>
> Can it be that everything is potency, and act is the mere shifting around of potencies? I would hesitate to say that this involves an actual contradiction. But it does seem to be a very counter-intuitive view. (1997:80)

Again, I do not find the idea that change is the shifting around of dispositional entities particularly counterintuitive, and nothing Armstrong has said here convinces me otherwise. At another point he makes the following claim:

> ...since on this view manifestations of dispositions can be no more than the acquiring of further dispositional properties by the particulars involved, potentiality can never pass over into genuine act, genuine non-potentiality. (1997:250)

First Armstrong said act would have to be construed as the shifting of potencies on the Dispositionalist view. Yet here he seems to be claiming there can never be 'genuine' act on such a view, because 'genuine' act is equated with 'genuine non-potentiality'. However, I do not think it is built into our concept of an action or event that only non-dispositional properties are shifted around. Nor is it likely: does our *common-sense* conception of such notions really include heavy metaphysical claims? Besides, even if our concepts were constrained in this way, the Dispositionalist is free to urge their revision. As such, I have no problem thinking of change as involving the shifting around of dispositional properties.

5.5 *Irreducibly Probabilistic Laws*

Dispositionalism entails that laws are necessary. It is a *Necessitarian* position. But one can be a Necessitarian without being a Dispositionalist: Fales is an example of this. In this section I will look at one argument which Armstrong mounts against this broader position.

Armstrong thinks it is at least plausible that the fundamental laws of nature could be irreducibly probabilistic. But this, he claims, is problematic for the Necessitarian:

> There is first the point that, given the candidate for the cause, the effect does not always follow. Perhaps that difficulty can be met by allowing contingency at that point while insisting that, where the effect does follow, then 'in every possible world' that effect must be of a certain nature. But the deeper difficulty is that it is hard to see how the precise probability is necessary. Suppose the probability is 0.4. Why could it not have been 0.45? In what does the necessity of the alleged necessity consist? Perhaps some very powerful scientific theory would to some degree answer these questions. But that puts the Necessitarian theory somewhat at the mercy of science. (1993d:191)

I reject Armstrong's way of fixing the problem of irreducibly probabilistic laws for the Necessitarian. Indeed, I deny that anything needs fixing. The Dispositionalist Necessitarian, such as myself, can say the universals involved in a certain type of cause have a nature such that, when instantiated, there is a 0.4

objective probability of a certain type of effect.[2] The Categoricalist Necessitarian, on the other hand, can avail himself of Armstrong's way of handling probabilistic laws.

Roughly speaking, Armstrong accommodates probabilistic laws by taking the N relation as admitting of degrees. With a fully deterministic law, such as the law that all Fs are G, the N relating F and G is of degree of probability of necessitation 1 (0 for 0% probability, 1 for 100%). This can be written as (N:1)(F, G). For a case where the probability is 0.4 of any F being a G, we would have (N:0.4)(F, G). So, for the causal case Armstrong considers above, we have (C:0.4)(CAUSE, EFFECT), where CAUSE and EFFECT are two universals, and C:0.4 the probability of an instance of the first causing an instance of the second (1983:Ch.9).[3] All the Categoricalist Necessitarian needs to add is that if the nomic relation holds in one world, it holds in all those worlds in which there exists the antecedent universal. That would have to be a brute fact, and so unsatisfactory in that respect.[4] But that, of course, is just one reason why I prefer a Dispositionalist account.

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[2] Heil (1998a:187) suggests that probabilistic laws be accommodated by properties having a fluctuating nature. Say there is a particle of type P which has a probability of 0.5 of doing X when in relation R to a Q-particle, and a 0.5 probability of doing Y when in relation R to a Q-particle. A particular P-particle may come into relation R to a Q-particle many times. Take one such particle. Heil's thought is that this particle sometimes does X and sometimes Y because its nature fluctuates. This isn't to say that it acquires and loses different properties. Rather, it is that sometimes the particle's P-ness has one nature – fully determinate, such that there is a probability of 1 of doing X – and sometimes another, where the probability is 1 of doing Y.

This is an option one could only take if properties are tropes rather than universals. The particle can be said to have a trope at time t which has one determinate nature, and then a different trope at t+1 with a slightly different determinate nature. Both tropes are P instances, so the particle is P throughout the change of nature.

There is no metaphysical barrier to universals having fluctuating natures. But if P is a universal with such a nature, *all* P-particles, at certain times, will have probability 1 of doing X, and *all* P-particles, at other times, will have probability 1 of doing Y. This means there could not be one P-particle at t which does X, and another P-particle at t which does Y. But this, I take it, is something we certainly do think is possible if there are irreducibly probabilistic laws. Therefore we cannot explain such laws by positing fluctuating natures for certain universals.

[3] There are subtleties to Armstrong's account of probabilistic laws which need not concern us here.

[4] The Categoricalist Necessitarian who is also an *Immanent Realist* has another problem here. It seems plausible that there are possible worlds where the probability of an outcome is so low that it never occurs. Say there is a 0.04 probability of a G, given F, but that F is very rarely instantiated. Then there could very well, we think, be no instances of G. But now consider this. Worlds in which F and G are instantiated are worlds in which (N:0.04)(F, G) holds. But if the law is necessary, as the Necessitarian says, it should also hold in all worlds in which F is instantiated *and not G*. After all, we would still want to say of those worlds that there was a 0.04 probability of a G, given an F. Fales – as a Platonist – would have no trouble with such an example: F and G can exist without being instantiated, as can the law. But the Immanent Realist is forced to say either that (N:0.04)(F, G) does not hold in worlds with F and not G *or* that there are no worlds with F and not G. Either option is counterintuitive.

Armstrong's 'deeper difficulty' is that he finds it hard to see why the probability couldn't have been 0.45 instead of 0.4. He presumably thinks the Necessitarian needs to explain why we should think the probability of 0.4 is necessary. But the Necessitarian can equally well ask him why we should think the probability of 0.4 is contingent. If the probability of EFFECT, given CAUSE, is 0.4 in the actual world, why should that be any different in a possible world? In answering this type of question, both parties can only point to how well their Contingency or Necessitarian account of laws fares in terms of explanatory power, simplicity, and coherence when compared to rival accounts. And which account comes out on top here is a big question indeed, one which this thesis as a whole is an attempt to answer.

I also wonder about Armstrong's contention that science might one day give us reason to believe the probability is necessary, but that this would make Necessitarianism 'somewhat at the mercy of science'. For one thing, if Armstrong thinks science could say anything which would show the probability's necessity, it means *his own theory* is equally 'at the mercy of science': showing that the probability is necessary is showing that some laws are not contingent and so is falsifying Armstrong's account.

More importantly, however, I do not see how science *could* help out Necessitarianism in this way, nor how Armstrong could think it might. Necessitarianism, like Armstrong's own account, is a metaphysical thesis about the ultimate nature of reality. It is not concerned with the content of any particular law, only with lawhood in general. Take **Powers**, the particular form of Necessitarianism I am advancing. It uses universals and the natures of those universals. Now science isn't going to give up on properties and relations altogether, though its evaluation of what properties and relations exist might change dramatically. And positing a dispositional nature to such properties and relations is just a way of explaining regularity, again something which science is hardly going to end up denying (though the basic regularities it ends up endorsing might change considerably). Giving

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Armstrong shouldn't think he ends up better off because of this. He faces a similar problem. He will have to deny there are possible worlds where (N:0.04)(F, G) holds and G is not instantiated – yet, as we have said, it seems quite plausible that a probabilistic law might hold and yet, because of the low probability, never be manifested. See Armstrong's denial of exactly this sort of possibility in Armstrong (1983:129).

universals a dispositional nature is also, of course, a way of capturing the Necessitarian intuition. But again, science doesn't have anything to say on the question of whether nomic necessity is metaphysical necessity; it is interested in what is nomically necessary – what the actual laws of nature are. Given the highly abstract nature of metaphysical enquiry, I cannot see how science could confirm or refute a metaphysical account of laws such as **Powers**.

What's more, Armstrong surely knows this. Faced with the fact that science specifies fundamental kinds in purely dispositional terms, he is not then persuaded to accept Dispositionalism (and so Necessitarianism). No: he holds on to contingency by claiming that these fundamental kind universals are in fact categorical; it's just that we can only pick them out by their causes and effects. I have no quarrel with this strategy. But it surely points to the irrelevance of science when considering highly abstract metaphysical claims. Metaphysicians must certainly pay attention to the deliverances of science. But science is of limited use. And as far as general metaphysical questions are concerned, I think it is no help at all.

5.6 *Are all Necessary Truths Known A Priori?*

The Necessitarian claims that necessary truths can be discovered by science, and so known a posteriori. But some have claimed that all necessary truths are known a priori, and that therefore Necessitarianism must be false. These are people who are taken with the Humean claim that there are matters of fact and matters of reason, where the former are truths about the empirical world and the latter truths about logic and our concepts. Clearly we do not have to look out into the world to know that bachelors are unmarried men, or that triangles have three sides, since these are true as a matter of *definition*. And definitional truths – if we can call them truths at all – seem obviously necessary. If the term 'bachelor' simply *means* 'unmarried man', then there is no possible world containing someone who falls under the first term but not the second. Similarly, we do not have to look out into the world to know that 'nothing is both red and not red' is true, since it is an instance of the logical rule that nothing is both A and not-A, and we accept this rule no matter what the world is like. So we can see how matters of reason, if they are truths derived from our concepts and

our logical rules, are thought necessarily true and are known a priori. But matters of fact do not hold by definition or by logic, and many, unable to see how a truth could otherwise be necessary, have held that the only necessary truths involve matters of reason. Therefore there are no a posteriori necessary truths.

Kripke (1980), however, has argued persuasively that this conclusion is false. There are necessary truths involving identity, such as 'water = H_2O'. Before water was shown to be H_2O, it certainly wasn't part of the concept of water that it be composed of H_2O. But that doesn't stop it being necessary that water *is* H_2O. Thus the idea that necessary truths involve only 'matters of reason' is undermined. There are necessary truths known a posteriori: and these are *metaphysically necessary*, as opposed to logically necessary.[5]

Some say that if proposition p is *logically necessary*, then it is true in all possible worlds. But that cannot *define* what it is for p to be logically necessary, since it might well be claimed that if p is metaphysically necessary it would also be true in all possible worlds. What, then, is the difference between these two categories of necessity? The difference comes from what it is that makes p true in all possible worlds. If p is logically necessary, it is true in all possible worlds in virtue of its being tautologous; p will be metaphysically necessary, without being logically necessary, if it is true in all possible worlds in virtue of the metaphysical nature of at least one of the objects or universals involved in p. There is another major difference. Proposition p is metaphysically *possible* if and only if the metaphysical natures of things do not rule p out, and if p is metaphysically possible it will be true in at least some possible world. However, I do not think there is an analogous form of possibility for logic, 'logical possibility' (see, e.g., Van Inwagen (1998)). If p isn't a contradiction, that doesn't mean p is true in some possible world. Logic may be enough to *rule out* certain states of affairs from obtaining in some possible worlds; it isn't enough to *rule in* certain states of affairs. Only metaphysics can do that.

With metaphysical necessity a genuine form of necessity aside from logical necessity, room is made for the necessary a posteriori. Kripke has argued that truths of identity, and of origin, can be necessary and yet only known a posteriori. The

[5] I am using logical necessity in a broad sense, incorporating not only truths of logic such as not (A & not A) but also definitional truths. Some people keep the latter separate and refer to them as *conceptual* necessities.

Necessitarian adds to this list. He takes the laws of nature to hold necessarily and yet only be known a posteriori.

5.7 *Conceivability and Distinct Existences*

Armstrong thinks he detects another problem for Necessitarianism. The antecedent and consequent of a law seem to be distinct existences, he says. But the following principle (let us call it D-E) is true: *there are no necessary relations between distinct existences*. Therefore, laws of nature are not necessary.

The Necessitarian is at liberty to reject this conclusion, however, by rejecting one of the premises. The first premise is a good one. One might deny it by taking identity statements such as 'Water = H_2O' to be law statements. I do not, and neither does Armstrong (1983:138), but one might. In such a case, a more cautious first premise, that the antecedent and consequent of *causal* laws seem to involve distinct existences, would get us to the conclusion that causal laws are not necessary and again show Necessitarianism to be false. The second premise is the one to question. Why should we think there are no necessary relations between distinct existences?

Armstrong endorses D-E because he holds a combinatorial view of possibility. A world is possible, he thinks, if it is recombinable from those distinct elements (i.e. simple particulars and simple universals) which make up the actual world. In turn, some state of affairs involving these elements is possible if it can be arrived at through recombination. If *a* is F in the actual world, and *b* is G, then it is possible, given that the particulars and universals involved are simple, that *b* be F and *a* be G. Even if his particular version of Combinatorialism (using particulars and immanent universals as the elements) is wrong, Armstrong (1993d:191) thinks we need combinatorial rules in order to both

(a) develop a systematic theory of possibility, and

(b) make sense of the idea that conceivability is at least a guide to possibility.

