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REALIZATION AND CAUSAL POWERS

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ABSTRACT

In this thesis, I argue that physicalism should be understood to be the view that mental properties are realized by physical properties. In doing this, I explore what the realization relation might be. Since realization is the relation that should help us formulate physicalism, I suggest that the theoretical role of realization consists in explaining some of the things that physicalists wish to explain. These are: (i) How are mental properties metaphysically necessitated by physical properties? (ii) How are mental properties causally efficacious? A theory of realization should provide resources for answering these questions. Having identified the theoretical role of realization, I discuss several theories of realization, but then focus on *the subset view* of realization. According to the subset view, a property *P* realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*. I argue that the realization relation as it is formulated by the subset view is a promising candidate to play the theoretical role that I want realization to play. I then investigate how this theoretical role is occupied. In doing so, I provide a general metaphysical framework that the defenders of the subset view can appeal to. This framework specifies in what ways properties are related to their causal powers. Discussing some problems that the subset view faces, I propose my own version of the subset view. I argue that a property *P* realizes a property *Q* if and only if (i) the causal powers of *Q* are a proper subset of the causal powers of *P*, and (ii) *P* is more fundamental than *Q*. Thanks to the requirement that a realized property is less fundamental than its realizers, two things that the original version of the subset view cannot explain are guaranteed: first, fundamental properties are not realized; second, arbitrary conjunctions of properties do not realize their conjuncts. By showing how a theory of realization can help us explain some of the things that physicalists typically wish to explain, I also show that a non-reductive variety of physicalism does not face the problems that it is commonly thought to face.

TABLE OF CONTENTS

LIST OF FIGURES

ACKNOWLEDGEMENTS

DECLARATION

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature:

Printed Name: UMUT BAYSAN

INTRODUCTION

This thesis is an exploration of the *realization* relation that is thought by physicalists to relate mental properties to physical properties. I argue for a modified version of what has come to be known as *the subset view* of realization, the defenders of which are Jessica Wilson (1999), Lenny Clapp (2001), and Sydney Shoemaker (2001; 2003; 2007; 2011; 2013). In doing so, I systematically lay out and critically evaluate different views on realization and causal powers. The notion of causal powers is central to the subset view, as the core idea of the subset view is that realization is ultimately a relation between causal powers of properties. Evaluating several theories of realization with respect to their implications regarding the formulation of physicalism and the explanation of mental causation, I argue for the following four claims:

1. Physicalism should be understood as the view that mental properties are realized by physical properties.

Physicalism is often understood to be the view that the mental is *nothing over and above* the physical. If physicalism is true, then the mental is nothing over and above the physical *because* of the way mental properties and physical properties are *related*. For realists about relations, the predicate "is nothing over and above" should correspond to a relation to be specified. In Chapter 1, I argue that *realization* is a better candidate than *identity* and (varieties of) *supervenience* for being such a relation. Throughout the thesis, I do not take a stance on whether physicalism is true or false; I only claim that a realization-based formulation of physicalism is better than other formulations and that some of the problems that physicalism is said to face can be solved thanks to a regimentation of realization.

In Chapter 2, I start exploring what the realization relation might be. For this, I identify its theoretical role. Given that realization is a relation in terms of which physicalism is to be formulated, a theory of realization should provide resources to explain some of the things that physicalists wish to explain. I argue that a theory of realization should provide the resources to explain how mental properties are metaphysically necessitated by physical properties, and how mental properties can be causally efficacious.

2. A property P *realizes a property* Q *if and only if (i) the causal powers of* Q *are a proper subset of the causal powers of* P*, and (ii)* P *is a more fundamental property than* Q*.*

This is the modified version of the subset view that I argue for in Chapter 6. In working towards this argument, in Chapter 3, I provide a comprehensive survey of the literature on realization–the only comprehensive survey that exists to date. I evaluate theories of realization other than the subset view. I also introduce the core idea of the subset view, and defend it against some objections. The core idea of the subset view simply takes realization to be the proper subset relation that is addressed in (i). However, unless (ii) is added, certain problems cannot be solved. In particular, without the addition of (ii), fundamental properties turn out to be realizable, and arbitrary conjunctions of properties turn out to realize their conjuncts. I demonstrate these issues in Chapter 6, and I argue that my version of the subset view solves these problems.

3. If realization is to be explained in terms causal powers, *then the relationship between properties and their causal powers must also be explained.*

Defenders of the subset view should provide an explanation of how properties and their causal powers are related. In Chapter 4, I provide a critical survey of the notion of causal powers. What makes this survey original is that it is structured around two theses that I argue in Chapter 5 to be relevant for the subset view. These two theses are:

(C1) Properties are individuated by their causal powers;

(C2) Properties have their causal powers essentially.

What makes the survey critical is that I argue that none of the arguments for or against these two theses are persuasive enough. Then, in Chapter 5, I argue that (C1) and (C2) are highly relevant for the subset view. With the endorsement of these two theses, the defenders of the subset view have the resources to explain how mental properties are metaphysically necessitated by physical properties.

4. The subset view's solution to the exclusion problem is not a distinctive one.

In Chapter 2, I argue that a theory of realization should provide the resources to explain mental causation. In Chapter 3, I argue that the subset view can do this. In Chapter 7, I critically examine how this is done. In particular, I focus on the exclusion problem. The exclusion problem is the alleged problem that any causal work that a mental property is

supposed to do is already carried out by the physical property that realizes it, in which case there is no room for mental causes. The subset view and other theories of realization are designed to solve this problem.

The subset view's solution to the exclusion problem is as follows: (i) because of the proper subset relationship between the causal powers of a mental property and its physical realizer, a mental property instance is a proper part of its realizer instance; (ii) parts and wholes do not causally compete; (iii) therefore, mental properties are not causally excluded by their realizers. In Chapter 7, I argue that although the exclusion problem can be solved, the endorsement of (i) is redundant and possibly problematic. I argue that the exclusion problem can be solved thanks to the observation that mental properties and their realizers are metaphysically non-distinct. Although it is true that parts and wholes are metaphysically non-distinct, this does not mean that mental property instances are parts of their realizers. Moreover, in order to show that mental property instances are parts of their realizer instances, the defenders of the subset view may have to make implausible metaphysical commitments. The reason that the subset view's solution to the exclusion problem is not unique is that many varieties of physicalism can and do recognise that mental properties and their realizers are metaphysically non-distinct.

The conclusion of the thesis is that if physicalism is true, then the causal powers of mental properties are a proper subset of the causal powers of physical properties, and physical properties are more fundamental than mental properties. With the endorsement of (C1) and (C2), a physicalist of this sort can easily explain how mental properties are metaphysically necessitated by physical properties. Given the explanation of metaphysical necessitation, physicalists can take mental properties and their realizers to be metaphysically non-distinct. Since metaphysically non-distinct properties do not causally compete, the exclusion problem is not a problem for physicalism of this sort.

CHAPTER 1: FORMULATING PHYSICALISM

1.0 Introduction

My aim in this chapter is to find a viable formulation of physicalism. In Section 1.1, I introduce physicalism as the view that mental properties are "nothing over and above" physical properties. I suggest that if physicalism is true, then that the mental is nothing over and above is true because of the way the mental and the physical are *related*. For realists about relations, then, the predicate "is nothing over and above" should denote some relation to be specified. For each such relation that may correspond to the predicate "is nothing over and above", there will be a distinctive formulation of physicalism. In Section 1.2, I discuss the proposal that *supervenience* is such a relation, and then list two supervenience-based formulations of physicalism. One conclusion to take from this section that will be important in the rest of this thesis is that, regardless of whether a supervenience-based formulation of physicalism is good enough or not, physicalism should be understood to entail that mental properties are *metaphysically* necessitated by physical properties. In Section 1.3, I introduce and endorse Horgan's (1993) argument that a supervenience-based formulation of physicalism is not good enough to distinguish physicalism from some anti-physicalist views, such as emergentism. His proposal is that physicalism should be formulated in terms of *superdupervenience*, which is a supervenience relation that is robustly explainable. Here, I will also introduce a relation that I call *superhypervenience*, which is a supervenience relation that is explainable, but the explanation that superhypervenience requires is different from the explanation that superdupervenience requires. In Section 1.4, I introduce the *realization* relation that is supposed to entail both superdupervenience and superhypervenience, and then propose that physicalism should be formulated as the view that mental properties are realized by physical properties. The two subsequent chapters will be devoted to the exploration of how the realization relation should be formulated.

1.1 "Nothing Over and Above"

Physicalism is usually understood as the view that nothing is over and above the physical. Understood this way, physicalism is quite a strong view, and it is not exactly the view that I am interested in this thesis. Stated this way, physicalism's domain is too large: it is a view about *everything*. It might be true that everything is ultimately physical, but the question that I am interested is what physicalism about the mind is. More precisely, I am

interested in the question what physicalism about mental *properties* is. By mental properties, I mean properties such as *believing that it is raining*, *having a painful sensation*, *desiring to drink water* and so on. So, physicalism, as I take it, is a view about properties, and specifically mental properties. Accordingly, the version of physicalism that I will focus on in this thesis is the view that mental properties are nothing over and above physical properties. Understood this way, physicalism is more or less captured by Smart's articulation that "sensations are nothing over and above brain processes" (1959: 145). Put in terms of properties, this is the view that *having* a sensation is nothing over and above *being* in some brain state or another.

The "nothing over and above" locution is rather vague, but the thesis can be understood in the following way: mental properties are nothing over and above physical properties in a *similar* sense that wholes are nothing over and above their parts (and how those parts are arranged). I do not mean to suggest that the relationship between a mental property and some physical property (or properties) is the very same relationship as the one between a whole and its parts. However, there are important similarities between these relationships, and it is partly my aim in this thesis to explore these similarities. One important similarity has to do with the notion of "ontological innocence".

Lewis (1991: 82) has argued that mereological composition is ontologically innocent in the following sense: insofar as you are committed to the existence of the parts of an entity, such as a chair, the existence of the chair itself as a whole is not an additional ontological cost. To generalise, for any entities, insofar as you grant the existences of these entities, ontological commitment to the mereological composition of them does not violate ontological parsimony.[1] Here, I am not taking up the task of defending this view about mereological composition. It is a controversial thesis that is challenged by some (e.g.

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[1] Armstrong (1997: 12-13) uses the phrase "ontological free lunch" for the products of mereological compositions to express a similar idea.

Merricks 2001). Rather, I am giving some content to the locution of "nothing over and above". Similarly, one might think that sets are not mysterious, because once you grant the existence of Plato and Socrates, you can grant the existence of the set {Plato, Socrates} with no additional ontological cost. Accordingly, if you agree with these substantial philosophical claims about parts and wholes on the one hand, and sets and their members on the other hand, you might also agree that a chair is nothing over and above its parts in a similar way that the set {Plato, Socrates} is nothing over and above its members Plato and Socrates. The physicalist thesis in question should be read as the view that mental properties are not additional ontological costs to the physical properties whose existence we are ready to grant.

Just as I will not pursue whether Lewis is right about composition or not, I will also not pursue whether physicalism about mental properties is true or not. What I will focus on is whether we can understand physicalism by means of using this analogy. The question is what it means to say that mental properties are nothing over and above physical properties. I take it that the predicate "is nothing over and above" is supposed to denote some relation in the world in the following way: if physicalism is true, then there is some relation between all mental properties on the one hand, and some physical properties on the other hand, such that the obtaining of this relation makes it true that mental properties are nothing over and above physical properties.

Before proceeding to the exploration of what relations might be designated by the predicate "is nothing over and above", I should note that I take physicalism to be a thesis about a given world (or a set of worlds). And, I take it that if physicalism is true in the actual world, it might be only contingently true. Again, I am not interested in defending physicalism, but for those who are willing to do so, this should be seen as a welcome constraint. Thanks to this constraint, one might defend physicalism against objections based on certain conceivability scenarios where mental properties are instantiated without physical properties.

Let us take *reductive* physicalism to be the view that mental properties are *identical* with physical properties. The identity of any given mental property (that is instantiated in the actual world) with a physical property would explain why mental properties are nothing over and above physical properties. So, the reductive physicalists' relation that is denoted by the predicate "is nothing over and above" with respect to mental properties and physical properties is *identity*. That is, according to reductive physicalism, mental properties are

nothing over and above physical properties *because* mental properties *are* physical properties.

However, reductive physicalism, understood this way, is known to be false, for the simple observation that organisms with different physical make-ups can and do have the very same mental properties (Putnam 1967; Fodor 1974). So in some cases, the very same mental property can be instantiated in different organisms with completely different physical make-ups, which makes it impossible to identify a mental property with any of the physical properties that any of these organisms have. If physicalism is true, it is clear that its reductive version cannot be true. So, identity should not be seen as a relation that is denoted by "is nothing over and above" in the formulation of a true variety of physicalism.

So, at best, a *non-reductive* version of physicalism can be true. Let us take non-reductive physicalism to be the conjunction of two theses then: (i) *physicalism*: mental properties are nothing over and above physical properties; and (ii) *non-reductionism*: mental properties are not identical with physical properties. What we now know is that, because of (ii), the relation that is denoted by the predicate "is nothing over and above" in (i) is *not* identity.

In the next section, I will discuss the proposal that supervenience is the relation that corresponds to the predicate "is nothing over and above" for the formulation of physicalism.

1.2 Supervenience

In the previous section, I suggested that, in order to formulate physicalism, we should find a suitable relation that corresponds to the predicate "is nothing over and above", and that identity cannot be a relation to do this job. Here, I will discuss the proposal that supervenience can be such a relation.

Many philosophers have appealed to the notion of supervenience to articulate the view that mental properties are nothing over and above physical properties (e.g. Davidson 1970; Horgan 1982; Lewis 1983; Kim 1984; 1993; Jackson 1998). Davidson has famously said that it might be

> that mental characteristics are in some sense dependent, or supervenient, on physical characteristics. Such supervenience might be taken to mean that there cannot be two events alike in all respects but differing in some mental respects, or that an object cannot alter in some mental respects without altering in some physical respects (1970: 88, emphasis added).

In Lewis's words "[s]upervenience means that there could be no difference of one sort without difference of the other sort" (1986: 15). But more precisely, supervenience is a relation between sets of properties: a set of properties supervenes on another if and only if indiscernibility with respect to the latter set implies indiscernibility with respect to the former set. Then, physicalism formulated in terms of supervenience is the thesis that being indiscernible with respect to one's physical properties implies being indiscernible with respect to one's mental properties. That is, physicalism in this sense is the view that there cannot be mental differences without physical differences. As a first attempt, we can try to formulate physicalism as follows:

> (*Physicalism-Supervenience-1*) As a matter of nomological necessity[2], for any mental property *M*, if an individual x has *M*, then there is a physical property *P* such that x has *P*, and if any individual y has *P*, then y has *M*.

Physicalism-Supervenience-1 appeals to what has come to be known as *weak* supervenience (Kim 1984: 158):

> (*Weak Supervenience*) The set of properties *A* weakly supervenes on the set of properties *B* just in case, necessarily, for any property *F* in *A*, if an individual x has *F*, then there exists a property *G* in *B* such that x has *G*, and if any individual y has *G*, then y has *F*.

Physicalism-Supervenience-1 is usually found to be insufficient for formulating physicalism, because weak supervenience is too weak to cover the purported relation between mental properties and physical properties (Kim 1984; Horgan 1993). Kim argues that weak supervenience lacks the "modal force" to explain the determination of the mental by the physical, or the dependence of the mental on the physical (1984: 159). *Physicalism-*

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[2] As a consequence of the fact that the strength of this modal operator is only nomological, we can accommodate the contingency of physicalism.

Supervenience-1 says that there is no nomologically possible world where two individuals share all their physical properties but not their mental properties. However, it does not say anything about two (or more) individuals which might be inhabitants of *different* possible worlds. In order to fix this, we can appeal to *strong* supervenience (ibid: 163):

> (*Strong Supervenience*) The set of properties *A* strongly supervenes on the set of properties *B* just in case, necessarily, for any individual x and any property *F* in *A*, if x has *F*, then there is some property *G* in *B* such that x has *G*, and *necessarily,* for any individual y, if y has *G* then y has *F*.

Physicalism formulated in terms of strong supervenience would be the following thesis:

> (*Physicalism-Supervenience-2*) As a matter of nomological necessity, for any individual x and any mental property *M*, if x has *M*, then there is some physical property *P* such that x has *P*, and *necessarily*, for any individual y, if y has *P* then y has *M*.

What *Physicalism-Supervenience-2* says is that, in order to have a mental property, it is nomologically required that one has a physical property that *necessitates* that mental property. The second modal operator gives physicalism the important "modal force" that Kim is looking for: mental properties are necessitated by physical properties. Although the strength of the first necessity operator in *Physicalism-Supervenience-2* is nomological, it has been suggested that the second necessity operator's strength should be *metaphysical* (Noordhof 2003; 2010; 2013). Although the truth of the supervenience thesis might be contingent, insofar as a world is such that this strong supervenience holds, then mental properties in that world are metaphysically necessitated by physical properties.[3]

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[3] Robert Kirk suggests that "the core of ... physicalism ... is the Strict Implication thesis, according to which the totality of physical truths strictly implies all truths about the mental states of organisms. Let the totality

What I said in the previous paragraph requires some elaboration. As I said, *Physicalism-Supervenience-2* makes a contingent claim, as the modal operator that binds the claim has only *nomological* strength: the given supervenience claim is true in the actual world and nomologically similar worlds. So, there might be worlds in which this supervenience does not hold. For example, there might be worlds where mental properties "float freely", so to speak, without any underlying physical properties. But the actual world and the worlds that are nomologically alike are not such worlds. Moreover, and this is what the second modal claim in *Physicalism-Supervenience-2* brings, the physical properties that accompany mental properties in the actual world and nomologically similar worlds are such properties that even if they were brought to worlds where supervenience does not hold, they would bring together the mental properties that they accompany.

Noordhof (2003: 88-93) argues that the proposal that mental properties are metaphysically necessitated by physical properties is what distinguishes physicalism from some anti-physicalist views that can also be formulated in terms of supervenience. Chalmers (2006), for example, defends an anti-physicalist view which takes mental properties to be only nomologically necessitated by physical properties.[4] Whether this is *sufficient* to distinguish physicalism from some anti-physicalist views might be disputed (see Section 1.3 below), but it is less controversial that it is *necessary* for a physicalist view to imply that mental properties are metaphysically necessitated by physical properties. For a physicalist, strictly speaking, my brain states alone might not be metaphysically sufficient for the mental properties I instantiate now, but my brain states *and* the appropriate physical background

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of physical truths be *P*, and the totality of truths about the mental states of organisms be *Q*. The Strict Implication thesis is that it is impossible that *P* should be true and *Q* false" (1996: 85). See also Stoljar (2010: Chapter 6) for a discussion of the proposal that physicalism is the view that mental properties are metaphysically necessitated by physical properties.

[4] See also Van Cleve (1990: 222).

conditions taken together are metaphysically sufficient for the mental properties I have (Shoemaker 1981; 2007: 21-22; Levine 2003: 34-37; Noordhof 2003: 93).[5]

Regardless of whether supervenience-based formulations of physicalism are good enough to capture what physicalism is about or not, in what follows, I will take the observations in the previous paragraph to be true. That is, I will assume that if physicalism is true in a world w, then mental properties in w are metaphysically necessitated by physical properties. Take a mental property M that is instantiated in the actual world. Let us say that, at a particular instant, M is instantiated in virtue of the instantiation of a physical property P. Physicalism entails that, at any possible world (including the nomologically impossible ones), if P is instantiated by x then M is instantiated by x too.[6]

In the next section, I will discuss whether *Physicalism-Supervenience-2* is physicalist enough.

1.3 Superdupervenience and Superhypervenience

In the previous section, I introduced a supervenience-based formulation of physicalism. I maintained that, regardless of whether such formulations are good enough or not, we should (or at any rate, I do) take physicalism to entail that mental properties are metaphysically necessitated by physical properties.

The proposal that physicalism should be formulated in terms of supervenience is not accepted by many, including some authors who, in their earlier works, defended supervenience-based formulations of physicalism. Horgan (1993) argues that a

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[5] I will discuss this point about the background conditions at length in Chapter 2, Section 2.3. Some laws of nature may or may not be included in such background conditions, depending on one's understanding of the relationship between properties and laws of nature. I will closely examine what theories of laws a non-reductive physicalist needs in Chapters 4 and 5.

[6] P can be an extrinsic property with specifications regarding the background conditions.

supervenience-based formulation of physicalism is not sufficient to distinguish physicalism from some anti-physicalist views which also invoke supervenience relations. Kim says that "the mere claim of mind-body supervenience leaves unaddressed the question what … accounts for it" (1998: 13, emphasis deleted). Similarly, Heil argues that "[w]hen supervenience holds, the interesting issue is not that it holds but *why* it holds" (1998: 146, emphasis added). In this section, I will focus on Horgan's argument.

Horgan reports that the concept of supervenience was introduced to the philosophical literature by Moore (1922), who argued that

> if a given thing possesses any kind of intrinsic value in a certain degree, then not only must that same thing possess it, under all circumstances, in the same degree, but also anything exactly like it, must, under all circumstances, possess it in the same degree (ibid: 261, cited in Horgan 1993: 555).[7]

Horgan (1993: 560-563) reads this as the claim that moral facts (which are taken to be non-natural) supervene on non-moral facts (which are taken to be natural). So, Moore's view takes non-natural facts to supervene on the natural ones. Horgan takes this to be the thesis of *meta-ethical non-naturalism*. The important point is that although moral properties (according meta-ethical non-naturalism) supervene on natural properties, this does not make them natural enough. In fact, Horgan argues that "no … naturalist position could embrace Moore's meta-ethics" (ibid: 561). We need not delve into Moore's meta-ethics to understand Horgan's analogy. All we need to note is that Moore's moral properties are not explainable in terms of natural properties although they supervene on natural properties.

Horgan draws the following analogy: just as a naturalistically unacceptable meta-ethical theory can embrace a supervenience relation between moral facts and natural facts, a physicalistically unacceptable metaphysical theory can embrace a supervenience relation between mental properties and physical properties. In fact, Horgan argues that

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[7] Though, Horgan notes that the term "supervenience" was first used to refer to this relation by Hare (1952).

emergentism of the sort that is defended by Broad (1925) is such a view. Broad has suggested that

> no amount of knowledge about how the constituents of a living body behave in isolation or in other and non-living wholes might suffice to enable us to *predict* the characteristic behaviour of a living organism. This possibility is perfectly compatible with the view that the characteristic behaviour of a living body is *completely determined* by the nature and arrangement of the chemical compounds which compose it, in the sense that any whole which is composed of such compounds in such an arrangement will show vital behaviour and that nothing else will do so (ibid: 67-68, cited in Horgan 1993: 559, emphases added).

Emergentism is an anti-physicalist view. Roughly, it is the view that all mental properties, in some sense, depend on physical properties, but some mental properties are as fundamental as some physical properties, and can have causal powers that the physical properties that they depend on may not have.[8] Such a view violates physicalism in at least three respects: (i) physicalists typically do not want mental properties to have causal powers that physical properties may not have[9]; (ii) physicalism is incompatible with the suggestion that mental properties are fundamental[10]; (iii) physicalists do not want it to be the case that the mental is not explainable (or predictable in Broad's sense above) in terms of the physical. At any rate, emergentists take mental properties to be *over and above* physical properties.

Horgan suggests that emergentism is compatible with a supervenience thesis:

> Certain higher-level properties could be supervenient on lower-level ones (ultimately on physical ones) and also possess the two key features the

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[8] An agreed-upon formulation of emergence does not exist yet. For a recent formulation that is along the lines of what I have suggested here, see Barnes (2012).

[9] Though, see Noordhof (1999; 2013: 99) for a criticism of this view. I shall discuss Noordhof's criticism in Chapter 3, Section 3.1.3.2.

[10] See Wilson (2006).

emergentists stressed: (i) the supervenient higher-order properties could be fundamental causal properties, generating causal forces over and above physical causal forces; and (ii) the connections between lower-order and higher-order properties … could be metaphysically fundamental, hence unexplainable (Horgan 1993: 559).

So a supervenience-based formulation of physicalism is compatible with emergentism, and since emergentism should not be compatible with physicalism for the reasons given above, formulating physicalism in terms of supervenience is not good enough.

Horgan's proposal is that physicalism should be formulated in terms of a relation that explains the supervenience of the mental on the physical in a physicalistically acceptable way. He calls this relation *superdupervenience*, where superdupervenience is an "ontological supervenience that is robustly explainable in a materialistically explainable way" (ibid: 566). A supervenience relation is an ontological one when the supervening entities are genuine entities; and a supervenience relation is robustly explainable when there is an objective explanation of why supervenience holds.

So, the proposal is that the predicate "is nothing over and above" in the mental-physical case is denoted by the superdupervenience relation that obtains between mental properties and physical properties. If we take supervenience in question as strong supervenience, the formulation of physicalism that is proposed should go as follows:

> (*Physicalism-Superdupervenience*) Mental properties strongly supervene on physical properties, and such supervenience is robustly explainable.

Even if one might think that superdupervenience is good enough to formulate physicalism, it can still be questioned whether such a superdupervenience-based formulation of physicalism is *required* for this end. If one disagrees with Horgan and thinks that

supervenience is good enough to formulate physicalism, a superdupervenience-based formulation might be good enough, but not required.

Noordhof (2003; 2010; 2013) disagrees with Horgan, and argues that a version of physicalism that is formulated in terms of strong supervenience cannot be conflated with anti-physicalist views that invoke supervenience relations, insofar as the strength of the second necessity operator in the strong supervenience relation that is appealed to by physicalists is metaphysical. After all, dualist views that appeal to supervenience relations suggest that mental properties are only *nomologically* necessitated by physical properties.[11] Noordhof writes: "I am as interested in the explication of supervenience relations as the next person. However, I do not think we should allow such preoccupations to distort our formulation of [physicalism]" (2003: 88).

So, if Noordhof is right, then *Physicalism-Supervenience-2* will be good enough, and *Physicalism-Superdupervenience* might be a possible formulation of physicalism, but will not be required. However, I disagree with Noordhof because there might be some room in the logical space for a dualist position that appeals to metaphysical necessity. Although the dualist accounts that Noordhof refers to appeal to only nomological necessitation, this does not mean that there cannot be any anti-physicalist who holds a strong supervenience relation that invokes metaphysical necessitation. So, going with a superdupervenience-based formulation will be safer than following Noordhof's suggestion. Moreover, even if Noordhof might be right about the redundancy of superdupervenience, holding a superdupervenience-based formulation will not do any harm.

Physicalism-Superdupervenience requires that there is an explanation of why mental properties strongly supervene on physical properties. But there is still a further, and arguably a stronger, kind of explanation that might be asked from physicalists. Although

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[11] See Van Cleve (1990) and Chalmers (2006) for such formulations.

mental properties superdupervene on physical properties, it can still be asked why a certain property has a given property in its supervenience base. In order to explain this, I shall introduce the *superhypervenience* relation. Let us say that a set of properties *A* superhypervenes on a set of properties *B* just in case (i) *A* strongly supervenes on *B*, and (ii) there is an explanation of why a certain property in *B* necessitates a certain property in *A*. I shall formulate a version of physicalism in terms of superhypervenience, which goes as follows:

> (*Physicalism-Superhypervenience*) Mental properties strongly supervene on physical properties, and how a physical property necessitates a mental property is explainable.

So, whereas *Physicalism-Superdupervenience* says that there is an explanation of the fact that mental properties supervene on physical properties, *Physicalism-Superhypervenience* says that the instantiation of a supervening property is explainable in virtue of the instantiation of the subvening property. I suspect that any physicalist should be happy with both *Physicalism-Superdupervenience* and *Physicalism-Superhypervenience*.

Ideally, there should be a relation *R* that obtains between mental properties and physical properties such that *R* entails both superdupervenience and superhypervenience. In the next section, I will introduce the view that *realization* is such a relation.

1.4 Realization

In the previous section, I introduced Horgan's argument that a supervenience-based formulation of physicalism might not be good enough. The proposal is that physicalists need a robustly explainable supervenience relation, namely superdupervenience. Moreover, I argued that there can be concerns about explanation on another level: it can still be asked why superdupervenience relates a pair of properties.

Let us say that *being a duper-hyper relation* is a *role* property in the sense that different relations can occupy the associated role. The associated role consists in entailing superdupervenience and superhypervenience. That is, all duper-hyper relations are supposed to entail both superdupervenience and superhypervenience. Now, the interesting question is which relations can occupy this role. (Of course, in an uninteresting way, the mere conjunction of superdupervenience and superhypervenience does this job. However, hopefully, there can be more interesting candidates for this role.) The proposal that I will take into consideration in the rest of this thesis is that *realization* is a relation that plays this

role when it comes to the formulation of non-reductive physicalism. The formulation of physicalism that is proposed is the following:

> (*Physicalism-Realization*) As a matter of nomological necessity, mental properties are realized by physical properties.

If I am right, the following two should be true: first, mental properties superdupervene on physical properties *because* mental properties are realized by physical properties; second, mental properties superhypervene on physical properties *because* mental properties are realized by physical properties.

Physicalism-Realization has been defended by a number of authors (e.g. Boyd 1980; Melnyk 1996; 2003; 2006; Wilson 1999; Shoemaker 2007). And the notion of realization has been regimented in a number of works (e.g. Shoemaker 2001; 2003; Gillett 2002: 2003; Shapiro 2004; Polger 2007; Polger & Shapiro 2008; Morris 2010; Bennett 2011, to name a few). It is my aim in the rest of this thesis to evaluate different accounts of realization, and find the most suitable one to appeal to for formulating physicalism.

1.5 Conclusion

In this chapter, I introduced physicalism as the view that mental properties are nothing over and above physical properties, and then discussed how we might understand the phrase "nothing over and above". I suggested that we should take the predicate "is nothing over and above" to correspond to some relation in order for physicalism to be true. Then I explored what relations might be denoted by this predicate. This relation cannot be identity, because a reductive form of physicalism is false. I discussed whether this relation can be supervenience of some sort, but then considered the problem that a supervenience-based formulation of physicalism might not be sufficient to distinguish physicalism from some anti-physicalist views. I proposed that, in order to satisfy two related kinds of explanatory demand, physicalism can be formulated as the view that mental properties are realized by physical properties. In the next two chapters, I will discuss what the realization relation is, and evaluate several theories of realization.

CHAPTER 2: REALIZATION AND ITS ROLE

2.0 Introduction

In the previous chapter, I introduced the debate about the formulation of physicalism, and, following the proposals of Boyd (1980), Melnyk (1996; 2003; 2006), Wilson (1999) and Shoemaker (2007), I suggested that physicalism (in philosophy of mind) can be formulated as the view that mental properties are *realized* by physical properties. I also maintained that physicalism might be only contingently true, and, in worlds where physicalism is true, mental properties are metaphysically necessitated by the instantiations of physical properties. In this chapter, I shall investigate the nature of the realization relation that is appealed to in the formulation of physicalism.

In Section 2.1, I will specify the theoretical role that I want realization to play. This role will include (i) explaining the asymmetric necessitation of a property by its supervenience base, and (ii) accommodating the causal efficacy of the necessitated property. Some relations may satisfy the desiderata (i) and (ii) but may not be suitable to relate mental properties to their physical bases. So, in addition to satisfying this role, (iii) the realization relation should *plausibly* relate mental properties to their supervenience bases. Having specified a role for realization, in the next chapter, I will evaluate several theories of realization. In Section 2.2 of this chapter, I introduce the debate about the *relata* of realization, and argue that realization can be taken to be a relation between properties or property instances. In Section 2.3, I explain in what sense a realizer property (or a property instance) should be taken as *metaphysically sufficient* for a property (or a property instance) it realizes. For this, I invoke Shoemaker's (1981) distinction between core realization and total realization, and suggest that, in most cases, it is the total realizer, not the core realizer, that is metaphysically sufficient for the instantiation of a realized property.

2.1 The Theoretical Role

In this section, I will introduce the strategy that I will endorse in this chapter and the next chapter. The strategy is the specification of the theoretical role of realization and then evaluating several theories of realization against the background of this theoretical role. In order to specify this theoretical role, I will consider two problems that are associated with physicalism in philosophy of mind, and then propose that realization should be a relation the postulation of which might plausibly solve these problems. The first problem has to do with the explanation of how it can be explained that mental properties (if physicalism is

true) are necessitated by physical properties. The second problem is about the causal efficacy of mental properties: if mental properties are nothing over and above physical properties, it needs to be explained how minds can make genuine causal contributions in the physical world.

2.1.1 Explanation of Asymmetric Necessitation

The physicalist contention is that mental properties are "nothing over and above" physical properties. In the previous chapter, I suggested that we should understand this to amount to the contention that mental properties are "ontologically innocent" in the sense that the commitment to the existence of mental properties does not bring any additional ontological cost on top of the commitment to the existence of physical properties. In the previous chapter, I also introduced the view that wholes are nothing over and above their parts, and suggested that physicalism can be seen analogous to this view. Of course, physicalism is not the view that mental properties have physical properties as their parts. The feature that grounds the analogy is physicalism's commitment to the claim that mental properties are metaphysically necessitated by the instantiations of physical properties. In the same sense that parts and wholes they compose are metaphysically non-distinct, mental properties and the physical properties they depend on, according to physicalism, are metaphysically non-distinct. So, the ontological status of mental properties is similar to the ontological status of wholes in the following sense: just as wholes are metaphysically necessitated by their parts, mental properties are metaphysically necessitated by physical properties. However, there is a *disanalogy*: the composition relation that relates parts to a whole is not mysterious, whereas the relationship between a mental property and a physical state of affairs is somewhat mysterious, at least *prima facie*. While the existence of a whole does not require a special explanation when the parts that compose the whole are present, the existence of a mental property requires some sort of explanation even when the physical state of affairs that gives rise to that mental property is present.

So, if we assume physicalism, then we suppose that mental properties are metaphysically necessitated by physical properties. Moreover, we should also suppose that the relation in question is asymmetrical because the instantiation of a mental property does not necessitate the instantiation of any certain physical property that necessitates it. What we do not know is how this asymmetric necessitation obtains. The first problem that I consider with respect to physicalism is the problem of explaining the asymmetric necessitation of mental properties by physical properties. If realization is supposed to be a relation in terms of

which physicalism is formulated, then a theory of realization should explain how mental properties are metaphysically necessitated by physical properties.

Moreover, a theory of realization should also be a theory of *multiple realization.* Multiple realization is the phenomenon whereby a given property can be realized by different properties at different instances. In fact, the observation that mental properties are such that individuals with completely different physical make-ups can instantiate them gave rise to the popularity of the *non-reductive* version of physicalism. Putnam (1967) and Fodor (1974) have persuasively argued that a reductive form of physicalism, according to which every mental property is identical with a physical property, cannot be true because of this observation. Take the property of *having pain*, for example. Different organisms with different neurophysiologies can have pain. Moreover, it is conceivable, and perhaps even nomologically possible that systems (such as robots) with no neurophysiology whatsoever have pain. Therefore, it is not possible to reduce *having pain* to a given neural property. The example generalises to (possibly) all mental properties, so mental properties are not reducible to physical properties. The constraint that the necessitation relations in terms of which physicalism is formulated should be an asymmetric one is due to the endorsement of what has come to be known as *the multiple realization thesis*.

2.1.2 Accommodation of Mental Causation

Non-reductive physicalism, namely the type of physicalism which asserts that mental properties are not identical with physical properties, but are asymmetrically necessitated by physical properties, is said to face a certain problem of mental causation. The problem is most notably illustrated by Kim (e.g. 1989; 1998; 2005). In a nutshell, the problem is that if non-reductive physicalism is true, then mental causation is not possible. This conclusion is obviously not welcomed by non-reductive physicalists. Hence, Fodor says that

> if it isn't literally true that my wanting is causally responsible for my reaching, and my itching is causally responsible for my scratching, and my believing is causally responsible for my saying ... if none of that is literally true, then practically everything I believe about anything is false and it's the end of the world (1990: 56).

This problem has come to be known as *the exclusion problem,* and the argument that is purported to show this problem has come to be known as *the exclusion argument*, because of its alleged conclusion that if non-reductive physicalism is true, then mental properties are causally *excluded* by physical properties that are said to necessitate them. I will

examine the exclusion argument premise by premise in detail in Chapter 7, so here, I will only introduce a simplified version.

Suppose that I have a mental property, say *believing that it is raining*. If mental properties can be causes, one event that this property might cause would be my taking an umbrella with me when I am leaving home. So, *believing that it is raining* causes me to take an umbrella with me. Now, suppose that non-reductive physicalism is true. In this case, the property of *believing that is raining* is asymmetrically necessitated by a physical property, say *P*. According to the *principle of causal closure*, which is commonly held by physicalists, if a physical event has a sufficient cause, it has a physical sufficient cause. My taking an umbrella with me has a sufficient cause, so, according to the principle of causal closure, it should have a physical sufficient cause. We can unproblematically assume that the instantiation of *P* is causally sufficient for this event. But if this is the case, then my taking an umbrella with me has at least two sufficient causes, namely *P* and *believing that it is raining*. However, if this is true, the point should apply to all cases of mental causation. That is, every event that is caused by a mental property should also be caused by a physical property. Believing that this is true is accepting that there is *systematic* causal overdetermination in the world: every case of mental causation is a case of causal overdetermination. However, it is suggested that this cannot be true. There might be genuine cases of causal overdetermination, as in the death of a victim who is shot by two assassins simultaneously, but the world cannot systematically include causal overdetermination. So, it cannot be true that both *P* and *believing that it is raining* are causes of my taking an umbrella with me. At most, one of these can be a cause of this event. The principle of causal closure favours the physical property over the mental one. Therefore, *P* excludes *believing that it is raining* from being a cause. Or, so say some opponents of non-reductive physicalism. The point generalises to all putative cases of mental causation. So, if non-reductive physicalism is true, mental properties are causally excluded by physical properties that asymmetrically necessitate them. That is, non-reductive physicalism implies *epiphenomenalism*, namely the view that mental properties are causally inefficacious.

So, the second problem that I want to consider is that non-reductive physicalism is said to face the exclusion problem. There is a substantial literature on the exclusion problem, and non-reductive physicalists have resources to respond to this argument. I discuss these responses in detail in Chapter 7. What is important for the sake of this chapter is that a good theory of realization should not imply epiphenomenalism. This is because realization

is a tool for formulating physicalism and physicalism should not imply epiphenomenalism if it is going to be a plausible view. This is an important constraint, because, as I will illustrate in the next chapter, some theories of realization make it true by stipulation that mental properties are not causally efficacious. Such theories should not be endorsed.

2.1.3 The Role of Realization

Having identified two problems that physicalism is said to face, and having decided that physicalism should be formulated in terms of realization, I propose that realization is a relation whose postulation will help physicalists solve these two problems. I propose that the theoretical role of realization should consist in providing resources to solve these problems. Let us call this role *the realization-role*. An asymmetric necessitation relation R can play the realization-role if and only if (i) R's feature of necessitating one property in virtue of the other is explained, and (ii) the properties that are related by R do not causally exclude each other. Then, if physicalism can be formulated in terms of a relation that plays the realization-role, the instantiation of a mental property in virtue of the instantiation a physical property is explainable, and physicalism does not imply epiphenomenalism. (Note that the satisfaction of (i) amounts to being a superhypervenience relation discussed in Chapter 1).

A physicalist should be able to show that there is a relation that plausibly plays this role. To do this, *first*, she should account for what it takes to explain an asymmetric necessitation relation. Some necessitation relations are not mysterious, so they do not require special explanations. Mereological composition is one example. There is not too much to say about how several parts make up a whole. But how a physical property necessitates a mental property requires an explanation.

Second, a physicalist that appeals to realization should be able to explain how the necessitated *relata* are not causally excluded by the necessitating *relata*. Perhaps it is the nature of asymmetric necessitation that there is no causal competition between properties that are related with it. Or perhaps, it is because of the nature of a specific relation that plays the realization-role that there is no causal exclusion when this specific relation obtains. Either way, a physicalist who follows the strategy I am proposing should explain how the postulation of realization explains away the exclusion problem.

And *finally*, a physicalist who follows this strategy should convince us that it makes sense to think that mental properties are related to physical properties by the relation she takes to

play the realization-role. The importance of this constraint will be clearer in the next chapter where I argue that some theories of realization fail to satisfy this criterion. There are relations that would satisfy the realization-role as I specified above but nevertheless may fail to relate mental properties to physical properties. Again, think of mereological composition. Mereological composition is an asymmetric necessitation relation, and, *pace* Merricks (2001), wholes are not causally excluded by the parts that compose them. But, a mental property is not a whole that is mereologically composed of physical properties. Or, determinable properties, such as *being red*, are asymmetrically necessitated by their determinates, such as *being scarlet*, but it might be argued, *pace* Yablo (1992), that mental properties do not have physical properties as their determinates.