If Necessitarianism is true, a combinatorial theory of possibility cannot work. Therefore, because of our need to do both (a) and (b), we should reject Necessitarianism.

The Necessitarian reply to this argument must question the contention that combinatorial rules are needed in order to do both (a) and (b). It can either try to show that the Necessitarian *can* do (a) and / or (b), or that there is no problem if the Necessitarian *cannot* do (a) and / or (b). Here I will pursue the latter strategy for (a), and the former for (b).

5.71 *Developing a Systematic Theory of Possibility*

Armstrong is a Fictionalist about possible worlds. They do not *really* exist. Recombinations of simple universals and particulars are merely *representations* of possible worlds. This is analogous to the way in which the situation described in a novel does not really take place. The sentences on the printed page merely represent that situation, they do not make that situation obtain. Other philosophers, in contrast, take possible worlds to exist. One can either say that all but the actual world are abstract entities, or one can take all possible worlds, including the actual world, to be concrete – non-abstract – entities.

David Lewis (1986) is a famous exponent of the latter view. But he still thinks that combinatorial principles can be used to tell us what those possible worlds are like. I take it that combinatorial principles make a theory of possibility 'systematic' for Armstrong precisely because application of those principles result in facts about what various possible worlds, or representations of those possible worlds, are like. Armstrong's claim is that only those theories which use combinatorial rules can get this result, and therefore Necessitarianism is disadvantaged.

It is true that any theory of possibility constructed with Necessitarianism in mind will not be systematic in this way. The theory itself will not be able to tell one what is or is not possible, since the theory will not incorporate all the necessary nomic relations which obtain between properties. It is for science to tell us what nomic relations obtain, not a theory of possibility. But because there are these necessary a posteriori laws, any theory of possibility acceptable to the Necessitarian will be deprived of a simple set of combinatorial rules which can churn out facts about what is possible.

Armstrong sees this as a disadvantage for the Necessitarian, but I do not think it is. The theory of possibility is supposed to tell us what possibility *is* – what makes

our possibility claims true – and there are a wide variety of theories telling us that which are compatible with Necessitarianism, including Lewis's concrete realism and theories which represent possible worlds using sets of sentences, propositions, and suchlike. A theory of posssibility does not also have to tell us which possibility claims *are* true. Armstrong's demand that it do so – i.e. his demand that the theory be 'systematic' – can therefore be rightly ignored by the Necessitarian.

5.72 *Conceivability as a Guide to Possibility*

One may think the fact that some state of affairs is conceivable is *not* a reliable indication that it is possible. By 'conceivable' I mean nothing more than 'not ruled out by our concepts'. Why should our concepts determine the way objects in the world can be and behave?

Our concepts need not, and do not, tell us everything about the things which fall under them. Let us assume, for the sake of the argument, that it is now part of our water concept that water is H_2O. It was not always the case: before the discovery that water is H_2O was made, and probably for some time afterwards, we could have conceived of water being other than H_2O. Still, water *is* H_2O, and many, such as Kripke, think it is *necessarily* H_2O: there is no possible world where water is anything other than H_2O. We have, then, one situation in which the conceivable turned out not to be possible.

And there are other examples. If Kripke is right, heat is necessarily mean molecular motion, but we can readily conceive of its being something else. And if the Necessitarian is right, laws are necessary despite our being able to conceive of their not holding or being slightly different. If it is a law that all Fs are G, there are no possible worlds containing Fs which are not G.[6] But it may nevertheless not be part of our F-concept that all Fs are G, and so we may well be able to conceive of Fs which are not G despite that state of affairs' metaphysical impossibility.[7]

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[6] Unless one takes laws to be defeasible in the way Armstrong does. See §1.13 and §5.81.

[7] Even if it was part of our F-concept that all Fs are G, it may be an *inessential* part of the concept. There may be both (a) characteristic features that something must have in order to fall under our F-concept and (b) characteristic features which something could lack and still fall under the F-concept. For our concepts to rule out Fs being non-G it would then have to be a 'core' aspect of our F-concept that all Fs are G.

This means we should be cautious about the use of conceivability. But it does not rule out its use altogether. Conceivability needn't *always* give us a possible situation for it to be a *reliable* method of discovering what is possible: it only needs to churn out possibilities a large majority of the time that we use it.

If laws are necessary, however, it is far from clear that it will give us possibilities even most of the time. The Necessitarian will have to restrict the use of conceivability to certain types of situations in order to ensure reliability. It seems, for example, far more reliable as a guide to the possible histories of *actual* people and things than it is concerning the possible histories of people and things in possible worlds very different from the actual. It can tell me if I could have gone to America last year, but not whether I could have had the power to melt iron bars with my mind. It can tell me whether this glass in front of me would have broken if gently tapped (and the answer is no, given the *actual* laws of nature) but not whether there are possible worlds where a physically indistinguishable glass, in physically indistinguishable surroundings, would have broken if gently tapped. In other words, the Necessitarian will need to say that use of conceivability is fine as long as we are not conceiving of worlds containing different laws of nature.

Armstrong says combinatorial rules are needed in order to make sense of the claim that conceivability is a guide to possibility. I think the Necessitarian should say something like the following. Simple combinatorial rules, of the kind Armstrong endorses, *do* play a role in determining what is possible. But the laws of nature take precedence. If the combinatorial rules take some state of affairs to be possible, and the laws of nature do not, then that state of affairs is not possible. But if the combinatorial rules take some state of affairs to be possible and the laws of nature dictate nothing about its possibility, then it is possible. That is enough, I think, to explain why conceivability works *when it does*.

5.8 *Fales' Objections*

Fales' Necessitarian account takes universals to be categorical entities, not dispositional ones, and so the nomic relation – more specifically, for Fales, the *causal* relation – to be external, not internal. He gives three arguments for denying that the

nomic relation is internal, and so for denying Dispositionalism and **Powers**. In this last section I consider each of these in turn.

5.81 *Complexity Argument*

Most laws, Fales says, are *defeasible*.[8] That means that of any one law, there may be all manner of circumstances which will interfere with its instantiation. Fales thinks this is problematic if the nomic relation is internal: "It is at best difficult to see how an internal relation theory can provide for this without supposing universals to have tremendously complex natures." (1993:139-140)

It is true that **Powers** needs universals to have "tremendously complex natures". But why is this a problem? It is only a problem if Fales' external relation theory does not require the same level of complexity. But I think it does. Defeasibility must be reflected in the large number of *laws* that obtain.

We have already encountered defeasible laws in §1.13, but let me recap. Say N(F, G) is a defeasible law. That might be because N(F&H, J) also holds, and J and G are incompatible. Since no particular can be both J and G, and the antecedent of this second law involves the antecedent of the first plus another universal, and so is in that way more specific, this second law defeats the first. In a situation where *a* is both F and H, it would be J rather than G. The law that all Fs are G is therefore defeated since *a* is F and *not* G. To give a causal example, take the law that match-strikings cause match-lightings: C(Striking, Lighting). We know that in the absence of oxygen the match will not light, and so we might say the aforementioned law has a defeater, the further law that C(Striking & Lack of Oxygen, X), where X is some positive universal other than lighting and incompatible with lighting. The pattern of defeating laws seems to be that it has the antecedent of the law it defeats as part of its antecedent universal, and it has a consequent universal which is incompatible with the defeated law's consequent universal. If one accepted negative universals, one

[8] One may deny that laws are defeasible and say that it is our knowledge of laws which is incomplete. We thought it was a law that match-strikings cause match-lightings, for example, but the law governing match-lighting is far more complex *and indefeasible*. Once the circumstances specified in the antecedent obtain, the consequent *must* be instantiated. But we do not have knowledge of all the circumstances in the antecedent, and so we say something like 'match-strikings (ceteris paribus) cause match-strikings', where the ceteris paribus clause marks our ignorance of the full law. This option, and the ceteris paribus clause, will be discussed later, in §6.21.

could replace the need for incompatibility between the consequent universals of the two laws with a defeating law which had as its consequent the negation of the defeated law's consequent.

Given the above, it seems clear that Fales' external relation view is no less complex than an internal relation view such as **Powers**. It ends up with the same number of nomic facts; it's just that the nature of these facts is different. For Fales, nomic facts are existing states of affairs with universals and the nomic relation as constituents. For **Powers**, these facts are determined by the natures of universals, and, while they can be said to 'hold' or 'obtain', they do not have an 'existence' of their own. The internal relation is not an entity which connects universals.

Fales, however, thinks there is a way for the external relation view to accommodate defeasibility which makes it far simpler than **Powers**. Here is what he says:

> Defeasibility reflects the fact that causes can join together in indefinitely many ways, the outcome being a function of their joint operation. It seems that an external-relation theory can accommodate this fact rather naturally, if we think of the causal contribution of a component cause as a kind of force. Causal relations – forces – can be graded in terms of their strength and perhaps other features (e.g. direction). What is then required is an algebra that determines how forces combine, and laws specifying what effect a total force shall have. On such a combinatorial approach, a relatively small number of basic laws may be able to account for an indefinitely large number of possible multicomponent causal interactions. (1993:139)

It is not clear to me just how this suggestion would go. What is far clearer, however, is that the complexity it entails will be no less than that of **Powers**. **Powers** takes there to be lots of universals (all instantiated) which have certain natures, and it is from these universals that lots of nomic facts are derived. Compare this with Fales' (albeit tentative) suggestion. He accepts lots of universals that are instantiated and (being a Platonist) some that are not. Even if 'a relatively small number of basic laws may be able to account for an indefinitely large number of possible multicomponent causal interactions', there are still going to be the same number of nomic – i.e. general counterfactual – facts, since the law-like regularities which Fales and **Powers** seek to explain are the same and the universals (instantiated or uninstantiated) that such facts involve will, given that both embrace at least a Scientific Realism about universals, also be much the same. The only important

difference is the matter of what these facts obtain in virtue of. For Fales it may be basic laws and an algorithm regarding strengths of forces, for **Powers** it is instantiated universals. Therefore, as with the comparison between **Powers** and the Armstrongian view of defeasible laws we began with, Fales' external relation view does not appear to enjoy any real reduction in structural complexity.

5.82 *Argument from Phenomenology*

The pushes and pulls on our body are our direct experience of causal relations, Fales says. "It seems impossible to account for these features of our experience if causal relations are not real, external relations."(1993:138)

This seems a weak argument, in that the phenomenological data is quite open to interpretation. Presumably, Fales thinks the force felt from a fist aimed at his stomach is an experience (in part) of the causal relation which holds between the punching event and the body recoiling event. And indeed, if one is perceiving this causal relation – if that is what one's experience (in part) amounts to – then it needs to exist as an entity of some description. One cannot, after all, perceive some *thing* if it is not there as an 'item' (particular, universal or state of affairs) in the world. 'Internal relations' are not items in the world, and so if Fales' description of our experience is correct, the relation cannot be internal. But it seems no less plausible to take that experienced force to be our experience of some part of the complex coming and going of universals in accordance with their natures, and this option does allow the causal relation to be internal.

5.83 *Explanatory Inversion Argument*

Causal relations play a role in explanation. When *a*'s being F causes *a*'s being G, we have no trouble explaining this in terms of an external causal relation – C – between the two states of affairs. We simply say that because there is a law C(F, G), *a*'s being F *causally necessitates a*'s being G. However, if the causal relation is an internal one, and so holds in all possible worlds where *a* is F and *a* is G, then "that conjunctive state of affairs explains the existence of the causal connection between them". According to Fales, "this gets the direction of explanation backwards. For

a's being G depends upon the existence of the connection [C], not vice versa". (1993:139)

In reply to this, I deny that **Powers** – and the internal relation view generally – is committed to the claim that *a*'s being F and *a*'s being G together explain the causal relation between them. It's true that given the two states of affairs, the internal relation holds. But this is not enough to show that the relation is *explained* by the conjunction of those states of affairs.

Fales should see this. Somebody might say that on his view the two states of affairs plus the law C(F, G) ensure that the causal relation holds between the states of affairs, and that therefore they explain the holding of the causal relation. But Fales would presumably reply that it is the first state of affairs and the law which ensures that the causal relation holds, and so explain its holding. **Powers** can surely say much the same. It is the first state of affairs, *a*'s being F, which ensures that the causal relation holds between *a*'s being F and *a*'s being G, and so it is this which explains the causal relation holding, *not* this and *a*'s being G. The first state of affairs is sufficient because F-ness is a dispositional entity such that anything instantiating it will (a moment later) instantiate G.

We might say, of course, that the red patch and the yellow patch explain why the *being darker than* relation holds between them. But one should not model all internal relations on this. The nomic relation is importantly different: given that *a* is F, *a* is G is *necessitated*. In contrast, the existence of the red patch does not ensure that a yellow patch comes into being, or that the relation of *being darker than* obtains between them.

There is no reason, therefore, to think that **Powers** "gets the direction of explanation backwards". It can say the fact that *a*'s being F causes (a moment later) *a*'s being G is explained by *a*'s being F and the fact that there is an internal causal relation between the universals F and G. Fales says exactly the same except 'external' replaces 'internal'.

5.9 *Conclusion*

I have built my case for **Powers** along a number of fronts. First, I assessed its advantages over Contingency theories, such as Armstrong's. Second, I assessed its advantages over other Necessitarian accounts, such as Fales'. In this chapter I have shown that it is able to counter the main objections levelled against Necessitarianism. In doing all this, I now take myself to have shown that **Powers** is the best overall theory of laws.

Though I have gone into some detail about **Powers**, there is more to be said about the metaphysical picture it offers. This will be the focus of the final chapter.

Chapter Six

THE NOMIC NETWORK

The 'Nomic Network' contains universals and their nomic relations to one another. For Armstrong, these universals are all instantiated. For **Powers**, they need not be. Though a principle of instantiation is held, existent universals can nevertheless be such that, if certain uninstantiated universals *were to be instantiated*, a certain outcome would result. In other words, Armstrong's Nomic Network is built from laws, which are taken to be relational states of affairs involving N, and the **Powers** Nomic Network is built from laws, which are taken to be general counterfactual facts holding in virtue of existent universals.

In this chapter I want to examine more fully the Nomic Network I am committed to. First, in §6.1, I look at what sorts of universals exist. Second, in §6.2, I characterise the nature of those universals in two ways which make clear how they determine what laws obtain. We should then have a good idea of what universals are in the network and how they come to be nomically related. In §6.3 I look at how both law-statements involving uninstantiated universals and law-statements containing supervenient terms can be true.

6.1 *Non-Supervenient Realism*

Powers is committed to a realism about universals no less parsimonious than Scientific Realism. But there is a principled way of being even more parsimonious. One might go further than accepting only those universals which would be referred to in mature scientific theory (and mature physics in particular); one might add that only *non-supervenient* universals exist. It is this further restriction that I want to consider here.

6.11 *Supervenience Defined*

The concept of supervenience has received a lot of consideration over the past decade, and I will not be discussing the literature in any detail here.[1] It is sufficient for my purposes that I set out a working definition of supervenience to which I may refer in the ensuing discussion.

Let us take supervenience to be a relation between *properties*. The claim that 'A-properties supervene on B-properties' is the claim that properties of one type, A, supervene on properties of another type, B. But supervenience claims may just as easily be made about single A and B properties (e.g. the belief that p supervenes on the physical property P) as about A and B properties in general (e.g. mental properties supervene on physical properties). As a first attempt to unpack the concept of supervenience, we might say the following:

> [Weak Supervenience] 'A-properties supervene on B-properties' is true in any possible world PW iff, for any two particulars x and y that exist in PW, it is not the case that x and y are indiscernible with respect to B-properties and discernible with respect to A-properties.

Weak Supervenience is too weak, however. It does not capture the idea that *a*'s having the belief that p, say, is *determined* once *a* has a certain physical property, or the idea that it is *in virtue of* having that physical property that *a* has the belief. A world in which all objects with the same B-properties had the same A-properties *as a matter of coincidence* would, on this definition, be a world in which A-properties supervene on B-properties. To incorporate the idea of determination, we can amend our definition like so:

> [Strong Supervenience] 'A-properties supervene on B-properties' is true in any possible world PW iff, for any x in PW and any y in possible world PW2, it is not the case that x and y are both indiscernible with respect to B-properties and discernible with respect to A-properties.

Determination is accommodated in this definition, since if across all possible worlds

[1] Relevant literature on supervenience includes Fodor (1981), Kim (1993), Heil (1998b), and Horgan (1993).

objects that have the same B-properties also have the same A-properties, it will be the case that if any object in PW *were to have* certain B-properties, it would have certain A-properties.

This variety of Strong Supervenience is too strong for Contingency theorists. For them, the belief that p might supervene on physical property P in PW and not supervene in PW2, since PW and PW2 might contain different laws of nature. If PW2 has no laws linking the physical property P with the *being the belief that p* property, or no laws determining that anything with physical property P has the functional role we associate with the belief that p, there will be no supervenience of the latter on the former. To accommodate the Contingency theorist, one can simply stipulate that PW and PW2 are worlds with the same laws, or one can move to a *global* supervenience thesis, where the distribution of properties or types of properties in whole possible worlds, rather than the properties instantiated by parts of worlds, are the relata of supervenience:

> [Global Supervenience] 'A-properties supervene on B-properties' is true in any possible world PW iff, for any world PW2 *which contains the same laws of nature* as PW, it is not the case that it and PW are indiscernible with respect to their distribution of B-properties and discernible in respect of their distribution of A-properties.

Though appeal to Global Supervenience would probably make my point just as well, I will stick with Strong Supervenience in what follows; and since laws only need putting into the definition of supervenience if they are contingent, I can either take the qualification about laws or leave it.

If a person's environment is important in determining what beliefs they have, Global Supervenience might be an easier way to state the supervenience of the mental on the physical. One can say that no two worlds (with the same laws as ours) are indiscernible with respect to the distribution of their physical properties and discernible with respect to the distribution of their mental properties, so mental properties supervene on physical properties; or one can focus on the distribution of a single mental and physical property for a more specific supervenience claim. One should bear in mind, then, that when I use mind-brain examples without mentioning those parts of a person's environment which need to be built into the 'supervenience

base', this will be for ease of exposition rather than a conviction that the situation is quite so simple.

I need to say a little more about the relata of supervenience on this formulation. I have said they are properties. But in order to allow the possibility that supervenient properties do not exist, I will have to be more specific.

The term 'properties' is not simply another word for 'universals', though I have often used it instead of 'universals' for stylistic reasons. The Nominalist can (and should) allow talk about properties, despite their denial of universals. Minimally, what they mean is this: talk about property F is legitimate if the *predicate* 'F' can be truly applied to one or more particulars. It is in this minimal sense that properties should be thought of as the relata of supervenience. If property S supervenes on property P, then if the predicate 'P' can be truly applied to x, so can the predicate 'S'. But when I say that *supervenient* properties might not exist, it is not in this minimal sense that I am applying the term 'properties'. What I am saying is that supervenient *universals* might not exist. Because of this there is no contradiction in allowing that there can be true supervenience claims and no supervenient properties. What I mean is that it can be true that property S supervenes on property P, and true that x is S and true that x is P, but nevertheless there only be a *universal* corresponding to 'P'.

6.12 *Determinates and Determinables*

Determinable properties, such as *having mass* and *being coloured*, are a specific sort of supervenient property. Once a particular instantiates the determinate property *having a mass m*, or *being red*, it instantiates the corresponding determinable. And, as with the supervenient and the subvenient (that on which something supervenes), whether a property falls under one of these categories is often a relative matter. The property *being red* is a determinate of *being coloured*, but it is also a determinable of *being crimson*. And the property *being the belief that p* is supervenient on *being brain-state type B*, but this latter property is itself supervenient on *having physical configuration P* (lots of different configurations can each 'realise' the same brain-state type).

One could even claim that supervenient properties are themselves just determinable properties, taking the various subvenient properties on which another property supervenes to be the determinates of that determinable property. But whether one merges them in this way, or one takes determinable properties to be supervenient properties, or one keeps determinable and supervenient properties separate, it is clear that most (if not all) of what I have to say about supervenient properties can also readily be said about determinables.

6.13 *Do Supervenient Universals Exist?*

For **Powers** the claim that all universals are involved in laws is entailed by the idea that universals are dispositional entities (since these, by their nature, support counterfactuals, and those which are *general* counterfactual facts are what **Powers** identifies as the laws). It also, however, appears to be a plausible claim in its own right. One might think that *all* entities must be able to influence others in some way. This claim forms the basis of an argument against supervenient universals[2]:

> [1] For an entity to exist, it must either (for particulars) have nomic powers or (for universals) *confer* nomic powers.
>
> [2] There is no nomic overdetermination, by both supervenient and non-supervenient universal tokenings, of a particular physical effect.
>
> [3] The non-supervenient tokening has the nomic power to necessitate the particular physical effect.
>
> [C] There are no supervenient universals.

For example, the universal *being physical configuration P* confers on a normal person whose proper part instantiates it the power to say 'no' when asked 'is it true that not-p?' But is there also another universal, that of *being the belief that p*, which confers the same power? We want to say that *being physical configuration P*, as a non-supervenient property, confers the power once instantiated, as [3] affirms. But are both universals instantiated and causally overdetermining the effect of saying 'no' when asked if not-p?

[2] A number of arguments of this kind are considered in Kim (1998).

I think we are inclined to think not. Furthermore, it seems there is nothing specific about *being the belief that p* supervening on *being physical configuration P* which rules this out, and that all cases of overdetermination involving supervenient universals are ruled out. Does the person really have to have part of his brain instantiate *being the belief that p* as well as *being physical configuration P* before he can say 'no' in response to the question? Intuitively we want to say that an instantiation of the latter universal is sufficient.

Perhaps in part because of arguments such as this, various philosophers have declined to put supervenient entities in their ontology. Instead of endorsing a *Supervenient Realism* about properties, taking both the non-supervenient and the supervenient to be part of a 'multi-layered reality', they have – or so it seems – opted for a *Non-Supervenient Realism*, taking there to be no supervenient entities and only a 'multi-layered way of describing reality'. Armstrong seems to have Non-Supervenient Realism in mind when he subscribes to what he calls the 'Ontological Free Lunch':

> It will be used as a premiss in this work that whatever supervenes or, as we can also say, is entailed or necessitated, in this way, is not something ontologically additional to the subvenient, or necessitating, entity or entities. What supervenes is no addition of being. (1997:12)

Keith Campbell also appears to endorse this way of thinking:

> ...I take it as a cardinal principle in ontology that *supervenient 'additions' to ontology are pseudo-additions*. No new being is involved. In the Creation metaphor, to bring supervenients into being calls for no separate and additional act on God's part...
>
> To establish that something supervenes on what we have already recognised is to establish our right to include it as no true ontic expansion. (1990:37)

Recently both Kim (1997, 1998) and Heil (1999) have argued that supervenient entities do not exist. In contrast, there are philosophers who fail to mention an ontological distinction between types of property and appear to hold the supervenient as 'real' as the non-supervenient. Prior (1985), for example, takes dispositions like solubility and fragility (standard candidates for supervenient properties) to be *second-order* functional properties, i.e. properties of properties; and Peter Forrest (1988)

seeks to explain the supervenience relation using the idea that supervenient properties are properties of subvenient properties.

I realise the case for Non-Supervenient Realism is far from closed. There are objections to the above argument, and I do not have the space to canvass them here. This omission might be serious if my aim was to argue in detail *for* Non-Supervenient Realism, but my aim is more modest: to show both that (a) Non-Supervenient Realism has some initial plausibility; and that (b) **Powers** can accommodate this form of realism *if* it is a viable option. To show (b), I look in the next subsection at one reason *some* supervenient universals might be accepted, and claim that it does not affect **Powers**. To show (a), I have presented the above overdetermination argument, and in §6.15 I also look at, and reject, an argument for accepting that *all* supervenient properties are universals.

6.14 *Armstrong and Determinables*

Armstrong is not altogether consistent in his support of an Ontological Free Lunch. He is willing to accept *some* determinable universals in order that there can be functional laws despite missing values. Take the law-statement 'F = MA'. There are going to be values of mass which are – as a matter of contingent fact – never instantiated. But given Armstrong's Categoricalism and his adherence to a Principle of Instantiation, his truth-maker for the law-statement 'F = MA' will have to be a law involving F, M and A which, laws being universals themselves according to Armstrong, is instantiated each time some particular has some mass, force and acceleration. But F, M and A are determinables; M, for example, is *being a mass*. Determinables can be admitted, Armstrong suggests, on a 'selective basis': postulated only where 'natural science demands them'(1983:115).

Armstrong's free lunch, then, is not open to anybody: sometimes the fact that one property supervenes on another doesn't show that it is not a real, mind-independent entity. As regards *being a force, being a mass, being an acceleration* and numerous other determinables referred to in true functional law statements, there *is* an 'addition of being'.

Driving Armstrong here are two key metaphysical aims:

(a) *Simplicity* – an account should be as ontologically, and structurally, simple as possible; and

(b) *Explanatory Power* – an account should be as explanatory as possible.

Armstrong's metaphysics is unable to *explain* the truth of 'F = MA' without positing some determinable universals. His theory therefore incurs a loss of simplicity but at the same time benefits from an explanatory gain. Armstrong weighs the situation up and concludes that explaining the truth of functional laws is more important than denying supervenient universals.