To recap: an asymmetric necessitation relation plays the realization-role just in case (i) the asymmetric necessitation in question is explainable and (ii) the necessitating *relata* do not causally exclude the necessitated *relata*. And, physicalism can be formulated in terms of a relation *R* only if (a) *R* plays the realization-role, and (b) *R* plausibly relates mental properties to physical properties. For the sake of the formulation of physicalism, it is important to show that a relation that plays the realization-role plausibly relates mental properties to their physical bases. However, this does not mean that this relation relates *only* mental properties and their physical bases. It could be a relation that relates different sorts of properties to each other. That is, it does not have to be that only mental properties are realized. Other, non-mental, higher-level properties can be realized by lower-level properties too.

2.1.4 Other Features

Realization (like many dependence relations) is also taken to be a transitive relation, and I shall assume in what follows that any relation that plays the realization-role should be a transitive relation. So, for all properties *F*, *G*, and *H*, if *F* realizes *G*, and if *G* realizes *H*, then *F* realizes *H*. This makes realization a *strict order*: asymmetric, irreflexive and transitive.

Another feature that is commonly attributed to realization is synchronicity. Shapiro thinks that one of the features that distinguish between realization and causation is the fact that causation is, paradigmatically, a diachronic relation, whereas realization is a synchronic relation (2004: 35). Although realization should be taken as a synchronic relation, I do not think that distinguishing it from causation is a good reason to maintain this. First, some

might contend that causation could be synchronic in some cases. Second, the modal strengths of realization and causation are paradigmatically taken to be different: that is, whereas realization is stipulated to be a metaphysical necessitation relation, causation is thought to be a nomological necessitation relation. That alone can distinguish realization from causation.

2.2 The *Relata* of Realization

In 2.1.3, I specified the theoretical role that realization should play: an asymmetric necessitation relation plays the realization-role just in case (i) the necessitation of one property by the other is explainable and (ii) the necessitating *relata* do not causally exclude the necessitated *relata*. Moreover, if this relation is needed to help us formulate physicalism, it should be a relation that plausibly relates the mental to the physical. There might be several relations that are suitable for this role. But let us assume, for convenience, that there is one such relation, and let us call it *realization*. The mental is supposed to be realized by the physical, according to physicalism. But what are the *relata* of realization? In this section, I will report a debate about the *relata* of realization, and argue that a realization thesis can be formulated in terms of properties or property instances.

First, I shall clarify a few things about my terminology. If we are after a useful theory of realization which does not disconnect our project completely from the previous literature on realization, it is worth spending some time on unifying different parts of the literature. In current literature, one encounters several kinds of entities as the *relata* of realization. On the one hand, we see statements like "*properties* are realized", "*types* are realized", and "*kinds* are realized". On the other hand we encounter statements like "*property instances* are realized", "*tokens* are realized", "*events* are realized", and "*states* are realized".[12]

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[12] Heil (1999; 2003a; 2003b) takes realization (in particular, multiple realization) as a relationship between predicates and properties: the predicate "is in pain" truly applies to different organisms which have different physical properties. One might ask whether we should include predicates in this list of the

According to the traditional view about ontological categories, the first class of statements above, namely the ones about properties, types and kinds are about *universals*. And the second class of statements, namely the ones about property instances, tokens, events and states are about *particulars*, unless one means *types* of events by "events" and *types* of states by "states". In order for my terminology to be continuous with a large part of the literature, when I talk about realization relations between universals, I will use the term "property"; when I talk about realization relations between particulars, I will use the term "property instance", or sometimes simply "instance". By a (property) instance, I mean the instantiation, or exemplification, of a property by an object at a time. So, when the property of *being red* is instantiated in two different objects at a given time or in the same object at different times, we have different instances of *being red*.

Given the clarification of what I mean when I talk about properties and their instances, the *relata* question could be rephrased as follows: Is realization a relation between properties, or is it a relation between property instances? My answer to this question will be that the talk of realization between properties and the talk of realization between instances are equivalent if we note a few subtleties.

Let me start with the examination of an argument by Polger and Shapiro (2008) for the conclusion that realization is *not* a relation between property instances. They give the following *reductio* against those who take realization as a relation between property instances:

1. Assume (for *reductio*) that what are realized are property instances, and there is at least one property instance that is realized.
2. Things that are realized are multiply realizable.

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possible *relata*. I think the answer to this should negative, because realization, according to this analysis, is reference: mental predicates multiply refer to different properties. This kind of predicate analysis is similar to those of Lewis (1966; 1972) and Kim (1998).

3. What is multiply realizable is repeatable.

4. Therefore, at least one property instance is repeatable.

5. Property instances are not repeatable.

6. (*Reductio* complete from 1 and 2) Therefore, what are realized are not property instances.

Gillett (2011), on the other hand, thinks that property instances are realized and do realize, and responds to Polger and Shapiro by suggesting that we can take realization as a relation between property instances once we accept the following condition: a property P realizes a property Q if and only if instances of P realize instances of Q. Although, I think, such a response is on the right track, we should be careful about a possible equivocation on "realization". It is plausible to suspect that there might be a difference between a relation that takes properties as *relata* and a relation that takes instances as *relata*. So, I propose altering Gillett's claim in the following way:

> (E1) A property P *realizes$_1$* a property Q if and only if each instance of P *realizes$_2$* an instance of Q.
>
> (E2) An instance of P *realizes$_2$* an instance of Q if and only if P *realizes$_1$* Q.

Let us call the conjunction of (E1) and (E2) *the equivalence thesis*. The equivalence thesis invokes two different relations, namely realization$_1$ and realization$_2$. Whereas realization$_1$ is a relation between properties, realization$_2$ is a relation between property instances. (E1) defines realization$_1$ in terms of realization$_2$, and (E2) defines realization$_2$ in terms of realization$_1$. The equivalence thesis implies that if an instance of a property P realizes$_2$ an instance of a property Q, then every instance of P realizes$_2$ an instance of Q.

I think that the analysis that the equivalence thesis gives us is helpful for the following reason. Some might think that realization is fundamentally a relation between properties and it is a relation between property instances only derivatively. That is, an instance realizes another instance *because* there is a corresponding relation between two properties that the instances are instances of. Or, some might think that realization is fundamentally a relation between property instances, but it holds between properties only derivatively. This is, for example, what Shoemaker implies when he says that "to speak of one property as realizing another is shorthand for saying that instances of one are among the possible realizers of the instances of the other" (2007: 3). However, once we hold the equivalence thesis as it is stated above, we can avoid taking a stance on this debate.

In what follows, I will not appeal to the subscript method, mainly for convenience. However, the reader is advised to remember that the talk of realization of properties is about realization$_1$ whereas the talk of realization of property instances is about realization$_2$.

2.3 Metaphysical Sufficiency

So far, I have specified the theoretical role of realization, and suggested that it can be seen as a relation between both properties and property instances. In this section, I will clarify in what sense realization can be seen as a *metaphysical* necessitation relation. In other words, in what sense is the instantiation of a realizer property metaphysically sufficient for the instantiation of the property that it realizes? First, I will consider counterexamples to the kind of sufficiency that realization is purported to imply. Second, I will introduce the total realization and core realization distinction to respond to these counterexamples.

If physicalism is the view that mental properties are realized by physical properties, and if realization is a metaphysical necessitation relation, it might be argued that physicalism is clearly false. Here are the alleged counterexamples:

- (*Case 1*) Suppose that in world *w*, the laws of nature are different than the laws of nature in the actual world. Some of these nomological differences have connections to human physiology. Consequently, in *w*, *having C-fibre stimulation* may fail to bring about the instantiation of *having pain*. This would be an example of the failure of metaphysical sufficiency.

The next two cases suggest that *having C-fibre stimulation* is not even *nomologically* sufficient for *having pain*, let alone metaphysically sufficient.

- (*Case 2*) *Having C-fibre stimulation* realizes *having pain* in human beings. But *having C-fibre stimulation* does not realize *having pain* in Martians. The point is not that *having pain* is realized by another property in Martians. Rather, even if Martians had C-fibres and their C-fibres fired, they would not have pain. The physiology of a Martian is so different from the physiology of a human being that such firings do not result in the instantiation of *having pain*. This means that *having C-fibre stimulation* is not metaphysically sufficient for *having pain*.
- (*Case 3*) Even though *having C-fibre stimulation* realizes *having pain* in human beings, not every instantiation of *having C-fibre stimulation* in a human being brings together an instantiation of *having pain*. In human beings whose bodies do not function

normally, *having C-fibre stimulation* may not do the work that it is supposed to do normally. Moreover, even in normal human beings, *having C-fibre stimulation* may not always result in pain. Take a normal subject who is anaesthetized for a medical operation. She does not feel pain even when her C-fibres are firing. So, *having C-fibre stimulation* is not metaphysically sufficient for *having pain*.

For the next case, assume *content externalism*: for being in certain mental states, namely the intentional ones, such as beliefs and desires, one has to be appropriately related to the environment (Putnam 1975b; Burge 1979). Beliefs are individuated by their truth conditions, and desires are individuated by their satisfaction conditions.

- (*Case 4*) Take property *P* as a realizer of *believing that water is wet*. In Twin Earth, there is no such thing as water, but the transparent and odourless liquid that falls from the sky and fills the lakes and so on is XYZ, which is a chemically different substance from H_2O. Eddie, who is an inhabitant of our earth, believes that water is wet, and he does so in virtue of *P*. However, on Twin Earth, Twin Eddie who is physically indiscernible from Eddie, despite having *P*, cannot entertain the same belief as Eddie, because Twin Eddie is not appropriately related to his environment in a way that enables him to have beliefs about water. Therefore, *P* is not metaphysically sufficient for *believing that water is wet.*

Case 4 suggests that, for the realization of intentional properties, having intrinsic properties as realizers is not sufficient. The point is generalized by Robert Wilson (2001) to cases where realized properties are not mental properties. One might think that having a certain shape and being made of a certain material would count as a realizer of *being a dollar bill*. However, if the bill was produced by a fake dollar machine, it cannot *really* be a dollar bill.

These cases may indicate two different things. *First*, it might be thought that the realizers of mental properties that philosophers have been giving examples of cannot be realizers in the intended sense, because they are not metaphysically sufficient for what they are supposed to realize. So, *having C-fibre stimulation* cannot be the realizer of *having pain* in human beings, but the realizers of pain have to be "wider". All we have to do is to change our examples to accommodate the sufficiency claim. Robert Wilson thinks that this would result in dropping what he calls *the constitutivity thesis*: "realizers of states and properties are exhaustively physically constituted by the intrinsic, physical states of the individual whose states or properties they are" (ibid: 5).

Second, these cases may suggest that realizers are not sufficient for what they realize. I think this would be an overreaction. It would mean that we have to give up the consensus on the most commonly attributed feature of realization, namely metaphysical necessitation. (In fact, as cases 2 and 3 show, even nomological necessitation would be in jeopardy.)

To deal with this problem, Shoemaker (1981; 2007) distinguishes between two kinds of realization: total realization and core realization. And correspondingly, there are two kinds of realizer: total realizers and core realizers. Total realizers are metaphysically sufficient conditions for realized properties, whereas core realizers are weaker conditions than total realizers. (A realizer can be seen as a condition in the following sense: if a property *P* is sufficient for a property *Q*, having *P* is a sufficient *condition* for having *Q*.)

What is metaphysically sufficient for a realized property *P* is a total realizer of *P* which specifies a detailed sufficient condition for the instantiation of *P*. If we are going to take a total realizer as a metaphysically sufficient condition for what it realizes, we may have to include in it the appropriate background conditions. Such background conditions will include what kind of an organism the realizer property is instantiated in and what things exist (and do not exist) in the relevant environment. So, an instance of *having C-fibre stimulation* cannot be a total realizer of an instance of *having pain*. It might be thought that even the fundamental physical laws might be included in the background conditions, if laws of nature are deemed to be contingent. Let us assume, for the sake of illustrating this point, that laws of nature are contingent. Let us say that *P* is a property that is *nomologically* sufficient for the instantiation of *having pain*. *P* will have to be a very "wide" property, specifying what properties the environment that the bearer of the property has. But since laws of nature are assumed to be contingent, it is not possible to construe the instantiation of *P* as a metaphysically sufficient condition for the instantiation of *having pain*. Let us say *L* is the property that one has just in case one inhabits the actual world or any world that is physically alike. Then, the conjunctive property (*P & L*) will be metaphysically sufficient for *having pain*. So, it will be metaphysically necessary that if one has (*P & L*), then one has pain. That is, it will be true in *all* worlds that if one has (*P & L*), then one has pain. In worlds where *L* is instantiated, having *P* will entail having (*P & L*), which necessitates *having pain*. In worlds where *L* is not instantiated, (*P & L*) is not instantiated either, in which case it will be vacuously true that, in such worlds, if one has (*P & L*), then one has pain. So either way, (*P & L*) will metaphysically necessitate *having pain*.

From this, it follows that the state of the whole universe in a world is a total realizer of each property that is instantiated in that world. However, for every property instance, there will presumably be states of affairs that are "narrower" than the state of the whole universe, and these states of affairs will be total realizers of these property instances. Levine (2003) thinks that such less-than-global total realizers can be found in the following way. Take a world *w* which is like our world with the exception that it lacks a few molecules that we have. World *w* will still be like ours with respect to most of its states of affairs. When you change a little more, you might still not affect the instantiation of a given mental property. "Surely, there comes a point ... when a physical change will make a [mental] difference, and that point marks the boundary of [a less-than-global total realization]" (ibid: 36).

Core realizers can be seen as *parts* of total realizers. If using the term "part" for a condition is found somewhat obscure, we can say that core realizers are conditions which are weaker than total realizers. According to Shoemaker's original introduction of the distinction between total realization and core realization, core realizers are property instances that are doing the salient work in the realization of a property instance. The common practice is to take the paradigm examples of realizers, such as *having C-fibre stimulation* for *having pain*, as core realizers. Since the total realizers of some properties will overlap to some extent in the sense that they will include similar background conditions, in many cases what distinguish between total realizers of different properties will be core realizers.

Mostly, when we talk about realizers, we talk about core realizers. In order to keep the articulation of the issues simple, I will follow the following rule: when I say that a property *P* realizes a property *Q*, I take *P* as a core realizer, unless I specify otherwise. In order to accommodate the shared wisdom about the necessitation feature of realization, I propose that saying that an instance of a realizer property *P* is metaphysically sufficient for the instance of a realized property *Q* is shorthand for saying that the *P* instance, with the appropriate background conditions, is metaphysically sufficient for the *Q* instance. For example, saying that *having C-fibre stimulation* realizes *having pain* in human beings is shorthand for saying that, in worlds like ours, in normal human beings who are not anaesthetized and so on, *having C-fibre stimulation* is metaphysically sufficient for pain.

Before concluding this section (and chapter), I should note that, in some cases, a total realizer and a core realizer of a property may fully overlap; that is, some core realizers may also be total realizers. This will be relevant when I argue, in the next chapter, that

determinable properties are realized by their determinates but every core realizer of a determinable property is identical with a total realizer of the same determinable property.

2.4 Conclusion

In this chapter, I identified the theoretical role of the realization relation. I proposed that realization should be seen as an asymmetric necessitation relation between properties (or their instances) whereby (i) the necessitation of a property is explainable and (ii) the necessitated property is not causally excluded. It is also important for the physicalist to show that the relation she postulates to play this role is a plausible candidate to relate mental properties to their physical bases. I then resolved a debate regarding the *relata* of realization. I argued that realization can be seen as a relation between properties or property instances. Finally, I explained in what sense realization is supposed to be a metaphysical necessitation relation. For this, I appealed to Shoemaker's distinction between a core realizer and a total realizer. In most cases, it is not the core realizer, but it is the total realizer (which is an extrinsic property that includes the core realizer and background conditions) that metaphysically necessitates the realized property.

In the next chapter, I will evaluate several theories of realization according to the theoretical role of realization that I specified in this chapter.

CHAPTER 3: VARIETIES OF REALIZATION

3.0 Introduction

In the previous chapter, I identified the theoretical role of realization, and argued that, in order for it to help us formulate physicalism, it should be seen as an asymmetric metaphysical necessitation relation between properties (or their instances) whereby (i) the necessitation in question is explainable and (ii) the causal efficacy of the necessitated property is not excluded by the necessitating property. Moreover, (iii) a relation that plays this theoretical role should also be a plausible candidate for relating mental properties to their physical bases. In this chapter, I will evaluate different theories of realization by examining whether the relations they posit can plausibly play the aforementioned theoretical role of realization.

In Section 3.1, I will make a distinction between two types of relation: whereas some relations relate properties of the same individual, other relations relate properties of different individuals. I shall call the first type of relations *horizontal* relations. In the remainder of Section 3.1, I will examine theories of realization that posit horizontal realization relations. Horizontal realization relations include (a) *higher-order property realization* (*h-realization*), (b) *determinable property realization* (*d-realization*), and (c) *subset realization* (*s-realization*). I shall call the second type of relations that I will consider *vertical* relations. In Section 3.2, I will examine theories that postulate vertical realization relations. These include (d) *mereological realization* (*m-realization*) and (e) *coincidental realization* (*c-realization*).

I will argue in this chapter that s-realization is a promising candidate to play the theoretical role of realization that is specified above. Those who postulate this relation are the defenders of what has come to be known as *the subset view* of realization (Clapp 2001; Shoemaker 2001; 2007; 2013; Wilson 1999). The subsequent chapters will be devoted to a thorough analysis and a discussion of s-realization and the subset view.

3.1 Horizontal Realization

In this section and 3.2, I will discuss a number of theories of realization. For this, I shall introduce a distinction between two types of relations which will correspond to a distinction between two types of theories about realization. Whereas some relations that are candidates to play the realization-role are horizontal relations, some are vertical

relations. A horizontal relation relates properties of the very same individual. A vertical relation, on the other hand, relates the properties of different individuals. In this section, I will evaluate theories of realization that postulate horizontal relations as candidates to play the realization-role. [13] The horizontal realization relations that are appealed to in the literature are, in my terminology, higher-order property realization (h-realization), (b) determinable property realization (d-realization), and (c) subset realization (s-realization). In sections 3.1.1, 3.1.2. and 3.1.3, I will introduce these relations (and the views that are associated with them) respectively.

3.1.1 Higher-order Property Realization (H-realization)

In this section, I will introduce h-realization as a candidate to play the realization role. H-realization is a relation that is postulated by *functionalism* to be the relation that relates mental properties to physical properties. Because of this, I will start with an explanation of what functionalism is by discussing some varieties of it, and then focus on one variety that appeals to h-realization. I will conclude that h-realization is *not* a good candidate to play the realization-role.

The idea that mental properties are multiply realizable usually goes hand in hand with functionalism, namely the view that mental properties are functional properties. A functional property is a property that is individuated by a causal role. So, functionalism about mental properties is the view that mental properties are individuated by causal roles. Such roles consist in what outputs are likely to be produced given certain inputs and internal states.

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[13] I am inspired by Carl Gillett's (2002; 2003) distinction between the *flat* and the *dimensional* views of realization. My reason to depart from his terminology is the following: whereas the flat view of realization (in Gillett's terminology) takes realization to be a horizontal relation (in my terminology), the dimensioned view of realization (in Gillett's terminology) takes realization to be a specific variety of vertical realization. I will discuss these relations and Gillett's view in Section 3.2.1 below in detail.

Let us start with what has come to be known as *machine functionalism.* It was Putnam (1960; 1967; 1973; 1975) who notably argued that the mind is a type of Turing machine, whose states are causal/functional states. A Turing machine is an abstract device that processes operations by following certain rules. To understand how the machine works, imagine a physical machine that works with a program which consists of some basic rules. Imagine that the machine has a tape on which it can print symbols, a head that scans and prints symbols, and a number of states it can go into. The machine follows rules which are sensitive to the states it is at and the symbols it scans. Based on these rules, it can erase a symbol, move to another symbol on the tape, print another symbol, and change the state it is in. In order to see how a mind can be identified with such a machine, consider that the machine takes sensory information as inputs and produces motor actions as outputs. The machine would have rules that specify the probability of the production of the motor outputs and the new internal states for possible combinations of sensory inputs and other internal states. When the pool of possible sensory inputs, motor outputs, the internal states and the rules is rich enough, the machine in question might be aptly called a "mind", according to this variety of functionalism. The machine in question is still an abstract entity, but, it could be implemented in a concrete entity if the concrete entity in question has a certain structure. In other words, this abstract machine can be *physically realized.*

Putnam does not give us a formulation of realization. However, he stipulates an important constraint on it: *functional isomorphism.* A system (or a set of states) *A* realizes another system (or a set of states) *B* only if *A* and *B* are functionally isomorphic. Putnam explains functional isomorphism as follows. "Two systems are functionally isomorphic if there is a correspondence between the states of one and the states of the other that preserves functional relations" (Putnam 1975: 291, emphasis deleted). In line with this, van Gulick says that the realization of

> a formal machine description requires roughly that there be some mapping relation from the formal states, inputs, and outputs of the abstract machine table onto the physical states, inputs, and outputs of the instantiating system, such that under that mapping the relations of temporal sequence among those physical items are isomorphic to the relations of formal succession among the machine table items (1988: 80).

So, the causal roles that individuate the states of a Turing machine are, so to speak, *occupied* by the physical properties of a system only if the machine and the system are functionally isomorphic.

The causal roles that are supposed to individuate mental properties are the ones that are assigned to them in one way or another. As it was introduced in a seminal work by Block (1978), there are (at least) two ways in which such roles are assigned. According to *analytical functionalism*, these role descriptions of mental properties are derived from a folk theory which consists of conceptual truths about the roles of mental properties. According to *psychofunctionalism*, these role descriptions are derived from the best explanations taken from empirical psychology. How the role descriptions are derived is orthogonal to the questions that I am dealing with here, therefore, I will not stress the differences between analytical functionalism and psychofunctionalism.

A more pertinent question is the following: What is the relationship between the (analytically or empirically derived) role description of a mental property and the mental property in question? Functionalism can be divided into (at least) two varieties according to possible answers to this question: *filler-functionalism* and *role-functionalism*.[14]

On filler-functionalism, a given mental property *M* is identified with a property that occupies a given role *R*. To illustrate filler-functionalism with an example, assume, for the sake of simplicity, that the role description of *having pain* is the following: *having pain* is the property that causes wincing in the case of tissue damage. Moreover, assume that *having C-fibre stimulation* is also *the* property that causes wincing in the case of tissue damage. From this, it follows that *having pain* is identical with *having C-fibre stimulation*. However, with the conclusion that *having pain* is to be identified with *having C-fibre stimulation,* filler-functionalism cannot be a *true* variety of physicalism, because, as I have explained in Chapter 1, reductive varieties of physicalism are false. The relation of role-occupancy in the filler-functionalist's sense cannot be a candidate to play the realization-role because what filler properties realize are not mental properties; filler properties are

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[14] Here, I adopt McLaughlin's (2006) terminology. Sometimes, the distinction is made between *realizer-functionalism* and *role-functionalism* (Esfeld & Sachse 2011: Chapter 1).

rendered identical with mental properties, which do realize roles. So, the realization relation that filler-functionalism deploys relates mental properties to their roles; here, mental properties are the things that do the realizing, but they are also physical properties.

Since it does not give an account of realization between mental properties and physical properties, there is no reason to discuss filler-functionalism here in detail. Nevertheless, a separate explanation of why filler-functionalism cannot be a true theory might give us further justification for not discussing it in detail. As I said above, the main problem with the filler-functionalist analysis of realization is the phenomenon of multiple realization. The multiple realization thesis says that mental properties are multiply realized by physical properties. It might be true that what occupies the pain-role in human beings is *having C-fibre stimulation*, yet in different species, different neural properties occupy the pain-role. In Martians, let us suppose, it is *having M-fibre stimulation* that causes wincing when there is tissue damage. And since *having C-fibre stimulation* is not identical with *having M-fibre stimulation*, *having pain* cannot be identified with any of these properties.

Lewis (1972) and Kim (1992; 1998) argue that the argument from multiple realization can be resisted by appealing to species-specific identifications. The argument is that there is no such property as *having pain simpliciter*, but there are properties such as *having human-pain*, *having Martian-pain* and so on. While *having human-pain* is identical with *having C-fibre stimulation*, *having Martian-pain* is identical with *having M-fibre stimulation*. In a way, it could be said that the predicate "is in pain" refers to different properties in different species.[15]

It should be noted that, for this argument to work, one needs to attribute different causal roles to *having human-pain* and *having Martian-pain*. If their causal roles are identical with each other, given functionalism about the mental, namely the view that mental

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[15] Put this way, this is also the view of Heil (1999; 2003a; 2003b).

properties are individuated by causal roles, *having human-pain* and *having Martian-pain* are identical. On the other hand, even when one attributes different causal roles to human-pain and Martian-pain, it is not clear why the role that is attributed to *having human-pain* cannot be occupied by different properties in different individuals, or in the same individual at different times. Horgan (1993b; 2001) makes this point when he argues that mental properties are *strongly* multiply realizable:

> mental states we attribute to one another might turn out to be radically multiply realizable at the neurobiological level of description, even in humans; indeed, even in individual humans; indeed, even in an individual human given the structure of his central nervous system at a single moment of his life (Horgan 1993b: 308, emphases deleted).

So, filler-functionalism is presumably false, and it does not give us a theory of realization anyway. However, another variety of functionalism, namely role-functionalism gives an account of realization.

According to role-functionalism, mental properties are higher-order properties.[16] In this context, the first-order properties that the higher-order ones are defined over are properties that play causal roles. Actually, the convention is to take these properties as *second*-order properties, where a second-order property is the property of having a first-order property. Functionalism of this sort attempts to take realization as a relation between second-order properties and first-order properties. However, if mental properties are second-order properties, and they are realized by first-order properties, and if realization is a relation between second-order and first-order properties, it would have to be that a first-order property can never be realized. But this consequence seems false. We tend to think that a realizer property may be realized by another property. That is, we can have chains of realization in the following sense: a mental property may be realized by a neural property, and that neural property may be realized by a biological property and so on. So, we should

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[16] See Block (1980), Loewer (2002) and Melynk (2003) for role-functionalist ideas.

not take role-functionalism to relate only *second*-order properties and *first*-order properties. Instead, we should take role-functionalism to suggest that the realized properties are *higher*-order properties of an order which is higher than the order of the realizer properties.[17]

Role-functionalism says that a given mental property *M* is the property of having some property (or other) that occupies a certain role *R*. The properties that occupy *R* are the properties that can be said to realize *M*. Let us call this role-occupancy relation h-realization. We can define h-realization as follows:

> (*h-realization*) A property *P* h-realizes a property *Q* if and only if for some role *R* (i) *Q* is the property of having a property that occupies *R*, and (ii) *P* is a property that occupies *R*.

A h-realizer property is always of an order that is lower than the order of the h-realized property. Since *being lower than* is an asymmetric relation, h-realization is an asymmetric (and irreflexive) relation too. Therefore, no property can h-realize itself. Also, note that different properties could occupy the same role, so the same property can be h-realized by different properties. *Having pain* would be the property of having a property that causes wincing when there is tissue damage. Both *having C-fibre stimulation* and *having M-fibre stimulation* cause wincing when there is tissue damage, and therefore can be said to h-realize *having pain*.

Nevertheless, role-functionalism faces a problem that filler-functionalism does not. Properties that are h-realized seem to be causally excluded by the properties that h-realize them. And, this seems to be true, almost by stipulation. If so, then h-realization cannot be a good candidate to play the realization-role. Recall that one of the desiderata on a theory of realization is that it should accommodate mental causation (by ruling out causal exclusion).

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[17] By suggesting this, I depart from the analysis of functional role realization given by Kim (1998).

What is the reason that h-realized properties are causally excluded? As it has been pointed out several times (Block 1990; Kim 1989; 1998; 2005; Shoemaker 2001; 2007), if one takes h-realization to be the right realization relation, then any causal role that we want to assign to a mental property will be excluded by its realizer. Because, for a property P to h-realize a property Q is for P to *play* the causal role that specifies Q. That is, if P h-realizes Q, by stipulation, it does the causal work that Q is assigned to do. Block (1990) gives the example of the dormitivity of a pill. If one construes *being dormitive* as a higher-order property in the aforementioned sense, having the property of *being dormitive* would be having a property P that causes one to sleep. Then, when I take a pill which is dormitive, what causes me to sleep will be the lower-order property P that plays the dormitivity-role, not *being dormitive* itself. And Block generalizes the point to all functional properties which are higher-order properties in the aforementioned sense. According to Block, the only cases where such higher-order properties could be causally efficacious are the cases in which intelligent beings are aware of such properties. For example, if I see a pill which I know to be dormitive, I may take the pill, and my taking the pill would be caused by my recognition of the fact that the pill is dormitive. Except such cases, h-realized properties cannot be causally relevant.

One might put the findings of this section in the form of a dilemma against functionalism. On the one hand, if we hold filler-functionalism, we cannot accommodate multiple realization of mental properties. On the other hand, if we hold role-functionalism, then we cannot explain the causal efficacy of mental properties. So, either functionalism is false, or it entails epiphenomenalism. In any case, filler-functionalism does not give us a theory of realization; and h-realization, which is role-functionalism's candidate to play the realization-role, cannot play this role.

3.1.2 Determinable Property Realization (D-realization)

In this section, I will introduce d-realization as a candidate to play the realization-role. On what I call *the determination view* of realization, the relationship between mental properties and their physical bases is the same relationship as the one between determinable properties and their determinates. Paradigmatically, colour properties are determinable properties, and their shades are their determinates, that have further determinates. So, on the determination view, the relationship between a mental property and its realizer is the same relationship as that between *being red* and *being scarlet*. In other words, mental properties have their physical realizers as their determinates. Here, I

will introduce the determination view, and consider objections against it. I will argue that d-realization can be considered to play the realization-role, but that it is questionable whether it relates mental properties their physical bases. I will suggest that we can count determinable properties to be realized by their determinates, but that it would be wrong to think that mental properties are determinables of physical properties.

The classical source for the determination view is Yablo (1992),[18] but varieties of it have been defended by Macdonald and Macdonald (1986; 1995)[19], Shoemaker (2001)[20], and Wilson (2009). Put simply, the view suggests that the relationship between mental properties and their physical realizers is the same as the relationship between determinable properties and their determinates. Paradigm examples of determinable properties and their determinates are colours and their shades. On the determination view, just as *being scarlet* is a determinate of *being red*, *having C-fibre stimulation* is a determinate of *having pain*. I shall call the relation that obtains between determinables and their determinates d-realization:

> (*d-realization*) A property *P* d-realizes a property *Q* if and only if *P* is a determinate of *Q*.

Then we should explain what it is to be a determinate of a determinable property:

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[18] See also Yablo (1997; 2001) for his defences of the same view.

[19] Macdonald & Macdonald (1986; 1995) think that the relationship between a mental property and its realizer is analogous to the relationship between determinable properties and their determinates. They also think that every instantiation of a determinable property is identical with an instantiation of one if its determinates. The account of property instances that I work with in this thesis (See Chapter 2, Section 2.2) does not allow for the of identification of determinable property instances with their determinate instances, because I take property instances to be individuated partly by properties (that they are instances of), and a determinable property and its determinate are non-identical properties.

[20] Shoemaker (2007: 23) has retracted this claim in his subsequent work. I will discuss Shoemaker's stance on this view in detail in 3.1.3 below.

(*determination*) A property *P* is a determinate of a property *Q* if and only if for an individual to have *P* is for it to have *Q*, not *simpliciter*, but in a specific way.

So, if we rephrase the definition of d-realization, we obtain the following:

(*d-realization*) A property *P* d-realizes a property *Q* if and only if for an individual to have *P* is for it to have *Q*, not *simpliciter*, but in a specific way.

If one takes the relation between mental properties and their realizers as d-realization, then the multiple realization of mental properties would be a natural consequence. The very same determinable property may have multiple determinates. Necessarily, if something is scarlet, then it is red. But if something is red it is might not be scarlet; it might be another shade of red.

It looks like d-realization satisfies the first desideratum for playing the realization-role. If mental properties are d-realized by their physical bases, that is, if mental properties are determinables of their physical bases, then there would be nothing mysterious about the necessitation of the mental by the physical. The instantiation of a mental property, such as *believing that it is raining*, would not be any more mysterious, or unexplainable, than the instantiation of *having mass*. Once you have a determinate mass property, such as *being 73 kg*, you also instantiate *having mass*.

What about the second desideratum for playing the realization-role? Are d-realized properties causally excluded by their realizers? The short answer to this is no. In fact, the determination view is known as a solution to the exclusion problem. Many people in the literature assume without providing an argument that determinable properties and their determinates do not causally compete. Macdonald and Macdonald articulate this assumption as follows:

> Many physical properties, like that of *being coloured*, or *being an animal*, are plainly distinct from the many determinate forms which they may take (such as *being red*, or [*being*] *green*, or *being a tiger*), since possession of a more determinate property (e.g., that of *being red*) by an object entails possession of the more determinable one (e.g., *being coloured*), but not *vice versa*. ... Does this mean that colour is causally inefficacious? Of course not; for any causally efficacious case in which a more determinate form of that property is exemplified is a case in which the exemplification of colour itself is efficacious (1986: 149, formatting added).

Yablo's (1992: 257) much-cited example for illustrating this point involves a pigeon named Sophie, who is trained to peck at only red things. When Sophie sees a red triangle, she pecks at the triangle. It is natural to think that the triangle's redness is causally relevant to the Sophie's pecking. But *being red* is a determinable property. Let us suppose that the red triangle in this example is scarlet. *Being scarlet* is a determinate of (or d-realizes) *being red*. Does the fact that *being red* is d-realized jeopardise the causally relevance of *being red*? Yablo's intuition is that it does not, because determinable properties and their determinates do not causally compete.

As I said above, it is accepted by these authors without argument that properties do not causally compete with their determinables. I will provide my explanation of why determinable properties and their determinates do not enter into causal competition, and how the exclusion problem can be avoided, in much more detail, in Chapter 7. For the sake of evaluating the candidacy of d-realization to play the realization-role, let us grant that there is no exclusion problem for determinable properties and their determinates. If it is true that mental properties are d-realized by their physical bases, mental properties are not causally excluded by their physical bases.

So, d-realization is a candidate to play the realization-role: (i) the necessitation of a d-realized property is explainable; (ii) d-realized properties are not causally excluded by their realizers. However, for the sake of explaining the dependence of the mental on the physical, d-realization is *not* a plausible candidate for this role. That is, it is wrong to think that a mental property is a determinable property whose determinates are its physical realizers. In order to demonstrate this, I shall introduce four problems that the determination view faces.

- (*Problem 1*) As I explained in the previous chapter, in most cases, physical realizers metaphysically necessitate what they realize only in the context of certain background conditions. But if we consider the paradigm examples of d-realization, such as the cases of the d-realization of a colour property by any of its shape properties, we see that the requirement for background conditions vanishes. Necessarily, if something is scarlet, then it is red, regardless of what kind of a thing it is, or what the environment is like, or what the laws of nature are and so on. However, if an organism is in C-fibre stimulation, it might not have pain. The organism has to be a non-anaesthetised normal human being in a world that is nomologically like ours in order to have pain in the presence of C-fibre stimulation. I think that this indicates that, at best, the cases of d-realization can be special cases of a more general realization relation that we are

looking for, and that mental properties are not d-realized by their physical phases. (Mental properties can be d-realized by other mental properties, though. For example, *having sharp pain* d-realizes *having pain*, and having the former metaphysically necessitates having the latter.)

- (*Problem 2*) Determinates of a determinable property are orderable with respect to their similarity relations, but physical realizers of a mental property are not orderable in this way. For example, *being orange*, *being red* and *being blue* are determinates of *having a colour*, and it is possible to arrange these colours according to their similarity to each other. Orange is more similar to red than it is to blue. However, there are no such similarity relations between the physical realizers of a given mental property (Ehring 1996; 2011; Funkhouser 2006). So, it is possible to take cases of d-realization as special cases of a more general realization relation such that, in these special cases, realizers are orderable with respect to their similarity relations, whereas in other cases, such as the cases where mental properties are realized by their physical bases, such ordering does not obtain. (However, it should be noted that the defender of the determination view might respond to this by suggesting that being orderable with respect to similarity is not a necessary feature of the determination relation, but it is a feature that we find in paradigm cases.)

- (*Problem 3*) It is not possible to have two (or more) distinct determinates (between which there is no determinable-determinate relationship) of a determinable property simultaneously, but it is possible to have two distinct realizers of the same mental property at a time (Ehring 1996; 2011; Funkhouser 2006). For example, an object cannot be uniformly scarlet and crimson at once, however it is possible to have C-fibre stimulation and another realizer of *having pain* at once. This might actually be the consequence of what we saw in the first problem above. Since having a core-realizer property is not sufficient for having what it realizes, it might be the case that only one of the realizers is "active" for the realization of *having pain*. That is, *having C-fibre stimulation* or *having M-fibre stimulation* alone does not necessitate *having pain*. An organism may have both of these realizers at once, but only one them might be accompanied by the appropriate background conditions.

- (*Problem 4*) This problem is raised by Funkhouser (2006), and I think it presents a conclusive case against the determination view. Maximally determinate mental properties cannot be d-realized by physical properties as maximally determinate properties are properties that cannot be determined any further. Consider a maximally determinate belief property. Let us assume, as Funkhouser does, that the determination

dimensions of beliefs are their contents and their degrees. In the relevant sense, a maximally determinate belief property would be believing a proposition with a maximally specific content with a certain degree of belief. For example, *believing that it is raining* could be determined by *believing with some confidence that it is drizzling*. This determinate property can be further determined by *believing with 0.86589643 credence that there are 54594 rain drops falling from the sky on the top of 33 Glenfarg Street between times 9:32 am and 10:00 am*. Let us assume that this is a maximally-specified determinate of *believing that it is raining*. Call this property M_{7812}. As physicalism requires, M_{7812} is physically realized, say by a physical property P. Now, d-realization cannot be the relation between M_{7812} and P, because if it were, being P would have been a determinate of M_{7812}. However, there is no specific way of being M_{7812} because M_{7812} is already maximally determinate.

The objection from the last problem clearly demonstrates that d-realization cannot be the realization relation in terms of which physicalism is formulated. Although d-realization is an asymmetric necessitation relation whereby necessitation is explainable and the causal efficacy of the necessitated properties are accommodated, there are considerable objections to the proposal that mental properties are d-realized by their physical base properties. However, this does not mean that d-realization cannot be considered as a realization relation. As I suggested, and will argue further in 3.1.3.3, we can take cases of d-realization to be special cases of realization.

3.1.3 Subset Realization (S-realization)

In the following six subsections, I will discuss and evaluate the subset view of realization and the s-realization relation that this view postulates.

3.1.3.1 The Subset View of Realization

In this section, I will introduce s-realization as a candidate to play the realization-role. The core idea of what has come to be known as *the subset view* of realization is that the relationship between a mental property and its realizer is explainable in terms of the subset relationship between the causal powers of these properties. Different versions of the subset view have been proposed and defended by Lenny Clapp (2001), Sydney Shoemaker (2001; 2003; 2007; 2011; 2013) and Jessica Wilson (1999). On a *simplified* version of the subset view, the relationship between a mental property and its realizer is s-realization:

(*s-realization*) A property *P* s-realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*.

(I should stress that s-realization is not exactly the relation that all defenders of the subset view claim to obtain between mental properties and their realizers. Rather, a simplified version of the view can be said to postulate this relation. I introduce other formulations of this relation and the subset view in 3.1.3.5 below.)

A lot has to be said about what causal powers are and how they might be related to the properties that are said to "have" them. I shall take up this task in the next chapter. In order to assess the subset view, a tentative explanation of what causal powers are will suffice. Properties can be said to have causal powers derivatively on their bearers. So, saying that a property *P* has a causal power *CP* is saying that bearers of *P* have *CP*. The classical example that Shoemaker (1980) gives is that the property of *being knife-shaped* has the causal power of cutting bread. This is to say that all things that are knife-shape have the power of cutting bread. But obviously, not all bearers of *being knife-shaped* can cut bread. So at best, in most cases, properties have their causal powers *conditionally* on the instantiations of other properties. A knife-shaped object has to be made up of a certain material in order to exercise this power.[21]

The set of causal powers of a property is the set that contains all causal powers that the bearers of that property have. The term that is commonly used to explain the relationship between a property and its set of causal powers is *conferment*. It is said that a property

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[21] I am not following Shoemaker's own terminology here. Shoemaker formulates s-realization in terms of *causal features*. Causal features can be divided into two groups: backward-looking causal features and forward-looking causal features. Backward-looking causal features of a property specify what might cause the instantiation of that property, under certain conditions. Forward-looking causal features specify what the instantiation of that property might cause, under certain conditions. So, in the terminology that I endorse in the text, a causal power is a forward-looking causal feature.

confers its causal powers on its bearers. There are a number of theories about the relationship between properties and the powers that they confer. The questions that these theories answer are mainly the following: Are properties individuated by the causal powers they confer on their bearers? Do properties have their causal powers necessarily? In the next chapter, I will discuss these theories in detail, and in Chapter 5, I will argue that the defenders of the subset view ought to give specific answers to these questions. For the sake of the issues that are discussed in this chapter, these questions can be kept aside.