I do not think **Powers** is pushed in the same way towards accepting supervenient universals. Armstrong's Nomic Network only involves instantiated universals. He needs to accept the existence of determinables because he needs laws from that network to make true the law-statement 'F=MA'. But the **Powers** Nomic Network, because it is constructed from the dispositional natures of instantiated universals, is able to involve both instantiated and uninstantiated universals. Indeed, it will incorporate *all* determinate universals and so there will be enough laws in the network involving them to ensure the truth of any true functional law-statement. If all determinates were instantiated, Armstrong would have said that determinate laws involving values of F, M and A make true the law-statement. **Powers**, on the other hand, can say that the Nomic Network contains all those determinates we would call values of F, M and A, and some subset of the counterfactual facts involving these – those of the form *(∀x) if x were to instantiate [determinate of F], then x would have [determinate of M] and [determinate of A]*, where all such facts have a value of F equal to the value of M multiplied by A – make true the law-statement 'F=MA'.

The strategy I have just outlined will be explored in more detail in §6.3, where it will also be used to explain the truth of other kinds of nomic statements. It paves the way for a decidedly parsimonious specification of universals in the Nomic Network. But to motivate this parsimony still further, let me now look at, and undermine, another argument for the claim that there are supervenient universals.

6.15 *Supervenient Universals and Occam's Razor*

Armstrong accepts some determinable universals, and therefore some supervenient universals. Given that, why doesn't he go the whole way and accept them all? The answer lies with Occam's Razor: *do not postulate more entities than are necessary*. To accept any more supervenient universals than are necessary is to be ontologically profligate and overly extravagant.

Against this, Chris Daly (1997:§4) claims it is not at all clear that supervenient universals do offend against Occam's Razor. He cites Lewis, who is untroubled by the huge number of possible worlds his modal realism commits him to. Lewis distinguishes between quantitative and qualitative parsimony and claims that only the latter is important: it doesn't matter how many of a particular kind a theory is committed to, only *how many kinds*. It is then open to Lewis to claim his theory is qualitatively parsimonious because it only posits a large number of *one* kind, namely that of *being a possible world*. Of course, if we take the various different kinds instantiated *in* Lewis's concrete possible worlds to be relevant kinds, his theory appears far less parsimonious.[3] But the crucial point here, Daly thinks, is that there is no good independent reason for choosing either set of kinds as those which are 'relevant', and therefore no way to argue that Lewis is being unparsimonious.

The same applies when we consider the theory that properties are universals. If the relevant kind is *being a universal*, rather than specific *microphysical universals*, *mental universals*, *dispositions* and so on all being relevant kinds, then qualitative parsimony is maintained even though supervenient universals are accepted. And if we have no good independent reason for saying that one of these groups contains the relevant kinds, one cannot argue against the inclusion of supervenient universals on the grounds of *qualitative* parsimony.

Though it seems questionable, I will not argue here against the claim that we cannot give good independent reasons for taking one group of kinds to be relevant in judging qualitative parsimony. What I want to dispute is the claim that *quantitative* parsimony is unimportant. Let us suppose, for the sake of the argument, that the relevant kind is *being a universal* for both the Supervenient Realist and Non-

[3] On this point see Melia (1992).

Supervenient Realist. The first still admits far more universals than the second, for he takes there to be numerous supervenient universals. And I think the *number* of entities of a particular kind that are postulated *does* matter.

Quantitative simplicity matters in everyday use of inference to the best explanation: I could posit five mice in the house – it's consistent with all the phenomena I'm trying to explain, and with my knowledge of the behaviour of mice – but I only posit one.

There is also a strong case for it mattering in scientific inference: we don't posit a larger number of particles of a particular kind than we need to explain the phenomena, even though we could. Take this (purely imaginary) example. Scientist Jack, seeking an explanation of various phenomena P, posits the existence of a new sort of particle with an electric charge of 10. Scientist Jill, to explain P, posits a new sort of particle with a charge of 2. Both scientists are positing one new kind, so each is being as qualitatively parsimonious as the other. But they differ as regards quantitative parsimony: to explain the same phenomena as Jack, Jill will need to posit five times more particles. Which theory do we prefer? Remember, there is no phenomena discovered (as yet) which makes either explanation more likely. If quantitative parsimony is unimportant, there should therefore be no reason to prefer one theory over the other. But I think we'd be inclined to go for Jack's theory over Jill's, and precisely because it posits the least number of things.

If quantitative parsimony matters in everyday and in scientific reasoning, there seems no reason to deny that it matters in metaphysical reasoning. In reasoning of all three kinds, we set out to provide an explanation of some phenomena by invoking various kinds of thing. In the metaphysical case under consideration, the phenomena are various (apparently true) claims which use supervenient predicates. Both Supervenient Realism and Non-Supervenient Realism invoke universals to account for the truth of these claims, but the first invokes a far greater number of them. If quantitative parsimony counts in everyday and scientific reasoning, then I think, all else being equal, we should prefer the theory which invokes the least number of universals, Non-Supervenient Realism.

I do not want to dispute the claim that qualitative parsimony is more important than quantitative. But I have shown, I think, that quantitative parsimony, whether one

takes Occam's Razor to be concerned with it or not, *is* important when evaluating rival theories. Even if we cannot show in a non-arbitrary way that Supervenient Realism posits more relevant kinds, we can see quite clearly that it posits a greater number of the same kind. And in seeing this, we are able to rule against it.

6.16 *How Far Does Supervenience Go?*

It becomes apparent, once one considers what supervenient properties are, that Non-Supervenient Realism is a far sparser realism than might at first be imagined. Supervenient properties are *multiply realisable* properties. Our basis for saying that mental properties supervene on physical properties is the idea that the same type of mental state can be realised by different types of physical state. Likewise, we think dispositions like solubility supervene on micro-structural physical properties because substances with distinct micro-structural properties might nevertheless all be soluble.[4] Many properties are multiply realisable.

Take temperature. This is realised differently for solid, gas and vacuum. We could try to hold on to temperature as non-supervenient by positing specific identities: for example, we could take temperature-of-a-solid to be mean molecular motion, temperature-of-a-gas and temperature-of-a-vacuum to be something else. Taking this line, *having a temperature of 10℃* would be identical with *having a mean molecular motion of m*. But the problem isn't over, for this latter property is itself multiply realisable, and so – because of the transitivity of identity – is the temperature property. Two objects can have their molecules moving at different speeds and yet still have the same molecular motion, just as X can give different, non-equivalent answers to Y in a maths exam and both still end up with the same score. Also, two objects can have different numbers of molecules and yet the same *mean* molecular motion, just as X can complete a test with more questions than the one Y completes and yet both end up with the same percentage score. Indeed, even a single object demonstrates the multiple realisability of temperature. If it is 10°C for some time,

[4] One's first instinct, on the grounds of ontological economy, is to seek an *identity* between properties at different levels. If a property is multiply realisable, however, it cannot be identical to – i.e. the very same property as – another property. Identity is symmetrical: if A is B, then B is A. If a property, A, is multiply realised, it cannot be identified with B; A might be instantiated by x and B not instantiated.

this will not be due to its having exactly the same number of molecules at exactly the same speed for that time. Some molecules may change speed, some may become part of the surrounding atmosphere: but even so, at each moment the object might be 10°C.

Take mass. Different objects may be composed of different materials and have the same mass. At the level of individual atoms, it is the number of neutrons which mostly dictates its (rest) mass. If that was the only factor, then we could *identify* having a particular mass with having a particular number of neutrons. But protons also give the atom some – though a negligible amount – of its mass. Nothing rules out a situation where two objects then have the same mass but different numbers of neutrons and protons. To put the point crudely, imagine neutrons have ten times the mass of protons. It will still be true that X and Y have the same mass even though X has 9 neutrons and 10 protons and Y has 8 neutrons and 20 protons. Therefore it seems the mass properties of individual atoms are supervenient.

We surely do not want to deny the ultimate reality of mass properties. But Non-Supervenient Realism does not lead to this: the mass properties of objects composed of neutrons and protons are supervenient, but the mass properties of neutrons and protons are not. True, if these fundamental particles are themselves composed of proper parts, *quarks*, it seems plausible to explain the mass of the particle by appealing to the properties of these parts and their relations to one another. But if neutrons all have the same number and variety of quarks, we can *identify* its mass property with some non-supervenient complex property of this collection.

It can be seen from this brief consideration of what properties are supervenient that only certain intrinsic properties of fundamental particles, together with those properties – e.g. *being a neutron*, *being* H_2O – which can be identified with complexes of fundamental particle properties, will be universals. We will have some mass universals – one for each type of fundamental particle – and, for the same reason, we will have some charge properties. There will also be spin properties. Aside from this, we will have various relations – spatial and temporal – which obtain

between these fundamental particles.[5] Most, if not all, other empirical properties are supervenient.

Non-Supervenient Realism requires truth-makers for truths involving supervenient properties, and these must be constructed from the aforementioned sparse ontology. Take the non-nomic claim that 'x has a mass of m', where x is not a fundamental particle. The truth-maker for this will be a complex state of affairs involving the fundamental parts of x and the mass universals they instantiate. The nomic claim that 'F=MA' will need to have as its truth-maker laws involving mass, force and acceleration universals which entail that objects composed of varying numbers of fundamental particles behave in a way that various supervenient terms (e.g. having a mass of m, where m is not the mass of any fundamental particle) can be applied to them.

6.17 *Supervenience: More Details*

At least two possible causes of confusion need to be cleared up. The first of these concerns the nature of supervenient properties, and the second concerns supervenience claims.

First, Non-Supervenient Realism says that supervenient predicates do not refer to supervenient universals. But what, then, makes us apply those predicates to objects? What is it about an object that makes it appropriate to describe it using one supervenient predicate but not another?

I think the answer to this question, by and large, involves *function*. If I say 'x is the belief that p' what I mean is that x is such that given various circumstances, various outcomes will result (e.g. if a person with x as a proper part were to have the desire to tell the truth, etc., then when asked if p, he will answer in the affirmative). If I say 'x is soluble', what I mean is that x is such that if it were placed in water, it would dissolve. The reason the belief predicate supervenes on the physical state predicate, and the solubility predicate supervenes on the microstructural predicate, is that if the second is truly applied to x, then x has the functional role associated with

[5] If temperature was a property of individual fundamental particles rather than *groups* of particles, some temperature properties could also have been included in this list of universals.

true application of the first. And if the subvenient predicate refers to a universal (i.e. it is not the supervenient relata of some other supervenience relation), then we have the universals *being physical configuration P* and *having microstructure m*, each of which confers certain powers – some of which are associated with true application of the predicates 'being the belief that p' and 'being soluble' respectively – on whatever instantiates it.

The second possible cause of confusion is that one might think the examples I have given are not genuine examples of supervenience, since correctly applying the subvenient predicate doesn't make it appropriate to apply the supervenient predicate. I have said that *being soluble* supervenes on *having microstructure m*. But if x also has a protective layer around it preventing it from dissolving in water, one might think that x can have microstructure m and *not* be soluble. I also took *being the belief that p* to supervene on *being physical configuration P*. But if, say, we remove from someone's brain the part where x instantiates physical configuration P, it might seem that x is still of physical configuration P but not now a belief state, since it no longer functions appropriately.

I think each of these objections rests on a misunderstanding.

As regards the solubility example, I agree that the object with the protective layer wouldn't be soluble. However, that object isn't the one which instantiates *having microstructure m*. Only a part of the object, the part left if we take away the protective layer, has that property. Therefore the supervenience relation between *having microstructure m* and *being soluble* can still hold.

As regards the belief example, an analogy is instructive. Take out the engine from a car and it does not stop being an engine. It is an engine because it has a certain functional role, regardless of whether it is currently hooked up to exercise that role. The truth of 'x is an engine' supervenes on x's having certain physical properties and parts *whether or not it is in a car*, just as the truth of '*a* is the belief that p' supervenes on *a*'s being physical configuration P *regardless of whether it is part of a functioning and embodied brain*. Therefore the supervenience relation between *being the belief that p* and *being phyiscal configuration P* can still hold.

With both examples, the functional role associated with the object cannot be exercised. But, as the car analogy shows, this doesn't mean that the object no longer

has that functional role, and therefore that it can no longer have the predicate 'is soluble' or 'is the belief that p' truly applied to it. The only difference between the two kinds of case is that with the *presence* of something extra, for example the protective layer, one can make the additional mistake of taking the object x with the subvenient property to be the object x *plus* the extra object y.

Undermining the claim that property S supervenes on property F is a matter of showing that one can have F without S. We have seen how two strategies for showing this – involving the addition of a protective barrier and removal from the appropriate environment – are unsuccessful. Furthermore, I think these are the only two strategies available. If I am right about this, I have shown that both supervenience examples are resistant to counter-example.

6.18 *Conclusion*

My aim in this section has been to show that Non-Supervenient Realism is a realism about universals worthy of consideration. It is not essential to **Powers**, but **Powers** seems to be compatible with it. Armstrong finds himself having to admit some supervenient entities because of his insistence that universals are categorical and immanent. I, on the other hand, seem able to avoid supervenient universals because of the way the **Powers** Nomic Network incorporates both instantiated and uninstantiated non-supervenient universals (see §6.3).

6.2 *Characterising the Nature of Universals*

Whatever universals form part of the Nomic Network, it is their *nature* which gives us the laws. The Nomic Network is a set of laws – general counterfactual *facts* – linked by the universals they involve. In getting clearer about the nature of universals, then, I will be getting clearer about the Nomic Network.

We can specify and define those universals which are in the Nomic Network using a *Ramsey Sentence* constructed from true law-statements. A statement's Ramsey Sentence is supposed to make clear our existential commitments in asserting it. However, since **Powers** takes there to be true law-statements which involve non-

existent universals, this use of the Ramsey Sentence will have to be qualified as follows: the Ramsey Sentence tells us what exists *in some nomically possible world*. With this proviso, let us see how the Ramsey Sentence is constructed.

Take the true law-statement 'All Fs must be G', where F and G are universals. To construct a Ramsey Sentence, consider its form. According to **Powers**, it is equivalent to a general counterfactual statement with the following form:

(∀x) if x were to be F, then x would be G

In plain English, this says that everything (every x) is such that, it it were to be F, it would be G. To get existential commitment to universal F, we can extrapolate from this claim the following:

(∃X) (∀x) if x were to be X, then x would be G

This says that *there exists* a universal (an X) such that if anything (any x) were to have it, that x would also have G. This X is the universal F. We can also do the same to get us existential commitment to G:

(∃Y) (∀x) if x were to be F, then x would be Y

And we can also extrapolate from this to make clear an existential commitment to both F and G:

(∃X) (∃Y) (∀x) if x were to be X, then x would be Y

This says that there exists two universals such that if anything were to have one, it would have the other. This Ramsey Sentence will not, however, be enough to uniquely pick out, and so to 'define', F and G. Other pairs of universals may well be such that if anything were to have one, it would have the other. To define F and G *all* true law-statements involving F and/or G need to be accommodated in the Ramsey Sentence. But this will bring in universals other than F and G, and the above procedure will have to be used for the true law-statements involving them. In the end *all* true law-statements will need to be bought within this Ramsey Sentence, giving us one big Ramsey Sentence which says that there exist certain universals and that they are nomically related to each other in certain ways. We can then take any one of these universals we have existentially quantified over and see how it is related to others. The Ramsey Sentence tells us that there exists one, for example, that is related in a certain way to another, another way to another couple, and so on. With

the Ramsey Sentence incorporating the existential commitments of all true (possible) law-statements, each universal in the Nomic Network is defined, i.e. uniquely picked out by the relations it has to others. According to **Powers**, at least, if F and G have the same nomic relations then F=G.

This Ramsey Sentence, even amended to range over all nomically possible worlds, will not pick out all nomically possible universals. Like Armstrong, I am inclined to accept conjunctive and structural universals. But the Ramsey Sentence only existentially quantifies over simple universals. For example, if 'Anything which is F&G must be H' is a true law-statement, the Ramsey Sentence quantifies over F, H and G. This means one needs to add the following two existence criteria: (a) if F and G are instantiated by a particular x in some nomically possible world, then the *conjunctive universal* F&G exists in that world, instantiated by x; and (b) if a number of universals F, G... are instantiated by proper parts of a particular x in some nomically possible world, and related in ways R, R2..., then the *structural universal* constituted by F, G... in relations R, R2... exists in that world, instantiated by x. I would not want to extend this treatment to negative or disjunctive universals.

While the Ramsey Sentence idea is useful, what we really want to know is how the nature of universals themselves fix those laws from which this Ramsey Sentence is constructed. There are at least two ways of making perspicuous this nature of universals, and I shall look at each in turn. Each is as useful as – and neither is in conflict with – the other. The first focuses on the idea that universals are 'powers' and 'dispositional', the second on the idea that universals are internally nomically related.

6.21 *Counterfactual Conditionals*

A universal is a dispositional entity. One can put this point in the following way: various counterfactuals are true of a universal, true in virtue of that universal's intrinsic nature, and all parts of that universal support counterfactuals in this way. As we saw in §3.11, Shoemaker takes these to be *conditional* counterfactuals, where the consequent of the counterfactual is itself a conditional. To examine the counterfactuals which hold in virtue of any x having F, let us take 'OU' to stand for *Other Universals*, C to stand for *Circumstances* and B for *Behaviour*, where both C

and B are complex states of affairs involving one or more particulars (including x). We can say:

> In virtue of any x having universal F, we have:
>
> (a) counterfactual facts of the form *If x were to have OU1, then if C were to obtain, B*.

The particular, x, might well be a proper part of some particular. This means the following will also hold, where y is any particular which in not x :

> (b) counterfactual facts of the form *If x were a proper part of y, and y had a distribution of proper parts P, relation between those parts R and distribution of universals of those parts U, then if C were to obtain, B.*

Most, if not all, (a)-type facts will involve x in both the antecedent and the consequent (i.e. the embedded conditional). With the (b)-type facts, however, it is y, not x, which features in the embedded conditional (though x is, of course, a proper part of y and so in that sense also included).

Let me illustrate both (a) and (b) with an example. Particles which have all the following universals are electrons: *having a rest mass of 9.109×10^{-31} kg*, *having an electric charge of -1.602×10^{-19} coulombs* and *having a spin of ½*. Now take any one of these: *having a spin of ½*, for example. In virtue of x having this, it will be a fact that if x were to have the other two universals, then if x were in certain circumstances it would behave a certain way. For each distinct type of circumstance in which behaviour would ensue, there will be a different counterfactual fact. Hence we have many (a)-type facts which hold in virtue of x *having a spin of ½*. But electrons are part of atoms, and atoms themselves behave in certain ways in certain circumstances (the same for particulars composed of atoms). So in virtue of x *having a spin of ½*, it will also be a fact that if x were to be a proper part of y, which has the P, R and U of that of a hydrogen atom, then if y (the hydrogen atom) were in circumstances C, then B. Therefore many (b)-type facts hold in virtue of x *having a spin of ½*.

There also seem to be counterfactual facts holding in virtue of x having F which are not conditional on the instantiation by x of any other universals. First, if x instantiates *having a rest mass of 9.109×10^{-31} kg*, for example, it seems reasonable to

think it will behave in certain ways given certain circumstances regardless of its also instantiating *having a spin of ½* and *having an electric charge of -1.602x10^{-19} coulombs*. Second, consider obviously complex universals. If we identify *being an electron* with the conjunctive universal of having the aforementioned charge, mass and spin universals, then it certainly seems true that in virtue of x being an electron there are counterfactual facts about x which are not conditional on x's instantiation of other universals. Third, for each object composed of atoms there will be a complex structural universal which it instantiates formed from the universals (monadic and relational) of its parts. Of any x, we can surely say that its instantiating that universal ensures that if it were put in certain circumstances, it would behave in certain ways. Fourth, consider the familiar law that all Fs are G. This doesn't say that all xs which are F *and instantiate certain other universals* are G. It says that if x is F, x is G.

One might take this to show that there are facts of a third type which hold in virtue of x having F: (c) counterfactual facts of the form *If x were in C, then B.* Alternatively, one can just take them to be counterfactual facts which are conditional on any set of universals, even the null set, also being instantiated by x. Shoemaker takes this sort of line when he discusses conditional powers and powers *simpliciter*, and there seems little of substance to choose between the two.

It should be clear how we get from counterfactual facts of types (a) and (b) to the laws of nature. Facts of type (a), for example, hold because it is of the nature of F that *any* x with F is such that, if it were to instantiate OU, then if it were in C, B. And this gives us general counterfactual facts of the form *(∀x) if x were F&OU, then if it were in C, B*, which is a law form since any fact of that form will ensure that a regularity obtains given that there are xs which are F&OU. Essentially the same can be said about facts of type (b).

6.211 *A Problem with Conditional Analysis*

Martin (1994) has tried to undermine a *reductive* conditional analysis of dispositions by showing that the truth of a conditional cannot be equated with the truth of a disposition ascription. **Powers** is a realist account, not reductive: universals ensure the truth of certain counterfactual conditionals, but the having of a universal isn't to be reduced to the truth of these conditionals. It might nevertheless seem that Martin's

idea undermines **Powers** as well. Let me outline what he says against the reductive account and then, in §6.212, examine its impact on **Powers**.

Take the following claim:

[A] *The wire is live*

and the conditional Martin puts forward as its *analysans*:

[B] *If the wire is touched by a conductor then electrical current flows from the wire to the conductor*

An 'electro-fink' is attached to a wire. This is a device that detects when the wire is touched by a conductor and reacts (instantaneously) by making the wire live throughout the duration of contact. Untouched by the conductor, the wire is dead. The device also has a 'reverse cycle', whereby the wire is live unless touched by the conductor, at which point (again, instantaneously) it makes the wire dead for the duration of the contact.

To see that [B] is not *sufficient* for the truth of [A], consider a case where the wire is untouched by the conductor and *not* live. The electro-fink still ensures that [B] is true. [B] is true despite [A] being false.

To see that [B] is not *necessary* for the truth of [A], consider a case where the electro-fink is on its reverse cycle, the wire is untouched by the conductor and the wire *is* live: that is, [A] is true. The electro-fink now ensures that [B] is false: as soon as the wire is touched, it makes the wire dead. [B] is false despite [A] being true.

Thus [A] and [B] are not equivalent, as the reductive analysis assumes. We are happy to claim [A] but accept the falsity of [B], or vice versa, when we consider electro-fink cases. Could [B] be modified so as to accommodate such cases, thereby allowing someone to hang on to a reductive analysis? Martin thinks not. He considers how one might try building into the conditional a *ceteris paribus* clause, making [A] logically equivalent, not to [B], but to

[C] *If the wire is touched by a conductor* ***and other things are equal****, then electrical current flows from the wire to the conductor*

However, cashing out this clause would mean specifying that various things are absent from the situation: that there is no electro-fink, and indeed nothing which has the same effect as an electro-fink. In short, we are left with

> [D] *If the wire is touched by a conductor,* ***and nothing happens to make it false that the wire is live****, then electrical current flows from the wire to the conductor*

[D] is equivalent to [A]; that is, in all situations in which [A] is true, [D] is true, and vice versa. But clearly [D] cannot be a *reductive analysis* of [A]. Our being able to formulate [D] is dependent on our *already* understanding what it is for [A] to be true. [A], after all, is a *linguistic part* of [D]. [B] is not dependent in this way, but [A] and [B], as we have seen, are not equivalent. We must conclude, since we have no reason to think *being live* is a special case, that no disposition ascription to x is equivalent to a conditional claim about x. The *reductive conditional analysis*, inasmuch as it seeks to show such an equivalence, is false.

6.212 *Conditional Analysis and* ***Powers***

One might think **Powers** faces a similar fate to the reductive conditional analysis. Suppose that we want to say the counterfactual claim 'If x were to have G, then if C, B' is true if x has H. We can always suppose, following Martin, that there is some finkish device which thwarts the instantiation of B even though x has H. This will be a device which detects when the conditions C are instantiated and acts in some way to prevent B. This possibility shows that the counterfactual claim isn't true if x has H, and the electro-fink strategy generalises to any counterfactual claim one might propose to hold if some x has a specific universal.

Mirroring the strategy Martin tries on behalf of the reductive analysis, **Powers** might try to incorporate a ceteris paribus clause into the counterfactual claim, giving us 'If x were to have G, then (all things being equal) if C, B', or perhaps 'if x were to have G, then if C (and all things are equal), B'. But what does this ceteris paribus clause amount to? In the disposition case Martin focuses on, the fink – as soon as the wire touches the conductor – makes it false that the wire is live, so the clause is cashed out as saying 'if nothing happens to make it false that the wire is live'. Adding 'if nothing happens to make it false that x has H' in the present example might be helpful, given that **Powers** does not seek a reductive analysis. But there is a way this counterfactual claim can be false without x losing H: one could ensure that, once the specified circumstances obtain, then (instantaneously) some other condition comes into play which prevents B.