Let M and P be properties with the sets of causal powers {cp1, cp2} and {cp1, cp2, cp3} respectively. According to the formulation above, P s-realizes M, because {cp1, cp2} is a proper subset of {cp1, cp2, cp3}. An attractive feature of this account is that it straightforwardly explains how properties are multiply realized. Let P^* be a property with the set of causal powers {cp1, cp2, c78}. P^* would also s-realize M.

A less formal illustration can be made through the classical example of the realization of *having pain* by *having C-fibre stimulation*. For the sake of simplicity, let us take the set of causal powers of *having pain* to be {wincing, crying}. Suppose that there is a neural detector which reads what neural properties are instantiated in an organism's brain and then reports the results by signalling the name of the property. The set of causal powers of *having C-fibre stimulation* will include all the causal powers of pain, but will also have to include the power of making neural detectors of the aforementioned sort signal "C-fibres". Let us call this causal power SCF. So, the set of causal powers of *having C-fibre stimulation* will be {wincing, crying, SCF, ...}. Now imagine that the neural detector is connected to a Martian who is in pain. Let us assume that, in Martians, typically, the neural base of *having pain* is *having M-fibre stimulation*. Then, in this case, the detector will signal "M-fibres". Let us call this power in question SMF. As a realizer of *having pain*, *having M-fibre stimulation* will also have the causal powers of pain, and SMF. So, the set of causal powers of *having M-fibre stimulation* will be {wincing, crying, SMF, ...}.

3.1.3.2 The Power Inheritance Principle

In a nutshell then, the idea behind the subset view is that the causal powers of mental properties are included in the causal powers of physical properties that realize them. Let us call this *the power inheritance principle.* Jessica Wilson (1999) thinks that something along the lines of the power inheritance principle is a requirement of physicalism. She maintains that physicalists

> cannot ... allow that mental properties have any causal powers that are different from those of their physicalistically acceptable base properties, for this violates the physicalist thesis that mental properties are 'nothing over and above' their base properties (ibid: 41).

It should be noted that not everyone thinks that the power inheritance principle is a requirement of physicalism. Two notable exceptions are Gillett (2002; 2003a; 2003b; 2010; 2011; 2013) and Noordhof (1999; 2003; 2013). Gillett proposes his own theory of realization, which I will discuss in detail in Section 3.2.1 below. Here, I shall mention Noordhof's objection to the power inheritance principle.[22]

Noordhof disagrees with the claim that a mental property has fewer causal powers than a given realizer of it. And if he is right, a mental property cannot inherit all of its causal powers from its realizers. Here is my reconstruction of Noordhof's argument (2013: 99). Let us suppose that pain experiences can cause pain behaviour in human beings and pain behaviour in Martians. So, two causal powers of *having pain* would be *exhibiting human pain behaviour* and *exhibiting Martian pain behaviour*. *Having pain* is realized by *having C-fibre stimulation* in human beings. So, if the power inheritance principle is true, both of the aforementioned causal powers are included in the set of causal powers of *having C-fibre stimulation*. But, *exhibiting Martian pain behaviour* cannot be a power of *having C-fibre stimulation*, because it is not a power that the bearers of this property (namely human beings) can exercise. Therefore, the power inheritance principle is false.

I think that the defenders of the subset view (and others who endorse the power inheritance principle) can survive this objection. What underlies the disagreement between the defenders of the subset view and objection is a difference in understanding the relationship

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[22] An ancestor of the power inheritance principle can be found in Kim (1992). Kim is not a defender of the subset view, and he is an ardent opponent of several varieties of non-reductive physicalism. Noordhof (1999) addresses Kim's version of the principle too, but his more recent discussions target the subset view's endorsement of this principle.

between causal powers and the properties that confer them. Those who subscribe to the power inheritance principle can deny that *exhibiting Martian pain behaviour* is a causal power of *having pain* in the first place. The reason for this is that they understand the causal powers of a property to be the causal powers that *all* bearers of that property have. In this case, *exhibiting Martian pain behaviour* would not be a causal power of *having pain*, because human beings that have pain cannot exercise that power.[23]

3.1.3.3 S-realization and D-realization

There is an interesting relationship between s-realization and d-realization. Something along the lines of the power inheritance principle must be true about determinable properties and their determinates, insofar as we consider these properties to have causal powers. The set of causal powers of *being red* are a proper subset of the causal powers of *being scarlet*, which suggests that, according to the definition of s-realization, *being red* is s-realized by *being scarlet*. To generalise, all determinable properties are s-realized by their determinates. And therefore, all cases of d-realization are also cases of s-realization.

Shoemaker (2001) noticed this similarity between s-realization and d-realization, and once subscribed to the determination view that I have discussed above in the previous section. According to the determination view, mental properties are determinable properties, and their physical bases are their determinates. So, Shoemaker had once thought that all cases of mental-physical realization are also cases of d-realization. However, observing that (a) determinable properties are s-realized by their determinates is one thing, establishing that (b) mental properties are d-realized by their physical bases is another thing. And (b) clearly does not follow from (a). And if we take the considerations against the determination view that I have introduced in the previous section seriously, we can see that (b) is not true. Shoemaker has subsequently retracted his subscription to the determination view and

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[23] I give the same reply to Noordhof's (2013) argument in Baysan (2014: 908).

agreed that although mental properties are not d-realized by their physical bases, all determinable properties are s-realized by their determinates (2007: 23). The relationship between s-realization and d-realization is then the following: every case of d-realization is also a case of s-realization, but some cases of s-realization (e.g. cases where mental properties are s-realized by physical properties) are not cases of d-realization.

3.1.3.4 S-realization and Non-reductive Physicalism

Before examining whether s-realization can play the realization-role plausibly, I shall discuss one objection that was raised against the subset view. This objection was raised by Kim (2010) and developed further by Morris (2011).

Kim's objection goes as follows: physical properties have only physical causal powers; if the causal powers of mental properties are causal powers of physical causal powers, then mental properties have only physical causal powers. Kim maintains that "there seems no good reason not to consider these supposedly mental properties to be physical properties, pure and simple" (2010: 111). Kim thinks that this would make the subset view a *reductive* sort of physicalism, because, mental properties would turn out to be identical with physical properties. In order to avoid this consequence, we can grant mental properties some mental causal powers. However, once we do that, because of the postulated subset relation between these mental causal powers and the causal powers of their physical realizers, we end up with the consequence that the properties that are supposed to realize these mental properties have mental causal powers, in which case they cannot be purely physical properties. This is supposedly worse than the first option, because it leads to the conclusion that there are mental elements in supposedly fundamental properties, which is at odds with physicalism.

Kim's objection can be formulated in terms of a dilemma: if mental properties are s-realized by physical properties, either all mental properties are physical properties because they have only physical causal powers, or some physical properties have mental causal powers. Either way, the view in question cannot be a non-reductive physicalist view. If the first horn is held, non-reductivism fails; if the second horn is held, physicalism fails.

However, this objection hinges on a number of ideas which are not supported, and can be resisted by the defenders of the subset view. One of them is the contention that physical properties have only physical causal powers. Kim does not provide an argument for this, but Morris (2011) does. Morris claims that that "there is some reason to think that a

physical property is only going to have physical causal powers ... [because] a physical entity, it seems, cannot have nonphysical components or parts" (2011: 322-323). However, this, I think, relies on a weak analogy, as it cannot be taken for granted that the relationship between a property and its causal powers is the same relationship between a physical object and its parts. Therefore, physical properties may be allowed to have causal powers of mental properties.

It is also an unsupported idea that there is a dichotomy between mental causal powers and physical causal powers. As far as the subset view is concerned, nothing prevents the reduction of mental causal powers to physical causal powers, in which case, physical properties may be allowed to have mental causal powers, which in turn would also be physical causal powers. So, it may not be problematic that physical properties have mental causal powers, because such powers can be identical with physical causal powers. This may or may not be true, but it seems to be available as a response on behalf of the subset view.

Moreover, having opinions about these matters, namely whether mental causal powers can also be physical powers or not, without having a clear account of what a physical causal power or a mental causal power is, seems wrong. Kim does not provide an account of what a physical causal power is, but Morris seems to do so. He suggests that physical causal powers are the powers that are "characterised in terms of other physical properties" (Morris 2010: 323). That is, a causal power CP is a physical causal power if and only if having CP leads to the instantiations of only physical properties. But ultimately, this characterisation is unhelpful, because Kim's and Morris's arguments use the premise that physical properties are the ones that have only physical causal powers. So, physical properties are characterised partly in terms of physical causal powers; and physical causal powers are explained in terms of physical properties.

I think that Kim's and Morris's arguments are insightful, but they fail to establish that the postulation of s-realization is not coherent with non-reductive physicalism, mainly because they rely on ideas that can easily be resisted by non-reductive physicalists who formulate their view in terms of s-realization.

3.1.3.5 Some Exegetical Issues

I remarked in of 3.1.3.1 that s-realization is not exactly the relation that the defenders of the subset view postulate. Rather, it is a relation that a slightly simplified and a unified

version of the view might be said to postulate. The problem is that the defenders of the subset view postulate slightly different formulations of realization at different sources, and Shoemaker has changed his mind about his version several times. I think that s-realization as I formulate it is good enough to represent the core idea of the view, but I will briefly introduce other formulations for the sake of completeness. The three alternative formulations of the realization relation that different versions of the subset view postulate are the following:

> (s_2-*realization*) A property P s_2-realizes a property Q if and only if (i) the causal powers of Q are a proper subset of the causal powers of P; (ii) P is not a conjunctive property that includes Q as a conjunct.

> (s_3-*realization*) A property P s_3-realizes a property Q if and only if (i) the forward-looking causal features of Q are a proper subset of the forward-looking causal features of P; (ii) the backward-looking causal features of Q are a proper superset of the backward-looking causal features of P.

> (s_4-*realization*) A property P s_4-realizes a property Q if and only if (i) the forward-looking causal features of Q are a proper subset of the forward-looking causal features of P; (ii) the backward-looking causal features of Q are a proper superset of the backward-looking causal features of P; (iii) P is not a conjunctive property that includes Q as a conjunct.

Something along the lines of s_2-realization is posited by Shoemaker (2001; 2007) and Wilson (1999; 2009). They feel the need to ban conjunctive properties as realizers of their conjuncts because, without such a ban, all conjunctive properties count as realizers of each and every conjunct they have. I am saving a detailed discussion of why such a ban might be problematic for Chapter 6, so I will not engage with this issue until then.

Note that s_3-realization and s_4-realization invoke the notions of forward-looking and backward-looking causal features. Shoemaker's term "forward-looking causal features" refer to what I call "causal powers". Backward-looking causal features of a property, on the other hand, specify what might cause the instantiation of a property under certain conditions. In his first treatment of the subset view, Shoemaker (2001) did not mention backward-looking causal features. But subsequently, he thought that a clause on backward-looking causal features was required, so in his (2003) and (2007), he provided s_3-realization (and s_4-realization). Due to arguments advanced by McLaughlin (2006; 2007),

Shoemaker changed his mind again, and in his (2011) and (2013), he argued that s-realization (or s_2-realization) was good enough. Some background knowledge regarding Shoemaker's metaphysics is required to report this issue. I address this issue in more detail in Chapter 5, Section 5.4.

As I said above, I take s-realization to be good enough to represent the subset view, and unless stated otherwise, in what follows, the subset view refers to the view that realization is s-realization (not s_2-realization, s_3- realization or s_4- realization).

3.1.3.6 S-realization and the Realization-role

I devote a significant part of the remainder of this thesis on the subset view and s-realization. I will do this, mainly because I take s-realization to be a promising candidate to play the realization-role.

First, let us see whether s-realization satisfies the first condition to play the realization-role. That is, in a case of s-realization, is the necessitation of an s-realized property explained by the instantiation of the base property? Take a property P with the set of causal powers {cp1, cp2, cp3}. Take another property, Q, with a set of causal powers of {cp1, cp2}. Because of the proper subset relationship between the causal powers of these properties, P s-realizes Q. But, is the instantiation of Q metaphysically necessitated by the instantiation of P because of the said proper subset relationship? Ideally, the subset view's answer to this question should be "yes", in which case, we would at least have a candidate explanation for the metaphysical necessitation in question. Opponents of the subset view have argued that the proper subset relationship between the causal powers does not explain the metaphysical necessitation feature of realization (Melnyk 2006; Kim 2010). My view on this matter is that this metaphysical necessitation feature can be explained through this subset relationship when certain principles about the relationship between causal powers, properties, and their instances are granted. I will introduce theories about this relationship in the next chapter, and argue for their relevance for the success of the subset view in Chapter 5. For the time being, it should suffice to say that we have at least a promising candidate to explain the asymmetric necessitation of s-realized properties. So, the first condition to play the realization-role is provisionally satisfied by s-realization.

The second condition s-realization must meet in order to play the realization-role is accommodating the causal efficacy of the necessitated property. The question to ask then is the following: Are s-realized properties causally excluded by their s-realizers? The short

answer to this question is "no", so s-realization can be said to satisfy the second condition for playing the realization-role. The longer, yet still provisional, answer goes as follows: as all defenders of the subset view emphasise, the view is designed to solve the exclusion problem.[24] I devote a full chapter (Chapter 7) to examine the solution that the subset view provides to the exclusion problem, so here, I shall only summarise it. The proposal is that, since the causal powers of an s-realized property are included in the causal powers of its s-realizer, there is (something like) a part-whole relationship between the instances of these properties. Since parts and wholes do not causally compete, s-realized properties and their s-realizers do not causally compete. And since they do not causally compete, an s-realizer does not causally exclude the property it s-realizes.

There is much to be said about the proposed solution, and mainly about the claim that because of the subset relationship between the causal powers of two properties, there is (something like) a part-whole relationship between the instances of these properties. I will examine this solution and the alleged link from subsethood to parthood in detail in Chapters 5 and 7. Here, it should suffice to say that s-realization is a promising candidate to satisfy the second condition of playing the s-realization role.

So far, I have suggested that s-realization is a good candidate to play the realization-role because it provisionally satisfies the two conditions of playing this role. But there is another desideratum that I stipulated above: a relation that is candidate to play the realization-role should also be a plausible candidate for relating mental properties to their physical bases, at least for the sake of formulating physicalism. The way to test this is to ask whether the power inheritance principle is true for mental properties and their physical bases. I have argued in Section 3.1.3.2 that the power inheritance principle is true insofar as the powers of a property are understood to be the powers that all bearers of that property

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[24] Clapp (2001: 133), Shoemaker (2007: 11), and Wilson (1999: 47-48) advertise their views as solutions to the exclusion problem.

have. So, I will take s-realization to be a relation worth pursuing in the remainder of this thesis.

3.1.4 Concluding Remarks on Horizontal Realization

So far I have only looked into horizontal relations, and I have argued that, among the horizontal relations that have been postulated to relate mental properties to their physical bases, s-realization is the promising candidate. In the next section, I will introduce vertical relations that might also be candidates to play the realization-role too.

3.2 Vertical Realization

In the previous section, I introduced several horizontal relations that are candidates to play the realization-role. A horizontal relation is a relation whose *relata* are properties of (or property instances in) the same individual. In this section, I provide a survey of vertical relations that might be candidates to play the realization-role. Vertical relations, unlike horizontal relations, are relations whose *relata* are properties of (or property instances in) different individuals. I will focus on accounts that have postulated vertical relations as realization relations. The two vertical relations that I will discuss are mereological realization (m-realization) and coincidental realization (c-realization).

3.2.1 Mereological Realization (M-realization)

M-realization is an asymmetric necessitation relation whereby one *relatum* is a property of an entity, whereas other *relata* are properties of the mereological parts of the same entity. There can be different asymmetric necessitation relations that satisfy this condition, but here, I shall consider one relation that does so, and call that relation m-realization. I borrow m-realization from Carl Gillett (2002; 2003a; 2003b; 2010; 2011; 2013), whose view on this matter has come to be known as *the dimensioned view* of realization. According to the

dimensioned view, the relation that relates mental properties to their physical bases (as well as any higher-level property to the lover-level ones) is m-realization:

> (m-realization) Property/relation instance(s) *P1-Pn*, m-realize an instance of a property *Q*, in an individual S, if and only if S has the causal powers of *Q* in virtue of the causal powers of *P1-Pn* that are conferred on the constituents of S, but not *vice versa*.[25]

M-realization is formulated as a relation between property instances, rather than properties, unlike other relations that have been introduced above. This is due to the fact that Gillett articulates his dimensioned view of realization always in terms of instances, rather than properties. However, as I suggested in Chapter 2, Section 2.2, we can understand realization relations between property instances in terms of realization relations between properties, and *vice versa*. For the sake of continuity with Gillett's account, I shall talk of realization between property instances when I am discussing the dimensioned view.

A recurring example in Gillett's works is a cut diamond. Gillett asks us to imagine a piece of cut diamond in which the property of *being hard* is instantiated. According to Gillett, *being hard* is instantiated in this cut diamond in virtue of the conferment of the causal powers of the diamond's having carbon atoms as its constituent parts with certain properties and relations. And this happens because the causal powers of *being hard* are conferred on the cut diamond in virtue of the conferment of the causal powers of the properties and relations of its parts. So, *being hard* is m-realized by the properties and the relations of the carbon atoms that are constituents of the diamond. What is crucial in this example is that although the carbon atoms that are parts of the cut diamond are not hard, the diamond itself is hard.

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[25] This formulation allows for a special case where the constituent of S is an *improper* part of S and where there is only one *P*. Such a case would be a case of horizontal realization, so m-realization would have horizontal realization as a special case.

Before examining whether m-realization can plausibly play the realization-role, I shall discuss Gillett's view that realization *is* m-realization. Gillett claims that the concept of realization that is implicit in the scientific theories about the relationship between higher-level properties (for example, functional properties) and lower-lever properties (for example, micro-physical properties) is the notion of m-realization (2003a: 594). And he maintains that other theories of realization, in particular the subset view of realization that I introduced above, fails to capture the scientific understanding of realization.

According to Gillett, the subset view, among other "flat" views of realization, as he coins the term, fails to recognise that realization is a relation between properties at different levels.[26] (Such views are called flat because their purported instances of realization take place in the same mereological level. Gillett's view, on the other hand, is called dimensioned, because the purported instances of realization obtain between different mereological levels.) The instantiation of *being hard* in the cut diamond does not depend on the instantiation of a putative realizer property in the same level of composition as the diamond. Rather, the instantiation of *being hard* depends on the properties of the micro-level entities that compose the diamond. So, realization should be seen as a relation between the properties of entities at different levels, as Gillett suggests.

As Gillett claims, a consequence of the claim that a realized property and its realizer properties belong to entities at different levels is that the causal powers of realized properties and their realizers cannot be identical. So, the observation that realization relates individuals at different levels, according to Gillett, implies that the power inheritance principle is false. Gillett aims to demonstrate this through his working example. He argues that it is clear that none of the causal powers that the cut diamond has are same as the causal powers that the carbon atoms that constitute the diamond. He then generalizes this

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[26] Here, we should understand this "levels" talk in the following sense: think of a chair and then think of its parts; the chair is at a mereologically higher level than its parts.

point to all cases of m-realization and says that the realizer properties and the realized properties/relations in m-realization have "qualitatively distinct" causal powers (Gillett 2010). The qualitative distinctness claim refers to the contention that properties at higher levels are different in kind, and such difference in kind is exemplified by the suggestion that such properties do not confer any common causal power to their bearers (ibid: 172).

Note that the idea that there is such qualitative distinctness among the relata of realization, understood this way, is directly the rejection of the power inheritance principle, so there is hardly an argument for the qualitative distinctness claim. However, Gillett claims that

> a survey of any number of examples of mechanistic explanation in the sciences, or the entities found at the distinct 'levels' related by such explanations, establishes that the relevant *relata* are usually of qualitatively different kinds (ibid: 172, emphasis added).

As a response to Gillett's inductive argument for the qualitative distinctness claim, one can cite numerous cases of m-realization that involve properties that are *not* qualitatively distinct in this sense. Imagine that Lily builds a Lego castle by using only red Lego pieces. The redness of the castle would be instantiated in virtue of the redness of its pieces. The redness of each piece "works" in the m-realization of the redness of the castle because the castle has the powers that individuate *being red* in virtue of the powers that *being red* confers to the Lego pieces, but not *vice versa*. The causal powers that are conferred by the realized property and its realizers are type-identical, so this is clearly not a case of qualitative distinctness. Assuming that more and more examples of this sort can be generated, it follows that qualitative distinctness of *relata* is not a suggestive mark of m-realization, or realization in general.

So, if I am right, qualitative distinctness should *not* be seen as mark of m-realization. There can be cases in which an m-realized property has the same causal powers of the properties at the realization base. Now, I shall also show that Gillett is wrong in thinking that m-realization is *the* realization relation. This can be seen through the observation that the obtaining of m-realization is compatible with the obtaining of a horizontal realization relation (such as s-realization). That is, that there is a vertical realization relation between the properties at different levels does not rule out the possibility of there being a horizontal realization relation between the properties at the same level, or between the properties of the same individual.

Moreover, the obtaining of an m-realization relation is not only compatible with the obtaining of a horizontal realization relation, but it also necessitates it. Gillett anticipates this objection, and his version of it goes as follows (2002: 320-321). Consider the piece of diamond which instantiates *being hard*; from the fact that it is m-realized by the properties/relations of the carbon atoms that constitute the diamond, it follows that the diamond has a property of having a certain structure of having constituents with such and such properties and so and so relations; that is, the diamond can be said to have a "highly complex structure of carbon atoms and their realizers and relations" (ibid: 321). Following Gillett, let us call this highly specific property *COMBO*. Both *being hard* and *COMBO* are properties of the very same object, the cut diamond. Also, note that the instantiation of *COMBO* necessitates the instantiation of *being hard*. And moreover, the causal powers of *COMBO* and *being hard* must match in a specific way. Given that *COMBO* necessitates *being hard*, all bearers of *COMBO* are also bearers of *being hard*. But not all bearers of *being hard* are also bearers of *COMBO*. Things can be hard without having this very specific micro-structure. From these, it follows that the causal powers of *being hard* are a proper subset of the causal powers of *COMBO*. Therefore, *COMBO* s-realizes *being hard*. This establishes that the obtaining of an m-realization relation necessitates the obtaining of an s-realization. If the dimensioned view is the view that the only realization relation is m-realization, then the dimensioned view is clearly false.

Gillett's response to this anticipated objection goes as follows. He asks us to consider the relationship between *COMBO* and the microphysical properties and relations that specify *COMBO*. *COMBO* is supposedly instantiated in the piece of diamond, and the microphysical properties and relations that are considered are instantiated in the constituents of the diamond. If the piece of diamond instantiates *COMBO*, it does so in virtue of the instantiation of the microphysical properties and relations of the constituents of the diamond. Given that the in-virtue-of relation in question is m-realization, Gillett argues that the instantiation of properties like *COMBO* "provide further cases of realization that [an account that appeals to a horizontal realization relation] ... fails to explain" (ibid: 321). However, this hardly responds to the objection. Because, by this, we only see that *COMBO* is m-realized; nothing is said as to why *COMBO* does not s-realize *being hard*.

There remains another way of blocking the argument from *COMBO*: denying the existence of properties like *COMBO*. Gillett (2010) argues that the postulation of properties such as *COMBO* is superfluous. He thinks that such properties are "ontological monsters", where an ontological monster is a kind of entity that mixes together different kinds of entities

such as particulars, properties, relations and so on (ibid: 181). He thinks that having ontological monsters should be avoided, because we should keep ontological categories separate from each other. Unless we avoid these monsters, we end up with "complicated ontological frameworks which are neither parsimonious, nor easy to understand or assess" (ibid). Nevertheless, this strategy is not satisfactory either. The truth of a metaphysical theory does not depend on how easy it is to understand or assess it. If the metaphysical inquiry in question requires "mixing" categories so as to create new entities, the *COMBO* objection is legitimate. Apart from being called "monsters", there does not seem to be anything wrong with ontological monsters.[27]

There is another reason to think that the instance of a horizontal realization relation must be present when there is an instance of m-realization. Gillett's diamond instantiates *being hard* in virtue of the properties and the relations of the carbon atoms that constitute it. However, *being hard* comes in degrees, because it is a determinable property. Something cannot be hard without being hard in a specific way. The diamond cannot be hard without instantiating a determinate of *being hard*, say H_1. As I argued above in Section 3.1.3.3, we have good reasons to think that the causal powers of a determinable property are a subset of the causal powers any of its determinate properties. That is, determinate properties s-realize their determinable properties. Therefore, H_1 s-realizes *being hard*. This, in turn, shows the inevitability of the existence of a horizontal realization relation.

Gillett's dimensioned view fails to show that a vertical relation, in particular, m-realization, is the *only* realization relation that exists, for the reasons specified above. Nevertheless, this does not mean that a mereological realization relation should not be regimented. Shoemaker acknowledges this when he says that

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[27] Gillett can appeal to other arguments to deny structural universals like *COMBO*. However, that would be an independent issue, and at any rate, the rejection of such properties should not be part of a view about realization. I shall briefly discuss the role of structural properties in Chapter 6, Section 6.1.

> we [also] need an account of realization that gives a role to the properties of micro-entities other parts of macroscopic objects ... [but] the cure for this is not to count the properties of parts of macroscopic objects as the realizers of properties of the macroscopic objects (2007: 32).

That is, theorising about a realization relation that gives a role to micro-level entities and their properties might be required, but this does not mean that the relation through which this is to be established should be counted as *the* realization relation.

Instead of taking realization as a relation between the properties of macro-level entities and the properties of micro-level entities that constitute the macro-level entities, Shoemaker provides us an explanation how such micro-level properties play a role in realization. Take a macro-level entity, say a cut diamond. Take the state of affairs $S_{diamond}$ that consists in the proposition that specifies the microphysical description of the cut diamond, namely, how its constituent atoms are related, and what properties they instantiate and so on. $S_{diamond}$ will be a microphysical state of affairs, because the proposition that constitutes the existence of the state of affairs is a proposition about the properties and relations of the microphysical constituents of the diamond. [28] According to Shoemaker's understanding of states of affairs, "the existence of a state of affairs simply consists in some proposition's being true" (ibid: 33). Such a proposition can assert that a given particular instantiates a certain property, that several particulars instantiate some properties, that they bear certain relations to each other, and so on. These propositions can specify more global states, such as how the world is, what laws of nature are true and so on. (A state of affairs can also assert a negative proposition which asserts that some particulars do not have certain properties and do not stand in certain relations or that a world is not in a certain way.)

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[28] Here, by "microphysical entities", Shoemaker does not mean maximally fundamental entities. We do not know if there are maximally basic entities because it could be the case that "each sort of micro-entity is composed of more basic entities, which are composed of more basic entities, and so ad infinitum" (ibid: 34).

Now, suppose that there is a property P which is individuated by the microphysical state of affairs $S_{diamond}$ in the following sense: P is a property that something has if and only if $S_{diamond}$ obtains within the boundaries of that thing. So, P is a highly determinate property that specifies the micro-physical makeup of the diamond alongside the obtaining of some facts in the surroundings of the diamond. P is a highly fragile property, in the sense that, as soon as $S_{diamond}$ fails to obtain (which might happen due to a minute change), the cut diamond ceases to be a bearer of P. In Shoemaker's own terminology, such properties like P are "microphysical states of affairs embedding (MSE) properties" (ibid: 35).

Since the diamond's boundaries embed $S_{diamond}$, the diamond is a bearer of P. Shoemaker suggests that P will s-realize (all) other properties of the cut diamond that are simultaneously instantiated with P. Once we have the formulation of s-realization, the explanation of this is very straightforward. Take Q as any property (except P) that the cut diamond has. All bearers of P are also bearers of Q, but not *vice versa*. So, a bearer of $S_{diamond}$ is also a bearer of Q. Shoemaker calls the relation that obtains between such microphysical states of affairs and the higher-level properties that the MSE properties of these states of affairs necessitate *microrealization* (2003b; 2007). Note that microrealization is not a relation between properties (or instances). It is a relation between states of affairs and properties (or their instances). For this reason, I do not take microrealization to be a realization relation. I take this story about microrealization to be an explanation of how, in realization, a role can be given to the properties of micro-entities.

Another person who thinks that a role to micro entities can be given in realization without defining the realization relation as a mereological relation is Endicott (2011). On Endicott's view, the rivalry of an m-realization account (for example, the dimensioned view) and a horizontal realization account (for example, the subset view) is only apparent. According to what he calls "comprehensive functionalism", there are at least two stories that can be told for the explanation of the instantiation of a higher-level property, such as the cut diamond's being hard. These two stories might be of interest for different scientific programs. One scientific program might want to explain how *COMBO* necessitates *being hard*, whereas another program might be interested in how *COMBO* is instantiated in the first place. While the former would appeal to a horizontal realization relation, the latter would make use of a vertical realization relation.

In the remainder of this thesis, I shall not focus on m-realization (and the dimensioned view) for the following reasons. First, regardless of whether m-realization can play the

realization-role plausibly or not, its obtaining entails the obtaining of s-realization. We have already seen that s-realization is a promising candidate to play the realization-role, so, the appeal to m-realization, on top of s-realization, is superfluous for the sake of my project. Second, and more importantly, arguably, m-realization does not play the realization-role. Recall that one of the conditions for playing this role is providing resources to explain how a property is necessitated by the instantiation of a base property (or properties and relations, as far as m-realization is concerned). However, m-realization is defined over an in-virtue-of relation, which is not explained any further. According to the strategy I have been following, a good theory of realization should explain, in an informative way, how the instantiation of a realized property is metaphysically necessitated by the instantiation of its realizer(s). If we appeal to an in-virtue-of relation in the formulation of realization, then metaphysical necessitation comes for free without any informative explanation. That is, using the in-virtue-of relation in the formulation of physicalism makes it true, just by stipulation, that realization is a metaphysical necessitation relation. But that is not explaining why metaphysical necessitation is a feature of realization; that is merely *saying* that it is. So I do not find an account of m-realization helpful for my purposes.

Next, I shall discuss a vertical realization relation that is purported to obtain between some properties of distinct coincident entities.

3.2.2 Coincidental Realization (C-realization)

In this section, I will discuss a realization account given by Shoemaker (2003b; 2007) to account for the realization relation between the properties of coincident objects. I will call this relation c-realization. C-realization is a vertical relation, as it relates the properties of different individuals. Beyond this section, I will not discuss c-realization and Shoemaker's account of it; I am including a discussion of it merely for the sake of completeness. First, I will explain what coincident objects are supposed to be. Second, I will spell out how c-realization relates the properties of these putative entities. Third, I will argue that, even if one thinks that there might be coincident entities, c-realization is not a fundamental realization relation: if it obtains, it obtains in virtue of a horizontal realization relation. For this reason, I will not examine whether c-realization plays the realization-role.

Coincident objects are distinct objects that allegedly occupy the same space at a time. The idea that there are coincident entities is usually motivated by the cases like the following.

Consider a statue which is made of clay. Let us say that Lump is the name of the lump of clay that statue is made of. Naturally, one might be inclined to think that Lump and the statue are identical. However, Lump and the statue differ in many properties. For example, they differ in temporal properties: Lump existed before the statue existed. They also differ in their persistence conditions: while Lump can survive being melted, the statue cannot; once the statue is melted, it is not a statue anymore. From Leibniz's law, it follows that the statue is not identical with Lump. If Lump and the statue are not identical, given that both occupy the same space at a given time, then different objects could occupy the same space at a given time.

Lump and the statue share some of their properties, and they differ with respect to some other properties. Presumably, there are some dependence relations between the properties of the statue and Lump. For example, the aesthetic properties of the statue partially depend on the shape properties of Lump. The question is whether there is any relation between the properties of the statute and Lump that might be thought to be a variety of realization. This question becomes more interesting when one considers the proposal that persons are coincident with their bodies and/or human animals. Shoemaker (2003b; 2007) thinks that this is the case. He takes this view to be a consequence of his neo-Lockean view of personal identity. On the neo-Lockean view, whereas persistence conditions for persons are psychological, persistence conditions for bodies are not. (I will not discuss Shoemaker's arguments for the neo-Lockean account of personal identity. Just as, I am neither defending nor rejecting the possibility of coincident entities, I am also impartial with respect to the proposal that persons and bodies are coincident.)

If persons and their bodies are not identical but coincident, then it might be thought that the mental properties of a person are, in one sense, realized (through a vertical relation) by the physical properties of the body. However, if physicalism is true, persons are physical substances too. And if one takes persons as physical substances, then the neo-Lockean view with the postulation of a realization relation yields the "too many minds" problem (Olson 1997). The too many minds problem can be illustrated as follows. Both Jess and her coincident body *B* are physical substances. Many, perhaps all, physical properties of *B* will be inherited by Jess. For example, if *B* weighs 62 kg, so does Jess. If *B* is having C-fibre stimulation, so is Jess. Assuming that *having C-fibre stimulation* is a realizer of *having pain*, it follows that both *B* and Jess have C-fibre stimulations that should realize *having pain*. The point generalizes to all mental properties that Jess has. Then there will be two psychologically indistinguishable subjects at the same space-time region.

Shoemaker develops the c-realization account to respond to the too many minds problem. In order to explain what c-realization is, I shall introduce the two kinds of property that Shoemaker distinguishes between: *thin* properties and *thick* properties. Thin properties are "properties that can be shared by coincident things of different kinds" (Shoemaker 2007: 7). All physical properties a person and her body share will be thin properties. Thick properties, on the other hand, are "properties that can belong only to things that are of certain sorts and have certain persistence conditions" (ibid). Mental properties are thick, because while persons can have them, their coincident bodies cannot. This suggests that thick properties entail *sortal* properties, namely the properties things have just in case they are of certain sorts. *Being a person* is an example of a sortal property. If *P* is a thick property that can be had only by persons, having *P* entails having the sortal property of *being a person*.

Thanks to the distinction between thin properties and thick properties, c-realization is formulated in such a way that a given physical property instance does not realize the same mental property in (two or more) substances:

> (*c-realization*) A property *P* of an individual *A* c-realizes a property *Q* of an individual *B* if and only if (i) *A* and *B* are coincident objects, (ii) *P* is a thin property; (iii) *Q* is a thick property that entails a sortal property *S*; and (iii) the conjunctive property (*P & S*) s-realizes *Q*.

The following is an illustration of c-realization. Think of Jess and her body *B* again. Let us suppose that *B* instantiates *having C-fibre stimulation*. This property would be a thin property, and will be shared by Jess too. Jess, as a person, then can be said to have the conjunctive property (*having C-fibre stimulation & being a person*). Since this latter property is an s-realizer of *having pain*, it s-realizes *having pain* in Jess. So, *having C-fibre stimulation* in *B* c-realizes *having pain* in Jess. Note that, *having C-fibre stimulation* in *B* does not realize *having pain* in *B* in any way, so *having pain* is not instantiated twice over. Therefore, the too many minds problem is avoided.

A shorter way of avoiding the too many minds problem, which is implied by this rather complicated account, would be to take mental properties to be such that they can only be instantiated in objects of certain sorts. Bodies are not the sort of things that can have pain, so *having C-fibre stimulation* in a body does not realize *having pain* in a body. *Having C-fibre stimulation* realizes *having pain* only when it is instantiated in certain sorts of entities.

This suggests that total realizers of mental properties should also include specifications of sortal properties.

Regardless of whether there can be coincident entities or not, it should be noted that c-realization is not a fundamental realization relation in its own right. That is, it is a realization relation that is instantiated in virtue of the instantiation of another realization. Any c-realization relation between the properties of two coincident objects obtains in virtue of an s-realization instance among the properties of one of these coincident objects. So, in what follows, I will not discuss c-realization any further. But, if one believes that there are coincident objects (and that persons and their bodies are examples of such objects), and wants to explain the necessitation of some of the properties of one object by the instantiation of some of the properties of a coinciding object, then one can appeal to c-realization.

3.2.3 Concluding Remarks on Vertical Realization

In this section, I introduced two types of vertical relation that are candidates to play the realization-role. As I explained, vertical relations are relations whose *relata* are properties that are instantiated in different individuals. The vertical relations I have discussed are m-realization and c-realization.

M-realization is a mereological relation whereby an instance of a property of an individual is instantiated in virtue of the properties and the relations of the constituents of that individual. I examined Gillett's dimensioned view of realization, which is the view that the right realization relation that should be invoked is m-realization. I have argued that Gillett is wrong, as he fails to notice that the existence of a vertical realization relation is compatible with the existence of a horizontal realization relation, such as s-realization. And, as I suggested in section 3.1.3 above, s-realization is a good candidate to play the realization-role. So, although, it might be thought that it is also required to explain how properties at macro-levels depend on properties at micro-levels, this does not have to be a constraint on formulating a relation that plays the realization-role. Moreover, I argued that m-realization cannot play the realization-role at any rate, as it is formulated in terms of an in-virtue-of relation, which is yet to be explained.

Then I examined Shoemaker's proposal that there is a realization relation, namely c-realization, which obtains between the properties of coincident objects. Whether c-realization is a real relation hinges on whether there really are coincident objects. At any

rate, c-realization, as I argued, cannot be a fundamental realization relation, as it obtains, if it obtains at all, in virtue of the obtaining of a horizontal realization relation, such as s-realization. Given that s-realization is already a good candidate to play the realization-role, I used these considerations to neglect c-realization as a candidate to play the realization-role.

3.3 Conclusion

In this chapter, I discussed five relations that might be thought to be candidates to play the realization-role. These five relations are h-realization, d-realization, s-realization, m-realization and c-realization. After providing the formulations of these relations, and discussing the views that are associated with these relations, I gave my reasons to focus on s-realization and the subset view of realization in the remainder of this thesis. The following is a brief summary of what I said about these relations, and why I shall focus on s-realization and the subset view.

H-realization is the following horizontal relation:

> (*h-realization*) A property P h-realizes a property Q if and only if, (i) Q is the property of having a property that occupies a role R, and (ii) P is a property that occupies R.

H-realization fails to play the realization-role, because it does not accommodate the causal efficacy of the realized property. The causal role of the h-realized property is screened off by stipulation, as the property that h-realizes it, by definition, occupies the causal role of the h-realized property.

D-realization is the following horizontal relation:

> (*d-realization*) A property P d-realizes a property Q if and only if P is a determinate of Q.

As I showed, although d-realization plays the realization-role (because the necessitation of a d-realized property by a d-realizer is explainable, and the causal efficacy of the d-realized property is presumably not in jeopardy), a mental property is not a determinable property whose determinates are the physical properties that serve as its realizers. Because of this, d-realization is not a plausible candidate for the sake of formulating physicalism.

S-realization is the following horizontal relation:

> (*s-realization*) A property *P* s-realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*.

The (simplified version of the) subset view of realization is the view that the realization relation that physicalists should appeal to is s-realization. I argued that s-realization is a plausible candidate to play the realization-role. The subset view provides resources to explain how s-realized properties are metaphysically necessitated by their s-realizers. As I will argue in Chapter 5, once a certain view about the relationship between properties and their causal profiles is held, the metaphysical necessitation feature of s-realization can be explained in virtue of the proper subset relationship between the causal powers of an s-realized property and its s-realizers. Moreover, because of the inclusion of the causal powers of the s-realized property within the causal powers of its s-realizers, the causal efficacy of an s-realized property can be maintained. Finally, as I maintained, once the relationship between a property and its causal powers is understood properly, there are no obvious unanswerable objections to the view that a mental property, according to physicalism, has a proper subset of the causal powers of its physical realizers.

As I have explained in Section 3.2.3 above, I shall not focus on the two vertical realization relations that are introduced in the literature. These are m-realization and c-realization. M-realization is the following vertical relation:

> (*m-realization*) Property/relation instance(s) P_1-P_n, m-realize an instance of a property *Q*, in an individual *S*, if and only if *S* has the causal powers of *Q in virtue of* the causal powers of P_1-P_n that are conferred on the constituents of *S*, but not *vice versa*.

I argued that the existence of m-realization is compatible with, and in fact entails, the existence of a horizontal realization relation. And moreover, m-realization does not play the realization-role, as the in-virtue-of relation in terms of which it is formulated is yet to be explained.

C-realization is the following vertical relation:

> (*c-realization*) A property *P* of an individual *A* c-realizes a property *Q* of an individual *B* if and only if (i) *A* and *B* are coincident objects, (ii) *P* is a thin property;

(iii) *Q* is a thick property that entails a sortal property *S*; and (iii) the conjunctive property (*P & S*) s-realizes *Q*.

C-realization, as I explained, is not a fundamental realization relation, because it obtains, if it obtains at all, in virtue of the obtaining of s-realization, which is a horizontal realization relation.

Because of these considerations, in what follows, I will focus on s-realization and the subset view. Since the subset view, which is the theory of realization that I will focus on in the remainder of this thesis, takes realization to be ultimately a relation between the causal powers of properties, I will provide a comprehensive survey of the theories that explain the relationship between properties and their causal powers in the next chapter. This will be an important task for the sake of evaluating the subset view. As I will argue in Chapter 5, the subset view's plausibility hinges on the plausibility of certain theories about causal powers.