We might try amending the counterfactual claim in the light of this possibility. But given more than one means of preventing B – the electro-fink *and* the newly introduced preventative factor – this ceteris paribus clause seems to then mean nothing more than 'as long as nothing prevents B from occurring'. And this is problematic. We are not characterising the nature of H if we say that x has H if and only if 'if x were to have G, then if C (and nothing prevents B from occurring), B' is true. Saying that 'nothing prevents B from occurring' is just saying that 'circumstances obtain which ensure that B follows'. If it wasn't, then presumably there could be a situation in which nothing was preventing B from occuring but the circumstances did not obtain to ensure that B follows. But if the circumstances did not obtain to ensure that B follows, then the counterfactual supposedly entailed by x having H would be false: if x were to have G in circumstances C, B would *not* be entailed. Now all objects, no matter what universals they instantiate, are such that if they were to have G, and if they were in circumstances C *and those other circumstances which ensure that B follows*, then B. One can't, then, say what it is for x to have H by invoking this counterfactual claim, since it is true of a particular instantiating *any* universal.

I am not about to offer a solution to this problem. My claim here is that even though **Powers** makes essential use of conditionals in characterising universals, it is not affected by the problem of unpacking the ceteris paribus clause.

To see this, bear in mind the distinction between counterfactual *claims* and counterfactual *facts*. Counterfactual claims are made by us, and can be true or false. Counterfactual facts, on the other hand, are independent of us, and the possible statement of such facts is true (recall what I said in §2.16: all it takes for x to be F, and so a fact, is that the possible statement 'x is F' be true). I have voiced the Martin-like objection using counterfactual claims. The problem, essentially, is that we cannot *state* the counterfactual facts which hold in virtue of x having H.

If **Powers** was concerned to characterise any universal in particular, it would face the problem of *stating* those characteristic counterfactuals. The counterfactual facts which hold in virtue of some x having H are far too complex for us to state – electro-fink examples show us at least that much. There is a Nomic Network. There are, as a result of that, all sorts of ways B could be prevented from occurring at time t+1 even when x has H and G and conditions C hold at time t. If we had knowledge

of the complete network, then theoretically we could list the ways in which B could be prevented, and so fully characterise particular universal H. But we don't have this knowledge. This means we will inevitably have trouble *saying* just what counterfactual facts hold in virtue of x having H. We have the problem of employing a ceteris paribus clause which, when unpacked, gives us counterfactual claims that do not enable us to differentiate x having H from x having any other particular universal.

It is fortunate, then, that **Powers** is only concerned with characterising the nature of universals *in general*. The problem of stating which counterfactual facts hold in virtue of x having any particular universal does not affect the *general* claim that counterfactual facts hold in virtue of universals, nor does it affect our ability to give some idea of the *form* those counterfactual facts take. When I talk about the *form* of such counterfactual facts, of course, 'F', 'C', 'B' and so on are to be taken as distinct variables which refer to no universal in particular, just as 'x' refers to no specific particular.

Furthermore, in stating the form of such counterfactual facts nothing stops me from using a ceteris paribus clause to gesture towards preventative factors. Such clauses are no part of the counterfactual *facts*, but they may nevertheless be part of my counterfactual *claims* about universals in general. There is no problem because, since I am not trying to characterise any particular universal, I do not face the difficulty of the associated counterfactual claims being equally true of any x instantiating any universal. Indeed, I am not making counterfactual claims as such. I am making claims *about* the forms which counterfactuals supported by universals take.

As it turns out, however, the ceteris paribus clause appears to be surplus to requirements in stating these counterfactual forms. Take, for example, *if x were to have OU1, then if C, then B*. I do not need to add '(ceteris paribus)' after 'then' or after 'C' because the conditions C can themselves be taken to include all that is needed to rule out prevention of B, either through finkish means or otherwise.[6]

[6] For an example of non-finkish prevention, take match-strikings (ceteris paribus) causing match-lightings. If oxygen is not present, the match will not light. Therefore, the presence of oxygen needs to be specified in the ceteris paribus clause.

Neither does using or avoiding the ceteris paribus clause mean that counterfactual facts will commit one to *negative* universals. We may talk about what would happen if, amongst other things, there was an *absence* of electro-finks. But such claims are grounded in the holding of many counterfactual facts involving purely positive universals; x being H, for example, supports various counterfactual facts of the more detailed form *if x were to have OU, then if the surrounding area of x were to be S* (where this is a specification of the position of every particle relative to one another and the universals these particles instantiate) *and other circumstances were to be C, then B.* There will be lots of specifications of S such that no electro-finks are present, but that just means there will be a large number of counterfactual facts holding in virtue of x having H. It will then be *true* that 'if x were to have OU, then if there were *no electro-finks* and there were other circumstances C, then B'. But there is no commitment to negative universals as part of the truth-maker for this statement: only a commitment to positive universal H and to its supporting various counterfactual facts involving positive universals which together give us, in their antecedents, *all* the situations in which an electro-fink would not be present. For more details of this strategy, as it is used to avoid commitment to supervenient universals, see §6.3.

To conclude. Martin's argument targets a reductive analysis of dispositional terms: ascription of any particular dispositional term is not equivalent in meaning to ascription of one or more counterfactuals. It can also be used to target a realist about dispositional properties seeking to characterise particular examples of these: the having of a particular dispositional property will not make true certain counterfactual *claims* that we might offer, given that we can never state all the factors which may prevent B from occurring. But it cannot be used to target **Powers**, which considers the *general* form of counterfactual facts holding in virtue of universals, and does not try to state *specific* counterfactual facts holding in virtue of *particular* universals.

6.213 ***Powers*** *and Defeasible Laws*

As we saw in §1.13, Armstrong takes there to be *defeasible* laws. But one can reject this notion. Take the supposedly defeasible law that all Hs are J. One can say that when we take this to be a law, we are missing out the the crucial ceteris paribus clause. There is no relation of *necessitation* between H and J, and so no law that all

Hs are J. The relevant law relating H and J is far more complex, involving many extra conditions which need to be met as well as some object having H.

Powers is naturally led to this second option for two reasons. Firstly, it would be wrong to call it a law that all Hs are J because the general counterfactual fact which holds in virtue of H is more complex than *(∀x) if x were to be H, then x would be J*. Secondly, H and J are not nomically related by an internal necessitation relation. Although there is a nomic relation between H and J, the fact that there can be Hs which are not J shows that the relation is not one of *_ is a universal which, if it were instantiated by x, the x would instantiate_*. It is, rather, one of *_is a universal which, if it were instantiated by x and factors X, Y, Z... obtained, then x would instantiate_*. Only the first of these can be seen as a *necessitation* relation; the second can be seen only as a *will be necessitated if X, Y, Z…* relation. But it seems plausible to take the *fundamental* nomic relation as that of necessitation, and for that reason take laws to involve the holding of that relation between universals.

The general counterfactual facts which hold in virtue of universals dictate what nomic relations obtain between universals. Having explored these counterfactual facts, it is now time to turn to a fuller consideration of what **Powers** takes nomic relations to be.

6.22 *Internal Relations*

There are at least two – incompatible – ways in which the distinction between an internal and an external relation has been defined. Fales (1990:244) and Armstrong (1989:105) endorse the following:

> [Def. 1] A relation is internal iff it holds in all possible worlds *where the relata have certain monadic properties*. Otherwise, it is external.

But Campbell (1990:110-113), and apparently Armstrong (1997:87), endorse an alternative:

> [Def. 2] A relation is internal iff it holds in all worlds *where the relata exists*. Otherwise, it is external.

To bring out the difference, consider Fales' example, *weighing twice as much as*. If *a* weighs 1 kilogram, and *b* weighs 2 kilograms, then *b* weighs twice as much as *a*. It is

then an internal relation according to Def. 1. But *a* and *b* may well have their weight contingently. If *a* and *b* are people, for instance, there is a possible world, PW, where *b* does not have such a voracious appetite, and where *a* and *b* exist and *b* does *not* weigh twice as much as *a*. This means the relation is external according to Def. 2.

Keith Campbell accepts Def. 2, but distinguishes between two sorts of *external* relation: the *founded* and the *unfounded*. He takes those relations holding in all possible worlds in which the relata have certain monadic properties to be external, *founded* relations. External *unfounded* relations, on the other hand, hold neither in all worlds containing the relata nor all worlds in which the relata have certain monadic properties. Spatial and temporal relations seem the obvious candidates for entry into this third category: *a* may be two metres away from *b*, for example, but the distance between them could have been different, and the spatial relation doesn't seem to hold in virtue of monadic properties of *a* and *b* either.

I shall adopt Def. 2, and Campbell's distinction between types of external relation, with one crucial amendment. This amendment is necessary if I am to accept that on Fales' account the nomic relation is external. Fales takes universals to occupy a Platonic realm. But if F and G are nomically related in this realm, that means there will be no possible world where both are instantiated and not nomically related. According to Def. 2, this makes the nomic relation internal. However, this clashes with Fales' own characterisation of the relation. Moreover, the relation seems to me to be internal. F and G are categorical according to Fales. They themselves do not ensure that the relation holds. Rather, they are nomically related in some Platonic realm, the only realm to contain them, and from this it is entailed that in all possible worlds instantiations of F are nomically related to instantiations of G.

It is because Fales accepts Def. 1 that he is able to say the nomic relation is external. It is external because F and G do not have any monadic properties ensuring that it holds. But there is at least one way to amend Def. 2 so that it takes Fales' nomic relation to be external. It is this:

> [DEF.] A relation is internal iff it both holds in all possible worlds in which the relata exist *and holds in virtue of the relata themselves*. Otherwise it is external.

This shall be my working definition. It is compatible with Fales' claim that the nomic relation is external, since for him it is not in virtue of F and G that the relation holds – as I said in §4.133, it is simply an inexplicable fact that the relation holds and only holds in one possible Platonic realm. And it is also compatible with **Powers**' claim that the relation is internal, since according to **Powers** it clearly is in virtue of F and G – as dispositional entities – that the relation holds. As well as this, it is clearly a distinct definition from Def. 1: someone might take the aforementioned weight-relation example and say that the relation there holds in virtue of the relata, *a* and *b* – but even if this is allowed, and it is not clear that it is (it seems, rather, to hold in virtue of them *having certain properties*), we clearly saw that it does not hold in all worlds containing *a* and *b*, and so it is not internal by my definition.

6.221 *The Ontological Situation as regards Internal Relations*

Neither Armstrong, Campbell nor Fales take internal relations to be ontological additions. If x and y are internally related by R, then R does not exist as a separate entity joining the relata. Armstrong puts the matter this way:

> If, as I further contend, what supervenes is not something ontologically more than what it supervenes upon, then, once given the terms, internal relations are not an addition to the world's furniture. External relations are those that are not internal, and are therefore the ontologically important relations.(1997:87)

Dispositional entities are prime candidates for the relata of internal relations. As we have seen, according to **Powers** it is in virtue of the dispositional nature of universals that certain general counterfactual facts obtain. But one can express this nature using internal relations. Take the law that all Fs are G. F supports the counterfactual fact that *(∀x) if F were to be instantiated by x, then x would be G*. But it appears that we could equally say that F is *internally related* to G. What is the relation here? It will be the one derived from this counterfactual fact: *_is such that if it were instantiated by any x, then x would also instantiate_*.

My concern in this subsection is with a related question: can internal relations obtain between relata even when one of the relata is uninstantiated? Certainly, both relata are needed for an external relation to obtain: for example, x cannot be two metres from y unless both x and y exist. But are internal relations different in this respect?

There is an interesting passage by Fales in which he might be saying that they are:

> Since Armstrong holds, plausibly, that there cannot be relations between non-existent universals or between an existent universal and a non-existent one, he cannot explain how [given the truth of his theory] such laws are grounded. He ends, implausibly, by denying there could be [laws involving non-existent universals]. But he needn't deny this if he were to accept the internal-relation theory. The worry about non-existent relata, after all, is a worry that concerns only cases in which we have a real relation. But internal relations are not real. Consider, this time, the law that P(G/F)=0.001, a law that might obtain in a world W in which there are Fs but no Gs. What makes this law true of W? The internal-relation theory has a ready answer: it is simply the nature of F. G does not exist in W; nor does the probabilistic nomological relation between F and G. But that relation would not exist even if G did. Moreover, if G existed, it would have a nature; and the law would be a consequence of that nature and F's nature. (1993:138)

This passage, however, strikes me as ambiguous. Fales could be claiming that on an internal relation theory of laws, either (a) there is an internal (nomic) relation between F and G even though G does not exist, or (b) the law involving F and G holds in virtue of it being the case that if G were to exist, there would be an internal nomic relation between it and F – and this counterfactual holds because of the nature of the existent universal F.

I do not know which of these Fales has in mind. But I am inclined to think that (a) is the correct way of viewing matters, because (b) itself, despite appearances to the contrary, admits internal relations between existent and non-existent universals. It says that if G were to exist, then F would bear an internal relation to it. That internal relation is presumably *_is such that, instantiated by x, there is a 0.001 probability of x being_*. But then if this claim is true, it seems that (b) is committed to the following counterfactual fact:

> [CF1] *If* G were to exist, *then* F would be such that, instantiated by x, there is a 0.001 probability of x being G.