CHAPTER 4: REALIZATION AND CAUSAL POWERS, PART I

4.0 Introduction

In the previous chapter, I introduced several relations that are candidates to play the realization-role and I provided reasons to focus on the subset view of realization. In the previous chapter, I called the realization relation that the subset view postulates "s-realization". Since, I will be exclusively working on the subset view's account of realization in the remaining of this thesis, I will call this relation merely "realization".

Setting aside some technical and exegetical issues regarding different formulations of realization, the core claim of the defenders of the subset view is that a property *P* realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*. It can be seen that, on this view, realization is explained by means of appealing to a set-theoretical relationship between the *causal powers* of properties. Having already discussed the motivations for not allowing mental properties to have causal powers that their realizers do not have, we can now turn to an assessment of the subset view with respect to its theoretical commitments regarding the notion of causal powers. Although most of the discussion of the subset view is based on an understanding of causal powers according to which properties are "tightly" connected to the causal powers that they confer to their bearers, it is yet to be investigated how relevant certain theories of properties and causal powers are to the subset view. There are various ways of explaining how properties might be related to causal powers. My main task in this chapter is to lay out a variety of views regarding this relationship. I shall start with explaining what causal powers are.

Here is how I shall proceed. In Section 4.1, I will explain what philosophers mean by "causal powers" or "dispositions" and introduce a categorisation of different types of dispositions. In Section 4.2, I will introduce the distinction between dispositional and categorical *predicates*. In Section 4.3, I will give a summary of the debate on what is known as the *conditional analysis* of dispositions. In Section 4.4, I will provide the distinction between categorical and dispositional *properties*. In Section 4.5, I will discuss various views regarding the nature of properties with respect to the distinction between categorical and dispositional properties. Here, I will introduce *the causal thesis*, according to which properties are individuated by their causal profiles and have these profiles essentially. The remainder of Section 4.5 will include a survey of arguments for and against the causal thesis. Understanding what the causal thesis amounts to is important for

my purpose because I will argue in the next chapter that the causal thesis is highly relevant for the subset view.

4.1 Causal Powers/Dispositions

First, I shall start with a note on terminology: although there are some exceptions, "causal powers" and "dispositions" are used interchangeably in the literature. As we shall see, there are some types of dispositions that might not be appropriately called "powers". Apart from the discussion of that issue in 4.1.2 below, I will follow the common practice in the literature on powers and use these two terms interchangeably.[29]

If the subset view is true, the notion of causal powers is central to the metaphysics of realization, and hence to physicalism in philosophy of mind. But the notion of causal powers has been notorious, so to speak, because of the controversies surrounding it. There had been a tendency in metaphysics (perhaps until recently) to deny the philosophical substantiality of dispositions. For example, Hume announced powers to be "obscure and uncertain" (1748: Chapter VII). Goodman put dispositions alongside angels and devils (cited in Cross 2012). Quine called dispositions "pretty disreputable", and suggested that a science that invokes dispositions is "rotten to the core" (quoted in Crane 1996: 3). Mellor, referring to the dismissive trend in metaphysics, said that dispositions are, "as shameful in many eyes as pregnant spinsters used to be–ideally to be explained away, or entitled by a shotgun wedding to take the name of some decently real ... [non-dispositional] property" (1974: 157). But what might be the reason to think that dispositions are strange entities?

Crane identifies the source of the aforementioned discontent with dispositions as their reference to merely possible entities, which is associated with the idea that "an object can have a disposition without ever manifesting it" (Crane 1996: 3). When Goodman condemned dispositions as strange, he also said that

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[29] See Heil (2005) and Choi & Fara (2012) for explicit endorsements of this terminological choice.

the peculiarity of dispositional predicates is that they seem to be applied to things in virtue of possible rather than actual occurrences–and possible occurrences are … no more admissible as unexplained elements than are occult capacities" (quoted in ibid, emphasis added).

Since causal powers are central to the subset view of realization, the defenders of the subset view can be asked to provide an explanation of how these worries might be responded to. The defenders of the subset view should ideally show that there is nothing mysterious about causal powers. One of my aims in this chapter is to show that this is the case. We have a fairly good understanding of what philosophers mean when they talk about causal powers, and this is due to the fact that there is a substantial literature on how to analyse those ascriptions. This chapter should be read, in part, as a critical survey of this literature.

4.1.1 What are Dispositions?

Although there is no consensus in the literature regarding how to define causal powers or analyse dispositional ascriptions, there is some agreement that the causal powers of a thing have to do with the ways that thing behaves, or is likely to behave, or would behave, under certain circumstances. As Ellis points out, *if* we have information about the causal powers of an object, we have information about what that thing is likely to do, or how it is likely to react to certain circumstances (2002: 65). Note that this is a conditional, so whether such information is possible is not relevant to this tentative explanation of what a causal power is.

Causal powers of things have to do with what those things are capable of doing. Of course, explaining powers in terms of capabilities is not very helpful. Nevertheless, in order to motivate an intuitive understanding of what causal powers might be, introducing notions from the same family is, at least, harmless. To fix ideas, consider a variation of Shoemaker's (1980) example of a sharp knife. A sharp knife is capable of cutting things. Depending on other features of the sharp knife, the capabilities of the knife vary. When we talk about the causal powers of things, we talk about such capabilities.

There is an important question regarding the source, or the ground, of this capability. In virtue of what is the knife capable of cutting things? As we shall see below, the answers to this question (and related questions) vary. One explanation would be that the knife is capable of cutting things in virtue of having the property of *being apt to cut*. Such properties are usually called *dispositional properties*. For those who believe that there are

such properties, these are properties whose natures consist in disposing things to behave in certain ways under certain circumstances. Another explanation would be that the knife is capable of cutting things in virtue of having a *non-dispositional* property. It is common practice to call such properties *categorical properties.* Those who prefer this explanation usually take micro-structural properties to be categorical, and think that micro-structural properties ground such capacities, as long as the laws of nature permit. I will discuss these options, among others, in detail in Section 4.4 below. But it should suffice to show that, insofar as we are realist about properties (and we are, given that this thesis is about a *relation* between *properties*), the study of causal powers is tightly connected to the study of properties.

4.1.2 Varieties of Disposition

As I said above, the terms "causal powers" and "dispositions" are used interchangeably. Other notions which are in the same family these are (merely) "powers", "capacities", "liabilities", "propensities" and "causal features". There are subtle differences between these terms, and I will note those differences where appropriate.

I use "powers" and "causal powers" interchangeably.[30] It might be questioned whether "dispositions" and "powers" should be used interchangeably too because it might mask the differences between varieties of dispositions, some of which deserve the term "power" better than others. We can take the specification of the dispositions of a thing to refer to the ways in which it might behave under certain circumstances. And, we can take powers as *active* dispositions as opposed to *passive* dispositions. Ellis uses the term "liability" to refer to passive dispositions, which include dispositions like *fragility* (2002: 65). Perhaps it is ultimately a verbal point, but it sounds rather odd to take *fragility* to be a power. On the

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[30] Though, note that Lowe (2013) thinks that the human will is a non-causal power. I shall exclude the discussion of the human will from this thesis.

other hand, if we consider the example of a sharp knife, its disposition to cut could be less problematically taken as an active disposition, or a power. Ellis uses the term "capacity" to cover both active and passive dispositions. Since nothing that I discuss in this thesis hinges on this issue, unless I specify otherwise, I shall be continuous with most of the literature and use "powers", "causal powers" and "dispositions" interchangeably.

Propensities are also taken to be in the same family with dispositions. The specification of the propensities of an object is the specification of how it is likely to behave under certain circumstances too. However, propensities can be taken as a special class of dispositions in the sense that the causal processes that they specify are stochastic. Ellis gives the example of "the emission of an electron from the nucleus of an atom resulting in an increase by one if its atomic number" (ibid: 78). As the example goes, nothing determines when an electron will be emitted, and the best that we can do is to calculate the probability of such emissions. Whether paradigm examples of dispositions are ultimately different from propensities is another question that might be asked. Nothing that we discuss hinges on this point, so I shall move on.

A more substantial issue concerning types of dispositions is about the difference between *conditional* powers and powers *simpliciter* (Shoemaker 1980; 1998). Sometimes things have powers conditionally on having some properties. Let us go back to the original example of a sharp knife. Something that is knife-shaped has the power to cut the things it might cut conditionally on what it is made of. *If* it is made of wood, a knife-shaped thing can cut butter. *If* it is made of steel, it can cut rigid things too, such as wood. If something has the power to do something regardless of such conditions, then the power in question is a power *simpliciter*.

Another aspect in which dispositions differ is that some dispositions are *multi-track* whereas others are *single-track*. A fragile thing, for example a glass, is disposed to shatter, or, it typically shatters when it is struck. (The locution "typically" is required to avoid some problems that I shall mention in Section 4.3.) Following the common practice, let us take the striking as the *stimulus* (or the *triggering*) condition, and the shattering as the *manifestation* (or the *exercising*) of the disposition. There is a sense in which dispositions can be understood in terms of the pairings of stimulus conditions and manifestations. The distinction between multi-track and single-track dispositions is related to the multiplicity of pairings that are required for a proper understanding of a given disposition. A disposition is multi-track if its specification refers to multiple stimulus conditions that can be paired with

multiple manifestations (Bird 2007: 21-24). In this sense, *fragility* can be characterised as a multi-track disposition, because fragile things tend to break in different ways in response to different types of strikes.

The talk of causal powers, in some sense, refers to (actual or possible) causal processes. In virtue of having powers, things can do things in response to certain events. Or so would say those who believe that causal powers are real properties. In accordance with this, another distinction between kinds of causal powers concerns the things that are involved in these causal processes. Sometimes these causal processes involve multiple objects, and sometimes there is only one object that undergoes a causal process. Typically, in order for *fragility* to be exercised, we need at least two objects: the fragile object and the object that strikes it. On the other hand, the exercising of a radioactive substance's disposition to decay involves only one individual, namely that substance (Ellis 2002: 65).

Another distinction among dispositions concerns the persistence conditions of the bearers of those dispositions (Zimmermann 2009: 681-682). With respect to persistence conditions, causal powers can be *identity-entailing*, *identity-excluding* or *identity-neutral*. An identity-entailing disposition is a disposition such that having that disposition entails the persistence of the thing that has the disposition for some time after the disposition is manifested. A glass of hot water in a cold room will be disposed to get colder. Since in order to get colder, it has to persist at least until it gets cold, its disposition to become colder is an identity-entailing disposition. An identity-excluding disposition is a disposition such that having that disposition entails the annihilation of the thing that exercises the disposition after some time. A substance's disposition to explode or burn is such a disposition, because its manifestation necessitates the cessation of the existence of the substance (at least as a uniform substance). An identity-neutral disposition is a disposition such that having that disposition implies neither the persistence nor the annihilation of the thing that exercises the disposition. Disposition to increase the temperature of a room would be an example for identity-neutral dispositions.

Although they are not dispositions, *backward-looking causal features* and their contrast with causal powers should be mentioned here. In Shoemaker's terminology, (conditional) causal powers that properties confer on their bearers are called "forward-looking causal features". They are contrasted with backward-looking causal features, which are the features that specify the possible causes of the instantiation of a property. (I will talk about

the relevance, or perhaps the irrelevance, of backward-looking causal features to the issues related to realization in Chapter 5, Section 5.4.)

4.2 Dispositional and Categorical Predicates

As I already mentioned, it is common practice to understand causal powers in terms of how they might be exercised under certain circumstances. It has been a source of dispute as to how to make use of this stimulus-manifestation pairing when analysing a dispositional expression. In particular, it is debated whether dispositional expressions can be analysed in terms of conditional statements that specify the stimulus-manifestation pairing. If they can be analysed in this way, we can make a distinction between dispositional predicates and non-dispositional, or *categorical*, predicates and stipulate that dispositional predicates entail certain conditionals whereas categorical predicates do not. I shall elaborate on this shortly.

Before proceeding to the debate on analysing dispositional ascriptions, one issue that needs to be addressed is the distinction between *conventional* (or *covert*) and *canonical* (or *overt*) dispositional expressions (Bird 2007: 18-19). When I say that the lock on the main door is disposed to open when it is pushed by drunk teenagers, I overtly specify the stimulus condition and the manifestation of the disposition that I refer to. The dispositional predicate "is disposed to open when pushed by drunk teenagers" is a canonical dispositional predicate. On the other hand, when we say that a glass if fragile, we do not overtly specify the stimulus conditions and the manifestations of the disposition that we refer to. Rather, it is a linguistic convention that the things that typically break when they are struck are called "fragile". For this reason, predicates such as "is fragile" are conventional dispositional predicates.

It might be thought that conventional dispositional predicates could be translated to canonical dispositional predicates. Take a disposition *D* that is expressed by a dispositional predicate "is D". Take the typical stimulus condition and the manifestation of *D* as *S* and *M* respectively. We might substitute the conventional dispositional predicate "is D" with the canonical dispositional predicate "is disposed to M when S". However, as we shall see, when the stimulus-manifestation pairings are constructed in a simple way like this, there may be some problems.

Either because of their overt reference to stimulus-manifestation pairings or because of the conventions that determine their meanings, there is a sense in which dispositional

ascriptions entail some conditionals. As Shoemaker claims, "it belongs to the *meaning* ... of a ... [dispositional] predicate that *if* it is true of a thing *then* under certain circumstances the thing will undergo certain changes" (1980: 210, emphases added). To say that something is fragile is to say that, typically, if it is stuck, it breaks. This sort of entailment is not true for all predicates. Although it is true that drinking very cheap tonic wine disposes teenagers to break into residential buildings (and let us suppose that this holds with metaphysical necessity), the predicate "drinks very cheap tonic wine" does not entail "breaks into residential buildings". We can say that "drinks very cheap tonic wine" is a categorical predicate, and this difference with respect to entailing conditions marks the distinction between dispositional predicates and categorical predicates.

As I will discuss in the next section, there are a number of counterexamples to the view that dispositional predicates entail conditionals. Before moving to the debate regarding that issue, I should mention that even the idea that categorical predicates do not entail conditionals is disputed by some. One paradigmatic example for a categorical predicate is "has a mass". The ascription of having some mass to a body entails some conditionals about the body, such as the "subjunctive conditional stating what a body with that mass would do if it were to have that force exerted upon it" (Crane 1996: 5, emphasis deleted). Though, it might be disputed whether the latter is a part of the meaning of the term, so it is yet to be resolved if this is really a counterexample in the intended sense.

4.3 The Conditional Analysis Debate

The fact that there is a distinction between dispositional and categorical ascriptions in the sense that the former entail and the latter do not entail certain conditionals motivates the idea that one can analyse dispositional ascriptions in terms of conditional statements. This idea has provoked a debate the highlights of which will be introduced in this section.

Let us take the typical stimulus condition and manifestation of *fragility* as *striking* and *breaking* respectively. Accordingly, let us, as a first approximation, define *fragility* in terms of the following stimulus-manifestation pairing:

     (1) Something is fragile iff it breaks *if* it is struck.

One problem with (1) is that it renders anything fragile if it is never struck (Bird 2012: 733). So, we need to change the indicative conditional in the right side of (1) to a subjunctive conditional in the following way:

(2) Something is fragile iff it would break if it were struck.

Assuming that for every conventional dispositional predicate there is an equivalent canonical dispositional predicate, and given that we can form sentences like (2) for every canonical dispositional predicate, we could have a general rule for analysing all dispositional ascriptions:

(3) (For disposition *D* with stimulus condition *S* and manifestation *M*) Something is *D* iff it would *M* if it were *S*.

This is what is commonly known as *the simple conditional analysis* (SCA). Recall Shoemaker's comment that it is part of the meaning of a dispositional predicate that it entails certain conditionals. The right side of the biconditional in (3) is the type of conditional that dispositional predicates are typically thought to entail.

However, the SCA has been susceptible to some counterexamples, and this has led to the development of a more detailed analysis for dispositional predicates. Let us begin with the case of *finkish* dispositions. The term "finkish" is derived from Martin's (1994) counterexample to the SCA which involves an "electro-fink". Let us take "is live" (for an electrical wire) to be equivalent to the canonical disposition "is disposed to conduct electricity when touched by a conductor". Then, the SCA would dictate the following:

(4) A wire is live iff it would conduct electricity if it were touched by a conductor.

Now suppose that there is an electro-fink connected to a dead wire. The function of the electro-fink is as follows. It detects if the connected wire is touched by a conductor, and if it is touched, then it makes the wire live. Now consider the dead wire that the fink is connected to. Because of the fink, it would conduct electricity if it were touched by a conductor. But as a dead wire, as the SCA says, it would *not* conduct electricity if it were touched by a conductor. We can imagine that the fink does the reverse when it is connected to a live wire, making it dead when it is touched by a conductor. Because of the fink, it would not conduct electricity when touched by a conductor. However, since it is live, as the SCA entails, it is supposed to conduct electricity.

Variations of this counterexample are abundant. Lewis (1997: 147) asks us to imagine a sorcerer who wants to protect a fragile glass. The sorcerer watches over the glass to see if it will be struck, and he is determined to cast a spell to change the intrinsic properties of the

glass so that it will not be broken. Bird (2007: 26) gives an example of temperature–dependent fragility: consider a glass that is warm enough that it will not be broken when it struck; the glass is very rapidly cooled down in the instance of striking, so that it becomes fragile. "So it is true of this object that were it to be struck it would break, but at the instant of striking it is not fragile" (ibid).

The dispositions that can be lost or gained thanks to fink-like interferences (whereby the associated counterfactuals would still be true) are called finkish dispositions. The problem with finkish dispositions for the SCA is that, for these dispositions, the stimulus conditions can be same as the conditions in which these dispositions are lost.

It should be noted that there must be a time interval between the stimulus condition and the manifestation in order for the finkish interference to take place. Typically, that is how dispositions are manifested. Finks (and sorcerers) take advantage of this fact. For example, Martin's electro-fink needs time to change the disposition of the dead wire to live before the manifestation takes place. At the moment of the touching of the conductor, the wire is dead. Right after the contact, it becomes live thanks to the electro-fink. Lewis's sorcerer also has to wait, perhaps for a very short period of time, for the spell to be effective. It has to be effective before the manifestation of fragility takes place. Bird's nonfragile glass has to cool down to gain fragility before the effect of the striking disappears.

Responses to these objections vary. One issue that needs to be addressed is whether the conditional analysis should be abandoned or altered. Here, I will discuss ways of altering the conditional analysis.

Lewis (1997) proposed a reformed version of the conditional analysis that can deal with finks, sorcerers and so on. This reformed version involves the time element and a clause regarding the intrinsic properties that are responsible for having the disposition. Consider the following analysis of the predicate "is live".

> (5) A wire is live at time t *iff*, for some intrinsic property *F* that the wire has and for some time t* after t, *if* the wire were to be touched by a conductor at t and to retain having *F* until t*, *then F* and the touching of the conductor would cause the wire to conduct electricity.

Let us see how this conditional analysis can deal with the case of electro-fink. What electro-fink does is to change the intrinsic properties of the wire during the interval

between the touching of the conductor and the manifestation of the disposition. However, according to (5), in addition to the stimulus condition, there is a condition for retaining intrinsic properties, and it is because of this requirement that the electro-fink fails to be a counterexample to (5). Generalising from this case, we can define disposition *D* (with typical stimulus condition *S* and the typical manifestation *M*) as follows:

> (6) x has *D* at time t *iff*, for some property *F* that x has at t, and for some time t*
> after t, *if* x were to undergo *S* at t and to retain *F* until t*, *S* and *F* would cause x
> to *M*.

Something along the lines of (6) is known as *the reformed conditional analysis* (RCA). With the RCA, we can deal with electro-finks, sorcerers, temperature-dependent fragility and so on. Since both the sorcerer and the cooling-down system change the intrinsic properties of the glass, they fail to be counterexamples to the RCA. So, we can say that the RCA deals with finkish dispositions.

The cases against the SCA that we considered above were cases in which intrinsic properties of the things were changed due to interference so that although the things do not have certain dispositions, the subjunctive conditionals that are associated with those dispositions are true (or false when they do bear dispositions). Those cases fail to be counterexamples to the RCA. Nevertheless, there are some other cases that are counterexamples to the RCA.

Bird (2007: 29) gives the following counterexample. Suppose that we have an iron pot which is very robust, so not fragile, and that we have a very powerful bomb connected to the pot. The bomb's sensor can detect if the pot is struck, so that when it is struck, the bomb explodes. Nothing can resist the power of this explosion, so the iron pot breaks. Although we stipulated that the pot is not fragile, the pot is fragile according to the RCA, because it underwent the typical stimulus condition of fragility, namely striking, and it retained its intrinsic properties until the bomb's explosion. Such cases are called *mimicking* cases, because although the object does not have the disposition, the circumstances mimic the disposition by rendering the associated counterfactual true.

Lewis considers a case of mimicking too (1997: 145-146). Styrofoam dishes are paradigmatically not fragile. In fact, that this is one of the reasons for making a dish out of Styrofoam. Suppose that someone strikes a Styrofoam dish next to the Hater of Styrofoam. The Hater obviously hates the Styrofoam and has some anger management problems. As

soon as he hears the sound of Styrofoam, as a response to the sound he does everything to smash the Styrofoam dish into pieces. As stipulated, the dish is not fragile, yet the counterfactual associated with *fragility* is true for the dish. The dish undergoes the typical stimulus condition of *fragility* and retains its intrinsic properties until the Hater breaks it.

However, one might say, as Lewis (ibid) and Choi (2003) suggest, these cases of mimicking do not show that the RCA is false. All that they show is that what we take to be the *typical* stimulus conditions of *fragility* are not really the stimulus conditions of *fragility*. Choi says that the Styrofoam dish "has the disposition to break in response to being stuck; yet it is not fragile" (ibid p 184). This is the case because *fragility* is not the disposition to break when struck *simpliciter*. A more proper conditional analysis of *fragility* should exclude some non-standard cases of striking and non-standard cases of breakings from the analysis. I will come back to Choi's proposal at the end of this section.

The cases that we will consider now cause trouble for both the SCA and the RCA. Bird (1998; 2007) gives cases of what might be called *masking* or *antidote* cases. Instead of changing the intrinsic properties of the glass (as the Lewis's sorcerer does), suppose that we cover a fragile glass with some packaging material. Or we can imagine the sorcerer to cast a spell on the glass, not to change the intrinsic properties of the glass, but "to administer shock waves to the struck glass which precisely cancel out the shock of the original striking, hence saving the glass from destruction" (2007: 28). The packaging, the administration of anti-shock waves, and so on are masks, or antidotes, for *fragility*.

Let us see how this troubles the RCA. The masked glass is struck and it retains its intrinsic properties. However, it does not break, which suggests that the typical stimulus conditions of *fragility* and the glass's retaining of the intrinsic properties do not causally suffice for the breaking of the glass. From the RCA, it follows that the glass is not fragile. But we stipulated that it is fragile. Here, it might be objected that, as Choi (2003) says for the Styrofoam case, we do not have the appropriate stimulus condition for fragility. The appropriate stimulus conditions should exclude packaging materials, anti-shock waves administered by sorcerers and so on.

Having proposed a way of defending the RCA against mimicking and masking on Lewis's behalf, Choi (2003: 184) gives a counterexample to the RCA. Suppose that we have a fragile glass, and a time bomb nearby the glass. At time t, the glass is struck, and shortly after t, the time bomb explodes. The glass breaks shortly after the explosion. And let us suppose that the cause of the breaking is not the striking, but the time bomb. (For this,

assume for the sake of the argument that the explosion is so powerful that even a glass which is not fragile would break in response to it.) The glass is struck and it retains its intrinsic properties until the breaking. But the glass does not break as a response to the striking, because, as we stipulated, it breaks as a response to the explosion. So, the antecedent of the counterfactual in the RCA is true, but the consequent is false, which means that the counterfactual is false. The RCA suggests that the glass is not fragile, and this contradicts our stipulation.

It might be suggested that the above considerations do not show that a conditional analysis of dispositions is false, but we need more sophisticated analyses of dispositions. Let us consider the case of the time bomb again. Choi suggests that if the glass "were to be struck in the absence of the time bomb, then the striking would cause it to break through a certain direct and standard process" (ibid: 186). We have already seen that the alleged counterexamples might suggest that we should exclude things like finks, masks and mimickers from the stimulus conditions. Considering the case of the time bomb, we might also want to exclude some non-standard processes from the specification of the manifestation.

Generalising from these, we can say that, in order for a conditional analysis for dispositions to be true, one should specify the stimulus conditions and the manifestations of the dispositions carefully enough to exclude all sorts of non-standard cases. We can try an analysis for *fragility* as follows:

> (7) A glass is fragile at time t *iff*, for some property F that the glass has at t, and for some time t* after t, *if* the glass were struck at t in the absence of mimickers, masks, finks, pre-empters, etc., and to retain F until t*, the striking and F would jointly cause the glass to break.

If (7) is the right conditional for fragility, one lesson that can be taken from this discussion is that the translation of a conventional dispositional expression to a canonical one is not that easy. If something along the lines of (7) is correct, "x is fragile" is not synonymous with "x is disposed to break when struck". So, perhaps, unlike what Shoemaker (1980) suggests, it does not really belong to the meaning of "is fragile" that if something is fragile, then if it were struck it would break. But does it belong to the meaning of "is fragile" that right hand side of (7) is true? Arguably, it is not. Then, if (7) is not an analytical truth, the aforementioned distinction between (conventional) dispositional predicates and categorical predicates might vanish.

I said that if the notion of dispositions is central to a theory, that theory should say something explanatory about dispositions. This is a challenge, because there has been some discontent with the notion of dispositions, as they were deemed "obscure". Now we have seen that dispositional locutions are not really obscure, because they are somehow explainable in non-dispositional terms. Varieties of conditional analyses provide such explanations. Not every form of conditional analysis is successful, but the fact that there has been great effort to explain them by conditionals show that it is part of our understanding that dispositional ascriptions tell us about what is likely happen under certain circumstances. This brings us to where we started: information about the dispositions of a thing gives us information about how that thing is likely to behave.

4.4 Dispositional and Categorical Properties

In the previous section, I discussed the nature of dispositional ascriptions, the difference between conventional and canonical dispositional predicates, whether there is a semantically significant difference between dispositional and categorical predicates, and how to analyse dispositional locutions. Perhaps a metaphysically more interesting question is *in virtue of what* a dispositional ascription can be true. When an object is disposed to do something, in virtue of what is it disposed to do so?

By analysing the meaning of a dispositional ascription, it might not be possible to understand the nature of a disposition. For Ellis, "it is the business of natural science, not of semanticists, to discover and describe these natures" (2002: 78). It can be disputed whether natural science could reveal the nature of dispositions or not, but it is not controversial to suppose that if a dispositional ascription about something is true, it is true in virtue of the way that thing is. Even if a variant of a conditional analysis is true of dispositions, the associated counterfactuals (either simple or sophisticated) are true because of the properties of the objects that those ascriptions are about.

The remainder of this section will proceed on this assumption that when dispositional ascriptions about things are true, they are true because those things have certain properties. In other words, dispositional predicates designate properties in such a way that the instantiation of these properties make it true that things have those dispositions. The metaphysically interesting question is the following: What sorts of properties are designated by dispositional predicates in this way? As it might be predicted, similar to the distinction between dispositional and categorical predicates, there is a distinction between

dispositional properties and *categorical properties* (at least for those who believe that there can be both kinds of property). Reformulating the question, we might ask: Do dispositional predicates designate dispositional properties? Do they designate categorical properties?[31]

For those who believe that there are dispositional properties, dispositions *are* either dispositional properties or conjunctions of dispositional properties. And they can be truth-makers of dispositional ascriptions: when I truly say that a glass is fragile, the truth of the ascription is grounded in the fact that the glass is the bearer of a dispositional property.[32] For those who believe in dispositional properties, *fragility* would be a paradigmatic example for such a dispositional property. Such properties are individuated by their causal profiles, namely the specifications of their stimulus conditions and their manifestations. Moreover, they have their causal profiles essentially. Necessarily, if something is fragile, typically, it is disposed to break when struck. It may never be struck, or it may never break (either because it is not struck, or because of masks or mimickers), but it is disposed to break.

Before proceeding to the discussion of categorical properties, it should be noted that dispositional properties do not have to be *relational* properties. It might be tempting to think that since dispositional properties are individuated by their stimulus conditions and manifestations, they are relational in the sense that they are related to their stimulus conditions and manifestations. But sometimes (and most of the time) dispositions are not

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[31] Surely, if one acknowledges the existence of dispositional properties, it would be natural to take dispositional predicates to designate such properties. But it is logically consistent to acknowledge dispositional properties and yet still think that (at least some) dispositional predicates designate categorical properties.

[32] Of course, one can believe that there are dispositional properties but hold that the truthmakers of dispositional ascriptions are categorical properties. (See footnote 31 above.) I cannot think of any reason to hold such a view, so I shall omit the discussion of such a view.

manifested, either because the stimulus conditions do not take place or because they are masked, finked, etc. Then, taking dispositional properties as relations is, in effect, taking them as relations to mere *possibilia*. So, if one does not want to admit real relations to mere *possibilia*, then it seems to be the right thing to deny that all dispositional properties are relational properties.[33]

For those who believe that there are categorical properties, either all or some properties are categorical. I will elaborate on this difference below. But before moving on to that, what is meant by a categorical property should be clarified. Again, for those who believe that there are categorical properties, such properties are not individuated by their causal profiles (if they have causal profiles), and they do not have their causal profiles essentially (if they have causal profiles). They may dispose their bearers to behave in certain ways depending on background conditions and the laws of nature. Or, they may just not dispose their bearers in any way, in which case they would be epiphenomenal. Paradigm examples of categorical properties (for those who believe that there are categorical properties) are shape properties. Consider the property of *being spherical*. Lowe thinks that "what it is for an object to be spherical is simply for the object to have as its boundary a surface all the points of which are equidistant from a given point" (2010: 19). From this perspective, *being spherical* is not something that is to be understood in virtue of having some manifestations under certain stimulating conditions. Spherical things may have some typical dispositional features. A spherical thing is disposed to roll from a hill, leave a round impression on sand and so on. But for someone who thinks that *being spherical* is a categorical property, such causal features neither individuate it nor are essential to it.

Fragility is a paradigmatic example of a dispositional property, for those who believe that there are dispositional properties. *Being spherical* is a paradigmatic example of a categorical property, for those who believe that there are categorical properties. Obviously,

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[33] Heil (2003: 82) appeals to this argument to show that dispositional properties are not relational properties.

for someone who believes that all properties are categorical, any *real* property will be an example of a categorical property. Similarly, for someone who believes that all properties are dispositional, any *real* property will be an example for a dispositional property.

What I call "real" properties are "genuine" properties in Shoemaker's (1980) terminology, and such properties exclude mere-Cambridge properties. Mere-Cambridge properties are properties whose acquisition and loss result in mere-Cambridge changes. If at time t I have a property *P*, and at time t* after t, I cease to have *P*, then between t and t* I undergo a change, according to the Cambridge understanding of change. Fodor's (1988: 33) example of *being an H-particle* is a mere-Cambridge property in this sense: a particle is an H particle if and only if the coin that Fodor most recently tosses lands heads. When Fodor tosses tails, the particle changes a property; it is not an H-particle anymore. Such properties are rendered not genuine, because they make no difference in world. However, as Heil correctly observes, "causally idle properties would 'make a difference' to their possessors, just not a *causal* difference: such properties would have no effect on what their possessors do or would do" (2003: 78). This understanding of genuineness is built on the assumption, which is put into slogan form by Kim, that to be is to have (causal) powers (1993: 202).

"Real" may also be taken to refer to *sparse* properties as opposed to *abundant* properties. According to an abundant conception of properties, for every predicate, (paradoxical cases aside) there is a property that is picked out by that predicate. Those who do not believe in disjunctive properties, for example, condemn such properties as non-sparse. According to the abundant conception of properties, a red ball and a blue desk share the property of *being a red ball or a blue desk*, for example. On this conception, we might say that every set of possible things is the extension of a given property. There is a set of all red balls and all blue desks, and this set would be the extension of the property of *being a red ball or a blue desk*. But apart from being members of this set, there is (arguably) no interesting thing that is common to all members of this set, so it is plausible (at least to some) to assume that

being a red ball or a blue desk is not a real property.[34] According to a sparse conception of properties, only a proper subset of all properties is the set of real properties.

4.5 Theories of Properties and Powers

Now that we have a working understanding of what causal powers are, and that we are familiar with the distinction between dispositional and categorical properties, let us lay out a logical space for views regarding the nature of properties regarding these issues. For this, in 4.5.1, I will explain dispositionalism and categoricalism. In 4.5.2, I will introduce the causal thesis (for properties), which is entailed by dispositionalism. 4.5.2 will be crucial for my argument in the next chapter, where I will show that the defenders of the causal thesis is highly relevant for the success of the subset view of realization. In sections 4.5.3 and 4.5.4, I will provide a survey of arguments for and against the causal thesis respectively.

4.5.1 Dispositionalism and Categoricalism

Proceeding from the distinction between dispositional and categorical properties in the previous section, I will introduce several views regarding the nature of real properties. Before starting this, let us consider the possibility of a third kind of property, a property which is both categorical and dispositional at once. I consider such possibilities in order to accommodate Heil's (2003) view in the logical space.

The first distinction that I will make is between monism, dualism, and pluralism. Monist theories will say that there is only one type of property. Dualist theories will say that there

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[34] Armstrong argues that "disjunctive properties offend against the principle that a genuine property is identical in its different particulars. Suppose a has a property *P*, but lacks *Q* while b has *Q* but lacks *P*. It seems laughable to conclude that from these premises that a and b are identical in some respect. Yet both have the 'property' *P*, or *Q*" (1978: 20).

are two types of property. And pluralist theories will say that there are more than two types of property.

According to our distinction between three types of property, there are three types of monism. According to the first type of monism that we will consider, the only genuine properties are dispositional properties (Shoemaker 1980; 1998; Bird 2007). [35] I shall call this view *dispositionalism*. For a dispositionalist, when dispositional ascriptions are true about things, they are true because things have dispositional properties that the dispositional predicates designate. However, since on this view there are only dispositional properties, any ascription that is true would be true because things have dispositional properties.

Leaving the issue of causally inert and mere-Cambridge properties aside, for dispositionalists, the properties that are paradigmatically known to be categorical are to be explained away. The allegedly paradigmatic categorical properties, such as shape properties, are rendered dispositional according to dispositionalism. In Shoemaker's (1980) original account, properties are clusters of causal powers. *Being spherical* is, perhaps, not a simple disposition, yet it is a conjunction of several dispositions. So, the dispositionalist can think of *being spherical* as equivalent to a cluster of simpler dispositional properties, such as *being disposed to roll when pushed from a hill*, *being disposed to leave a round impression when located on sand* and so on. If the latter are not simple enough, they can be analysed into conjunctions of simpler dispositions.

According to the second type of monism about properties, all properties are categorical. This view is called *categoricalism*. Lewis (1986; 2009) and (Armstrong 1997; 1999) are

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[35] Shoemaker does not use the term "dispositional" for properties because he thinks that the dispositional-categorical distinction is a semantic distinction, in the sense that dispositional ascriptions conceptually entail certain conditionals whereas categorical ascriptions do not. This is merely a terminological preference.

the main references for categoricalism and other associated views. According to categoricalism, when dispositional ascriptions are true, they are true because of the categorical properties of things (and background conditions). On Armstrong's (1997) view, instantiating a categorical property on its own is not sufficient for something to have a disposition to do something. Certain laws of nature have to be true in order for a categorical property to make a dispositional ascription true. According to Lewis (1986; 2009), things are rather more complicated, because laws of nature also supervene on the array of categorical property instances. I will come to Lewis's account in Section 4.5.4 in more detail.

Alternatively, one might be tempted to present categoricalism as a reductive theory of dispositional properties. Accordingly, allegedly dispositional properties are reduced to, or identical with, categorical properties. Take *fragility* as a purported dispositional property. Saying that a glass is fragile is, in effect, saying that it has some categorical micro-structural property (or properties), and because of the instantiation of that property and the laws of nature, the glass is likely to break when it is struck. The problem with this way of presenting categoricalism is that the fragile behaviour of the micro-structural property is only *contingent*. If you change the laws of nature, the glass may not be fragile anymore. So identifying dispositional properties with categorical properties seems impossible unless one thinks that identity can be contingent.

According to the third type of monism, all properties are both dispositional and categorical at once. Although properties have double-sided natures on this view, it is appropriate to take this view as a monist view, because it says that there is only one type of property. Martin (1996; 1997) and Heil (2003; 2005) are typically cited as main sources of this view. Following Martin, Heil uses the term "qualitative" instead of "categorical", and says that all properties to be "powerful qualities". His main reason to think that properties have qualitative features in addition to dispositional ones is that a world without qualitative properties would be materially empty.

Dualist theories about properties say that properties can be divided into two types. Since we are considering a distinction between three types of property, namely categorical properties, dispositional properties and powerful qualities, we have three possible dualist views. According to the first one, there are dispositional properties and categorical properties. On the second view, there are dispositional properties and powerful qualities.

And on the third one, there are categorical properties and powerful qualities. I shall omit the discussion of the latter two, because I cannot think of any reason to hold such views.

Dualists say that both dispositional and categorical properties exist. There are yet two ways of being a dualist of this sort. According to one version, there is a supervenience relation between dispositional properties and categorical properties, in the sense that for an object to have a dispositional property, it has to instantiate some categorical property (or properties) that grounds that dispositional property. A seminal source for the defence of this view is Prior, Pargetter and Jackson (1982). They argue that, for a dispositional property to be a cause of an event, or in other words, for a disposition to be manifested, it needs to have a causal basis. By a causal basis, they mean "the property … of the object that … is the causally operative sufficient condition for the manifestation" (ibid: 251). The requirement for a causal basis comes from the observation that, if something is fragile, and if it breaks, there must be a causally sufficient antecedent for the breaking. (Note that a dispositionalist can respond to Prior, Pargetter, and Jackson, and identify the sufficient cause with the dispositional property of *being fragile*.) An interesting consequence of this account is that, at least as Prior, Pargetter, and Jackson argue, dispositional properties are epiphenomenal. They argue that once the existence of a categorical causal basis and the non-identity of categorical and dispositional properties are granted, (unless manifestations are systematically causally overdetermined by dispositional properties and their categorical bases), it follows, according to Prior, Pargetter, and Jackson, that the causal roles of dispositional properties are excluded.

Note that one can be a property dualist and believe that there are both dispositional and categorical properties, yet deny the grounding thesis that Prior, Pargetter and Jackson provide. Examples for this version are Place's (1996) and Elliss's (2002) views according to which all properties except spatial and temporal properties are dispositional. On Place's view, "the only things that are 'purely categorical' are the existence of the property bearer and the spatio-temporal relations between its parts and between it and other substances" (1996: 22). Among categorical properties, Place adds properties regarding the origins of things too (ibid: 27).

And finally, one can be a pluralist about properties, in which case one would take dispositional properties, categorical properties and powerful qualities to be real and distinct.

In the next section, I will introduce the causal thesis which is entailed by dispositionalism.

4.5.2 The Causal Thesis (for Properties)

If dispositionalism is true, in other words, if all properties are dispositional properties, then what I call *the causal thesis* is true. The causal thesis is the conjunction of two theses.

(C1) Properties are *individuated* by their causal profiles;

(C2) Properties have their causal profiles *essentially*.

The first of these theses, (C1), provides an identity criterion for properties. It says that, for all properties *F* and *G*, if *F* and *G* have the same causal profile, then *F* is identical with *G*. If two properties confer the same causal powers to their bearers under same circumstances, we do not have two properties, but we have only one property. Suppose that we discover a property that behaves exactly like *charge*, and call it *marge*. (C1) dictates that *marge* is *charge*.

According to the second thesis, (C2), the causal profile of a property is essential to it. To put it more formally, for all properties *F* and *G* and for all worlds w_1 and w_2, if *F* in w_1 and *G* in w_2 have different causal profiles, then *F* is not identical with *G*. In effect, (C2) fixes the causal profiles of any property to all possible worlds in which they can be instantiated. Since the causal profile of *charge* is such that like charges repel (but not attract), according to (C2), it is impossible for like charges to attract.

There are different ways in which (C2) might be true.[36] On the one hand, it might be the case that the set of all possible worlds are exhausted by nomologically possible worlds. In that case there would be no worlds whose laws of nature are different from the laws of nature in the actual world. Since all worlds would be governed by the same laws of nature, the causal profiles of properties would be fixed by the same laws across all possible worlds. On the other hand, it might be allowed that there are worlds which are nomologically

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[36] See Schaffer (2005) for a disambiguation.

different from the actual world, but some properties would exist in only some worlds. In that case, with the change of laws, some properties would fail to exist in some worlds. So, if a property *P* in a world *w* is not allowed by the laws of nature in *w* to do the things that *charge* in the actual world does, then *P* fails to be identical with *charge*. In what follows, when I talk about (C2), I will be neutral between these different readings of (C2).

(C2) is closely connected to a specific understanding of laws of nature. From this perspective, (C2) can be ultimately seen as a thesis about the relationship between properties and laws of nature. According to this interpretation, one of the roles of laws of nature is to govern causal relations, and laws hold with metaphysical necessity. So, on this view, if a law L governs the behaviours of a property *P*, it does so with metaphysical necessity: since it is metaphysically necessary that L is true, *P* cannot have different causal profiles in different worlds.

It is common practice to motivate (C2) from this understanding of laws. Shoemaker (1980; 1998), Swoyer (1982) and Bird (2001; 2007) are examples of those who provide such accounts. However, there is (at least) one exception: Mumford (2006) argues that something along the lines of (C2) is true, but that it gives us reasons to think that laws of nature should be dispensed with. My reconstruction of his argument is as follows: the central role of laws of nature is to govern events; according to (something along the lines of) (C2), the modal nature of properties governs events; in other words, (C2) gives the role of governing to properties; so, if (C2) is true, laws of nature are redundant. Note that Mumford's conclusion can be resisted if we think that there is more to laws then governing events, or if we think that the governing role could be occupied by both properties and laws.

There two things to note about the relationship between (C1), (C2) and dispositionalism. *First*, there is a sense in which dispositionalism might be false without rendering the causal thesis false. It is possible that some properties are not dispositions, yet for some reason, (C1) and (C2) are true of them. Regarding (C1), perhaps, in addition to their causal profiles, there are other dimensions in which properties are individuated. It would be true that having a certain causal profile *C* is sufficient for being the property *Q*, but *C* is not the only thing that individuates *Q*. The following analogy might be helpful. Think of Neil and his son Finn. Since we are not entitled to have more than one biological father, being the father of Finn individuates Neil. Now consider, Aoife, Neil's daughter. What we said for Finn is also true for Aoife: being the father of Aoife also individuates Neil. By analogy, although

properties might be individuated by their causal profiles, there could be more to them than their causal profiles.

Second, as far as I can see, neither (C1) nor (C2) entails the other. (C2) does not entail (C1), as entities with the same essential properties may fail to be identical. It appears to me that (C1) does not entail (C2) either. Going back to the analogy in the last paragraph, it is true that being the father of Finn individuates Neil, however, it is not an essential property of Neil to be the father of Finn. He was Neil before Finn was born, and (assuming trans-world identity for individuals) he is Neil in possible worlds in which he exists but Finn does not. By analogy, properties might be individuated by causal profiles, so whenever a property *P* has causal profile that individuates property *Q*, *P* is identical with *Q*, but *P* can cease to have this causal profile.[37]

As far as I can see, (C1) and (C2) motivate each other, and they jointly motivate dispositionalism. However, motivation is one thing, entailment is another. For this reason, during my discussion of the causal thesis and the subset view's relationship to it, I will examine (C1) and (C2) in separation as much as it is possible to do so.

4.5.3 Arguments for the Causal Thesis

Now that we have identified the two theses that jointly constitute the causal thesis, let us discuss some reasons that have been given in order to motivate these two theses. The considerations in favour of the causal thesis can be divided into four groups: *arguments*

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[37] Hawthorne (2001: 377) observes the following trivial entailment of (C2) from (C1). Take (C1) as a sufficiency thesis according to which having a given causal profile *A* is sufficient for being the property *P*. Take (C2) as a necessity thesis according to which having a given causal profile *B* is necessary for being *P*. Now think of other causal profiles *C* and *D*, each of which individuates *P*. Then we can identify *B* with the disjunction of *A*, *C* and *D*, in which case *B* would be both sufficient and necessary for being *P*. Apart from taking the individuative and essential causal profiles to be disjunctions of causal profiles, it seems, (C1) does not entail (C2)

from knowledge, *arguments from science*, *the argument from anti-quidditism*, and *the bad-intuition argument*.

4.5.3.1 Arguments from Knowledge

The most commonly mentioned motivation for the causal thesis is the observation that rejecting (C1) or (C2) is not compatible with what we take ourselves to know (or have good reasons to believe). In favour of both (C1) and (C2), without distinguishing between them explicitly, Swoyer says that

> if we subtract the active and passive ... powers that a property bestows upon its instances, whatever is left would not enable it to affect our sensory apparatus, measuring instruments, or anything else (1982: 214).

Swoyer's concern is that if we rule out the possibility of causally interacting with properties through sensory experience or scientific means of (perhaps meditated) observation, we can never take ourselves to acquire knowledge about properties.

Shoemaker (1980: 237) argues for each thesis separately. As he notes, if (C1) were false, different properties could have same causal profiles, so from the fact that an object exhibits the same behavioural patterns, we could never know (or believe with good reasons) that it retains its properties. Similarly, if (C2) were false, properties could change their causal profiles, so from the fact that an object changes its behavioural patterns radically, we could never know (or believe with good reasons) that it changes its properties.

In order to make these arguments more conclusive, we need to assume that we know (or have good reasons to believe) certain facts about things in the world and their properties. As it stands, Shoemaker's and Swoyer's implicit assumption is that the costs of scepticism about the properties (of the things that we observe) is too much to accept. Bird, on the other hand, is more explicit about this rather wishful approach; he says that "we do not *want* our metaphysics of properties to condemn us to the necessary ignorance of them" (2005: 453, emphasis added).

Though, Shoemaker does more than just wanting that we have such knowledge. Regarding (C1), he writes:

> if there are sets of properties whose members are identical with respect to their causal features, we necessarily lack the resources for referring to particular members of these sets. . . So if there are such properties, they don't fall within the extension of our term 'property'. Which seems to imply that if there are

> such properties, they aren't properties; which seems to imply that there are no
> such properties (Shoemaker 1998: 66).

The success of this argument depends on the truth of Shoemaker's claim that the term "property" denotes what Shoemaker's theory of properties takes it to denote. But at any rate, this argument seems resistible: one might question Shoemaker's move from the claim that one does not have singular reference to properties to the claim that such things would not be properties. Therefore, this argument does not seem to be successful. In general, the epistemic arguments for the causal thesis fail to be persuasive.

4.5.3.2 Arguments from Science

Sometimes the causal thesis is motivated by some scientific concerns. The gist of this approach is that scientific explanations invoke actual or possible causal relations, so the investigation of scientifically acceptable properties should be about their causal features. Blackburn says that "just as the molecular theory gives us only things with dispositions, so any conceivable improvement in science will give us only a better pattern of dispositions" (1990: 62). Esfeld and Sachse (2011, Chapter 2) argue that physical explanations are causal explanations in nature, so properties that physics invoke are causal properties.

Let us try to identify scientific arguments for (C1) and (C2) individually. In defence of something along the lines of (C1), Ellis (2002) argues that the nature of scientific classification requires that we ought to explain similarity by the similarity of dispositional patterns:

> [e]lectrons have something in common in virtue of which they have the same
> causal power to generate electromagnetic fields. ... The things classified
> together as being of the same kind are so classified because they have the same
> or similar causal powers (ibid: 67).

Since, the truth of (C2) partially depends on the viability of some commitments regarding laws of nature, showing that (at least some) laws of nature are metaphysically necessary can provide reasons to believe that (C2) is true. Bird (2001) provides such an argument from a scientific point of view. In summary, he argues that scientific explanations regarding the nature of water and salt molecules and Coulomb's law demonstrate that it metaphysically necessary that salt dissolves in water. (Coulomb's law is a law that explains electrostatic attraction.) Let us call the law that salt dissolves in water L.

Bird's argument goes as follows. Let us assume, for *reductio*, that L is contingent. For L to be contingent, there must be a world in which L is false. Call this world *w*. Note that in *w*, salt and water must exist, otherwise L would be vacuously true. (If there were no salt molecules in *w*, it would be true that *all* salt molecules dissolve in water.) So far, *w* is a world in which there is salt and water, and L is false. Then, Bird argues that for L to be false, Coulomb's law must be false too. (For the sake of argument, Bird assumes that Coulomb's law is contingent too). But, why does he think that Coulomb's law entails L? He argues as follows:

> [i]t is the polar nature of the molecules that make up water that enables it to dissolve sodium chloride ... [T]he process of dissolving is ... entirely electrostatic in character. The force of electrostatic attraction between ions and dipoles, as between any charged objects, is just the force governed by Coulomb's law. Hence, if there were a world in which salt failed to dissolve in water, that would have to be a world in which Coulomb's law is false (ibid: 269).

After the observation that Coulomb's law entails L, we can describe *w* again: in *w*, salt and water molecules exist, L is false, and Coulomb's law is false. Now, Bird's crucial step is to claim that Coulomb's law is necessitated by the existence of water molecules.

> What makes a water molecule a molecule is not merely that there is an oxygen atom neighboured by two hydrogen atoms, but that these neighbouring atoms are chemically bonded to one another in a certain way. So the chemical bonding found in water is an essential feature of it, and any world in which there is water is a world in which there exists that kind of bonding (ibid: 270).

And it is Coulomb's law that explains this bonding. In fact, Bird says that the same holds for the relationship between the existence of salt molecules and Coulomb's law too.

> The ionic character of salt is essential - any world in which there is salt is a world in which there exists an ionic bond. An ionic bond is, by definition, a bond that exists in virtue of the electrostatic attraction between ions. And electrostatic attraction is, necessarily, the force that exists between charged objects in virtue of Coulomb's law. Hence a world in which there is salt is a world in which Coulomb's law is true (ibid).

With the last two observations, we can describe *w* again: in *w*, salt and water molecules exist, L is false, *Coulomb's law is false and Coulomb's law is true*. With the demonstration of this contradiction, the *reductio* is complete: there is no world in which L is false, which means that L is metaphysically necessary.

Although it is not my aim to defend or reject either (C1) or (C2), I should mention that Bird's argument for (C2) is not persuasive. To begin with, it is only an argument for the necessity of one law, namely L. So, Bird's aim can be seen as motivating (C2) by providing a case study. But even so, this case study about the alleged necessity of L is problematic. Bird's argument invokes at least three controversial and objectionable claims. First, he says that it "is the polar nature of the molecules that make up water that enables it to dissolve sodium chloride" (ibid: 269). However, why should we disallow that, in *w*, not the polar nature of the molecules, but something entirely different grounds dissolving? Even if the polar nature of molecules is necessary, why should we assume that only Coulomb's law can ground this fact? Second, he argues that "the chemical bonding found in water is an essential feature of it" (ibid: 270), and that this bonding is explained by Coulomb's law. And third, he argues that the same is true for the ionic character of salt. For these latter two points, Bird follows Kripke (1980) in holding that the properties of nomic substances are essential to them. However, as Psillos (2002) observes, Kripke's account does not say that *all* properties of these substances are essential. Some of these properties may be contingent. So, it can be said in response to Bird that the chemical bonding of water and the ionic character of salt may be only contingent. Therefore, there does not seem to be any conclusive argument from science for the causal thesis.

4.5.3.3 The Argument from Anti-quidditism

The argument from anti-quidditism, variations of which have been explicitly or implicitly proposed, has the following structure: if (C1) is false, *quidditism* is true; quidditism is false (or, we do not want quidditism to be true); therefore, the causal thesis is true (or, we do not want the causal thesis to be false).

Quidditism is the thesis that properties are individuated by their *inner natures*, where this inner nature cannot be specified by a causal profile, or anything else other than the *suchness* of the property. To understand quidditism, we should explain what a *quidditistic difference* is. Two things, x and y are quidditistically different just in case x and y are different, and nothing constitutes their difference apart from the fact they are different. We can call such facts *quidditistic facts*. According to quidditism, distinctness of properties is constituted by quidditistic facts. Similarly, their identities are constituted by quidditistic facts. Relating it to a version of the causal thesis, Black defines quidditism as the thesis that

> nothing constitutes the fact that a certain quality playing a certain nomological [or causal] role in that world is identical with a certain quality playing a different role in ours; they just are the same quality, and that's all that can be said (2000: 92).

So, quidditism is the rejection of (C1), as (C1) could be read as the thesis that for all properties *F* and *G*, and for all causal profiles *C*, the fact that *F* and *G* both have *C* constitutes the fact that *F* is identical with *G*.

Quidditism is usually taken to be the analogue of *haecceitism* for properties. Haecceitism is a view about individuals, not properties. According to haecceitism, an individual A in world w_1 could be distinct from an individual in w_2, although A and B share all of their properties. In other words, the indiscernibility of two individuals in different worlds does not entail their identity. Haecceitism is commonly taken to be a counterintuitive view, at least for those who believe that the trans-world identity of individuals is possible.

Since quidditism rejects the causal thesis, those who think that quidditism is counterintuitive might motivate the causal thesis from this point of view. To some, there are some reasons to be uncomfortable with quidditism. First, its similarity to haecceitism is found problematic (for those who find haecceitism problematic). Those who think that indiscernibility of individuals in different worlds entails their identity might think that an analogue of it should be true for properties. Second, it is thought that quidditism entails "distinctions without differences" (Black 2000: 94). And if there is no principled reason to make distinctions, one should not make them. Or, so the objection goes.

It should be noted that the opponents of the causal thesis (categoricalists, for example) ardently hold quidditism (Armstrong 1997; Lewis 2009), so the argument from anti-quidditism cannot be persuasive for them. As we shall see in the next section, Lewis (2009) argues for quidditism and its supposedly counterintuitive implications. Moreover, Dustin Locke (2012) argues that there is nothing counterintuitive about quidditism insofar as it is understood as merely a thesis for numerical identity of properties. According to Locke, whereas two properties can be qualitatively identical in having same causal features, they may yet be numerically distinct. Therefore, it should be concluded that no version of the argument from anti-quidditism makes a persuasive case for causal thesis.

4.5.3.4 The Bad-Intuition Argument

The final case for the causal thesis that I will consider could be explained very briefly as follows: opponents of the causal thesis are misled into thinking that properties are not individuated by their causal profiles and that properties do not have these profiles necessarily, because these philosophers have bad modal intuitions. Consider the following analogy. Although water is H_2O, one might have the wrong intuition that water's molecular structure could have been XYZ. Similarly, although the causal profile of electric charge is such that like charges repel, one might have the wrong intuition that like charges could attract. Or one might have the wrong intuition that the causal roles of mass and charge could have been swapped. As Bird notes, such conceptions do not yield new possibilities: the world in which mass does what charge does in the actual world and *vice versa* "is just the actual world plus a decision to swap the names 'electrical charge' and 'mass'" (2005: 450).

I do not believe that this argument is persuasive. First, it seems to be doing nothing more than favouring one's intuitions over the intuitions of others. But, second, the argument is resistible because one can either dispute the apparent contingency of water's coextension with H_2O, or accept this apparent contingency but reject the analogy.

Having introduced a number of arguments for the causal thesis, I concluded after each section that no conclusive case for the causal thesis has been made. Next, I shall introduce the arguments against the causal thesis.

4.5.4 Arguments against the Causal Thesis

Now, let us consider reasons to reject (C1) and (C2). The first group of considerations against the causal thesis that I will discuss are motivated by the nature of dispositions: these are *arguments against dispositions*. The second group will take the nature of laws of nature to suggest that the causal thesis is false: these are *arguments from contingent laws*. And finally, we will consider Lewis's endorsement of quidditism and its allegedly uncomfortable consequences: this is *the "so-what" argument*.

4.5.4.1 Arguments against Dispositions

The first argument against the causal thesis that we will consider is by Armstrong (1997, Chapter 5; 1999). Armstrong thinks that the individuation of properties by their causal

powers requires the individuation of them partly by the manifestations of those powers. However, most of the manifestations of the causal powers that properties confer to their bearers are never actualised. A fragile glass can be fragile although it might never be broken (because it might never be struck). Armstrong thinks that this is a form of *Meinongianism*, named after Meinong who permitted possible-but-not-actual entities to his ontology. Although this is not a knockdown argument against (C1), Armstrong thinks that this is a reason to be unsatisfied with (C1).

This argument echoes the quotations that I introduced in the beginning of Section 4.1 above to explain discontent with the notion of dispositions. The counterfactual nature of dispositions seems problematic to some. Armstrong (1996: 15-16) thinks that if some properties are dispositional, then dispositional ascriptions are true in virtue of instantiation of these dispositional properties; but this entails a wrong understanding of truthmaking according to which something about the actual world is true because things about non-actual possible worlds are true. This makes a counterfactual state of affairs a part of the actual world. If Armstrong is right that no proposition can be true in virtue of a non-actual state of affairs, then grounding dispositions in their possible manifestations would be a bad strategy. However, an argument needs to be given why this is the correct understanding of truthmaking. So, I do not think that this is a conclusive argument against dispositions.

The next argument that we will consider is an argument against dispositionalism, according to which all properties are dispositional. This argument is known as the *always-packing-never-travelling objection*. Armstrong introduces it as follows:

> [c]an it be that everything is potency, and act is the mere shifting around of potencies? … Given a purely Dispositionalist account of properties, particulars would seem to be always re-packing their bags as they change their properties, yet never taking a journey from potency to act. For 'act', on this view, is no more than a different potency (1997: 80).

The objection involves a beautiful metaphor, but the metaphor needs unpacking. Here is how I understand it: if every property is a disposition, then the stimulus conditions of these dispositions are instantiations of dispositions too; the stimulus conditions of these stimulus conditions are dispositions too, and *ad infinitum*; so, the stimulus conditions of a disposition can never be actualised; then, nothing ever happens.

There is a possible response to the always-packing-never-travelling objection: that all properties are dispositions does not mean that no manifestation is ever actualised. If the

stimulus condition of a disposition D_2 is itself the instantiation of a disposition D_1, once D_1 is instantiated, even if it is not manifested, D_2 can be manifested as a response to the instantiation of D_1. So, things could happen. Following the metaphor, particulars could travel as a response to other particulars' packing their bags. Therefore, if my interpretation of Armstrong's metaphor is correct, then the always-packing-never-travelling objection can be resisted.

4.5.4.2 Arguments from Contingent Laws

Another objection that is commonly given against the causal thesis is that it is not compatible with some of the most commonly shared views about laws of nature. Here, I will discuss two views of laws: *the relation view* and *the Humean view*. What is common to these views is that both take laws of nature to be contingently true. If laws of nature are contingent, and same properties can be instantiated in worlds with different laws, (C2) is rendered false because different laws could hold in different worlds, and properties could be causally related to each other in ways different than they are in the actual world.

The relation view is attributed to Dretske (1977), Tooley (1977) and Armstrong (1983: Chapter 6; 1989 Chapter 7; 1997, Chapter 15). Here I shall take Armstrong's account to be the representative of this view. According to Armstrong, laws are relations between properties in the following sense. Let us suppose that it is a law that all Fs are Gs, and let us take F and G to denote properties. For it to be a law that every F is also a G, there must be a relation between the properties that F and G denote such that having the former lawfully necessitates having the latter. The relation that relates these properties is symbolised as "$N(F,G)$". Note that if we take properties and relations as universals, N is rendered a higher-order universal, a universal relating two universals.

Armstrong thinks that we need a nomic necessitation relation to explain laws in order to explain the intuition that laws *govern* some states of affairs. A law L is not merely a statement that expresses that all Fs are Gs. If it were, we would not have had the resources to distinguish between mere regularities and lawful regularities. This claim is motivated by the intuition that only some contingent truths are lawful. (This feature of the relation view also marks its difference from the Humean view that I will discuss shortly. Whereas the relation view gives laws the role of governing, the Humean view takes laws to be a special class of regularities.)

What is crucial about the relation view regarding the discussion of the causal thesis is the modal status of these nomic necessitation relations. Most lawful truths are taken to be a special class of *contingent* truths.[38] So, the relation view takes this nomic necessitation relation *N* that obtains between properties that *F* and *G* denote as a contingent relation. At first, it might sound puzzling to take a necessitation relation to be contingent. However, although it is contingently true (if it is true) that *N* is a law, in any world in which *N* is a law, *F* (metaphysically) necessitates *G*. In other words, it is contingent that *N* is a law, but *necessarily*, if *N* is a law and if something is *F*, then it is *G*.[39]

That laws of nature are contingent in this view is central for the rejection of the causal thesis. It seems that Armstrong wants the relation view to be consistent with the commonly held view that laws of nature are contingent. But why is it commonly believed that laws of nature are contingent? One reason might be this: it is conceivable that salt does not dissolve in water and that like charges attract, so it must also be possible for salt not to dissolve in water and for like charges to attract. However, it should be noted that this would not convince the defender of the causal thesis, because she can argue that such conceivability scenarios result from having bad modal intuitions.

It is also true that, unlike laws of logic, laws of nature are empirically discovered. This suggests that true lawful statements are knowable *a posteriori*, not *a priori*. So, it might be said that the *a posteriori* nature of lawful statements motivate the idea that laws of nature are only contingent. However, it should be noted that there is an immediate response to this. As Kripke (1980) has convinced nearly everyone, not all *a posteriori* truths are contingent. It is known *a posteriori* that water is H_2O, nevertheless water is *necessarily* H_2O. But as a

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[38] Lawful truths of logic are not contingent, but they are not laws of *nature* anyway.

[39] When the law in question is probabilistic, the law is still a necessitation relation, with the only difference that, instead of necessitating being *G simpliciter*, the law *N* and having *F* necessitate a certain objective probability of having *G* (Armstrong 1989: 100)

response to this Kripkean point, Schaffer (2004) argues that using the Kripkean view for the necessity of laws is not appropriate. Kripke's water example is an example about *identity*, namely the identity of water and H_2O. The fact that identity relations are necessary goes without saying. But lawful relations are different from identity relations. Schaffer maintains that "any conception of water being XYZ can only be an illusion. But the relation between [e.g.,] charge and Coulomb's law is *governance rather than identity*, and hence no comparable compulsion to necessity exists" (ibid: 218, emphasis added).

Unlike the relation view, on the Humean view, laws are a special class of regularities, and they do not govern events. Instead, laws supervene on events. But, like the relation view, the Humean view takes laws to be contingent. The defenders of the Humean view include David Lewis (1973 1986; 1994; 2009), Barry Loewer (1996), Helen Beebee (2006). Here, I shall take Lewis's view as the representative of the Humean view.

The Humean view is based on Lewis's thesis of *Humean Supervenience*. This thesis can be explained by the following classic passage from Lewis:

> [Humean Supervenience] is the doctrine that all there is to the world is a vast mosaic of local matters of particular fact, just one little thing and then another. … We have geometry: a system of external relations of spatio-temporal distance between points. Maybe points of spacetime itself, maybe point-sized bits of matter or aether or fields, maybe both. And at those points we have local qualities: perfectly natural *intrinsic* properties which need nothing bigger than a point at which to be instantiated. For short: we have an arrangement of *qualities*. And that is all. There is no difference without difference in the arrangement of qualities. All else supervenes on that (1986, ix-x, emphasis added).

Before moving to the discussion of the above quote in relation to the Humean View of Laws, one thing about this quote should be noted: the structure allegedly supervenes on *intrinsic* properties, or *qualities*. Intrinsic qualities, according to Lewis, are categorical properties. To someone who argues against the causal thesis from the thesis of Humean Supervenience, it would be a fair objection that their argument assumes the truth of categoricalism. So, let us take the Humean view (and its endorsement of the thesis of Humean Supervenience) as an account of laws of nature, formulated and defended independently on the discussion of the causal thesis. This particular argument from the contingent laws against the causal thesis would have the following structure: (i) we have good reasons to think that the Humean view is true; (ii) the Humean view entails the falsity of the causal thesis; (iii) therefore, we have good reasons to think that the causal thesis is false.

The thesis of Humean Supervenience says that, for every world, the distribution of qualities, namely the arrangement of particulars with respect to their properties and their relations is fundamental. Anything that is true in each world is true because of this fundamental distribution of particulars. This will be true for laws of nature too. Moreover, this will render laws of nature contingent, as I will explain below.

For the thesis of Humean Supervenience to render laws of nature contingent, we need to invoke something along the lines of *the combinatorial principle of possibility*. According to this principle, every *possible* recombination of the distribution of particulars is a different possible world. As Lewis suggests, we

> can take apart the distinct elements of a possibility and rearrange them. We can remove some of them altogether. We can reduplicate some or all of them. We can replace an element of one possibility with an element of another (2009: 208).

Most importantly, this method of recombination is as liberal as it gets, and it is because "there is no necessary connection between *distinct* existences" (ibid, emphasis added). The latter statement is what is commonly known as *Hume's dictum*.[40] (What counts as distinct and what counts as non-distinct is disputable. "Distinctness", on one interpretation, is more than "non-identity". Wholes and their parts are non-identical, but they are not wholly distinct. The parts of a whole cannot be separated from the object without resulting in a change in the whole. So, there are necessary connections between parts and wholes.)

When the combinatorial principle of possibility is combined with Hume's dictum, it follows that, in order to have a different possible world, we can change the distribution of any quality in a world as long as it is not bound by non-distinct entities. While the alteration of an electron does not necessarily result in the alteration of another electron, the

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[40] David Hume's own words for the dictum are as follows: "There is no object, which implies the existence of any other if we consider these objects in themselves" (as quoted in Wilson, 2010).

alteration of one part of an object may result in the alteration the whole. Now, recall that, as the thesis of Humean Supervenience says, in a world, everything, including each law, supervenes on the distribution of particulars. So, for each pair of possible worlds each of which has a sufficiently different distribution of particulars from the other, there are different sets of laws of nature. Given that laws of nature could change from world to world, they are contingent. And if they are contingent, (C2) cannot be true. (It should also be noted that, the endorsement of Hume's dictum is a rejection of (C2). Since there are no necessary connections between distinct existences, two distinct electrons with like charges could have attracted each other without thereby changing their charges.)[41]

The set of arguments against the causal thesis that we considered in this section rely on the stipulation that laws of nature are contingent. In order to have a persuasive case against the causal thesis, it needs to be established that laws of nature are contingent. I discussed two theories of laws that are supposed to support this conclusion. I believe that the one that I attributed to Armstrong could be resisted, as nothing in the core of that view rules out the possibility that the relations that laws are identified with are necessary connections. The relation view could well take the nomic necessitation relation as a metaphysical necessitation relation. For example, Swoyer (1982) thinks that the relation view is accurate

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[41] Although this short explanation is sufficient to explain why someone who holds this view would not subscribe to the causal thesis, as it stands, it is not a complete explanation of the Humean view as Lewis and others hold it. My discussion of the Humean view allows for an interpretation according to which laws are regularities. However, although it is true that laws are regularities, according to Lewis, not every regularity is a lawful regularity. Lewis takes laws to be the true statements of the best deductive system for a given world. A deductive system is the set of theorems that are derived from a set of axioms. Each different set of axioms yields a different deductive system, because, from different axioms, different theorems follow. Some deductive systems are more precise than others, because they have more true axioms and theorems. And some deductive systems are simpler than others, because they are derived from fewer axioms. The best deductive system is obtained by having the optimal combination of precision and simplicity.

in essence, but he thinks that the modality of the lawful necessitation relation should be strengthened to metaphysical from only nomological. Moreover, the account that I attributed to Lewis, presupposes that properties have intrinsic natures, or quiddities. So, although one might find the Lewisian picture plausible independently, it seems rather difficult to argue for it without rejecting (C1) in the first place.

4.5.4.3 The "So-what" Argument

The final argument against the causal thesis that I will discuss is from Lewis's (2009) posthumously published article 'Ramseyan Humility', in which he argues that quidditism and its epistemological consequences are inevitable but should not be worrisome. This can be seen as an argument against the causal thesis indirectly. It can be read as follows: (i) the causal thesis is motivated by the epistemic worries associated with its failure; (ii) there is nothing epistemically worrisome about the failure of the causal thesis; (iii) therefore, the causal thesis is not well-motivated. What follows is Lewis's argument for the premise (ii) of this argument.

First, let us accept that causal roles are occupied by properties. Let us invoke what is known as the "Ramsey-Lewis method" and Ramsify the world in the following way. Once we conjoin all law statements which are in the form of "Fs cause Gs", we substitute each term that denote a property by a variable. Then we add an existential quantifier for each variable to the beginning of the sentence. Let us call this existentially quantified sentence "R". R could be made true by different possible arrangements. What makes R true in the actual world is its actual realization. But R has multiple realizations. It could be made true by different states of affairs in different worlds. According to this understanding, both laws (construed as such Ramsey sentences) and causal roles of properties are multiply realizable.

To show that these Ramsey sentences have multiple realizations, Lewis invokes his *permutation argument*. The permutation argument is an extension of the combinatorial principle of possibility (together with Hume's dictum) that I introduced above. Take the aforementioned Ramsey sentence R to be true in the actual world. It is true in virtue of a global state of affairs which is constituted by particulars instantiating fundamental properties. Take two of these properties, F_1 and F_2. It is crucial for the argument that F_1 and F_2 are distinct properties. Perhaps F_1 and F_2 are instantiated in only a few individuals, or perhaps they are instantiated all over the world. Now substitute every F_1 with an F_2, and *vice versa*. The combinatorial understanding of possibility (together with Hume's dictum)

allows this possibility. But moreover, it also allows this new arrangement to be a realizer of R. Before proceeding to the next step, let us note that, as we already saw above, this combinatorial understanding (together with Hume's dictum) already rejects (C2).

If we allow different properties to occupy same causal roles, and in effect, allow different arrangements of particulars (with respect to their properties and relations) to realize same Ramsey sentences, then we separate properties from their causal profiles. In Lewis's Ramseyan account, (C2) is already explicitly rejected; but with this, we also deny (C1). If we allow F_1 in world w_1 to occupy the causal role of F_2 in world w_2, and yet take F_1 and F_2 to be distinct properties, we cannot say that properties are individuated by their causal profiles.

According to Lewis, we can know what laws are true and what causal roles are occupied. But from this knowledge, we cannot derive which states of affairs make those laws true and which properties occupy those causal roles. In this picture, F_1 and F_2 are taken to be properties that occupy causal roles, or ground dispositions. Lewis says that to "be the ground of a disposition is to occupy a role, but it is one thing to know that a role is occupied, another thing to know what occupies it" (ibid: 204). No information can tell us what properties occupy these roles. So, R could be true in virtue of indefinitely many different states of affairs, each of which is different with respect to the distribution of F_1, F_2, and other properties. So, "no possible observation can tell us which one is actual, because whichever one is actual, the Ramsey sentence will be true." (ibid: 207)

The conclusion is usually stated as the thesis of *Humility*. Humility is a thesis about our ignorance about properties: "we are irremediably ignorant about the identities of the fundamental properties that figure in the actual realization of the true final theory" (ibid: 214). Lewis takes Humility to spread to most properties, not only to fundamental properties. Properties that are not fundamental are taken to supervene on fundamental properties. As Lewis correctly observes, if "Humility applies to most or all of the fundamental properties, then it spreads to a great range of less than fundamental properties, intrinsic and extrinsic alike" (ibid: 204).

According to Lewis, Humility is a consequence of quidditism, which in turn is a consequence of Lewis's understanding of laws and causal structures. And both quidditism and Humility are welcomed by Lewis: "[w]hy is Humility 'ominous'? Who ever promised me that I was capable in principle of knowing everything?'' (ibid: 211). This final statement is the reason I call this argument the "so-what" argument. If one agrees with

Lewis with respect to this latter point, the arguments from knowledge that we considered in favour of the causal thesis in the previous section will not be compelling. However, it should be noted that the Ramseyan account that Lewis gives already presupposes the rejection of (C1) and (C2). So, as an argument against the causal thesis, it would not persuade the defender of the causal thesis.

Before closing, I should mention that Lewis's argument for Humility is not unanimously accepted. Schaffer (2005), for example, argues that although some sort of quidditism might be accepted, Humility can be resisted. He takes Humility as a form of external world scepticism, and claims that there are a vast number of possibly effective ways of rejecting external world scepticism.

This concludes my discussion of arguments against the causal thesis. We saw that some of these arguments are, ultimately, arguments against the reality of dispositions. Those who take dispositions to be real would not be convinced by them. And we also saw that other arguments that are construed against the causal thesis are motivated by theses like Hume's dictum, which are fundamentally at odds with the causal thesis. So, it seems like it is perhaps impossible to reconcile the defenders of the causal thesis and its opponents.

4.6 Conclusion

I started this chapter with the suggestion that we ought to understand what causal powers are and how they might be related to properties in order to assess the subset view of realization. After providing a survey of several issues related to the notion of causal powers, including varieties of disposition, the debate about the conditional analyses of dispositions, dispositionalism, categoricalism and other views, I focused on what I call the causal thesis. According to the causal thesis, (C1) properties are individuated by their causal profiles, and (C2) properties have their causal profiles essentially. I gave a survey of accounts that are in favour of and against the causal thesis. Independent discussions of (C1) and (C2) are required because I will show in the next chapter that these theses are relevant to the subset view for different reasons.

Before proceeding to the next chapter, I should reemphasise that none of the arguments for the causal thesis will persuade its opponents, and none of the arguments against it will persuade its defenders. This is why I suggest that we should suspend judgment on this debate, at least as far as this chapter is concerned. Then it might be questioned why a rather long chapter is devoted to this debate in this thesis. There are three reasons for this: first,

one quick objection against the subset view of realization says that the subset view defines realization in terms of causal powers, and that causal powers are mysterious entities. From this survey-like chapter, we can conclude that this objection is not fair. There is no conclusive case against the legitimacy of metaphysics of causal powers.

Second, since the subset view defines realization in terms of causal powers, a full treatment of the subset view requires an elaboration on what causal powers might be. As I have shown, there are various ways of understanding what they are, and how they are related to properties. Someone who is studying the subset view, thanks to this survey, will have more resources to evaluate the subset view.

Third, in the next chapter, I will examine what the defenders of a viable version of the subset view should say about how causal powers are related to properties. I will argue that, in order to explain the metaphysical necessitation feature of realization, defenders of the subset view can hold the causal thesis. Since I provided a detailed treatment of the causal thesis in this chapter, one can easily find the implications of the subset view through studying the implications of the causal thesis in this chapter.

CHAPTER 5: REALIZATION AND CAUSAL POWERS, PART II

5.0 Introduction

In the previous chapter, I stressed that the notion of causal powers is central to the subset view of realization because the subset view explains realization in terms of a proper subset relation between the causal powers of properties. I suggested that, in order to assess the subset view properly, we should understand what causal powers are, and how they might be related to the properties that are said to "have" them. Having defined realization in terms of a relation between the causal powers of properties, it might be expected from the defenders of the subset view to also hold that that there is a "tight" connection between properties and their causal profiles. In the previous chapter, I identified two theses about the connection between properties and their causal profiles: (C1) Properties are individuated by their causal profiles; (C2) Properties have their causal profiles essentially. I called the conjunction of these two theses *the causal thesis*. The causal thesis provides a tight connection between properties and their causal powers. My main claim in this chapter is that the causal thesis is highly relevant to the subset view.

In Section 5.1, I will introduce what I call *the independence thesis*. According to this thesis, the issues regarding the nature of properties and their relationships with causal powers are irrelevant to the issues regarding the subset view. In Section 5.2, I will introduce a problem for the subset view. The problem is that the subset view cannot explain the metaphysical necessitation feature of realization unless a story about properties and their relationships with their causal powers is told. In Section 5.3, I will argue that the causal thesis provides resources to solve this problem and avoid a further problem that I call *the overrealization problem*. In Section 5.4, I will discuss a somewhat exegetical issue regarding Shoemaker's different formulations of the subset view against the background of the causal thesis.

5.1 The Independence Thesis

Let us recall how the simplified version of the subset view defines realization: a property *P* realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*. Having formulated realization in terms of a relationship between the causal powers of properties, it might be expected that the defenders of the subset view could hold a view according to which properties and their causal powers are "tightly" connected. In any case, it is natural to expect from the defenders of the subset view an explanation as to what causal powers are, and how they might be related to properties that confer them. An

explanation of a tight connection between properties and their causal profiles can be given by the causal thesis:

>(C1) Properties are individuated by their causal profiles.
>
>(C2) Properties have their causal profiles essentially.

Note that I am not arguing that the best explanation of how properties are related to their causal profiles is given by the causal thesis. Rather, I am pointing out that if one thinks that there is a tight connection between properties and their causal profiles, the causal thesis would account for that tight connection. So, it might be expected from the defender of the subset view to also hold the causal thesis.

Nevertheless, Wilson (2011) argues that such expectations would be mistaken. She thinks that issues that are related to causal powers and their relations to the properties that confer them are *irrelevant* to the issues that the subset view is concerned with. In a discussion of whether the subset view is committed so something along the lines of the causal thesis, she says that "even a Humean categoricalist may endorse a powers-based account of realization and associated subset strategy" (ibid: 133). Recall that both (C1) and (C2) are false according to Humean categoricalism.[42] So, if the subset view is compatible with Humean categoricalism, then the subset view is not shown to be interestingly connected to the causal thesis. Note that Wilson is not merely saying that the defender of the subset view is not committed to the causal thesis. Her claim is stronger; she argues that the defender of the subset view is not committed to *any* theory about the nature of properties regarding their connection to the powers that they confer. Let us call this *the independence thesis.*

Wilson's reasoning in favour of the independence thesis is as follows. Take two opposing views regarding the nature of properties and their causal powers: dispositionalism and

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[42] See Chapter 4, Section 4.5.2 for a discussion of Humeanism and categoricalism.

Humean categoricalism. These two views can be said to be on two extreme sides of a spectrum of views regarding properties and their relationships with their causal profiles. According to dispositionalism, both (C1) and (C2) are true; according to Humean categoricalism, both (C1) and (C2) are false. Wilson maintains that issues concerning (C1) and (C2) are irrelevant to the issues concerning the subset view (or any view as to what realization is). The subset view is a theory of realization, and it concerns the formulation of physicalism and the explanation of mental causation. However, whether any of (C1) and (C2) is true or not hinges on whether properties can have *non-causal* features in addition to their causal features. Whether properties have non-causal features is irrelevant to the explanation of mental *causation*. It is also irrelevant to a formulation of physicalism, because any physicalistically acceptable explanation of a phenomenon will only refer to causal features; physical explanations will not be sensitive to non-causal, epiphenomenal, features of entities.

I should note that, in the same work where Wilson argues for this claim, she takes realization to be a *nomological* necessitation relation (ibid: 124). That is, if a property *P* realizes a property *Q*, then, *P* nomologically necessitates *Q*. She thinks that in order to explain the nature of a nomological necessitation relation, one does not have to endorse theses about the profiles of properties in all *metaphysically* possible worlds. The modal strength of the necessitation feature of realization that I am interested in this thesis, however, is metaphysical, as I explained in Chapters 1 and 2. The question that I want to address here is whether the subset view can explain the metaphysical necessitation feature of realization. So, the argument that I will provide in what follows will not directly target Wilson.

Although Shoemaker does not invoke the independence thesis, he thinks that the subset view is not committed to the causal thesis (2001; 2007). He thinks that a modally weaker thesis is sufficient for the subset view to effectively explain realization. This is an exegetically interesting fact because Shoemaker himself (1980; 1998), for independent reasons, believes that (C1) and (C2) are true. The modally weaker version of the causal thesis would say that properties in the actual world and nomologically similar worlds are individuated by the causal powers that they confer in those worlds, and they have these causal powers only with nomological necessity. He thinks that although this modally weaker version of the causal thesis might be true, we can still take realization to hold with metaphysical necessity; all we have to do is to include the laws of nature into the background conditions of total realizers, and metaphysical necessitation comes for free

(2001: 435, footnote 12). But still, a story needs to be told about how it is the case that when something has a property *P*, it also has another property with a proper subset of the causal powers of *P*.

As far as I know, this leaves Clapp (2001) as the only defender of the subset view who motivates the view from a theory of properties that entails the causal thesis. But still, he does not argue that the subset view entails the causal thesis; instead, he argues that the subset view is implied by the causal thesis. His construal of the subset view assumes a version of dispositionalism according to which properties are clusters of causal powers. Clapp argues that

> [t]his account of realization ... is strongly suggested by the causal power model of properties ... On the causal power model of properties, an object instantiates a property if and only if it possesses every causal power in the set that constitutes that property (ibid: 129).

I believe that Clapp is doing the right thing by presenting the subset view as an extension of a causal understanding of properties. I shall show that this is the right thing by explaining how certain questions about realization can be answered thanks to the causal thesis.

5.2 The Problem of Metaphysical Necessitation

According to a minimal physicalist thesis, mental properties strongly supervene on physical properties. On this understanding, in order for something to instantiate a mental property *M*, that thing *must* instantiate a physical property *P* such that *P necessitates* the instantiation of *M*. As I have explained in Chapter 1, the necessitation relation in terms of which physicalism is to be formulated is a *metaphysical* necessitation relation, even if one thinks that physicalism is only contingently true. That is, it might be possible for some non-physicalist worlds to exist in which mental properties are instantiated without physical properties, but necessarily, when a supervenience base of *M* is instantiated, *M* is instantiated too.

In Chapter 2, I stipulated that one of the roles of the realization relation is to explain the metaphysical necessitation of mental properties by their physical bases. Necessarily, whenever a realizer of *M* is instantiated, *M* is instantiated too. I call this feature *the metaphysical necessitation feature* of realization. If *P* is a realizer of *Q*, then that something has *P* metaphysically necessitates that it has *Q*.