And this counterfactual fact is in effect asserting the following relation between F and G:

> [R1] *_is such that, if it were to exist, then _ would be such that, instantiated by x, there is a 0.001 probability of x being it*.

This relation is an internal relation, since in all worlds containing F and G, [R1] will hold, and furthermore hold in virtue of F and G themselves. Of course, [CF1] tells us what would be the case if G *were* to exist. But there is no contradiction in holding both that there exists G and a fact about what would obtain if G *were* to exist, and so no problem arising from this of the relation [R1] holding between F and G in worlds with G. The counterfactual's antecedent, while perhaps suggesting that G does not exist, does not explicitly say as much. An everyday example may help here. It seems that the following two facts can both hold: first, that if I were to hold my hand over the fire, I would get burnt, and second, that I have put my hand over the fire. Imagine that I come to you and ask whether the former is a fact or not. You say yes, it is. Do you change your mind once I produce my burnt hand? I think not. The fact still holds despite my now having burnt my hand. The same for [CF1] in worlds containing both F and G.

[R1] is also a *nomic* relation. It is nomic because its holding between F and G ensures that a law-statement, 'P(G/F)=0.001', is true. Given that it can hold despite a relatum being non-existent, there seems no principled reason to deny this capability to other nomic relations. Nomic relations are derived from the general counterfactual facts that hold in virtue of the nature of universals. [CF1] holds in virtue of the nature of F, but, as I claimed in §6.21, so do facts such as the following:

> [CF2] (∀x) *If* F were to be instantiated by x, *then* there is a 0.001 probability of x being G.

And because this obtains in virtue of the nature of F, so the following internal relation holds between F and G in virtue of the nature of F:

> [R2] *_is such that if it were instantiated by any x, there is a 0.001 probability of x being_*

The metaphysical picture I have uncovered is one where existent universals are nomically related to non-existent ones. But once we see what that involves, I do not find this picture problematic. When I say that [CF2] is a fact, all I mean is that what [CF2] states is true. What makes the statement of [CF2] true is F itself, which does exist. To then say that [CF2] shows us that an internal relation holds is just to say that [CF2] exhibits relational form. Abstract F and G from [CF2] and we discover what the relation is. But clearly, this relation is not an extra constituent of

reality. We have a true counterfactual statement and we have F. That statement is made true by F. It is not made true, even in part, by there being a extra entity, a nomic relation, which holds between F and a non-existent G.

Let me put matters another way. Neither Armstrong, Campbell nor Fales take internal relations to be ontological additions. But I see no other way of ensuring that internal relation R holds in all worlds with F and G and is no ontological addition other than by taking the assertion of R's holding to be no more than the assertion that 'F is R to G' is true in all worlds with F and G, and is made true by F and G. Now according to **Powers**, there are relational statements about non-existent universals which are made true by existent universals. 'F is R to G' can be true in worlds without G. But if so, it seems we should also say that R, where R is the nomic relation, holds between F and G in worlds without G.

6.222 *Nomic Relations according to **Powers***

I have taken there to be general counterfactual facts holding in virtue of instantiated universals. If I am to avoid ontological commitment to these facts, of course, what I mean is this: there are true general counterfactual statements which could be made, and which would be made true by instantiated universals. '*(∀x) If F and H were to be instantiated by x, then x would be G*' is one such statement. But law-statements are rarely in explicit counterfactual form. We might get '*All F&Hs must be G*' or '*F&H necessitates G*' instead. However, this should not make us think there are distinct facts being reported. All three sentences make the same claim: the truth of any of these entails the truth of the others.

If this is true, we can state the nomic relations which hold between universals using counterfactual or non-counterfactual phrases. The relation _ *is such that, if it were instantiated by any x, x would be* _, for example, is identical to _ *necessitates* _. Working with this idea, and bearing in mind the types of general counterfactual fact set out in §6.21, we can get an idea of the types of nomic relation that **Powers** is committed to.

One type of counterfactual fact involves the instantiation of one complex universal causing the instantiation of another. The relation here is _ *is such that, if it were instantiated by any x, x would cause an instantiation of_*, but this, as we have seen, is just the relation _ *in instantiation causes an instantiation of* _.

The relata of this relation, as complex universals, will have other universals as parts. It is the dispositional nature of the parts which gives us the dispositional nature of the complex universal they are parts of, and this fact points to another nomic relation: *_is a universal which is part of a complex universal which, if it were instantiated by any x, x would cause an instantiation of_* (or: *_is part of a complex universal which in instantiation causes the instantiation of_*).

There are then variations on the same theme. For example, we may include reference to some of the universals involved, giving us various nomic relations like *_is a universal which is related to F and G and some others and which together are the event universal which, if it were instantiated by any x, x would cause an instantiation of_*.

Another type of counterfactual fact involves *coinstantiation*: the non-causal law that all Fs are G, for example, ensures the 'coinstantiation' of F and G. From this type of counterfactual fact we get such nomic relations as *_is such that, if it were instantiated by any x, then x would also instantiate_* (or more simply: *_must be coinstantiated with_*).

In short, there are many *nomic relations* because there are many different *general counterfactual facts* obtaining in virtue of instantiated universals. Armstrong talks only of the nomic relation N, or (when he considers probabilistic laws) a whole range of N-relations with different strengths, that of the deterministic law being the strongest (1983:131). But he will accept that there are general counterfactual facts holding in virtue of the laws, and so can also accept that internal nomic relations hold in virtue of them. But those laws, and so those facts and relations, will involve only instantiated universals,[7] and N is the nomic relation on which all others are based. **Powers**, in contrast, denies that there is an external relation N. Taking nomic relations to be internal leads to there being a multitude of distinct nomic relations, none more *ontologically* basic than any other.

[7] Unless, of course, those counterfactual facts involve determinates of some higher-order law from which they are entailed. This idea was discussed in §2.222.

6.3 *The Nomic Network: Further Details*

I have shown how the nature of instantiated universals fixes the Nomic Network they are part of: i.e. fixes what possible law-statements involving them are true. There are various possible general counterfactual statements which are true, many of which we may not have formulated, some of which we may never be in the epistemic position to formulate. But still, of the possible general counterfactual statements, some set of them will be made true by instantiated universals, and it is the members of this set which together describe the Nomic Network in full. These general counterfactual statements, I have claimed, are equivalent to true law-statements that do not have explicit counterfactual form.

It is clear how general counterfactual statements about a mixture of existent and non-existent universals can be true. But I also think there are true general counterfactual statements about universals which are *all* non-existent. As well as this, some people think that there are true law-statements involving supervenient terms. How might **Powers** accommodate such statements? In this section I look at each of these issues in turn.

6.31 *Law-Statements about Uninstantiated Universals*

There are two ways in which '*(∀x) if x were to instantiate F, then x would instantiate G*' can be true even though *neither* F or G exists. These are also ways in which more complicated general counterfactual statements about universals can be true.

First, if F and G are *complex* universals, the statement will be made true by any of the structural or conjunctive parts of F or G which exist. It will be the nature of one of these parts of F that if it were to be instantiated with, and in certain relations to, certain other universals (the complex whole being F), then whatever instantiates this whole would also instantiate G. It will also be the nature of one of the parts of G that if it were to be instantiated by any x and if x were to be in certain relations to certain other universals (the complex whole being G), then whatever y instantiates this complex whole could have come to be instantiated by y's being F.

Second, even if F and G are simple universals, or complex universals whose parts are also uninstantiated, the statement will be made true by any instantiated universal that shares the same Nomic Network as F and G. Recall that the universals in the Nomic Network could not be nomically related in different ways, since universals are dispositional entities and the nomic relations they enter into hold in virtue of that dispositional nature. But this means that it is also part of the intrinsic nature of a universal to be part of a certain Nomic Network. The argument taking us from this claim to the conclusion that law-statements about non-existent universals with non-existent parts can be true then goes as follows:

> [1] Universals exist as part of the actual world.
>
> [2] Take any one of these universals, and call it 'X'. It is of X's nature that it be part of the network of laws NN.
>
> [SUPP] One of the laws constituting NN – call it 'L' – involves universals which are all uninstantiated, and so do not exist, in the actual world.
>
> [3] If X's nature is such that it is part of NN, then if X exists, so all the laws which constitute NN obtain.
>
> [C] L – a law involving non-existent universals – obtains in the actual world.

The realist about universals will find the first premise uncontroversial. The second also seems reasonable. If X exists, it will be necessarily 'bound up' in one Nomic Network, NN, the network of laws governing the world of which X is a part (i.e. the actual world). Premise [3] also seems reasonable given premise [2]. If X's nature were not such that it is part of NN, X could presumably be instantiated in a possible world governed by some network other than NN. This, however, is not possible. And given this, we are drawn to the conclusion that the existence of X itself ensures that all the laws contained within NN hold. If there are laws in NN which involve purely uninstantiated universals – and there is no reason to think not – then that means that such laws obtain in the actual world.

All that is being claimed here is that a world containing X is such that if certain other universals were to be instantiated, certain behaviour would ensue. Once X is in a world, the nomic possibilities of that world are fixed. There will be certain

universals which do not exist but which might have – these will be universals in NN. There are also ways in which objects instantiating those universals would have behaved – these ways being dictated by laws within NN. The possibility is left open that there are other universals, in other possible worlds, which are not part of NN. But X being in the actual world means that such universals could not possibly be instantiated in this world.

I find this picture an appealing one. It preserves the idea that in a world containing very few universals there might nevertheless be truths about how various other universals would behave if they were to be instantiated. We might well be unable to frame law-statements involving those universals if neither they nor their constituents exist, but this does not mean there are no such truths: it only means we cannot formulate the statements to express those truths.

Citing X in response to the question "what makes 'All Fs must be G' true?" may be to give a true reply, but it will no doubt be puzzling. How, it might be asked, is X connected to this law? F and G are connected in an obvious way, but even citing them is liable to cause consternation. How, it might be asked, do F and G ensure that the law holds? The problem here is not that F, G and X are not truth-makers for 'All Fs must be G'; it is that we are not really, or are no longer, enquiring about what the claim's truth-maker is. We are, rather, after the answer to a quite different question, namely "*why* is X / F / G a truth-maker for 'All Fs must be G'?" This *explanatory* question is not settled by citing mere universals nor the mere existence of certain universals. We also need to mention the dispositional natures of certain universals to show how they ensure that the law holds and the law-statement is true. Resistance to F, G or X as a truth-maker for 'All Fs must be G' may have its roots in the inability to see how the universal could fill this truth-making role. If that is so, my discussion of **Powers** and the argument I have just set out should have made the idea far more palatable.

6.32 *Law-Statements which use Supervenient Terms*

The functional law-statement 'F=MA' provides a good example of how **Powers** can deal with law-statements involving supervenient terms. 'Force', 'Mass' and 'Acceleration' are such terms. But if Non-Supervenient Realism is right, there are no

supervenient universals corresponding to supervenient terms, and so their dispositional nature cannot be invoked to ensure the truth of 'F=MA'. At the same time, of course, not all determinates of mass, force and acceleration are instantiated, so one cannot invoke them, and their combined dispositional nature, to account for the truth of 'F=MA'.

The answer lies with the argument I presented in §6.31. As we saw, any instantiated universal makes true those general counterfactual statements which fully describe NN. NN will contain all nomically possible determinate universals, and so all determinates of F, M and A. If 'F=MA' is true, each determinate of F being instantiated by an x will have a value equal to the value of the M instantiated by x multiplied by the A instantiated by x. Therefore, if NN contains a determinate law of this form for each determinate of M, then 'F=MA' is true. Even with 'missing values', then, the truth of 'F=MA' does not, for **Powers**, require the existence of supervenient universals. It only requires an instantiated non-supervenient universal.[8]

Law-statements with supervenient terms predominate in the so-called 'special sciences'. Biological, psychological, and economical terms, to name just a few, are predicated of many distinct physical types of object. Take the biological term 'heart'. It denotes a part of many different animals, mammals, reptiles, and so on, and there seems to be nothing *physical* shared by these creatures in virtue of which this term is applied. But some think this does not stop there being true law-statements which use the term, such as 'drug X affects the heart and causes heart-attacks'. Or consider psychology. Mental state types, as we have already seen, are multiply realisable, but some think there are law-statements using mental terms, for example 'Opium relieves *pain*' and 'Ecstasy gives the user *a feeling of well-being*'.