On a simplified version of the subset view, a property *P* realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*. If the subset view's account of realization is to be successful with respect to the satisfaction of the said role of realization, than its proposed definition of realization should account for the necessitation feature of realization. So, the following conditional should be true: if the causal powers of *Q* are a proper subset of the causal powers of *P*, then, necessarily, if something has *P*, it has *Q*.

Let us, for the sake of illustration, specify two properties *P* and *Q* and two associated sets of causal powers as illustrated below:

P: {cp1, cp2, cp3}
Q: {cp1, cp2}

As far as the subset view's definition of realization is concerned, *P* realizes *Q* because {cp1, cp2} is a subset of {cp1, cp2, cp3}. If metaphysical necessitation is a feature of realization, and if the subset view is true, then *P* necessitates *Q* because {cp1, cp2} is a subset of {cp1, cp2, cp3}. However, although having cp1, cp2 and cp3 necessitates having cp1 and cp2, we need an explanation of why *P* necessitates *Q*. This is *the problem of metaphysical necessitation* for the subset view. [43]

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[43] Similar remarks have been made by Melnyk (2006). "Why assume that along with possession of power-tokens of certain types there automatically comes possession of a property ... that would have conferred them? Even if being N essentially confers causal power-tokens of certain types on objects that possess it, it doesn't follow – at least from anything that ... [the subset view] says – that causal power-tokens of those types are essentially such as to be conferred by being N. The property of being N is one thing, the causal powers that it confers are another, and nothing in ... [the subset view] entails that the presence of the latter guarantees the presence of the former" (2006: 139-140). See also Kim (2010: 108) for the same observation.

Next, I shall show that the problem of metaphysical necessitation is soluble if the causal thesis is true.

5.3 The Causal Thesis as a Solution

The subset view faces the problem of metaphysical necessitation as I explained above. As this problem shows, the fact that a property P has the causal powers cp1, cp2 and cp2 does not necessitate that that any bearer of P is also a bearer of the property Q which has the causal powers cp1 and cp2. In order for this problem to be solved, the defender of the subset view should give an explanation along the following lines:

(i) having P necessitates having cp1, cp2, and cp3;

(ii) having cp1, cp2, and cp3 necessitates having cp1 and cp2;

(iii) having cp1 and cp2 necessitates having Q;

(iv) therefore, having P necessitates having Q.

Since (ii) is an analytic truth, the soundness of (i)-(iv) hinges on the truth of (i) and (iii). In order to make sense of (i) and (iii), we need to invoke principles that tie the instantiations of properties to their causal powers.

Let us start with (iii). It can be explained by a principle that relates the causal powers of properties to their instances in virtue of the following principle:

(IP1) Necessarily, if an individual S has the causal powers of a property F, then S instantiates F.[44]

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[44] Before moving on, I should mention that, although he never discusses it explicitly, Shoemaker seems to implicitly hold something along the lines of (IP1). This has been observed by Zimmerman (2009) too. As Zimmerman says, "the claim I find implicit in Shoemaker's remarks on these topics is that having all the ...

We need to explain (i) by the converse of (IP1) so that we can relate the instantiations of properties to the conferment of their causal powers thanks to the following thesis:

(IP2) Necessarily, if an individual S instantiates a property *F*, then S has the causal powers of *F*.

In order to explain the metaphysical necessitation feature of realization, we can appeal to the conjunction of (IP1) and (IP2). Let us call this conjunctive thesis (IP3):

(IP3) Necessarily, an individual S instantiates a property *F if and only if* S has the causal powers of *F*.[45]

[causal powers] conferred by a property is *sufficient* for having that property" (ibid: 679, emphasis in the original).

[45] I have been calling the three-place relation between properties, causal powers and individuals "conferment": properties confer causal powers on their bearers. If (IP3) is true, then it can explain what is meant by conferment. On this proposal, saying that a property confers a causal power on an object is nothing more than saying that if that property is instantiated by that object, that object has that causal power. It would be a mistake to take conferral to be ontologically seriously as if properties "transfer" their causal powers to objects. Seeing conferral that way would cause some problems. Audi (2011), when he criticises the subset view, sees conferral in this ontologically serious fashion. He proposes a dilemma to the subset view. The dilemma goes as follows. Let us assume that the subset view is true and *P* realizes *Q*. *P* and *Q* cannot both confer cp1 and cp2 distinctly, because if that were the case, then there would be systematic causal overdetermination. So, cp1 and cp2 are conferred by either *P* or *Q*. If they are conferred by *P*, then *Q* does not confer any causal powers, so cannot be causally efficacious. However, if they are conferred by *Q*, then *Q* would not need to be realized by *P* because it can confer its causal powers without *P*. In either case, we have unsatisfactory results. This problem vanishes if we do not take the conferral locution literally. It is not that *P* transfers its causal powers to the individual S, and then *Q* also transfers its causal powers to S too. Conferral should be understood as a conditional, or in fact, as a biconditional: S has *Q iff* S has cp1 and cp2.

One might be inclined to explain the necessity of this biconditional statement by identifying property instances with the causal powers that are conferred. On that proposal, (IP3) would be true because of the following identity thesis:

> (*Power-Instance-Identity*) An instance of a property F is identical with the causal powers that F confers.

If *Power-Instance-Identity* is true, an instance of P would be a cluster of the instances of causal powers cp1, cp2 and cp2. Since, according to *Power-Instance-Identity*, any cluster of the instances of cp1 and cp2 would be an instance of Q, it would be straightforward to see how a P instance metaphysically necessitates a Q instance. However, (IP3) does not entail this *Power-Instance-Identity*: (IP3) says that having the causal powers of a property F is both sufficient and necessary for having F. *Power-Instance-Identity,* on the other hand, says that property instances are identical with causal powers. So, *Power-Instance-Identity* is a logically stronger thesis than (IP3). So, as far as the solution to the problem of metaphysical necessitation is concerned, *Power-Instance-Identity* is not required, but something along the lines of (IP3) is required.[46]

Now, consider (IP3). One conjunct of the thesis, namely (IP2), is equivalent to (C2). The causal profile of a property is the specification of the conferment of the causal powers of that property. To say that a property confers its causal powers necessarily is to say that it

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[46] Melnyk (2006) thinks that the subset view is committed to *Power-Instance-Identity*. He identifies the gap between the instantiation of a property and the conferment of the causal powers of the property, and argues that, in order to close the gap, the "*key move* is to identify property-instances with something like clusters of [conferred causal powers]" (ibid: 140, emphasis added). In order to show that *Power-Instance-Identity* is required, Melnyk gives another reason. He argues that only the identification of property instances with the tokenings of causal powers can explain Shoemaker's comments that a realized property instance is a part of the instance of its realizer. However, as I will argue in Chapter 7 in detail, we should not take Shoemaker's claim about parthood literally.

has its causal profile essentially. This observation brings us to my first conclusion: the independence thesis should be rejected. The reason for this is that this observation shows that (C2) is crucial for the subset view, as without (C2), the defenders of the subset view lack resources to explain the metaphysical necessitation feature of realization.[47]

If I am right, a Humean categoricalist should not hold the subset view. Wilson (2011) argues that issues about the causal or non-causal features of properties are not relevant to the issues about realization. However, physicalism as a strong-supervenience-entailing thesis requires the metaphysical necessitation of the mental by the physical, and realization is the relation by which the required necessitation is supposed to be explained. If a theory of realization cannot explain this necessitation feature, this should be seen as a failure on its part.[48]

Now, I will show how (C1) becomes relevant to the subset view. Perhaps, one might use Wilson's reasoning for the independence thesis with respect to only (C1). Asking whether (C1) is true is asking whether properties with identical causal profiles could yet be distinct. If they can be distinct, then it should be granted that they have non-causal features. With this reasoning, we might think that whether there are such features or not is irrelevant to issues regarding physicalism and mental causation. Next, I will show that it is, in fact, relevant.

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[47] If one were to modify the subset view in the following way, (IP1) would be sufficient to explain the metaphysical necessitation feature of realization: a property P realizes a property Q if and only if, *necessarily*, the causal powers of Q are a proper subset of the causal powers of P. Then, the need for (IP2) would vanish. What (IP2) does it is to guarantee that the proper subset relationship between the causal powers of P and Q holds necessarily, which makes the modification of the relation that the subset view postulates redundant.

[48] As I said above, since Wilson takes realization to be a nomological necessitation relation, her version of physicalism does not face this problem.

The subset view's need for a thesis like (C1) comes from the observation that the subset view with (C2) but without (C1) encounters *the overrealization problem*. The overrealization problem can be explained as follows. According to a view of properties which accepts (C2) but rejects (C1), it is possible that Q and Q^* are distinct properties with the same causal profiles that are essential to them. Let us call properties like Q and Q^* *doppelganger properties*. Given that the subset view defines realization as a function of the causal profiles of properties, it follows that if Q and Q^* are doppelgangers, then the subset view should take any realizer of Q to be a realizer of Q^* too. Take the property P to be a realizer of Q. Since realization is a metaphysical necessitation relation in the sense specified above, then necessarily, whenever P is instantiated, both Q and Q^* are instantiated. If Q has other doppelgangers, they are also instantiated. Let us call this *overrealization. If* overrealization is a problem, the easiest way for the subset view to solve it would be to give up the possibility of doppelgangers, so hold (C1). Next, I will show that overrealization is a problem indeed.

Overrealization leads to a problem of causal overdetermination. Suppose that we want to explain the causal efficacy of Q, and for this, we (somehow) explain that P does not exclude the causal role of Q. For the subset view, both P and Q could be causally sufficient for a subsequent event without problematically overdetermining it. And more importantly, since there is an asymmetry between P and Q (either because of the proper subset relation between their causal powers or because of the proper parthood relation between their instances), we can choose one but not the other as the more appropriate cause of a subsequent event.

But what are we going to do with Q^*? Any event that is purported to be caused by Q is also caused by Q^*. There seems to be no non-arbitrary way of choosing between Q and Q^* to be the cause of a subsequent event, because their causal profiles are *identical*. There is no asymmetry between Q and Q^* that can break the causal competition in question. For any event E, if Q is a cause of E, Q^* is also a cause of E. Therefore, Q and Q^* causally overdetermine their effects systematically. To generalise, whenever a property realizes another property, if the latter is a cause of an event, all doppelgangers of it are causes of that event.

Recall that the subset view is advertised as a solution to the exclusion problem, and one of the sources of the exclusion problem is the contention that there is no systematic causal overdetermination. If the subset view faces another problem of systematic

overdetermination, its solution to the exclusion problem would not be complete. Overrealization is what would cause this sort of systematic overdetermination, and endorsing (C1) blocks overrealization.

I should note that it might be possible to solve this overdetermination problem by appealing to the fact that *Q* and *Q** are metaphysically non-distinct. I will discuss the solutions to the exclusion problem in Chapter 7 in detail, and one of those solutions can solve this problem too. If that is the case, then (C1) would not be *required* for the solution of this problem. At any rate, I take it that (C1) provides resources to solve this problem, which speaks to the fact that what one thinks about (C1) is *not* irrelevant to what one thinks about realization and mental causation. Given that my intended conclusion in this chapter is that the causal thesis is *relevant* to the subset view, I take it that the fact that there might be other solutions to the overrealization problem does not refute my point.

This concludes my demonstration that the causal thesis is relevant for the subset view. (C2) provides resources to explain how mental properties are metaphysically necessitated by the properties that realize them. (C1) provides resources to block the problem of overrealization.

5.4 Backward-looking Causal Features and Metaphysical Necessitation

Before starting, I should mention that the discussion in this section is purely exegetical of Shoemaker's philosophy, as it examines how his accounts of the subset view develops from 2001 to 2013.[49] Here, I will report an issue about the subset view, regarding the causal profiles of properties and the necessitation feature of realization. The issue has now been resolved after a debate between McLaughlin (2007; 2009) and Shoemaker (2011; 2013), but its discussion is central to the issues that I examine in this chapter, so I will summarise the debate, and relate it to the main claim of this chapter.

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[49] Shoemaker (2001; 2003; 2007; 2010; 2011; 2013).

Although I formulated the subset view in terms of a relationship between causal powers of properties, Shoemaker's original formulation invoked *causal features* rather than causal powers. So, in his terminology, the formulation of realization goes as follows:

> (s-realization*) A property P realizes a property Q if and only if the *forward-looking causal features* of Q are a proper subset of the *forward-looking causal features* of P.

Except for the exclusion of the possibility of conjunctive properties realizing their conjuncts, this is the formulation that Shoemaker gives in (2001).[50]

For Shoemaker, causal powers are forward-looking causal features, the features that specify what the instantiation of the property would cause under certain conditions. Shoemaker contrasts forward-looking causal features with backward-looking causal features. Whereas the forward-looking causal features of a property are the causal powers of that property, the backward-looking causal features of a property specify what might cause the instantiation of that property under certain conditions. In his postscript to his paper "Causality and Properties" (1980), Shoemaker says that he was told by Richard Boyd that it might be possible that properties with same forward-looking causal features could be distinct in virtue of having different backward-looking causal features. Although Shoemaker says that he was never convinced that properties with same forward-looking causal features could differ with respect to their backward-looking causal features (1998; 2007:12), in his (2003) and (2007) versions of the subset view, he includes in the definition of realization a clause on backward-looking causal features:

> (s_3-realization) A property P realizes a property Q if and only if (i) the forward-looking causal features of Q are a proper subset of the forward-looking causal

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features of P; (ii) the backward-looking causal features of Q are a proper superset of the backward-looking causal features of P.[51]

He thinks that this would do no harm, and satisfy those who think that Boyd's aforementioned point is plausible. We have seen the reasons why the forward-looking causal features of Q are taken to be a subset of the forward-looking causal features of P. But why are the backward-looking causal features of Q supposed to be a *superset* of the backward-looking causal features of P? It is because of the observation that since a realized property (typically) has multiple realizers and since anything that causes each of the realizers is also a cause of the realized property, the backward-looking causal features of the realizer property includes the backward-looking causal features of any of its realizers. To fix ideas, take Q to be realized by P_1 and P_2. Anything that is a cause of P_1 is also a cause of Q; anything that is a cause of P_2 is also a cause of Q. So, causes of Q include the causes of P_1 and P_2. But things that can cause P_1 might fail to cause P_2 and *vice versa*. So, the backward-looking causal features of Q include as a proper subset of the backward-looking causal features of both P_1 and P_2.

But, McLaughlin (2007; 2009) observes that the addition of a condition on backward-looking causal features actually causes a serious problem for the subset view.[52] The problem is that, according to McLaughlin, this formulation fails to capture the metaphysical necessitation feature of realization. Let us assume that the property P realizes the property Q. So, P must metaphysically necessitate Q. The problem that McLaughlin identifies can be illustrated as follows. The fact that an object S has P necessitates the fact that S has a property with a subset of the forward-looking causal features of P.[53] (For

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[51] I introduced this relation in Chapter 3, Section 3.1.3.5.

[52] See also Hofmann (2007), who uses McLaughlin's observation to criticise the subset view.

[53] Here, it becomes clear that both Shoemaker and McLaughlin (at least for the argument's sake) are assuming what I called (IP1): having the causal powers of a property is sufficient for having that property.

example, if you have forward-looking causal features x, y, z, then you have x and y.) However, the fact that S has *P* does *not* necessitate that S has a property with a *superset* of the backward-looking causal features of *P*. (For example, when you have backward-looking causal features x and y, you may fail to have backward-looking causal features x, y and z.) Therefore, if the formulation of realization as it is given in s_3-realization is true, then *P* does not necessitate *Q*.[54]

In his more recent discussions (2011; 2013), Shoemaker agrees with McLaughlin and goes back to the original formulation that he gave in 2001. So, he thinks that we do not have to give a role to backward-looking causal features in the formulation of realization: realization can be explained in terms of a relationship between the forward-looking causal features of properties. In order to justify this simplification, he gives an argument to show that the alleged possibility of two distinct properties with same forward-looking causal features but different backward-looking causal features is not really a possibility.

The original example that Shoemaker (1980, postscript) considers for the alleged possibility of two properties with same forward-looking causal features but different backward-looking causal features is as follows. Suppose that we have two substances, X and Y. X is the resultant of the combination of two simpler substances A and B, and Y is the resultant of the combination of two simpler substances C and D (where A, B, C and D are distinct substances). Suppose that *being X* and *being Y* are alike with respect to their forward-looking causal features. However, their instantiations are caused by different events. *Being X* is caused by the combination of A and B, whereas *being Y* is caused by the

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[54] I am not sure if McLaughlin's objection really goes through, but at any rate, Shoemaker (2013: 43) thinks that it does. McLaughlin argues that having the backward-looking causal features of a proper subset does not necessitate having another property with the superset of the backward-looking causal features of that property. However, the notion of backward-looking causal features can easily be understood in the following way, in which case, the objection can be resisted: a property *P* has *B* as its set of backward-looking causal features if any bearer of *P* has *some* member of *B*.

combination of C and D. So, it appears that *being X* and *being Y* differ with respect to their backward-looking causal features.

As Shoemaker (2011, 2013) correctly observes, this example does not show that two distinct properties could differ with respect to their backward-looking causal features when they have the same forward-looking causal features. There is nothing incoherent about taking *being X* to be identical with *being Y* (because they have the same forward-looking causal features) but taking *being X* to have different possible causes. We can take *being X* as a multiply realizable property. It can be realized by the *being the combination of A and B*, and *being the combination of C and D*.[55]

I take the issue of backward-looking causal features to be resolved, and I shall not refer to s_3-realization when I talk about the subset view's realization relation.

5.5 Conclusion

Having introduced in Chapter 4 the causal thesis and its two constituents, namely (C1) and (C2), in this chapter, I proceeded to my central argument, namely that the defenders of the subset view require something along the lines of the causal thesis in order to explain realization. I argued that if nothing is told about how properties are related to the causal powers that are said to "have" them, as it stands, the subset view cannot explain how mental properties are metaphysically necessitated by their realizers. Since the explanation of this sort of metaphysical necessitation is part of the theoretical role of the realization relation, I take it that this is a serious problem for the subset view as a theory of realization. Then I showed how this problem can be sidestepped if the causal thesis is held. I also demonstrated how the causal thesis provides resources to block a particular sort of causal

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[55] Note that, if (C1) is true, we do not have a case of multiple realization here. Not only the substances X and Y would be identical, but also what appear to be their different realizers would be identical too. At any rate, X and Y would be identical, and that is what matters for the sake of Shoemaker's reply.

overdetermination. In the final section, I reported a debate between Shoemaker and McLaughlin regarding realization and causal features of properties.

In the next chapter, I will present a new problem for the original formulations of the subset view. The problem is that the subset view does not have a principled way of identifying when a conjunctive property can realize its conjuncts and when it cannot. I will propose my own version of the subset view in order to solve this problem.

CHAPTER 6: REALIZATION AND FUNDAMENTALITY

6.0 Introduction

In the previous chapters, I introduced and evaluated several theories of realization, and focused mainly on *the subset view* of realization defended by Clapp (2001), Shoemaker (2001; 2007: 2013) and Wilson (1999). According to a *simplified* version of this view, a property *P* realizes a property *Q* just in case the causal powers of *Q* are a proper subset of the causal powers of *P*. I argued that the defenders of a viable version of the subset view should endorse something along the lines of *the causal thesis*, according to which properties are individuated by their causal profiles and have these profiles essentially. It is the task of this chapter to explain why the aforementioned formulation of the subset view is a simplified one. None of the writers mentioned above want it to be the case that arbitrary conjunctions of properties realize their conjuncts. However, the aforementioned formulation of realization, when it is conjoined with the causal thesis, entails that this must be the case.

In 6.1, I introduce *the problem of conjunctive realizers* in terms of a dilemma: on the one hand, it is undesirable that conjunctive properties are realizers of their conjuncts; on the other hand, once a ban on conjunctive realizers is stipulated, granting some assumptions, no property can realize another property. In sections 6.2 and 6.3, I introduce Shoemaker's attempts to solve this problem and then argue that he is not successful in doing so. Although Shoemaker's response is on the right track because it captures the fact that the dilemma mentioned above is a false one (because only *some* conjunctive properties might be undesirable as realizers), I argue that his criterion for demarcating the problematic cases from the unproblematic ones does not work. In 6.4, I introduce my own solution to this problem. I argue that if it is established that realization is a *priority* relation in the sense that a realized property is always less fundamental than its realizers, we can exclude the problematic cases of conjunctive realizers. In 6.5, I consider some possibly problematic cases that my proposal does not exclude. I leave it open whether these cases raise a genuine problem for my proposal. But I suggest that if they do so, a further restriction on realization can be imposed: the realizing property is always *explanatorily connected* to the realized property.

6.1 The Problem of Conjunctive Realizers

Before I start the main argument of this chapter, I shall acknowledge an assumption that I am making: there are conjunctive properties. In fact, I assume that for all properties *F* and *G*, if an individual has both *F* and *G*, it also has a conjunctive property (*F & G*). For those who do not believe in conjunctive properties, the problem of conjunctive realizers that I will illustrate in this chapter will not arise. But, most participants of this debate (and I) do believe that there are such properties. In fact, the existence of such properties is central to this literature in many ways.

First, structural properties in general are central to this work, as many issues that I have discussed involved such properties. Total realizers (as opposed to core realizers) (see Chapter 2) and structural properties (see Chapter 3) are such properties, for example. And, following Armstrong, I take it that "if there are complex [properties] at all, then conjunctions of [properties] should qualify" (1997: 31). Armstrong is

> inclined to deny that there are disjunctive and negative [properties]. But conjunctive [properties] seem much more acceptable. Given that *F* and *G* are distinct [properties], then *F&G* can be a [property], provided always that a particular exists at some time which is both *F* and *G* (ibid).

Those who deny the existence of disjunctive and negative properties argue that there are no such properties because different instances of the same allegedly disjunctive or negative property do not always bear resemblance to each other. However, this problem (if it is a problem at all) does not arise for conjunctive properties: different instances of the same conjunctive property will always resemble each other.

Second, conjunctive properties are nothing over and above their conjuncts, in a similar sense that wholes are nothing over and above their parts. So, those who appeal to the principle of parsimony to deny the existence of conjunctive properties by saying that we do not need them on top of simple properties can be responded by saying that conjunctive properties, like wholes, do not violate parsimony. They are not additional beings over and above their conjuncts; they are "ontologically innocent", so to speak.

Third, following Armstrong (1978: 32), I take it that it is a genuine possibility that all properties are conjunctive properties. In the same sense that it is possible that the world does not have a bottom, fundamental, level, so that each and every entity could be divisible to other entities, it is also possible that there are no simple properties so that each and every

property could be divisible to simpler properties. Armstrong notes that this is not only a logical possibility, but also an epistemic possibility. That is, for all we know, it is possible that there are no simple properties.[56] Now, suppose that the denier of conjunctive properties is right; then it would be the case that only properties that exist are the simple ones. But given that it is an epistemic possibility that there are no simple properties, then it should also be an epistemic possibility that there are no properties at all. I take it that the consequences of such a possibility are detrimental to the type of metaphysics that most of the participants of this debate are doing. So, I shall hold on to my assumption that there are conjunctive properties.

Now that one central presupposition I have is acknowledged, I shall proceed to the main argument of this chapter. We have seen that, on the simplified version of the subset view, a property realizes a property if and only if the causal powers of the latter are a proper subset of the causal powers of the former. The reason this is a simplified version of the view is that this formulation allows for some cases of realization that the defenders of the view do not want to allow. Such cases are the ones where the realizer property is a conjunctive property which includes the realized property as a conjunct. Take two non-identical properties P and Q. The set of causal powers of the conjunctive property (P & Q) will be the union set of the sets of the causal powers of P and Q. So, if one takes realization to be the relation that the aforementioned simplified version of the subset view takes it to be, the conjunctive property (P & Q) will be a realizer of P (and also of Q), because the causal powers of (P & Q) will include as a proper subset the causal powers of P (and also of Q).

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[56] Even Lewis, who argues against complex properties, grants to Armstrong this argument: "[m]aybe there is no end to this complexity. Maybe there are no simples, just structures of structures ad infinitum. (Or maybe there are simples but not enough of them--if elecetronhood were simple but protonhood were a matter of structures ad infinitum, that would be enough to defeat the plan of dispensing with hydrogen in favour of the simples it involves.) Even if we believe in (enough) simples, should we adopt a doctrine of universals that presupposes this, and leaves no room for even the possibility of infinite complexity? … I take this … reason [for believing in complex properties] to be weightiest" (1983: 30).

The point generalises to all properties: so, if the aforementioned simplified version of the subset view is true, every conjunctive property realizes each of its conjuncts. It will also be true that every property is realized by any conjunctive property which includes it as a conjunct.

The observation that this version of the subset view entails that all conjunctive properties realize their every conjunct (and that all properties are realizable by arbitrarily chosen conjunctive properties that include them as conjuncts) is a problem for the subset view, and, as I shall show in this chapter, it is not a problem that can easily be fixed by merely stipulating that conjunctive properties do not realize their conjuncts. That stipulation, as we shall see, has its own problems.

Let me explain why it might not be desirable that conjunctive properties count as realizers of their conjuncts. First, as Shoemaker (2007: 24) observes, allowing conjunctive properties to realize their conjuncts has the following consequence. For all properties *F* and *G*, if *F* and *G* can be instantiated together, there is a conjunctive property (*F & G*). Every property belongs to indefinitely many conjunctive properties as a conjunct. If we allow all properties to be realized by all conjunctions to which they belong, every property will have indefinitely many realizers. But more crucially, there will not be any property that is not realiz*able*: you can take any property, *F*, and conjoin it with an arbitrarily chosen property *G*: insofar as *F* and *G* can be coinstantiated, (*F & G*) would be a conjunctive property which would realize *F*. Note that *F* can be any property; if this is the case, in Shoemaker's terminology, there would be "no self-constituted properties" (ibid). By "self-constituted" properties, Shoemaker means *fundamental* properties, namely the properties that need no other properties as dependence bases. If we want physicalism to be the view that mental properties are ultimately realized by fundamental physical properties, and if we (correctly) think that fundamental properties are not realized (but their instantiations are "self-constituted" in Shoemaker's terms), then physicalism cannot be viably formulated in terms of realization.

Second, consider the connection between realization and the determinate-determinable property relation. As I have argued in Chapter 3, if the subset view is true, then determinate properties are realizers of their determinables. The causal powers of *being red* are a proper subset of the causal powers of *being scarlet*, for example. The example generalises to all determinable properties and their determinates insofar as these are properties with causal profiles. In fact, I have argued that these observations show that the

determinate-determinable property relation is a special case of realization. (Every case of d-realization is a case of s-realization, but not every case of s-realization is a case of d-realization; *being red* is s-realized by *being scarlet,* but *having pain* is not d-realized by *having C-fibre stimulation.*) Now, if we allow that all conjunctive properties are realizers of their conjuncts (and that every property is realized by a conjunctive property that includes it as a conjunct), then we would have to say the same for determinable properties: all determinable properties would be d-realized by properties that include them as conjuncts, in which case a determinate property would be a conjunctive property that includes the determinable property as a conjunct. But, as Shoemaker notes, it "is commonly said about the [determinable-determinate] … relationship that a determinate cannot be regarded as the conjunction of the determinable and some other property" (ibid).[57] If this is true, then we should not think that conjunctive properties are realizers of their conjuncts (and that every property is realized by a conjunctive property that includes it as a conjunct).

The view that determinate properties are not conjunctive properties that include their determinables as conjuncts is attributed to W. E. Johnson and A.N. Prior.[58] A more contemporary list of people who endorse this view is as follows:

- Yablo (1992) thinks that determinate properties do not have their determinables as their conjuncts. He thinks that the ban on conjunctive determinates is one of the reasons why the determinate-determinable property relation should not be identified with asymmetric property necessitation *simpliciter* (1992: 253, footnote 23). That is, there is more to determinable-determinate property relation than merely asymmetric necessitation.

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[57] See also Shoemaker (2001: 443).

[58] See Johnson (1921) and Prior (1949), both cited in Sanford (2011).

- Funkhouser (2006) gives the following reason for such a ban on conjunctive determinates: a "determinable property *X* is determined only with respect to its *X*-ness (or *X*-ity, or similarly appropriate grammatical construction)" (ibid: 550). This is because a property *Q* counts as a determinable of a property *P* only if being *P* is a specific way of being *Q*. Funkhouser's example is that the conjunctive property (*being red & being square*) does not count as a determinate of *being red*, because *being square* does not specify how red something is.

- Wilson (2009) does not seem to be thinking that this is controversial point. She implies that it is part of our understanding of the determinate-determinable property relation that "property *P* determines property *Q* only if ... the having of *P* does not consist in the having of a conjunctive property consisting of *Q* and some property *P** wholly distinct from *Q* as conjuncts" (2009: 152).

- Rosen (2010: 127-8) thinks that this ban on conjunctive determinates of determinables is what distinguishes determinate-determinable property relation from genus-species relation. Traditionally, it is thought that having a species property consists in having a genus property and a differentia property. The paradigm example is that *being human* (the species property) consists of *being animal* (the genus property) and *being rational* (the differentia property).[59]

Third, one might think that there is something interesting about realization (and also about the determinate-determinable property relation) that cannot be captured if one allows for arbitrary conjunctions to be realizers (or determinates) of their conjuncts. This

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[59] If both Rosen and Shoemaker are right, then we obtain an interesting result: species properties do not realize genus properties. *Being human* is not a realizer of *being animal*. Although this might be true, as I shall show in what follows, its truth does not consist in the claim that conjunctive properties are never realizers of their conjuncts. I will argue that *some* conjunctive properties are realizers of *some* of their conjuncts, and there *might* be independent reasons to think that *being human* is not a realizer of *being animal*.)

consideration will be relevant for my stance on the issue of conjunctive realizers, and I will discuss this in more detail in sections 6.4 and 6.5 below, where I introduce my own solution to this problem of conjunctive realizers. For the time being, let us grant that it is undesirable that *all* conjunctive properties are realizers of their conjuncts (and that every property is realizable by arbitrary conjunctions that include them as conjuncts), so something should be done to rule out undesirable cases.

Something should be done to rule out undesirable, or "bad", cases of realization, but what exactly? It might be thought, though mistakenly, that the obvious way of dealing with this problem is imposing a necessary condition for realization to the effect that the realizer property is never a conjunctive property that includes the realized property as one of its conjuncts. Shoemaker once thought that the solution would be exactly this. He suggested that "if we are to define realization in terms of the subset relation we need to impose some restriction that rules out conjunctive properties as realizers of their conjuncts" (2001: 442). With this restriction, realization would be defined as follows: a property P realizes a property Q if and only if the causal powers of Q are a proper subset of the causal powers of P and P is not a conjunctive property having Q as a conjunct (ibid: 432).[60] However, as I will explain in what follows, this seemingly easy solution causes another problem for the subset view.

I shall introduce this problem by means of a *reductio*: assume, for *reductio*, that no conjunctive property realizes its conjuncts. Take, as the classic example suggests, *having C-fibre stimulation* to be a realizer of *having pain*. (See Figure 1 below to follow the formalism.) The causal powers of the latter will be a proper subset of the causal powers the former. Take set A to be the set of the causal powers of *having pain,* and set B to be the set of the causal powers of *having C-fibre stimulation*. As a consequence of the subset view, A is a proper subset of B. Now think of the causal powers of *having C-fibre stimulation* that

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[60] Compare this to s_4-realization that I introduced in Chapter 3, Section 3.1.3.5.

do not belong to the set of causal powers of *having pain*. Let us call the set that includes these powers *C*. What follows from these is that the set *B* will be the union of sets *A* and *C*. Now, let us say that *P* is a property that corresponds to the causal powers in set *C* in the following way: *P* confers the causal powers in *C*.[61] Now take the conjunctive property (*having pain & P*). The causal powers of this property will be the causal powers in the union of *A* and *C* (namely the set *B*). But the causal powers of having *C-fibre stimulation* are the causal powers in this set. As the causal thesis (that I have shown in Chapter 5 that the defender subset view should hold) suggests, properties are individuated by their causal profiles. Given the causal thesis, *having C-fibre stimulation* and the conjunctive property of (*having pain & P*) are the very same property because they have the same causal profiles. So, the conjunctive property of (*having pain & P*) is a realizer of *having pain*. Therefore, there is a conjunctive property that is a realizer of one of its conjuncts, which we assumed to be false. The *reductio* is complete: it cannot be the case that no conjunctive property realizes its conjuncts.

$$having\ pain \quad \& \quad P \quad = \quad having\ C\text{-}fibre\ stimulation$$
$$A \quad \cup \quad C \quad = \quad B$$
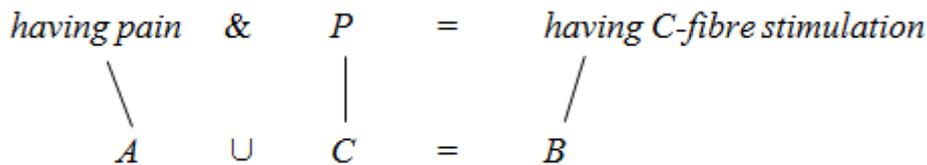
Fig 1: *C-fibre stimulation* as a conjunctive property

One might consider what would happen if properties were not to be individuated by their causal profiles. Quidditism would be true, and *having C-fibre stimulation* might fail to be

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[61] Here, I am assuming that there is such a property *P* that is non-identical with *having C-fibre stimulation*, and I shall not let this assumption remain unacknowledged. Whether there is really such a property is an important question, and that there is such a property is challenged by Shoemaker, as I shall report below. For those who are not convinced that this property exists, the argument of this section will not be compelling.

identical with this conjunctive property: there could be two non-identical properties with the same causal powers. In that case, one way out of this argument would be to say that *having C-fibre stimulation* is not identical with the conjunctive property in question. Although the former is a realizer of *having pain*, the latter cannot be by stipulation. But this paints a very unattractive picture: nothing would guarantee that an individual with the causal powers of *having C-fibre stimulation* instantiates *having pain*. Worse: nothing would guarantee that an individual with the causal powers of *having pain* instantiates *having pain*. I examined the problems the subset view would face in the case of the falsity of the causal thesis in Chapter 5; I am not going to discuss this option further.

Note that this also shows that the subset view with the restriction on conjunctive properties as realizers of their conjuncts entails that no property is a realizer of a property (and hence no property is a determinate of a determinable property too) because the point about *having C-fibre stimulation* and *having pain* generalises to all cases. For all properties *F* and *G*, if the causal powers of *G* are a proper subset of the causal powers of *F*, then there is a property *F** such that *F** confers the causal powers that are conferred by *F* but not by *G*. Then *no* two properties can satisfy both of the following necessary conditions on realization at once: (a) *F* realizes *G* only if the causal powers of *G* are a proper subset of the causal powers of *F*; (b) *F* realizes *G* only if *F* is not a conjunctive property that includes *G* as a conjunct.

Before discussing (and rejecting) Shoemaker's response to this problem, let me introduce the problem in terms of a dilemma: (1) if the subset view is formulated without a restriction on conjunctive properties as realizers, then the view generalises too much; conjunctive properties such as (*being red & being square*) count as realizers of their conjuncts, and there are no properties that are not realized; (2) on the other hand, if the subset view is formulated with a restriction on conjunctive properties to the effect that conjunctive properties are never realizers of their conjuncts, then, as the *reductio* above shows, no property realizes any property.

It goes without saying that both (1) and (2) are undesirable. But might this be a false dilemma? It would be if there is a way of formulating the subset view with a restriction on only *some* conjunctive properties as realizers of their conjuncts. Surely it is possible (in principle) to formulate the view with an exclusion clause that enumerates all the "bad" examples of conjunctive realizers. But what needs to be done is to find a principled way of excluding such bad cases, without thereby disallowing the acceptable, or "good" cases.

There are at least two ways of giving a criterion for demarcating between good and bad cases as such. One belongs to Shoemaker (2001: 441-445; 2007: 22-28), and the other to me (see sections 6.4 and 6.5 below). In the next two sections, I will introduce and reject Shoemaker's solution.

6.2 The Unity Condition for Powers

In the previous section, I introduced a problem for the subset view in terms of a dilemma: if conjunctive properties realize their conjuncts, then the subset view generalises too much; if conjunctive properties cannot realize their conjuncts, no property realizes any property. Here and in the next section, I will critically discuss Shoemaker's response to this problem.

Shoemaker's (2007: 24-26) first response to (a differently articulated version of) this problem is that the second horn is not problematic.[62] The second horn of the dilemma is that if conjunctive properties cannot realize their conjuncts, then no property can realize any other property. I explained this through the following example: *having C-fibre stimulation* is identical with the conjunctive property of (*having pain & P*) (where *P* is the property that corresponds to the causal powers of *having C-fibre stimulation* except the causal powers of *having pain*). If conjunctive properties do not realize their conjuncts, then *having C-fibre stimulation* does not realize *having pain*. The point generalises to all putative cases of realization. Shoemaker thinks that the second horn of the dilemma is not problematic, because he thinks that *having C-fibre stimulation* is *not* a conjunctive property in the aforementioned sense. In a nutshell, his response is that the property *P* that is supposed to be a conjunct of *having C-fibre stimulation* is not a property. If *P* is not a property, then (*having pain & P*) is not a conjunctive property. Therefore, the response

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[62] The problem has not been formulated in terms of a dilemma before, so it might be misleading to present Shoemaker's response as a response to the second horn of the dilemma.

goes, there is no problem of conjunctive realizers. Of course, the crucial task is to show why *P* is not a property.

It is clear that Shoemaker does not think that there is a property that corresponds to every cluster of causal powers. He says that "it will clearly not do to say that given a property and its set of ... [causal powers] there is a property corresponding to every subset of that set" (ibid: 23). This can be questioned, and I am sympathetic to the contrary view that any cluster of causal powers can be taken to correspond to a property. After all, this property *P* in question is the property of having a property that corresponds to a certain set of causal powers. Such correspondence can be spelt out in different ways. For example, it could be the property of conferring all (but not only) the causal powers in that set. This property does not have to be a sparse or a natural property. So, at best, we should take Shoemaker to be saying that property in question is not sparse or natural enough to count as a genuine property. If it is not a genuine property, the purported conjunctive property is not a genuine conjunctive property, because it includes a non-genuine property as a conjunct.

But, why is this property not sparse or natural enough? In order to understand this, we will have to study Shoemaker's metaphysics in some detail. Here is a condition that Shoemaker stipulates about properties and causal powers:

> [causal] powers X and Y are bestowed by the same property if and only if it is a consequence of the causal laws that either (1) whatever has either of them has the other, or (2) there is some third ... [causal] power such that whatever has it has both X and Y (2007: 25).

Let us call this condition *the unity condition for powers*. Now think of a property *F* with the set of causal powers *A*. *F* confers *all and only* causal powers in *A* just in case every pair of causal powers in *A* satisfies the unity condition for powers. This follows from how the unity condition for powers is formulated: take a set causal powers; if it is true that every pair in this set satisfies this condition, and then any bearer of any of these powers will also be the bearer of all and only powers in this set, which means that, if there is a property that corresponds to this set, then that property confers all and only powers in that set. The next step has to be the stipulation that a putative property with a given set of causal powers is genuinely a property only if every pair in that set satisfies the unity condition for powers. If every pair of causal powers in a set satisfies this condition, the set in question can be said to be "closed under nomic and metaphysical entailment" (ibid: 26). So, if a set of causal powers is not closed under nomic and metaphysical entailment, according to these

stipulations, there is no genuine (or sparse, or natural enough) property that corresponds to that set.

Let me explain the idea in the previous paragraph through an illustration. Take a set of causal powers {cp1, cp2, cp3}. If it is possible, for example, that an entity has the causal powers cp1 and cp2 without thereby having cp3 (and there are no causal powers x and y such that having x entails having cp1 and cp3, and having y entails having cp2 and cp3), then {cp1, cp2, cp3} is not closed under nomic and metaphysical entailment. And by stipulation, there is no property that corresponds to the set {cp1, cp2, cp3} in a *genuine-property-making* way. (Genuine-property-making is a relation between a set of causal powers and a genuine property such that the property has all and only causal powers in the given set.) Another example: take a set of causal powers {cp4, cp5, cp6}; if it is (either nomologically or metaphysically) necessary that whatever has the causal power cp4 has also the causal power cp7, which is a power that is not a member of the set in question, then {cp4, cp5, cp6} is not closed under nomic and metaphysical entailment. In that case, there is no property that corresponds to this set in a genuine-property-making way.

A putative property *F* corresponds to a set of causal powers *A* in a genuine-property-making sense only if *F* confers *all and only* causal powers in *A* as a matter of nomic or metaphysical necessity. Based on the illustrations in the previous two paragraphs, {cp1, cp2, cp3} and {cp4, cp5, cp6} are not genuine-property-making sets. The former is not, because cp3 is (nomically or metaphysically) independent from cp1 and cp2 so that the conferment of cp1 and cp2 does not necessitate (nomically or metaphysically) the conferment of cp3. The latter set is not a genuine-property-making set, because the conferment of some of the causal powers in that set necessitates (nomically or metaphysically) the conferment of cp7, which is not in that set.

Obviously, these stipulations rule out conjunctive properties as real properties from the outset. Take a conjunctive property (*F* & *F**). If *F* is a genuine property, it should conform to the aforementioned criterion. So should *F**. But if both *F* and *F** conform to this criterion, then the conjunctive property (*F* & *F**) does not. Because if *F* can be instantiated without *F**, then it is not true that the causal powers of (*F* & *F**) are necessarily (in a nomic or metaphysical sense) conferred together. That no conjunctive property counts as a genuine property is not acceptable (unless one is a denier of conjunctive properties for other reasons). Shoemaker is aware of this problem and says that "we can give this as an

account of what it is for there to be a basic, nonconjunctive property that bestows all and only the ... [causal] powers in a set" (ibid: 25).

What is important for Shoemaker's argument is that, if he is right (or rather, if we agree with his stipulations), then the putative conjunctive property (*having pain & P*) is not a conjunctive property, because *P* does not correspond to a set which is closed under nomic and metaphysical entailment. So, *having C-fibre stimulation* cannot be identified with a conjunctive property that includes *having pain* as a conjunct. But, why, according to Shoemaker, is *P* not a property in his restricted sense of the term "property"?

The main reason that *P* fails to be a genuine property in the relevant sense is that the set that is supposed to be the genuine-property-making set of *P* has members whose conferment entails the conferment of causal powers that are not members of this set. Let us see why this is the case through an example. For the sake of simplicity, let us assume that the causal powers of *having pain* are *crying* and *wincing* so that, necessarily, anything that has this property is disposed to cry and wince. *Having C-fibre stimulation* has these two causal powers as well, but it has additional causal powers that other realizers of *having pain* do not have. Some of these powers are related to the fact that the bearer of this property is a human being.[63] Think of the causal power of *crying like a human being.* Necessarily, any individual that has C-fibre stimulation is disposed to cry like a human being, because any such individual will be a human being and will have pain. So, *crying like a human being* is a causal power of *having C-fibre stimulation*, and it is not a causal power of *having pain*. What follows from this is that this causal power is a member of the set that corresponds to the putative property *P*. Now consider that, necessarily, any

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[63] I assume, for the sake of this argument, that *having C-fibre stimulation* can be instantiated only in human beings. If this is found problematic, as it should be, because it is too simplistic, then the example could be modified so as to change *having C-fibre stimulation* with a determinate of *having C-fibre stimulation* that can be instantiated only in human beings.

individual that is disposed to cry like a human being is disposed to cry *simpliciter*. But *crying* is not a causal power of *P*. It is a causal power of *having pain*. So, bearers of *P* have some causal powers that are not in the set that *P* is supposed to correspond to. If Shoemaker is right, then this disqualifies *P* as a genuine property. If *P* is not a property, then (*having pain & P*) is not a conjunctive property.

Recall that the second horn of the dilemma says that if conjunctive properties cannot realize their conjuncts, then no property realizes any other property. The reason for this is that all realizers are conjunctive properties that include realized properties as conjuncts. Then, Shoemaker's response to this is that this conditional is not true, as the putative conjunctive properties in question include non-genuine properties as conjuncts, hence they are not genuine conjunctive properties. Therefore, the second horn of the dilemma fails to be problematic.

$$\begin{array}{ccccc} \textit{being red} & \& & Q & = & \textit{being scarlet} \\ \diagdown & & | & & \diagup \\ B & \cup & C & = & A \end{array}$$
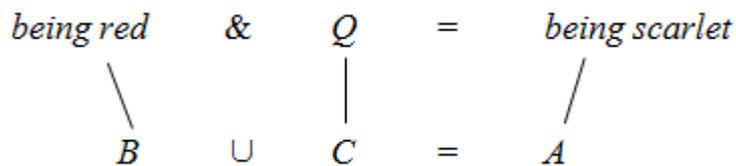
Fig 2: Scarlet as a conjunctive property

Another example (which is actually Shoemaker's working example throughout his discussion of this issue) is the realization of *being red* by *being scarlet* (ibid: 24-28). (See Figure 2 above to follow the formalism.) The same point can be illustrated by means of this example. *Being scarlet* is putatively identical with the conjunctive property (*being red & Q*) where *Q* is the property that confers the causal powers that *being red* does not. For the reasons given above, Shoemaker thinks that there is no such property as *Q*, because some of the causal powers that *Q* confers entail the conferment of the causal powers of *being red*. Think of a pigeon, Alice, who is trained to peck at all and only scarlet things. In this case, *eliciting pecking behaviour in pigeons like Alice* is a causal power that *being scarlet* has but *being red* does not have, because there could be other pigeons that peck at other shades of red but not at scarlet. So, *eliciting pecking behaviour in pigeons like Alice* is a causal power of *Q*. But this is not a causal power that can be exercised without the exercising of some causal powers that *being red* has. The conferment of these powers entails the conferment of some powers of *being red*. One such causal power is *eliciting pecking behaviour at pigeons that are trained to peck at red things.*

Do these illustrations really show that realizer properties are not identical with conjunctive properties that include the realized properties as conjuncts? It is true that (in the case of *having C-fibre stimulation*) there is no property that confers all and *only* the causal powers that are in the set of causal powers of *having C-fibre stimulation* but are not in the set of causal powers of *having pain*, because the set in question is not closed under nomic and metaphysical entailment. As Shoemaker maintains, there are some causal powers in that set whose conferment necessitates the conferment of causal powers that are not in that set. (And *mutatis mutandis* for all cases of realization.) But why should we stipulate that there is no property that corresponds to the set in question in a slightly different way? I suggest that one can reject Shoemaker's criterion for being a genuine property, and hold that some properties may correspond to some sets of causal powers which are not closed under nomic and metaphysical entailment. For example, a property can correspond to a set of causal powers in a way that it confers on its bearers all causal powers in that set, and powers beyond that set insofar as such powers are necessitated by the powers in the set. One might have worries about the sparseness (or the naturalness) of this property, but that is an independent issue.

If I am right, then *having C-fibre stimulation* is identical with the conjunctive property of (*having pain & P*), where *P* is the property that corresponds to the set of causal powers in question in this specific way. This set consists of the causal powers that *C-fibre stimulation* confers but *having pain* does not confer; and the correspondence relation in question is not *conferring all and only causal powers in that set*. Instead, it is the relation of *conferring all but not only causal powers in that set*.

In this section, I evaluated Shoemaker's first response to the dilemma that I have articulated in 6.1. Shoemaker's argument relies on his understanding of properties according to which a property corresponds to a set of causal powers only if that set is closed under nomic and metaphysical entailment. I suggested that we can work with a more liberal understanding of properties according to which some properties can correspond to sets of causal powers in a different way. That makes room for seeing realizer properties as conjunctive properties that include the realized properties as conjuncts. In the next section, I will explain how Shoemaker subsequently endorses this possibility and responds to this version of the problem.

6.3 Narrowing Powers

In the previous section, I showed that Shoemaker's first attempt to rule out the possibility of realizers having realized properties as their conjuncts can be said to fail, given an understanding of properties according to which properties can correspond to sets of causal powers that are not closed under nomic and metaphysical entailment. According to this understanding, it is inevitable that *being scarlet*, for example, includes *being red* as a conjunct (alongside the other conjunct *Q*). Shoemaker (2007: 27-28) subsequently grants that this might be the case, and proposes a criterion according to which only some conjunctive properties count as realizers of only some of their conjuncts. In this section, I will introduce and reject Shoemaker's criterion.

Take set *A* to be the set of causal powers of *being scarlet*. (See Figure 2 above.) Take set *B* to be the set of causal powers of *being red*. *B* is a proper subset of *A*. The discussion of the previous section mainly focused on the question whether there is any property that corresponds to the remainder set of *A* after *B*. Let us call this set *C*. As I have explained, Shoemaker argues that there is no property that confers *all and only* the causal powers in set *C*, because *C* is not closed under nomic and metaphysical entailment. The reason for this is that there are causal powers in *C* whose conferment entails the conferment of causal powers that are not in *C*. I have argued that this does not mean that there is no property that corresponds to *C* in a more specific way. If there is such a property, call it *Q*, then *being scarlet* can be identified with the conjunctive property of (*being red & Q*).

Shoemaker (ibid: 27-29) considers a possibility along the lines of this. He thinks that if this specific way of corresponding to a set of causal powers can be articulated properly, we can make an exception for some conjunctive properties to realize some, but not all, of their conjuncts. Now, the task is to see how this specific way can be articulated. If we are successful in doing this, then we will have a response to the dilemma I introduced in 6.1. The dilemma that I considered showed that (1) if the subset view allows all conjunctive properties to realize all of their conjuncts, the view overgeneralises. On the other hand, (2) if conjunctive properties cannot realize their conjuncts, then no property realizes any property. If we can find a principled way of showing that there are exceptions to the rule that conjunctive properties cannot realize their conjuncts, then we can show that the dilemma that we considered is a false one. I think this is the right response to the dilemma. As I will argue in Section 6.4, according to one conception of properties, all realizer properties are conjunctive properties that include the realized properties as their conjuncts,

but not all conjunctive properties realize their conjuncts. But let me first introduce how Shoemaker follows a structurally similar line of reasoning.

Shoemaker grants the possibility that *being scarlet* might be identified with the conjunctive property (*being red & Q*), and says that

> the subset view needs to be formulated in such a way that it is not true in general that conjunctive properties are realizers of, and determinates of, their conjuncts. But as we just saw, the formulation must not be such as to imply that no conjunctive property can be a realizer of one of its conjuncts … What we want to rule out is, for example, that the property of *being red and square* should count as a realizer of the property of *being red*, or of the property of *being square* (ibid: 27, formatting changed).

So, we need a criterion that tells us which conjunctive realizers are good, and which ones are bad. To do this, we will have to pay attention to what kind of a property *Q* is, and in what way it is related to *being red*. It should be a different kind of property than *being square*, and its relation to *being red* should be different than the relation between *being square* and *being red*.

Remember that *Q* is a property that corresponds to a set of causal powers which is not closed under nomic and metaphysical entailment. The set of causal powers that it corresponds to (in the way to be specified above) has some members, such as the power of *eliciting pecking behaviour at pigeons like Alice* and *eliciting experience with the phenomenal character PC in human beings*.[64] What is interesting about these causal powers is that they cannot be conferred unless some of the causal powers of *being red* are conferred. Such powers are, respectively, *eliciting pecking behaviour at pigeons* and *eliciting experience with a reddish phenomenal character in human beings*.[65] But note that

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[64] These examples are from Shoemaker (ibid).

[65] This phenomenal character would be the normal phenomenal character that an experience of a typical human being has when she looks at something red.

eliciting pecking behaviour at pigeons is a determinable power of *eliciting pecking behaviour at pigeons like Alice,* and that *eliciting experience with a reddish phenomenal character in human beings* is a determinable power of *eliciting experience with the phenomenal character PC in human beings.* So, the relationship between Q and *being red* is such that some powers that belong to the former are determinates of the powers that belong to the latter. In fact, the reason that C fails to be closed under nomic and metaphysical entailment is that there are determinate-determinable relationships between the causal powers in the set C and some powers of *being red*.

Q is a property such that its instantiation determines (in the determinate-determinable relation's sense) the causal powers of *being red*. Q is a property that cannot be instantiated unless some of the powers of *being red* are conferred to its bearer. The relation that is specified here (namely the relation that obtains between Q and the powers of *being red*), according to Shoemaker, is asymmetric. *Being red* does not have causal powers that determine the causal powers of Q. This, of course, is a consequence of the fact that the set of causal powers of *being red* is closed under nomic and metaphysical entailment, because *being red* is a genuine property in Shoemaker's restricted sense: since the set in question is closed under nomic and metaphysical entailment, its powers will not entail the conferment of powers beyond this set, and hence, the said relationship that obtains between Q and *being red* will be asymmetric.

Note that this specific relation does not obtain between *being square* and *being red*. The causal powers of *being red* do not determine the causal powers of *being square* and *vice versa.* This is because both properties have causal powers that form sets that are closed under nomic and metaphysical entailment. That is, *being red* confers all and only causal powers in its set, and *being square* confers all and only causal powers in its set. The conferment of the causal powers of one of these two properties does not entail the conferment of the causal powers of the other. Can we articulate what is important about this difference between the two cases so as to provide a principled way of demarcating between bad cases of conjunctive realizers and good cases of conjunctive realizers? Shoemaker thinks that we can; as I will explain shortly, I am sceptical that we can.

Shoemaker tries to articulate a principled way as follows:

> I think, then, that a conjunctive property counts as a realizer of one of its conjuncts only when there is such an asymmetrical relation between the conjuncts, one of them being such that its instantiation narrows the way the

determinable powers bestowed by the other (the one that is realized) can be exercised (ibid: 28).

Let us see how some of the cases are handled by this criterion:

- The conjunctive property (*being red & Q*), which is identical with *being scarlet*, counts as a realizer of *being red* because *Q*'s instantiation narrows the ways the determinable powers of *being red* are exercised. When I see a scarlet tablecloth, the tablecloth does not only cause me to have an experience with a reddish phenomenal character, it causes me to have an experience with the phenomenal character PC.

- The conjunctive property (*being red & Q*), which is identical with *being scarlet*, does *not* count as a realizer of *Q*, because *being red* does not narrow the ways the powers of *Q* are exercised. This is evident from the fact that the relation that is specified is asymmetric and that (*being red & Q*) counts as a realizer of *being red.*

- The conjunctive property (*having pain & P*), which is identical with *having C-fibre stimulation,* counts as a realizer of *having pain* because *P*'s instantiation narrows the ways the determinable powers of *having pain* are exercised.

- The conjunctive property (*having pain & P*), which is identical with *having C-fibre stimulation,* does *not* count as a realizer of *P* because *having pain* does not narrow the ways the powers of *P* are exercised.

- The conjunctive property (*being red & being square*) does not count as a realizer of *being red*, or *being square.* Both conjuncts have sets of powers that are closed under nomic and metaphysical entailment, so the specified *asymmetric* determination relation between their powers does not obtain: the powers of *being red* do not entail the conferment of powers beyond *being red*'s set of causal powers; and the powers of *being square* do not entail the conferment of powers beyond *being square*'s set of causal powers.

This might make it look as if we have a good principled way of demarcating between good and bad cases of conjunctive realization. However, the problem with this solution becomes evident if one adds this restriction to the definition of realization. With this restriction, this version of the subset view defines realization as follows:

(*Realization-Narrow*) A property *P* realizes a property *Q* if and only if (i) the causal powers of *Q* are a proper subset of the causal powers of *P*; (ii) if *P* is a conjunctive property that is constituted by *Q* and another property *Q** as conjuncts, then there is a relation between *Q* and *Q** such that (a) the bestowment of some of the causal

powers of Q^* narrows the ways some determinable causal powers of Q can be exercised, and (b) it is not the case that the bestowment of some of the causal powers of Q narrows the ways some determinable causal powers of Q^* can be exercised.[66]

But, what is this relation of *narrowing the ways the causal powers of a property can be exercised* exactly? It seems to be the same relation as the determinate-determinable property relation. When we say that the bestowment of the causal powers of G^* narrow the ways the causal powers of G can be exercised, in effect, we are saying that some causal powers of G are determinables of the causal powers of G^*.

Now, and this is the crux of my response to Shoemaker's solution, recall that the determinate-determinable property relation is a species of the realization relation, at least, according to the subset view. In fact, as I have argued in Chapter 3, if the subset view is true, all determinable properties are realized by their determinates in the same way that mental properties are realized by their physical bases. This means that the realization relation between properties is defined in *Realization-Narrow* partly in terms of a realization relation between causal powers. In order to see what is at stake, let us substitute the term "narrows the ways ..." with "realizes" (with appropriate grammatical alterations):

> (*Realization-Narrow**) A property P realizes a property Q if and only if (i) the causal powers of Q are a proper subset of the causal powers of P; (ii) if P is a conjunctive property that is constituted by Q and another property Q^* as a conjunct, then there is a relation between Q and Q^* such that (a) some causal powers of Q^* *realize* some causal powers of Q and (b) it is not the case that some causal powers of Q *realize* some causal powers of Q^*.

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[66] The addition of (b) is required to specify that the emphasised relationship between the two conjuncts is asymmetric.

This formulation of realization is not very helpful: it explains the realization relation between properties in terms of a realization relation between the causal powers of these properties. As I shall show in the next section, I think we can do better than this and provide a better way of demarcating between the good cases and the bad cases of conjunctive realizers.

6.4 Fundamentality

I think that I showed in the previous section that Shoemaker's way of demarcating between bad and good cases of conjunctive realizers is not desirable because realization ends up being formulated in terms of another realization relation. It invokes the notion of "narrowing down", which is supposed to correspond to the realization relation according to the subset view. In this section, I propose a way of solving the problem of conjunctive realizers without adding a constraint on conjunctive properties as realizers. I think we should stipulate that what counts as a realizer of a property must always be *more fundamental than* the realized property. I will elaborate on fundamentality below, but let me first introduce the new formulation of realization according to this proposal:

> (*Realization-Prior*) A property *P* realizes a property *Q* if and only if (i) the causal powers of *Q* are a proper subset of the causal powers of *P*; (ii) *P* is a more fundamental property than *Q*.

Let us, for the time being, assume that we have a working understanding of what it means to be a more fundamental property than another property, and see how this formulation can demarcate between good and bad cases of conjunctive realizers. It should be noted that I take fundamentality to come in degrees. This is an assumption that I will discuss in more detail shortly. I am not going to provide an analysis of relative fundamentality; that is, I am not going to attempt to explain what it is for one thing to be more, or less, fundamental than some other thing. As I will discuss in what follows, there are some particular cases where philosophers have some intuitions as to what things are more fundamental than other things. For example, according to physicalists, mental properties are not more fundamental than physical properties.

Before showing how this formulation will be helpful in solving the problem, let me say something about the addition of (ii). I am not the first person to suggest that a necessary condition on realization is that the realized property is less fundamental than the realizer property. By and large, dependence relations are taken to be *priority* relations, whereby a

dependent entity is less fundamental than its dependence base. Bennett (2011; forthcoming) has recently argued that priority (or "directionality" according to her terminology), is a feature of all "building" relations. Bennett's building relations are:

- *composition* (the mereological relation whereby parts compose wholes[67]);
- *truth-making* (namely the relation by which a true proposition is made true by the obtaining of a state of affairs);
- *grounding* (in the sense in which some facts are grounded in, or obtain in virtue of, other facts);
- *structure-making* (in Armstrong's (1986) sense where a state of affairs is made of up of particulars and universals);
- *bundling* (as in the relation whereby objects are thought to be made up of tropes[68]);
- emergence[69];
- and *realization.* (According to Bennett's use of the term "realization" all types of realization that I discussed in Chapter 3 are species of realization.)

The list that Bennett provides may or may not be accurate, but I follow the spirit of her proposal in the sense that I think that we should take realization as a priority relation.

One might (mistakenly) think that the addition of (ii) is superfluous because it is covered by (i) already. But it would be wrong to think so, and the reason for this is the crux of the argument of this section. Any conjunctive property has a set of causal powers whose

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[67] Though, see Schaffer's (2010) disagreement about the direction of priority in part-whole relations.

[68] Though, if tropes are (mereological) parts of the particulars that they make up as in Paul's (2002) sense, bundling is a form of composition.

[69] Bennett is wrong in putting emergence in this list of building relations for the simple reason that those who take emergence as the relation between mental properties and their bases, namely emergentists, take mental properties to be as fundamental as physical properties. See Barnes (2012) for a discussion.

proper subsets correspond to the causal powers of its conjuncts, but, not every conjunctive property is more fundamental than each of its conjuncts.

Realization-Prior as formulated above does not have a condition which explicitly bans (some) conjunctive properties as realizers, but it will help us rule out some, namely the bad, cases of conjunctive properties as realizers of their conjuncts. Recall that I argued that *being scarlet* is the conjunctive property of (*being red & Q*). What is crucial for the illustration of how my proposal solves the problem of conjunctive realizers is that the three properties in question, namely *being scarlet*, *being red*, and *Q*, are not properties at the same level of fundamentality. [70] It is not too controversial (insofar as we grant that fundamentality comes in degrees) that *being scarlet* is more fundamental than *being red*, at least for those who think that (i) grounding is a priority relation, and (ii) the fact that something is scarlet grounds the fact that it is red. A similar ranking can be made for the properties *having C-fibre stimulation* and *having pain*: *having C-fibre stimulation* is more fundamental than *having pain*.

Having provided the ranking of fundamentality of these properties, now we can see what cases of conjunctive realizers are allowed and what cases are excluded by *Realization-Prior*:

- The conjunctive property (*being red & Q*), which is identical with *being scarlet* counts as a realizer of *being red*. The proper subset relation between two properties obtains, and the latter is a less fundamental property than the former.
- If *Q* is as fundamental as, or more fundamental than, *being scarlet*, then *Q* will not be realized by *being scarlet*. If it is less fundamental than *being scarlet*, then *being scarlet* will count as a realizer of *Q*.

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[70] Again, I am assuming that there is such a property *Q* that is non-identical with *being scarlet*. This is an assumption that should not go unacknowledged.

- The conjunctive property (*having pain & P*), which is identical with *having C-fibre stimulation*, counts as a realizer of *having pain.* The proper subset relation between two properties obtains, and the latter is a less fundamental property than the former.

- If *P* is as fundamental as, or more fundamental than, *having C-fibre stimulation*, then *P* will not be realized by *having C-fibre stimulation.* If it is less fundamental than *having C-fibre stimulation*, then *having C-fibre stimulation* will count as a realizer of *P*.

- The conjunctive property (*being red & being square*) does *not* count as a realizer of *being red*. The proper subset relation obtains but there is presumably no difference in the degrees of fundamentality of these properties.[71]

Note that, on my view, anti-physicalists, at least the ones who think that mental properties are as fundamental as physical properties, cannot say that mental properties are realized by physical properties. I do not think that this is a disadvantage for my view. Different views regarding the mind-body problem are individuated by the relations they posit to obtain between mental properties and physical properties. As I suggested in Chapter 1, saying that this relation is realization is sufficient for being a physicalist. So, anti-physicalists should not say that mental properties are realized by physical properties. (Of course, they are free to say that determinable properties are realized by their determinates.)

So far, I have not provided an account of what it is to be a (relatively) fundamental property. But I do not think that it is necessary to do so. There are some fairly agreed upon intuitions about fundamentality (at least among physicalists), and we can use these intuitions in these cases. In other cases where there are no agreements, then there will be less agreement on whether there is realization or not. But what I need for my solution is

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[71] If I am wrong about this, according to *Realization-Prior,* then (*being red & being square*) would realize *being red.* If I am wrong about this, and if *Realization-Prior* is correct, then Shoemaker would be wrong in thinking that (*being red & being square*) does not realize *being red.*

that our intuitions about fundamentality should ideally coincide with our intuitions about whether there is realization or not.

We have the intuition that macro entities, such as tables, chairs, cities, planets, galaxies and so on, are not as fundamental as micro entities that ultimately compose those macro entities. Speaking of composition, in fact, mereological relations are paradigm cases where questions about fundamentality are (almost) uncontroversial. It is natural to think that mereologically simple (or simpler) entities are more fundamental than the (complex) entities that they compose.[72] There is an intuitive sense in which wholes are "nothing over and above" their parts. Unless one allows for the possibility of emergent properties (that I have discussed in Chapter 1), the properties of wholes are, again in this sense of the term, "nothing over and above" the properties of (and the relations between) their parts. A paradigmatic example of a claim about fundamentality is Lewis's (1986) thesis of Humean supervenience (see Chapter 4 above). According to this thesis, what ultimately exist are the bits of space-time, their properties and their arrangement; all else (including laws of nature) supervene on this array. On this view, then, the array of space-time would be (more) fundamental, and all else would be less fundamental. So, macro entities, properties of such entities, and the laws of nature, would be "nothing over and above" this fundamental structure of space-time. Although we do not have to agree with Lewis on the thesis of Humean supervenience, it is easy to understand this thesis in terms of fundamentality. So, I think that, in general, we can understand this "nothing over and above" locution in terms of a matter of fundamentality to the effect that if an entity (a property or an object) X is "nothing over and above" an entity (a property or an object) Y, X is not as fundamental as Y (unless X is identical with Y).

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[72] Yet, it is only *almost* uncontroversial that this is so. Schaffer (2010) thinks that what he calls the 'One', namely the whole universe, is ontologically prior to its parts. I will not be critically engaged with Schaffer's account.

So far I have been working with the assumption that fundamentality comes in degrees, and I have no intention to dispense with this assumption. However, it is worth noting that what might be called the *graded* model of fundamentality, or the "layered model of reality" as Kim (1998: 15) calls it, is not the only (meta-)ontological framework that talks about fundamentality. Just to mention a couple, Barnes (2012) and Cameron (2010) provide a meta-ontological framework according to which the talk of "fundamentality" should not be understood in terms of degrees. Let us call this model the *non-graded* model of fundamentality. According to this view, "things are either fundamental or they are not, in which case they are derivative. Fundamentality does not come in degrees" (Barnes 2012: 876).

On Cameron's (2010) version of the non-graded model, the task of ontology is to distinguish what "really" exists from what "merely" exists. He thinks that the English verb "exists" does not "carve the world at its quantificational joints" (ibid). This is because "exists" can be truly predicated of both fundamental entities and non-fundamental entities. (Similarly, "is instantiated" can be truly predicated of both fundamental properties and non-fundamental properties.)   On this view, what is not fundamental is simply derivative, and cannot be said to *really* exist, where "really exists" is a verb that is supposed to carve the world at its quantificational joints.

It is not my task here to argue against the non-graded model, but it is important to note that, in order for my proposal for formulating realization to work and capture the cases where I think there is realization, the graded model has to be true. It is essential for my proposal that properties come in different degrees of fundamentality, so that a realizer property F is more fundamental than a property G that it realizes. Moreover, if F realizes G, and if G realizes H, then the difference between the fundamentality degrees of F and H is greater than the difference between the fundamentality degrees of F and G.

Although I have not argued for the graded model of fundamentality, I should briefly note that it is not an *ad hoc* move to endorse it. The questions related to physicalism are usually framed in terms of an understanding of a world with different levels. Kim describes this "multi-layered" understanding of the world as follows:

> the world is stratified into different "levels," "orders," or "tiers" organized in a hierarchical structure. The bottom level is usually thought to consist of elementary particles, or whatever our best physics is going tell us are the basic bits of matter out of which all material things are composed. As we go up the

ladder, we successively encounter atoms, molecules, cells, larger living organisms, and so on (1998: 15).

This multi-layered picture of the world is shared by most of the participants in the debate that I am engaged in. For example, think of Gillett's (2002: 2003) dimensioned view of realization, or Shoemaker's (2003; 2007) account of micro-realization, both discussed in Chapter 3. Such relations are all formulated against the background of a layered understanding of the world. It is one those theoretical commitments one has to make in order to proceed. So I do not feel the burden of demonstrating the accuracy of this model. What is true is that the priority feature of realization is compatible with this model, and is not compatible with the non-graded model.

If my observations are correct and my proposal is to be taken seriously, it follows that, in my conception of properties, all cases of realization are such that the realizer property is identical with a conjunctive property that includes the realized property as a conjunct. But it is not the case that all conjunctive properties are realizers of all of their conjuncts. A conjunctive property counts as a realizer of a conjunct only if the former is a more fundamental property than the latter.

Before moving to the next section, I want to briefly mention an interesting result of the considerations of this section. I have mentioned (in 6.1) above that it is customary to think that a species property is the conjunction of a genus property and a differentia property (Rosen 2010). *Being human* is the conjunctive property of (*being animal & being rational*), for example. Does *being human* realize *being animal* (or *being rational*)? The proper subset relation between the putative realizer and the putative realized properties obtains. The causal powers of *being human* include the causal powers of *being animal* as a proper subset (and the causal powers of *being rational* as another proper subset). But do we have difference in fundamentality in the relevant sense in any of these cases? That is, is any of these conjuncts (*being animal* or *being rational*) less fundamental than the conjunctive property (*being animal & being rational*)? It is very hard to answer this question, but what I can say is that even if there is priority in this specific sense, it is not obvious. If I am allowed to infer from not-obvious to presumably-false, and generalise this intuition to all cases of the genus-species relation, I would say that, as a rule of thumb, genus properties (and differentia properties) are not realized by species properties. If I am not allowed to make these inferences, then I am happy to suspend judgment on this matter.

Before closing this section, I shall briefly consider and respond to a possible objection. The objection goes as follows: (i) parts are more fundamental than the wholes they compose; (ii) on my version of the subset view, a realizer property includes the realized property as a conjunct; (iii) conjunctive properties include their conjuncts as their parts; (iv) so a conjunct is more fundamental than the conjunction it belongs to; (v) so, on my version of the subset view, a realized property is more fundamental than its realizers; (iv) but realized properties are not more fundamental than their realizers; (v) therefore, my version of the subset view is false. The short answer to this objection is that the premise (iii) can be resisted. Nothing that my version of the subset view says is committed to the claim that conjunctive properties are mereological wholes that are composed of their conjuncts as their parts.

In this section, I argued that realization should be formulated as it is in *Realization-Prior* so that the realized property is always less fundamental than the realizing property. I argued that this helps us distinguish the bad cases of conjunctive realizers from the good cases.

6.5 The Explanation Link

I believe that I showed that my formulation of realization which imposes priority (of the more fundamental compared to the less fundamental) as a constraint is good enough to cover the good cases (namely the ones where we intuitively think that there is a realization relation) and to exclude the bad cases (namely the ones where we intuitively do not think that there is a realization relation) that we have covered so far. In this section, I want to consider some cases which are *possibly* problematic for my formulation. If these cases are not really problematic, my formulation that I gave in the previous section stands. But I will take this possibility seriously, and provide an alternative version of my formulation.

Again, consider the conjunctive property of (*having pain & P*), which is identical with *having C-fibre stimulation.* According to *Realization-Prior*, since *having C-fibre stimulation* is more fundamental than *having pain*, and since the proper subset relation obtains between the causal powers of these properties, *C-fibre stimulation* counts as a realizer of *having pain*. And I suggested that the conjunctive property of (*being red & being square*) presumably does not count as a realizer of any of its conjuncts, because there is no difference in fundamentality as required by *Realization-Prior*.

However, it seems possible to generate counterexamples to *Realization-Prior* in the following way. Take a non-fundamental property *P* and a fundamental property *Q*. (Or take *P* to be less fundamental than *Q*). The causal powers of *P* will automatically be a proper subset of the causal powers of the conjunctive property (*P & Q*). Does (*P & Q*) realize *P* regardless of what these properties are? An apparent example for this would be the one where we substitute *P* with *believing that it is raining*, and *Q* with a neural property which has nothing to do with beliefs, say *having C-fibre stimulation*.

If it is the case that the conjunctive property of (*believing that it is raining & having C-fibre stimulation*) is more fundamental than *believing that it is raining*, then it would also be the case that the conjunctive property in question is a realizer of *believing that it is raining*. Depending on the truth of the antecedent, this would be a fairly problematic objection to my proposal. The point could easily generalise, and my formulation might end up allowing a bunch of bad cases of realization.

It is possible to respond to this objection by saying the antecedent is false. That is, it is *not* the case that the conjunctive property of (*believing that it is raining & having C-fibre stimulation*) is more fundamental than *believing that it is raining*. The fact that there is no interesting connection between the two conjuncts, namely *believing that it is raining* and *having C-fibre stimulation,* works in the favour of this response. After all, how can arbitrary conjunctions of unconnected properties be (relatively) fundamental properties? At any rate, the following principle strikes me as a wrong one:

> (*The Wrong Principle*) For all properties *F* and *G*, if *F* is more fundamental than *G*, the conjunctive property (*F & G*) is more fundamental than *G*.

If the Wrong Principle were true, it would be very easy to generate new (relatively) fundamental properties. We could take a (relatively) fundamental property, conjoin it with a non-fundamental property, and if the principle that is considered were true, the conjunction would yield a (relatively) fundamental property. But this does not seem to be the case.

To fix ideas, think of the disjunctive property of *(having a mass of ~1.67 x 10^{-27} kg and being observed before 2050) or (not having a mass of ~1.67 x 10^{-27} kg and being observed after 2050).* For convenience, let us call this property *being hydrogrue.* All hydrogen atoms that are observed before 2050 are hydrogrue; but no hydrogen atom that is observed after 2050 is hydrogrue. So, like Goodman's (1955) "is grue", "is hydrogrue" is an unprojectible

predicate. If that is the case, *being hydrogrue* is not a fundamental property which "carves nature at its joints". However, *being hydrogrue* can be co-instantiated with relatively fundamental properties, such as *being a hydrogen atom.* (This conjunction is possible until 2050.) But is the conjunctive property of (*being hydrogrue & being a hydrogen atom*) a relatively fundamental property? Or is it more fundamental than *being hydrogrue*? I think that both questions should be answered negatively. In this particular example, the conjunctive property in question seems to inherit its non-fundamentality from its non-fundamental conjunct. If this observation is accurate, the Wrong Principle is false.

If the Wrong Principle is false, then nothing (that I am aware of) guarantees that the conjunctive property (*believing that it is raining & having C-fibre stimulation*) is a more fundamental property than *believing that it is raining.* So, nothing (that I am aware of) guarantees that my proposal of realization in terms of priority is in trouble.

However, I shall not be too confident, and grant the *possibility* of such problematic cases for my proposal. So let us take the possibility of such cases seriously, and make an amendment to *Realization-Prior* to the effect that it also rules out the considered bad case:

> (*Realization-Prior-Connectional*) A property *P* realizes a property *Q if and only if* (i) the causal powers of *Q* are a proper subset of the causal powers of *P*; (ii) *P* is more fundamental than *Q*; (iii) *P* and *Q* are "interestingly connected".

The phrase "interestingly connected" in (iii) is deliberately left unclear; I shall pursue how we should understand this interesting connection shortly. What is problematic about the putative realization of *believing that it is raining* by the conjunctive property (*believing that it is raining & having C-fibre stimulation*) is that there is no connection between these two properties apart from the conjunct-conjunction relation (and the inevitable consequences of this relation). The gist of the objection against my proposal based on this putative case of realization is the intuitive unconnectedness of *believing that it is raining* and *having C-fibre stimulation*. And because of this unconnectedness, there is the absence of the "interesting connection" between *believing that it is raining* on the one hand, and (*believing that it is raining & having C-fibre stimulation*) on the other hand. A straightforward way of fixing this problem would be to add (iii) to the formulation of realization, and the problem is fixed.

However, in what sense can the required "interesting connection" be explained? What is the "interesting connection" between *having pain* and *having C-fibre stimulation* which is

missing in the case that is in consideration here? What connection are we looking for? I can think of two options for cashing out the "interesting connection" in question. The first option will not be desirable for reasons to be explained. Hopefully, the second one will work. I shall discuss these in 6.5.1 and 6.5.2 respectively.

6.5.1 Minimal Base

Can the interesting connection in question be some sort of *dependence*? In other words, can we formulate realization along the lines of the following?

> (*Realization-Prior-Minimal*) A property *P* realizes a property *Q if and only if* (i) the causal powers of *Q* are a proper subset of the causal powers of *P*; (ii) *P* is more fundamental than *Q*; (iii) *P* is a *minimal base* for *Q*.

For all properties *F* and *G*, *G* is a minimal base for *F* just in case something's being *G* is sufficient for its being *F*, and "nothing less than" *G* would be sufficient for *F*'s instantiation in this case. That is, *G* cannot be identified with a conjunctive property whose conjuncts include a property that does not make any difference with respect to whether *F* is instantiated or not. So, (*believing that it is raining & having C-fibre stimulation*) does not realize *believing that it is raining* because something less than (*believing that it is raining & having C-fibre stimulation*) would have realized *believing that it is raining*.

Although it looks like we can use *Realization-Prior-Minimal* to rule out the bad case considered, there are some reasons to resist the addition of (iii). First, it makes the appeal to priority mentioned in (ii) redundant. We can use something along the lines of the following to rule out the bad cases that priority helped us to:

> (*Realization-Minimal*) A property *P* realizes a property *Q if and only if* (i) the causal powers of *Q* are a proper subset of the causal powers of *P*; (ii) *P* is a minimal base for *Q*.

The conjunctive property (*being red & being square*) does not count as a realizer of *being red*, because something "less than" this conjunctive property, such as *being scarlet*, would have realized *being red*. (Though, we could still impose priority for independent reasons that I have introduced in 6.4.)

Second, and this is more important than the first reason, *Realization-Prior-Minimal* and *Realization-Minimal* jeopardise the inclusion of some good cases. Think of *having pain*.

Perhaps, in a possible world other than the actual world, where the laws of nature are only slightly different, something "less than" *having C-fibre stimulation* realizes pain. Or more interestingly, even some actual world realizers of *having pain* may be "less than" *having C-fibre stimulation.* Since the locution of "less than" in this specific sense is not perfectly clear yet, I am not going to investigate how serious this problem is.

Third, introducing the notion of "base" as I articulate it should be found problematic for the sake of explaining realization. I have argued in Chapters 2, 3 and 5 that a theory of realization ought to explain in what way mental properties are metaphysically necessitated by their realizers. If we make it true by definition that the realizer property is a base for the realized property, there would not be anything to explain with respect to metaphysical necessitation. The necessitation of the mental by the physical should be the consequence of the formulation of realization, not part of the definition of it.

6.5.2 Explanation

A more promising way of cashing out what the "interesting connection" might be in the formulation of *Realization-Prior-Connectional* is by means of appealing to the notion of *explanatory connection*:

> (*Realization-Prior-Explanatory*) A property P realizes a property Q *if and only if* (i) the causal powers of Q are a proper subset of the causal powers of P; (ii) P is more fundamental than Q; (iii) Q and P are *explanatorily connected.*

Saying that two things are explanatorily connected is *not* saying that one *fully* explains the other. So, demanding that P and Q are explanatorily connected is not demanding that something's being P explains that thing's being Q (or that something's being Q explains that thing's being P). A requirement of explanation in this sense, which might also be called *metaphysical explanation*, or *grounding* (Fine 1994; Correia 2008; Rosen 2010; Schaffer 2010), is stronger than what I am intending to impose as a constraint on realization.

Explanation, in the full, metaphysical, sense is something that is linked to grounding in a particular way. In a nutshell, metaphysical explanation should be understood along the following lines:

- x's *being red* is (metaphysically) explained by x's *being scarlet*;

- x is red *because* (not in the causal sense of the term "because") x is scarlet;
- x is red *in virtue of* x's being scarlet;
- x's being red is *grounded in* x's being scarlet.

The reason that *Realization-Prior-Explanatory* does not invoke the notion of a full, metaphysical, explanation is that explanation, understood along the lines of the locutions listed above, is connected to metaphysical necessitation. All of the claims listed above entail a metaphysical necessitation claim, namely that *being scarlet* metaphysically necessitates *being red*.[73] And when I eliminated the option of adding a minimal base constraint on realization in 6.1 above, I explained why building the metaphysical necessitation feature of realization into the definition of realization is not desirable. As I suggested in Chapters 1, 2 and 5, metaphysical necessitation should be a consequence of our account of realization.

What we need is not a condition about full explanation, but rather a requirement about some explanatory connection. I do not know how this explanatory connection can be spelled out, but what I know is that it does not exist in the bad putative cases of realization considered above. Normally, something's being red has no explanatory connection to its being square, so it also should not have any explanatory connection to its *being red and square*; someone's believing that it is raining has no explanatory connection with that her brain's C-fibres firing, so it should not have any explanatory connection to her *believing that it is raining and her brain's C-fibres firing*; so on and so forth.[74]

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[73] Though, that grounding entails metaphysical necessitation is challenged by some; see Leuenberger (2014).

[74] In some cases, something's colour and shape might be interestingly connected. For example, think of a blue paper with a red square-shaped image printed on it. What marks the boundaries, and hence the shape, of the red image is its difference in colour from the rest of the paper. I am excluding such cases from my analysis.

A brief remark about the notions of explanation and explanatory connection are in order. The notion of explanation might raise the worry that I am suggesting some subjective, mind-dependent, constraints on realization, because explanation is usually understood as an epistemic, mind-dependent phenomenon. However, this would be a misguided worry. The notion of explanation, or explanatory connection, that is at work here has nothing to do with explanation in this subjective sense. An objective understanding of explanation is coherent, and the idea of such a kind of explanation is a traditional one. As Koslicki maintains, it is sometimes thought that an explanatory connection between two phenomena "can be traced back to there being a law connecting [them]" (2012: 213, footnote 27, emphasis deleted). And the existence of laws is not a subjective matter. Or, think of the Aristotelian understanding of explanation. On this understanding, things are to be explained according to four causes: material cause, formal cause, final cause, and efficient cause. As Koslicki notes, although these four causes are explanations, they "are real and privileged constituents of the world" (ibid). So, they are not subjective explanations.