Powers can account for the truth of special science law-statements in much the same way as it accounts for the truth of 'F=MA'. All the nomically possible determinate universals of F, M and A are said to be nomically related in such a way that the law-statement 'F=MA' is true. In the same way, a special science law-

[8] The matter will be more complicated if, according to Non-Supervenient Realism, *some* determinates of F, M and A are also multiply realisable, and so supervenient. I omit this complication here, and in what follows. But it in no way affects the claims I am making. Say there are a dozen universals upon which a determinate of M supervenes. NN will then merely need to contain twelve general counterfactual facts instead of one in order that our determinate general counterfactual fact also obtains.

statement is true if all the nomically possible complex universals which the supervenient terms could pick out have nomic relations such that the law-statement's truth is secured. Take as our example 'drug X affects the heart and causes heart-attacks'. All the nomically possible complex universals which would, instantiated by x, lead us to call x a 'heart', and all the nomically possible complex universals which, instantiated by y, would lead us to call y a 'heart-attack', and (if 'X' is a supervenient term) all the possible complex universals which, instantiated by z, would lead us to call z an 'X', are nomically related to each other and other universals such that the heart-attack law-statement is true. What makes it true, again, will be any instantiated universal, since any instantiated universal will of its nature be part of the Nomic Network partly constituted by the relevant nomic relations between universals.

Most, if not all, special science laws hold ceteris paribus. The aforementioned law-statement, therefore, might be better stated as 'drug X (ceteris paribus) affects the heart and causes a heart-attack'. But this does not radically affect what I have said. If there is a ceteris paribus clause, there are circumstances C in which X would not produce a heart-attack and yet the law-statement would still hold true. To be true, the Nomic Network simply has to contain laws ensuring that in circumstances C the drug X does not cause a heart-attack, but that in all other circumstances it does.

If these kinds of law-statements can be made true by instantiated non-supervenient universals, it seems open to us to admit law-statements involving negation and disjunction while at the same time denying the existence of negative or disjunctive universals. This should not be surprising, given that negative and disjunctive properties are supervenient. If x has mass m, x also has the property of not being mass m', not being m'', not being m''', and so on; but x having any one of these negative properties does not entail that it has mass m. Similarly, if x has the property P, it has the property P-or-Q, the property P-or-Q-or-R, and so on; but x having any one of these disjunctive properties does not entail that x has the property P. In §6.212 we saw how one law-statement involving negation could be accommodated with only a Nomic Network composed of non-supervenient universals. The basic idea is that if 'no Fs are G' is true as a matter of law, there are no laws in the Nomic Network allowing Fs to be G. Similarly, if 'All Fs are either G or H' is true as a matter of law, there are no laws in the Nomic Network allowing Fs to be anything other than G or H.

I have characterised the Nomic Network as containing universals and their nomic relations to one another. But if we admit law-statements containing supervenient terms, the Nomic Network seems to be enlarged. The only *entities* within the Nomic Network are universals, but there are more laws than those involving only universals. There are laws such as F=MA. By that, of course, I mean only that there are true law-statements such as 'F=MA' which contain supervenient terms.

In order to accommodate these extra laws within the Nomic Network, we can say there are two levels of law. What I have so far been calling the Nomic Network is the inner core, containing universals and the general counterfactual facts about them. But there is also an outer core, containing all the general counterfactual facts which obtain in virtue of the situation in the inner core. Let us continue to use the term 'Nomic Network' for the inner core, and use 'Supervenient Network' for the outer core, and 'Complete Network' for the two combined.

I have shown how **Powers** can accommodate true law-statements containing supervenient terms. Any instantiated universal is of its nature part of a specific Nomic Network, and the law-statement, if it is true, is entailed by the laws in that network. But there is an interesting issue here, which I shall end on, concerning the modal status of the laws of this Supervenient Network. The laws in the Nomic Network are necessary. If it is a law that all Fs are G in some possible world, it is a law in all possible worlds containing F or G or indeed any of the universals in the same Nomic Network. But can we say the same about the laws of the Supervenient Network?

To be necessary, it would have to be the case that all objects in all possible worlds falling under the supervenient terms in this Supervenient Network behave in the way the network dictates. But to show this, it appears that one would have to rule out the possibility of worlds governed by different Nomic Networks. It is clear – given that universals are irreducibly dispositional entities – that there are no worlds governed by networks containing some or all of the same universals as the actual network, but in different nomic relations. But are there possible networks which both (a) contain no universal which is part of the actual network, and (b) govern worlds containing objects which fall under the supervenient terms in the actual world's Supervenient Network?

One might think so. For take the actual network, NN, and add a hypothetical extra universal, one which is just directly nomically related to a couple of universals in such a way that its instantiation would hardly be noticed. This isn't possible, of course: in adding this universal we have changed the identity of all the universals in NN; indeed, it is now no longer NN. Nevertheless, in imagining this transformation we get the strong feeling that the resultant network, NN+, would govern worlds almost *perceptually* and *behaviourally* indistinguishable from our own. And in such worlds, there would be objects sharing *none* of the actual world's universals which meet the criteria for being a heart-attack, etc.

If NN+ is possible, then so are a great many other Nomic Networks which could govern worlds almost perceptually and behaviourally indistinguishable from our own. But then there seems no reason why worlds which are behaviourally quite different to our own are not also possible. And if we admit this, we also have no reason to deny that there are, for example, possible universals which, instantiated by x, are such that x fulfils the criteria for 'heart-attack', and possible universals which, when instantiated by y, are such that y fulfils the criteria for 'drug X', but where some of these universals, in one Nomic Network, are involved in a set of laws making true 'X causes heart-attacks' and some of these universals, which are part of *another* Nomic Network, are not. We are led, in other words, to accept possible worlds where X does not cause heart-attacks. This means the law-statement 'X causes heart-attacks' will be only contingently true.

Powers can maintain that all laws are necessary only if there is a way of ruling out possible networks like NN+. Perhaps there is: the fact that such worlds are conceivable does not, after all, entail their possibility. But if there are other possible networks, and these govern possible worlds which *appear* very much like our own, then **Powers** will need to admit a duality concerning the modal status of laws. Those in the Nomic Network are necessary, those in the Supervenient Network are contingent. What's more, this duality would seem readily explicable in terms of the non-existence of supervenient entities. Necessity lies with the fundamental building blocks of reality, one might say. And those fundamental building blocks are non-supervenient.

6.4 *Conclusion*

In this final chapter I have done a number of things. First, I outlined the sorts of universals which are part of the Nomic Network, introducing a sparse realism which rules out supervenient universals but which allows (at least) the universals instantiated by fundamental particles, spatial and temporal universals, and structural and conjunctive universals formed from these. Second, I characterised the nature of universals in terms of counterfactual conditionals and in terms of internal nomic relations. Certain counterfactual facts hold in virtue of F; alternatively, one may say that F is related to certain other universals by certain counterfactual internal relations. Third, with an eye to avoiding commitment to determinable or supervenient universals, I showed how **Powers** can account for the truth of both those possible law-statements which refer to uninstantiated universals and those which contain supervenient terms.

CONCLUSION

This thesis has been concerned to argue for a theory explaining law-like regularity. I have called this theory **Powers**. Laws, according to it, are general counterfactual facts which hold in virtue of instantiated universals. The law-like regularity that all Fs are G, for example, is explained by the law that that all Fs are G, which is the fact that all Fs must be G, which is itself nothing more than the fact that *(∀x) if x were to be F, x would be G*. F and G, and universals in general, are dispositional entities and therefore there are, of their nature, general counterfactual facts about them. Regularity is thereby explained by citing the dispositional natures of instantiated universals.

I have not presented knock-down arguments for my theory: as became clear when considering the arguments of others for similar positions, it seems unlikely that knock-down arguments are available. Rather, each theory of laws needs to be weighed up against its rivals to see which is the *best explanation* of regularity. This has been the way I have argued for **Powers**. Evaluation turns on at least three criteria. First, structural and ontological simplicity. Second, explanatory power. Third, internal and external coherence: how the various claims of a theory cohere and how those claims cohere with widely accepted metaphysical, scientific and everyday claims. I compared **Powers** to a number of rival theories and concluded that overall it is the best account. Let me now briefly summarise how I got to that conclusion.

Armstrong's Account is the best Contingency theory of laws, and by showing that **Powers** is a better explanation than it I have shown that **Powers** is a better explanation than all Contingency theories. Armstrong's account is disadvantaged in a number of ways. For one thing, it has less explanatory power: unlike **Powers**, it cannot explain why F is nomically related G (§2.21). More importantly, unlike **Powers** it is unable to allow for the truth of certain nomic claims involving uninstantiated universals (§2.22).

I also looked at a number of Necessitarian theories. *Shoemaker's Theory* is very similar to **Powers**. But there is an explanatory advantage in having properties as dispositional entities without taking them (as Shoemaker does) to be composed of

many entities which are their powers (§2.11). And Shoemaker seems to take all powers to be causal powers, but that leaves unexplained co-instantive regularities which are just as essential to a property as the causal regularities of which it is a part (§3.13). *Swoyer's Account* is also very similar. But he apparently endorses the view that only some properties and relations are dispositional, giving us both categorical and dispositional universals instead of just the latter. This introduces more complexity than **Powers**, and seems to have little justification (§3.231).

Fales' Platonic Account denies irreducibly dispositional universals, and so is less similar to **Powers** than the last two theories. It is also, as a result, less explanatory than **Powers**. It explains the fact that a universal's nomic relations are essential to it by claiming that each universal is nomically related to others in only one possible Platonic realm. But it cannot say why it is only part of one possible Platonic realm. **Powers**, on the other hand, can explain why a universal's nomic relations are essential to it in a way that doesn't leave questions unanswered which we think should be answered (§4.133). It also does this without a Platonic realm. Since taking universals to be dispositional entities does not itself bring with it a greater ontological burden than taking universals to be categorical entities, admitting a Platonic realm seems to tip the scales of ontological parsimony against Fales and in favour of **Powers**.

Two other types of account were looked at. The first took universals to have –in some way – two sides, one dispositional and one categorical. There were two varieties: *Two Bits* and *Two Aspects*. The first of these seems to introduce a type of entity – the categorical 'side' – beyond necessity (§4.21). The second is explanatorily less satisfying than **Powers** (§4.22). I also looked at a type of account which involved both necessary and contingent nomic relations. Again, there were two varieties: *Variable* and *Fixed*. The first of these, I argued, introduces a new type of entity for the occasion, and so is in that respect ad hoc (§4.31). The second suffers from the same problem as Armstrong's account regarding uninstantiated laws (§4.32). Both share Armstrong's inability to explain why F is nomically related to G, where that relation is contingent.

The drawbacks facing each of these theories are not compensated for by any significant advantage over **Powers**. Neither does **Powers** have any real problems of its own regarding simplicity, explanatory power and internal and external coherence.

To show this, I examined what I take to be the strongest arguments against it. First, I looked at three regress arguments which aim to show that accounts like **Powers** are internally incoherent, and argued that none achieve that aim (§5.1-§5.3). I then looked at Armstrong's claim that if universals are irreducibly dispositional, then at least two implausible metaphysical claims are true: first, that objects we would call non-existent still exist in some way (a claim he attributes to 'Meinongian metaphysics'), and second, that there are no 'genuine' acts. I argued that neither of these claims is a consequence of universals being dispositional entities (§5.4), and also that other points Armstrong makes against accounts like **Powers**, attacking their explanatory power and external coherence, are misguided (§5.5). I then undermined a variety of other such attacks: the claim that **Powers** clashes with the idea that all necessary truths are known a priori (§5.6), that it cannot make sense of our use of conceivability as a guide to possibility (§5.7), that it is more ontologically complex than Fales' account (§5.81), that it does not sit well with the phenomenology of causation (§5.82), and that it gets the direction of explanation wrong (§5.83).

I also argued against Contingency theories, such as Armstrong's, by claiming that they clash with intuitions ruling out the possibility of certain 'rogue' laws (§1.2). Intuitions on this matter, it has to be admitted, are of limited use, partly because they are not universally shared. But the lack of external coherence between Contingency theories and these intuitions will at least have some force for those who share the intuitions.

One may point out that even if people do share those intuitions, they are also likely to have intuitions indicating the possibility of some laws that **Powers** rules out. **Powers**, after all, is very strict here: if it is a law that H_2O boils at 100ºC at pressure p, or that light travels at S m.p.h., then there are no possible worlds containing H_2O where it does not boil at 100ºC at pressure p and no worlds where light travels at anything but S m.p.h. My answer to this is comes in two stages. First, I remind you that conceivability, as Kripke and others have shown, does not entail possibility. Second, I use this to *explain away* those intuitions in which certain different laws involving familiar properties are taken to be possible. Such intuitions arise as a result of our mistakenly taking conceivability to show possibility on these occasions. Why not explain away intuitions regarding 'rogue' laws instead and claim that all conceivable laws are possible? Because, if nothing else, **Powers** is a better

explanation of regularity than any Contingency theory *even if* we discount matters of external coherence with intuitions.

I conclude that on balance **Powers** is the best explanation of regularity. As a consequence, we should think of the world as one containing irreducible dispositionality: a world where properties themselves actively dictate what happens, rather than being passively manipulated by the laws of nature. I find this a plausible and exciting idea, and one which has great potential for future research.

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