The next question that I will consider is whether, in *Realization-Prior-Explanatory*, (iii) makes (ii) redundant. It might be thought that it does, because metaphysical explanations are always directional in the sense that what is explained is less fundamental than what explains it. But that would be a mistake. In *Realization-Prior-Explanatory*, what we have is not full explanation, but an explanatory connection. Still, the same worry might be (mistakenly) thought to apply: if two things are explanatorily connected in a metaphysical sense, even if the connection is not full metaphysical explanation, these two things should differ from each other with respect to their fundamentality. What underlies these remarks is the assumption that metaphysical explanation is a priority relation. But this assumption is dubious.

The problem with this assumption is that we can have metaphysical explanations regarding only non-fundamental entities. Arguably sets are non-fundamental entities, or at least, they

are not as fundamental as their members. Take three sets: {a, b, c, d}, {a, b}, and {c, d}. The existence of the first set can be metaphysically explained in terms of the existences of the latter two sets; that is, the existence of the former set can be inferred from the existence of the latter two sets by using the axiom of union. Is the set {a, b} more fundamental than the set {a, b, c, d}? If it is more fundamental, then this requires an argument.[75] Here is another example: the genus-species relation is arguably not a priority relation, but having a species property metaphysically explains having the genus property.[76] So, I do not think that the addition of an explanatory connection requirement makes the priority requirement redundant.

To sum up, I believe that it is possible to respond to worries about the (problematic) realization of *believing that it is raining* by the conjunctive property of (*believing that it is raining & having C-fibre stimulation*). In order to do this, we can posit a further condition on realization so that the realized property and the realizer property must be explanatorily connected: since there is no explanatory connection between *believing that it is raining* and *having C-fibre stimulation*, this example fails to be a case of realization.

6.6 Conclusion

In this chapter, I introduced the problem of conjunctive realizers for the subset view. The problem can be explained in terms of a dilemma: if the subset view is formulated without a restriction on conjunctive properties as realizers of their conjuncts, then the view

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[75] I can think of one way of arguing for this, though: Suppose that Lewis (1991) is right about the relationship between set theory and mereology, so sets have their subsets as their parts, in the mereological sense of the term "part". Assume that wholes are less fundamental than their composing parts. So {a, b, c, d} is less fundamental than {a, b}. I can happily discard this argument, by resisting the Lewisian proposal that is mentioned.

[76] This, again, is controversial. Rosen (2010) thinks that the species property is explained by the genus property and the differentia property. Socrates is a human being because he is an animal and he is rational.

overgeneralises and we end up with bad cases of realization; if the view is formulated with a ban on conjunctive properties as realizers of their conjuncts, it follows that no property realizes any property. The right response to this problem is that this is a false dilemma. Only some, namely the bad, cases of conjunctive realizers should be ruled out. However, it is not an easy task to provide a principled way of demarcating between bad cases and the good ones. Shoemaker provides such a principled way of doing so. But as I explained, his strategy is not very good, because he builds the notion of "narrowing down" into the definition of realization, and this notion, according to the subset view, refers to realization. So, if we take Shoemaker's solution, we end up with a formulation of realization partly in terms of realization.

I maintained that realization should be seen as a priority relation in the sense that a realized property is always less fundamental than its realizer(s). I argued that once this point is accepted, we can rule out the bad cases of conjunctive realizers and allow all the good cases. I considered a possible objection to my proposal, and argued that, if this objection is taken seriously, it can also be stipulated that the properties that are connected through realization are always explanatorily connected.

In the next chapter, I will go back to the simplified version of the subset view (because the problem of conjunctive realizers can be ignored for the sake of the issues that are discussed that chapter), and evaluate the subset view's solution to the exclusion problem.

CHAPTER 7: REALIZATION AND THE EXCLUSION PROBLEM

7.0 Introduction

According to the theoretical role of realization specified in Chapter 2, the postulation of a realization relation between mental properties and their physical bases should not imply that mental properties are causally excluded by their physical bases. This is an important constraint, because I take realization to be a relation in terms of which (non-reductive) physicalism can be formulated, and it is commonly thought that this variety of physicalism faces *the exclusion problem*, namely the problem that mental properties are causally excluded by their realizers. The subset view of realization that I have focused on in this thesis is commonly advertised as a distinctive solution to it. In this chapter, I will examine the exclusion problem and the subset view's solution to this problem. I will argue that the solutions that the defenders of the subset view provide are available to all varieties of non-reductive physicalism. This should not be seen as an objection to the subset view, but should be seen as an objection to the way it has been advertised.

In 7.1, I will re-introduce the exclusion problem premise by premise. In 7.2, I will re-introduce the simplified version of the subset view and provide the two solutions that the defenders of the view appeal to in order to solve the exclusion problem. The first solution is that mental property instances are proper parts of their realizing instances, and wholes do not causally exclude their parts. In the second solution, a distinction between causal *sufficiency* and causal *relevance* is made, and it is argued that although both realized and realizer properties can be causally sufficient, only one of them can be causally relevant. In 7.3, I will critically examine the first solution, and argue that we should not take the subset view's defenders' claims about parthood literally. Once this is acknowledged, it can also be seen that the solution that is given is available to other varieties of non-reductive physicalism too. In 7.4, I will evaluate the second solution. I will argue that all defenders of non-reductive physicalism can appeal to the distinction between causal sufficiency and causal relevance.

7.1 The Exclusion Problem

In this section, I will introduce the exclusion argument, which purports to show that non-reductive physicalism is false. Those who think that the exclusion problem is a problem suggest that if non-reductive physicalism is true, then mental properties are causally excluded by their realizers. They claim that any event that appears to be caused by a

mental property instance is already causally necessitated by the instantiation of the realizer of that mental property. Assuming that there is no systematic causal overdetermination, there is no room for mental causes, if mental properties are realized by physical properties. Jaegwon Kim (1989; 1998; 2005) is probably the most-cited source of the arguments that are purported to demonstrate this alleged problem for non-reductive physicalism.[77]

The demonstration of the exclusion problem starts with the platitude that mental properties can be, and sometimes are, causes of physical events. For instance, my belief that it is raining can cause me to open my umbrella. Call the event of opening my umbrella *E*. It is natural to assign a causal role in this case to the property of *believing that it is raining*. Call this property *M*. But if non-reductive physicalism is true, then *M*, like every instantiated mental property, is physically realized. Let us call the realizer of this mental property *P*. Recall that realization is an asymmetric, and hence an irreflexive, relation, so *P* is not identical with *M*. Now consider the physicalistically acceptable principle that if a physical event has a cause, it has a sufficient physical cause. This principle has come to be known as *the principle of causal closure*, and is suggested to be a significant component of physicalism.[78] The importance of it for physicalism comes from the contention that if physicalism is true then anything that is explainable can be fully explained by physics. Kim argues that if this principle were not true for what appear to be the effects of mental causes, then "to explain some physical events you must go outside the physical realm and appeal to nonphysical causal agents and laws governing behaviour!" (1996: 147).

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[77] There is a debate as to whether the same can be said for chemical properties, biological properties and so on. Noordhof (1999) argues that Kim's argument, if it is sound, also shows that those properties are inefficacious too, insofar as they are multiply realized. Kim (1997; 1998; 1999) takes those properties to be micro-based and argues that the exclusion problem does not arise for micro-based properties. Micro-based properties are properties like COMBO that I discussed in Chapter 3. However, it can be disputed that they are micro-based properties and that micro-based properties are not causally excluded.

[78] See Montero (2003) for a critical survey of versions of this thesis.

So far, the picture we have is the following: *M* (*believing that it is raining*) causes *E* (my opening the umbrella). But as the principle of causal closure suggests, *E* has a sufficient physical cause too. Given that *M* is realized by *P*, we can unproblematically suppose that *P* is the sufficient physical cause of *E* in question. Given that *M* and *P* are not identical, it follows that *E* has two non-identical sufficient causes. Let us call this case UMBRELLA.

Now, consider *the exclusion principle*: no event has multiple sufficient causes (that are instantiated simultaneously) unless it is genuinely causally overdetermined. [79] So, according to this principle, unless we have a case of genuine causal overdetermination, the existence of one cause for a subsequent event rules out other possible simultaneous causes for the very same event. The exclusion principle is controversial, as I shall highlight in 7.3. So, let us not focus on how to motivate it. What is important for our purposes here is its consequences regarding UMBRELLA. Since *E* has two non-identical sufficient causes instantiated simultaneously, it follows from the exclusion principle that UMBRELLA is a case of genuine causal overdetermination: *P* and *M* causally overdetermine *E*.

Before proceeding to the next steps of the demonstration of the problem, a short note on causal overdetermination is in order: a paradigm example of genuine causal overdetermination is the case where two snipers simultaneously shoot a victim and each shot is sufficient for the death of the victim. Let us call this case SNIPERS. It is clear that genuine causal overdetermination is possible, because SNIPERS is possible. It is not relevant whether there are actual cases of genuine causal overdetermination of this sort.

If we were to stop the demonstration of the exclusion problem at this stage, generalising from UMBRELLA to all mental-to-physical-causation cases, we would conclude that non-

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[79] The addition of the simultaneity constraint is required so as not to rule out cases of causal chains. Take event E_1 as a cause of event E_2, and E_2 as a cause of event E_3. Assuming that causal sufficiency is transitive, both E_1 and E_2 are causally sufficient for E_3, but this is obviously not a case of causal overdetermination. If it were, then almost every event would have been genuinely causally overdetermined.

reductive physicalism implies that mental properties and their physical realizers genuinely causally overdetermine their effects. However, the next step in the argument rejects this consequence. It says that mental properties and their realizers do not causally overdetermine their effects. The motivation for this comes from the contention that if such causal overdetermiantion is to be permitted, then *systematic* causal overdetermiantion has to be permitted, because whenever there is a mental property instance, there is also its realizer instance which is causally sufficient for the event that the mental property instance claims to cause. And, a prominent metaphor suggests that systematic causal overdetermination entails "bad engineering" on God's part, so we should not believe in such overdetermination.[80]

Let us recap what we have seen so far:

(1) Some mental properties are causes of physical events. *(Mental Causation)*

(2) Mental properties are realized by physical properties. *(Realization)*

(3) If a physical event has a cause, it has a sufficient physical cause. *(Closure)*

(4) No event has multiple (simultaneous) sufficient causes unless it is genuinely causally overdetermined. *(Exclusion)*

(5) Mental properties and their realizers do not causally overdetermine their effects. *(No Overdetermination)*

And the argument for (5) goes as follows:

(5a) If mental properties and their realizers causally overdetermine their effects, they do this systematically.

(5b) There is no systematic causal overdetermination.

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[80] See for example Schiffer's comments that "causal superfluousness is hard to believe in; it is hard to believe that God is such a bad engineer" (Schiffer 1987, quoted in Garett 1998: 355)

(5) Mental properties and their realizers do not causally overdetermine their effects. *(No Overdetermination)*

Now, let us see what is at stake through UMBRELLA. (1)-(4) imply that UMBRELLA is a genuine case of causal overdetermination because *M* and *P* are non-identical sufficient causes of *E*. However, (5) says that this is not the case. Therefore, (1)-(5) are mutually inconsistent. At least one of (1)-(5) must be false. Depending on the dialectic, the target of the argument changes, but a dilemma along the following lines follows: either non-reductive physicalism entails epiphenomalism (the view that mental properties are causally inert), or non-reductive physicalism is false. Accepting the first horn of the dilemma is not desirable, because it is given as a platitude that mental properties can be causes. So, non-reductive physicalism is false. Or so would say an opponent of non-reductive physicalism. If the opponent in question is a reductive physicalist, she would target (2), because (2) postulates the non-identity of mental and physical properties. If the opponent is opposing the physicalist component, she could oppose either (2) or (3).[81]

In the next section, I will introduce the subset view's response to the exclusion argument.

7.2 The Subset View as a Solution to the Exclusion Problem

If we take the exclusion argument that is introduced in the previous section seriously, then non-reductive physicalism seems to be in trouble. However, I believe that non-reductive physicalists have the resources to solve this problem. Here, I will introduce the subset view's solution to this problem.

The subset view is sometimes advertised as a solution to the exclusion problem. Shoemaker says that his view "is designed to avoid this consequence [that mental properties are causally excluded]" (2007: 11). Similarly, Clapp maintains that, on his view,

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[81] Emergentists can and do take these option. See O'Connor & Churchill (2010).

"the problems forcefully presented by Kim concerning causal and explanatory exclusion of mental properties by physical properties do not arise" (2001: 133). Wilson also presents her version of the subset as a solution to the exclusion problem (1999: 47-48).

According to the simplified version of the subset view, a property *P* realizes a property *Q* if and only if the causal powers of *Q* are a proper subset of the causal powers of *P*. (Recall that, in Chapter 6, I found this simplified formulation problematic because it entails that all properties are realizable and all conjunctive properties realize their conjuncts. I argued that, in addition to the subset relation between their causal powers, realizer and realized properties should also have a priority relation in the sense that realized properties are always less fundamental than their realizers. Since nothing in this chapter hinges on this problem, and since this problem can be solved, I will sidestep it and work with the simplified version of the subset view.)

There are two strategies that are appealed to by the defenders of the subset view to solve the exclusion problem. The first strategy is to show that mental properties and their realizers do not (genuinely or problematically) causally overdetermine their effects because mental property instances are *parts* of their realizers. The second strategy appeals to a distinction between causal sufficiency and causal relevance and an arguement that although both a realized property and its realizer can be causally sufficient for a subsequent event, only one can be causally relevant. I shall discuss these two strategies in 7.2.1 and 7.2.2 respectively.

7.2.1 The Parthood Strategy

The first strategy is to show that the proper subset relationship between the causal powers of a realized property and its realizer explains why mental properties are not causally excluded by their realizers. The idea is as follows: because of the proper subset relation between the causal powers of these properties, there is a *part-whole* relation between the instances of these properties. According to Shoemaker, the "instantiation of a realizer property … might naturally be said to include as a part, the instantiation of the … property that is realized" (2007: 11). And this is supposed to be the key to the solution of the exclusion problem. As Clapp writes, "just as there is no causal and/or explanatory competition between a whole and its parts, so there is no causal and/or explanatory competition between instances of mental properties and instances of their physical

[realizers]" (2001: 133). This point about the *instances* applies to the *properties*: there is no causal competition between mental properties and their realizers.[82]

I set aside until the next section the discussion of how to establish the aforementioned part-whole relation. Now, let us see how the alleged part-whole relation between mental properties and their realizers solves the exclusion problem. Here is an analogy that Shoemaker uses. Suppose that Smith is killed by a salvo of shots. But suppose also that, among the salvo, there is only one shot, namely Jones' shot, which hits the target. Let us call this case SALVO. It would be right to say that the "salvo killed Smith, but it did so because it included a particular shot, Jones', that killed Smith" (Shoemaker 2007: 13). With respect to killing Smith, there is no causal competition between the salvo as a whole and Jones' shot. By analogy, regarding UMBRELLA, we can say that there is no causal competition between the *P* instance and the *M* instance, because the latter is a part of the former. Here, the *dis*analogy between these two cases on the one hand and SNIPERS on the other hand should be noted: in the latter case, the two causes (two shots) are not related to each other by a part-whole relation, and if it were the case that any event could have at most one cause, we would have to say that one of these causes is excluded.

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[82] This solution to the exclusion problem is inspired by Yablo's (1992) solution. Yablo thinks that mental properties are determinable properties whose determinate properties are their physical realizers, and that determinable properties and their determinates are not in causal competition for their effects. (See Chapter 3 for my discussion of Yablo's view.) Determinables and their determinates are not in causal competition, because they are in the "same team" (ibid: 259). Yablo explains the "same team" metaphor in the following way. "Take for example the claim that a space completely filled by one object can contain no other. Then are even the object's parts crowded out? No. In this competition wholes and parts are not on opposing teams" (ibid: emphasis deleted). Yablo's explanation is that just as physical objects and their parts do not compete for the occupation of space, determinables and their determinates do not compete for causing subsequent events. Based on this analogy of parthood, Yablo then says that determinable properties and their determinates are in a part-whole relation. (See also Yablo 2001: 4-5).

It is worth asking why, in SALVO (and by analogy, in UMBRELLA too) there is no causal competition. Regarding SALVO, Shoemaker appears to have two conflicting intuitions. In one place, he says that SALVO "is obviously not a case of overdetermination" (ibid). On this reading, Shoemaker is resisting the exclusion argument, because he is rejecting premise (4), namely the exclusion principle. The salvo as a whole and Jones' shot are non-identical events, and they are both causally sufficient for the subsequent event. Although we have non-identical events that cause the very same event, we do not have a case of causal overdetermination. By analogy, UMBRELLA is not a case of causal overdetermination either.

Elsewhere, regarding the very same case, namely SALVO, Shoemaker says that this is "not overdetermination of an objectionable sort" (2007: 53).[83] This appears to conflict with what he says above. There, he says that SALVO is not a case of causal overdetermination. Now, it seems that Shoemaker grants that it is a case of overdetermination, but it is not a problematic one.[84] Putting aside this apparent conflict momentarily, it is clear that we can resist the exclusion argument anyway. On this reading, premise (5b) turns out to be false: SALVO could be a case of causal overdetermination because systematic causal overdetermination is not ruled out. Every case in which both a whole and a part of that whole are causally sufficient for a subsequent event would be a case of causal overdetermination. The bus runs over and kills Frank, but the half of the bus is sufficiently big and heavy to be lethal. Neil has food poisoning from a portion of chicken pakora, but only one piece of chicken in the whole portion is bad. Examples can be multiplied. But since such cases are common and undeniable, it is wrong to think that accepting them would be problematic.

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[83] See also Shoemaker (2001: 436) for similar remarks in an earlier text without reference to SALVO.

[84] Morris (2011) observes this apparent conflict too. As I shall illustrate below, I think this conflict is resolved with a charitable reading of Shoemaker.

Although Shoemaker's two interpretations of SALVO seem to conflict, I think there is a way of reconciling them: we can take genuine overdetermination as the type of overdetermination which is problematic when it is systematic. So, when we say that SALVO is not a case of problematic overdetermination even though it is a case of systematic overdetermination, we say that it is not genuine overdetermination. By analogy, UMBRELLA is not a case of genuine overdetermination, because even though it is an instance of systematic causal overdetermination, it is not problematic to grant its existence.

7.2.2 The Relevance Strategy

Now, let us move to the second strategy of the defenders of the subset view: the appeal to the notion of causal relevance. On his other comments on the exclusion problem, Shoemaker suggests that the subset view not only vindicates the causal efficacy of mental properties, but it also gives reasons to think that, in some cases, realizer properties could be causally excluded by realized properties (2007:14).

Recall that, when considering the first strategy, we saw that the P instance in UMBRELLA is a cause of E in virtue of including the M instance as a part. Although this seems to suggest a compatibilist reading where both P and M are causes, we see Shoemaker suggesting that, because of the in-virtue-of relation, M has priority over P with respect to causing E. This priority claim will become more evident in the subsequent discussion.

In order to see how the second strategy works, let us consider the case SOPHIE, which is originally introduced by Yablo (1992). Sophie is a pigeon that is trained to peck at all and only red things she sees. Suppose that Sophie is shown a scarlet patch. Since scarlet patches are red, she pecks at this patch. Inspired by Yablo, the defenders of the subset view all think that determinable properties are realized by their determinates. So take the determinable property *being red* to be realized by its determinate *being scarlet* in this example. Regarding SOPHIE, Shoemaker says that

> [t]his instantiation of red was realized in an instantiation of scarlet, and the instantiation of scarlet was of course causally sufficient (in the circumstances) for the occurrence of Sophie's pecking. But it seems right to say that *it was the instantiation of red, not the instantiation of scarlet, that caused Sophie's pecking"* (2007: 14, emphasis added).

Now, recall UMBRELLA. By analogy, it might be said that although both M and P are causally sufficient for E, it is right to think that M, rather than P, is the cause of E. So, Shoemaker's intuitions seem to have transformed from a compatibilist account to an

exclusion account. In SOPHIE, *being red* excludes *being scarlet*. In UMBRELLA, *M* excludes *P*. And by analogy, in SALVO, Jones' shot would exclude the whole salvo.

If we are to agree with this new exclusion account, we have to endorse a distinction between a *sufficient* cause and a *relevant* cause. In SOPHIE, while both *being red* and *being scarlet* are sufficient for the pecking behaviour, only *being red* qualifies as a relevant cause. *Being scarlet* is causally sufficient, but it is not causally relevant. One of the sufficient causes excludes the other as a relevant cause. I will discuss the understanding of causation that underlies this reasoning in 7.4 below.

In the last two subsections, I introduced the subset view's two strategies to solve the exclusion problem. In the next two sections, I will examine these two strategies respectively.

7.3 Examining the Parthood Strategy

Now, I will critically examine the first strategy that the defenders of the subset view appeal to in their response to the exclusion problem. The solution goes as follows: mental property instances are parts of their realizer instances, and parts and wholes do not causally compete. Since their instances do not causally compete, the properties are not causal competitors either.

The idea that mental property instances are parts of their realizer instances seems to have a significant role in this solution. However, it is not established how this parthood relation can obtain. From the fact that the causal powers of a property Q are a proper subset of the causal powers of a property P, it does not straightforwardly follow that any P instance includes a Q instance as a part. Melnyk (2006) observes this gap between the subset claim and the parthood claim, and offers the defenders of the subset view a solution to close this gap. According to this solution, properties are identified with the sets of causal powers they

confer.[85] And corresponding to this identification of properties and sets of causal powers, the instances of these properties can be identified with sets of the tokens of these causal powers.[86] If property instances are identified with sets of token causal powers that are associated with these properties, any property instance, which is identical with a set of such powers, would include the instances of the properties it realizes.

To illustrate, suppose that property P has causal powers cp1, cp2 and cp3, and that property Q has causal powers cp1 and cp2. Suppose that an individual S instantiates P. This instantiation of P would be identical with the set $\{cp1_S, cp2_S, cp3_S\}$ (where cpn_x should be read as the tokening of cpn in individual x). This set includes the set $\{cp1_S, cp2_S\}$, which would be identical with the instantiation of Q in S. So the instantiation of P in S includes the instantiation of Q in S.

The first problem with this solution is that it commits the subset view to more than it is originally committed to. In fact, Melnyk presents this "solution" as some sort of a *reductio* against the subset view. Naturally, the defenders of the subset view would have the burden of proof to justify the identification of property instances with sets of token causal powers, and the identification of properties with sets of causal power types. I should note that it is possible to defend this view, but the problem is that this is an additional task, and the subset view, as it is advertised by Shoemaker, is independent of this view (2007: 142).[87]

The second problem with this solution is that even if the defenders of the subset view can justify the aforementioned identification claim, it still does not follow that a P instance

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[85] The identity of properties with sets of causal powers is something that Shoemaker (1980) has argued for independently of the issues related to the subset view. However, he wants to keep the subset view independent from this view (2007: 142). See Chapter 5 above for my examination of this dissociation.

[86] I called the thesis that Melnyk commits the subset view *Power-Instance-Identity* in Chapter 5.

[87] However, see Chapter 5 above. In Chapter 5, I argued that keeping the subset view independent of similar metaphysical commitments is not possible.

includes a *Q* instance as a *part*. What follows is that *Q* instance is a *subset* of the *P* instance. In order for the intended conclusion to follow, we need to endorse the view that sets have their subsets as parts. Again, it is possible to defend this view. It might be argued that there is a mereological relation between two entities although it *prima facie* does not seem to be so.[88] The problem is that this is still an additional commitment for the subset view, which requires an argument. And, regardless of the possibility of the success of the required argument, it would reduce the logical space for the subset view even further.

Based on these observations, it would be fair to say that the defenders of the subset view have not made a persuasive case for the claim that realized property instances are parts of their realizer instances. (Perhaps, they will in the future.) But does this mean that the subset view cannot solve the exclusion problem?

It is true, or at least very plausible, that parts and wholes do not genuinely (or problematically) causally overdetermine their effects. There is something intuitive to the idea that SALVO is not a case of genuine (or problematic) overdetermination. So, Shoemaker's intuitions about SALVO seem right. Given this, the following two are true:

(a) Jones' shot is not causally excluded by the whole salvo;
(b) Jones' shot is a part of the salvo.

Moreover, it is true that (b) entails (a), because of the general rule that parts and wholes are not causal competitors. What is disputable is whether the part-whole relation is *required* to explain away the causal competition.

Consider a relation *R* which is *logically weaker* than *proper parthood*. That is, for all x and y, that y is a proper part of x entails x*R*y, but x*R*y does not entail that *y* is a proper part of x. And suppose further that *R* is a relation such that if x*R*y, then x and y do not causally

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[88] Lewis (1991) thinks that classes have their subclasses as mereological parts.

compete. If we can show that there is some relation that occupies the role R as specified, and if it can be demonstrated that, in SALVO, Jones' shot and the salvo are related with this relation, then we can have an explanation for (a) that would be less committal than (b).

What could occupy the role of R as specified above? I suggest that a good candidate is asymmetric necessitation. Asymmetric necessitation is weaker than proper parthood in the sense specified above. If something is a proper part of another thing, the presence of the latter asymmetrically necessitates the presence of the former.[89] But the presence of something could asymmetrically necessitate the presence of another thing without the latter being a proper part of the former. That is, proper parthood is only a species of asymmetric necessitation. (For example, the existence of a statue is asymmetrically necessitated by the existence of the lump of clay that constitutes the statue. But on a standard understanding of material constitution, the statue is not a proper part of the lump of clay.) And things that are related through asymmetric necessitation are not causal competitors. This latter claim is less obvious than the former, but it is defensible, as I will argue below.

The idea that there is no "genuine" causal overdetermination when there is a necessitation relation between two causes has been around for a while (Block 1990; Yablo 1992; Garrett 1998; Funkhouser 2002; Bennett 2003; Sider 2003; Kallestrup 2006). Variants of the case of SNIPERS can be seen as examples of genuine, or "standard", causal overdetermination. The disanalogy between SNIPERS and SALVO is clear. None of the shots necessitates the other in SNIPERS. But in SALVO, the presence of the whole salvo necessitates the presence of Jones' shot. (Here, I am assuming mereological essentialism, namely the view that wholes have their parts essentially. If this is found problematic, the same point could be made by granting that most salvos have proper parts which are lethal collections of shots. So, such lethal salvos necessarily include lethal proper parts.)

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[89] I am assuming mereological essentialism here. I shall comment on this assumption below.

Now, the question is why there is no genuine causal overdetermination when causes are related by a necessitation relation. Bennett (2003, 2008) provides an account of causal overdetermination thanks to which we can have an answer to this question. While it is difficult to provide a full account of genuine causal overdetermination, we can give an account of some of its necessary conditions. In order for an event E to be causally overdetermined by two non-identical events A and B, A must be causally sufficient for E when B is absent, and B must be causally sufficient for E when A is absent. Although it is not required to invoke a counterfactual theory of causation in order to explain causal overdetermination, we can appeal to subjunctive conditionals to formulate it. The overdetermination test that Bennett gives goes as follows:

> (OD) (For non-identical events X, Y and Z) X and Y causally overdetermine Z only if (i) if X had happened without Y, Z would have happened; (ii) if Y had happened without X, Z would have happened; (iii) the conditions (i) and (ii) are not *vacuously* true.[90]

Now, let us consider SNIPERS. Let us say that event A is sniper A's shooting the victim, event B is the sniper B's shooting the victim, and event C is the death of the victim. First, if A had happened but B had not happened, C would still have happened. Second, if B had happened but A had not happened, C would still have happened. Third, the two conditions are not vacuously true: A without B (and likewise, B without A) is not impossible. So, the case is not disqualified as causal overdetermination by (OD).

However, SALVO fails the test. The reason is that the whole salvo necessitates Jones' shot: it would not have been the same salvo without thereby including Jones' shot, if mereological essentialism is true. Even if mereological essentialism is false, it would not

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[90] The subjunctive conditional "if P were the case, Q would have been the case" is vacuously true when P is necessarily false.

have been a lethal SALVO without including a lethal part. This means that it is only vacuously true that if the salvo were present and Jones' shot were absent, then Smith would have died. Similarly, in UMBRELLA, it is only vacuously true that if I had instantiated *P* without instantiating *M*, I would have opened my umbrella, because it is not possible to instantiate *P* without thereby instantiating *M*. It is stipulated from the outset that *P* metaphysically necessitates *M*. That mental properties are metaphysically necessitated by their realizers (in the worlds where physicalism is true) is already a part of physicalism.

Strictly speaking, it is not required by physicalism that a given realizer property, *on its own*, is metaphysically sufficient for a property it realizes. What is metaphysically sufficient is usually the total realizer, and this includes the core realizer (which is the property that is readily thought to be the realizer property), the appropriate background conditions.[91] But then, what I said in the previous paragraph might be resisted. After all, having *P* without *M* is possible when the appropriate background conditions do not obtain (or the laws of nature are different). In that case, the conditional in question would not be vacuously true. However, there is an available response to this objection: although this conditional would not be vacuously true in this case, it would not be true anyway. If the appropriate background conditions do not obtain, nothing guarantees that *E* happens when *P* is instantiated (Bennett 2008: 288-289).

If these observations are correct, then UMBRELLA is not case of genuine causal overdetermination regardless of whether the *M* instance is a part of the *P* instance or not. What is important is that *M* is necessitated by *P*. Considerations like these provide reasons to reject the premise (4) or (5b) in the exclusion argument. There could be non-identical causes for a subsequent event without genuine (or problematic) causal overdetermination. Both the salvo and Jones' shot are causally sufficient for Smith's death. Both *M* and *P* are

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[91] See Chapter 2 above for a more detailed discussion of total and core realization distinction.

causally sufficient for *E*. Neither case is a case of genuine (or problematic) causal overdetermination.[92]

So, when Shoemaker says that SALVO is not a case of causal overdetermination, he actually echoes the aforementioned contention that there is a significant difference between cases like SALVO and cases like SNIPERS. Since asymmetric necessitation is weaker than parthood and sufficient to explain away the causal competition, the positing of the parthood relation between the realized properties and their realizers is a step that Shoemaker and other defenders of the subset view do not need to take. And, considering the problems associated with the demonstration of the part-whole relation between mental property instances and their realizers, perhaps it is a step that they should avoid.

Others who take the subset view's parthood claims literally include Audi (2011) and Morris (2011). They both raise objections against the subset view based on this. Morris (2011) poses the following problem. Taking realized property instances as parts of their realizers leads us to a conclusion which is at odds with physicalism. According to physicalism, a mental property instance depends on the physical property instance that realizes it. However, when part-whole relations are considered, standardly, it is thought that wholes depend on parts, not *vice versa*. So, by analogy, the subset view takes physical properties (as wholes) to depend on mental properties (their parts). Audi makes a similar point when he says that realizer properties, "on the … [subset] view, are the wholes, and hence not ontically prior to what they realize. So this view fails to accommodate a basic feature of realization" (2011: 16). Once the parthood relation that is stipulated by Shoemaker is not taken literally as a mereological realization, Morris's and Audi's objections can easily be rejected.

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[92] See Arnadottir & Crane (2013) for a recent article against the exclusion principle. They argue that the exclusion principle "is contrary to our ordinary judgments about causation, has no strong independent defence, and ought to be rejected" (ibid: 253).

My claims in this section lead to a dilemma for the subset view: either the subset view's solution to the exclusion problem requires the parthood claim, or it requires less than this. If the parthood claim is required, then the defenders of the subset view should explain how the subset condition on the causal powers of properties entails the part-whole relation between the instances of these properties. The commitments that are required for this explanation reduce the plausibility of the view. On the other hand, if a weaker relation than parthood is sufficient for this solution, the most plausible candidate is asymmetric necessitation. However, if this sort of necessitation is what is required to solve the exclusion problem, then the subset view becomes superfluous with respect to the solution to the exclusion problem, because any form of non-reductive physicalism can use this strategy. Realization is stipulated by all non-reductive physicalists as an asymmetric necessitation relation. Of course, merely saying that the mental is metaphysically necessitated by the physical is one thing, explaining how that is so is another thing. And, I believe that the subset view has the resources to explain how that is so. But with respect to responding to the exclusion argument, this is a step that is not required.

So, this is not an argument against the subset view, a version of which I proposed. Instead, I intend to show that it is misleading to advertise the subset view as if it is a distinctive solution to the exclusion problem. In the next section, I will critically examine the second strategy that the defenders of the subset view appeal to.

7.4 Examining the Relevance Strategy

In the previous section, I argued that the first strategy that the defenders of the subset view ultimately appeal to in their response to the exclusion problem can be used by all forms of non-reductive physicalism. In this section, I will discuss their second strategy, and argue for a similar conclusion.

Suppose that the exclusion principle as it is given in premise (4) is false. Can there be a plausible version of the exclusion principle other than the one given in (4)? As I mentioned in 7.2 above, Shoemaker seems to provide an exclusion account although he rejects (4), which seems to suggest that he appeals to a different exclusion principle. This is clearer in his discussion of SOPHIE, where he thinks that *being scarlet* does not seem to be the right cause of the pecking behaviour. In a way, *being red* excludes *being scarlet*, although both are casually sufficient for the pecking behaviour. This different exclusion principle could be formulated along the following lines:

(*NewEx*) If there are simultaneous multiple sufficient causes for an event *E*, only one of these is an *appropriate* cause of *E*, unless *E* is genuinely causally overdetermined.

According to this new exclusion principle, unless we have a case of genuine causal overdetermination, we can choose at most one of the causally sufficient conditions as an appropriate cause of *E*. In SOPHIE, *being red* is the appropriate cause. In UMBRELLA, *M* is such a cause. In SALVO, Jones's shot is the appropriate cause. And finally, in SNIPERS, both shots are causes, and because of this, SNIPERS is a case of genuine causal overdetermination.

The idea that is expressed by *NewEx* should not be uniquely associated with the subset view: Yablo (1992) and Menzies (2008; 2013)[93] have argued for the plausibility of a principle like this. The plausibility of *NewEx* hinges on the plausibility of the distinction between sufficient causes and relevant causes. As Menzies notes,

> the fact that causal sufficiency doesn't amount to causation has been known for some time ... A man's taking a contraceptive pill is causally sufficient for his not getting pregnant, [but] there is no causal relevance here, as the man's taking a contraceptive pill makes no difference to his not getting pregnant (2013: 71-2).

What we need to pay attention to is the notion of *causal relevance*. There are different ways of cashing out what causal relevance is. Here, I will sketch two ways of doing so. First, it is possible to explain causal relevance in terms of *proportionality*. Yablo (1992) thinks that causes should be proportional to their effects as much as possible. And proportionality is understood as follows: a cause should be *required* by the effect in the sense that nothing less than it would have caused the event, and a cause should be *enough* for the effect in the sense that nothing more is needed to cause the event. When Yablo originally introduced the case of SOPHIE, he suggested that *being red* is a better candidate

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[93] See also List & Menzies (2009).

than *being scarlet* for causing the pecking behaviour because, in this case, *being red* is a better candidate for proportionality. *Being red* is both required and enough for the pecking behaviour; although *being scarlet* is enough for the same behaviour, it is not required by the effect; if the patch were crimson, Sophie would still have pecked.

NewEx can be formulated in terms of this proportionality account of causation in the following way:

> (*NewEx-Proportionality*) If there are simultaneous multiple sufficient causes for an event *E*, only one of these is a proportional cause of *E*, unless *E* is genuinely causally overdetermined.

In SOPHIE, *NewEx-Proportionality* excludes *being scarlet* in favour of *being red*. In SALVO, it excludes the salvo in favour of Jones' shot. But we can consider another case (another recurring example in this debate) where Sophie's sister Alice is trained to peck at all and only scarlet things. She is given a scarlet patch, and she pecks. Let us call this case ALICE. In ALICE, *being scarlet* excludes *being red*, because *being red* (although required), is not enough for the pecking behaviour; Alice would not have pecked at a crimson patch.

Second, we can explain causal relevance by means of appealing to the notion of *difference-making*. Considering SOPHIE, Menzies says the following:

> the target's being red makes a difference to the pigeon's pecking because in any relevantly similar situation in which the pigeon is presented with a red target it pecks, and in any relevantly similar situation in which it is not presented with a red target it does not ... [These] observations confirm the conjecture that the requirement that causes make a difference to their effects captures the crucial notion of causal relevance (2013: 73).

With this account of causation as difference-making, we can reformulate *NewEx* as follows:

> (*NewEx-Difference*) If there are simultaneous multiple sufficient causes for an event *E*, only one of these is a difference-making cause of *E*, unless *E* is genuinely causally overdetermined.

Similar results will be obtained when *NewEx-Difference* is applied to the cases that we have been considering.

The proportionality and the difference-making accounts are not the only two accounts of causation by which we can highlight the distinction between a sufficient cause and a relevant cause. But the discussion of these two accounts suffices to show that what is at work in the subset view's second strategy is this distinction. The subset view does not provide an additional account of why there is such a distinction. If this is correct, then, regarding this second strategy, we can conclude that any non-reductive physicalist is free to appeal to it. This strategy's tenability does not provide any extra support for the subset view. Again, this is not an objection against the subset view. Rather, it intends to show that if the subset view can solve the exclusion problem, so can other variants of non-reductive physicalism.

7.5 Conclusion

In this chapter, I evaluated the subset view's response to the exclusion problem. I discussed the two strategies that the defenders of the subset view use in order to solve this problem. I maintained that if these solutions work, they work independently of the truth of the subset view. The first strategy boils down to the observation that mental properties and their realizers do not causally overdetermine their effects because they are connected through an asymmetric necessitation relation. But any non-reductive physicalist can appeal to this strategy, because, realization is, by stipulation, an asymmetric necessitation relation. On the other hand, if the second strategy works, it works in virtue of the distinction between causal sufficiency and causal relevance. Any non-reductive physicalist can appeal to this distinction. These considerations support the conclusion that the subset view should not be advertised as a distinctive solution to the exclusion problem, because the strategies that its defenders use are open to all non-reductive physicalists.

CONCLUSION

In this thesis, I have argued that physicalism should be formulated as a realization thesis: mental properties are realized by physical properties. I have argued that the core idea of the subset view provides a helpful formulation of realization. So, if physicalism is true: the causal powers of a given mental property are a proper subset of the causal powers of its realizer. Although the core idea of the subset view is presumably true, there is more to realization than the proper subset relationship between causal powers of properties. In particular, if realization were simply the said proper subset relationship between causal powers of properties, it would also be true that, *first*, all properties (including the fundamental ones) are realizable by other properties, and *second*, every conjunctive property is a realizer of its conjuncts. I suggested that we should take realization to be a *priority* relation to solve this problem: a realizer property is always *more fundamental than* the properties it realizes. From these observations, I proposed that the following formulation of realization is plausible:

(*Realization-Prior*) A property P realizes a property Q if and only if (i) the causal powers of Q are a proper subset of the causal powers of P, and (ii) P is more fundamental than Q.[94]

I maintained that physicalists' intuitions as to which properties are more fundamental than others match their intuitions as to when there is a case of realization.

Given that it is one of the core ideas of physicalism that mental properties are metaphysically necessitated by physical properties, and that physicalism in my understanding is the view that mental properties are realized by physical properties, a

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[94] Although I am not entirely convinced about this, in case some counterexamples to this formulation might be generated, a third condition on realization can be added so that P is explanatorily connected to Q. I discuss this in detail in Chapter 6, Section 6.5.2.

theory of realization should provide the resources to explain how it is the case that if a property *P* realizes a property *Q*, then, *necessarily*, if something has *P*, it also has *Q*. If realization is the relation that is specified in *Realization-Prior*, then the metaphysical necessitation feature of realization should ideally be explainable in terms of a relationship between properties and their causal powers. I argued that if *the causal thesis* is true then the metaphysical necessitation feature of realization can easily be explained. The causal thesis is the conjunction of the following two theses:

(C1) Properties are individuated by their causal profiles.

(C2) Properties have their causal profiles essentially.

Although the causal thesis might be required for a theory of realization that endorses *Realization-Prior,* it should be noted that both (C1) and (C2) are very controversial theses. Those who find these two theses implausible will have indirect reasons to find the theory of realization I have defended implausible too.

By and large, theories of realization have focused on issues about mental causation; many theories of realization have been motivated by the solutions they give to the exclusion problem. The exclusion problem is the alleged problem that mental properties are causally excluded by their realizers because all the causal work that appears to be done by a given mental property is already carried out by its realizer. I argued that a theory of realization should provide the resources to explain how mental causation is possible, so show how the exclusion problem is not a real problem. I concluded that the real solution to the exclusion problem boils down to the claim that mental properties are not metaphysically distinct from their realizers. Since *Realization-Prior*, coupled with the causal thesis, can easily explain how a mental property is metaphysically necessitated by its realizer, the exclusion problem can be easily responded to under the version of physicalism that I formulated in this thesis.

I have clarified the notion of realization by mapping out its connections to the formulation of physicalism, a general metaphysics of properties, causal powers and laws of nature, causation in general, and mental causation in particular. I hope that the future research on these and related issues will benefit from the discussions and the arguments I have given and the strategy I have endorsed. I expect that similar strategies can be used for studying and formulating other views regarding the mind-body problem and the relations those views postulate.

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