

Physical Determinability

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ABSTRACT

I defend a dualist model of psychophysical causal relevance, according to which mental events are not causes in the physical domain, but are causally relevant in this domain because they enable – or, in other words, provide the appropriate structure for – physical events to be caused. More specifically, I defend the claim that mental events are ‘double preventers’ within the physical domain, where double preventers are a type of enabling event. The distinction that I make between causes and enabling events and the dualist model of psychophysical causal relevance that I defend has emerged from my acceptance of the powers theory of causation. In this paper, I explore how this dualist model of psychophysical causal relevance offers a response to Papineau’s defence of the causal completeness principle via the conservation laws.

Keywords: the causal completeness principle, conservation laws, the powers theory of causation, double prevention

1. Introduction

In the contemporary mental causation debate, it is generally accepted that some version of physicalism – the doctrine that everything is physically constituted – must be true in virtue of the causal completeness of the physical domain. Despite the importance of the causal completeness principle to physicalism, detailed defences of this principle are seldom provided. In ‘The Rise of Physicalism’, Papineau attempts to address this gap in the literature, providing what is, without doubt, one of the most thorough defences of the principle to date (Papineau, 2001). In this defence, Papineau rejects the claim that there is *sui generis* mental energy, arguing that if there is no *sui generis* mental energy then this, in combi-

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nation with the laws of conservation of energy and momentum, establishes the causal completeness principle. In an earlier paper I argued that Papineau's argument is questionable because it smuggles in two causal assumptions, either one of which the interactive dualist is free to reject (Gibb, 2010). The first assumption is that the redistribution of energy and momentum cannot be brought about without supplying energy or momentum (*Redistribution*). The second is that the only way that something non-physical could contribute to determining an effect in a physical system is by 1) affecting the amount of energy or momentum in it, or 2) redistributing the energy or momentum in it (*Physical Determinability*). Since writing that paper, I have gone on to develop and defend a new dualist model of psychophysical causal relevance that is based within the framework of a powers theory of causation. According to this model, the causal role of mental events in the physical domain is to serve as 'double preventers'. (See, for example, Gibb, 2013.) The aim of this paper is to locate this dualist model of psychophysical causal relevance within my previous discussion of Papineau's argument. I argue that this dualist model entails the rejection of one of the hidden causal premises in Papineau's argument that I identified in Gibb, 2010 – namely, *Physical Determinability*. By rejecting *Physical Determinability*, it thereby allows one to reject Papineau's argument for the causal completeness principle.

2. The Argument from Causal Overdetermination

Alongside most contemporary physicalists, Papineau holds that, given the causal completeness principle – which he formulates as the claim that 'All physical effects are fully determined by law by prior physical events' – a relatively straightforward argument can be presented for physicalism and against dualism (Papineau, 2001, p. 8). This three-premise argument, commonly referred to as the 'argument from causal overdetermination', can be set out as follows:

1. *Relevance*: Mental events are causally relevant in the physical domain.
2. *Completeness*: All physical effects are fully determined by law by prior physical events.
3. *Exclusion*: There is no systematic causal overdetermination.

Mental events (that are causally relevant in the physical domain) are identical with physical events.¹

¹ For simplicity, with Papineau, I shall assume that the causal relata are property instantiations (Papineau,

To briefly explain this argument: In accordance with *Relevance*, say that M is a mental event and that it causes physical event E. Given *Completeness*, E must be fully determined by prior physical events. Call the (complex) physical event that fully determines E 'P'. Given *Exclusion*, as P fully determines E, then, for M to determine E as well, contrary to dualism, M must be identical with P or part of a cause that is identical with P.

Assuming that the argument from causal overdetermination is valid, the dualist must reject either *Relevance*, *Completeness* or *Exclusion*. Along with most of those in the mental causation debate, few dualists are willing to reject *Relevance* – that we are capable of performing intentional actions which result in the movement of our bodies is taken for granted in everyday life; to abandon this idea is to abandon our pretheoretical conception of human agency. Rejecting *Exclusion* is also an unattractive option for the dualist. Depending on one's account of the causal relation, one may well allow that there are *isolated* cases of causal overdetermination. Hence, for example, if two shots are independently fired and both bullets reach the victim at the same time, given that each bullet striking was on its own enough to determine the death of the victim, then the victim's death was causally overdetermined. But what seems implausible is that events are *systematically* – that is, as a general rule – causally overdetermined. And, it is precisely this kind of *systematic* causal overdetermination that the combination of *Relevance* and *Completeness* gives rise to, unless physicalism is correct. Consequently, given that the argument from causal overdetermination is valid, the plausibility of dualism hinges upon whether or not *Completeness* is false.

3. Papineau's Argument for *Completeness*

The conclusion of Papineau's 'The Rise of Physicalism' is that *Completeness* «by any normal inductive standards, has been fully established by over a century of empirical research» (Papineau, 2001, p. 33). What is Papineau's argument for *Completeness*?

A popular assumption in the mental causation debate is that *Completeness* is a fact of current science, that there is some evidential connection between

2001, p. 10). Hence, following Kim, I shall assume that events are the causal relata, where an event is the instantiation of a property by a substance at a time. Given this Kimean account of the causal relata, the identity of mental causes with physical causes requires the identity of mental properties with physical properties. Therefore, the conclusion of the argument from causal overdetermination directly rules out both substance dualism and property dualism.

current science and ‘finished’ science and, hence, that finished science will also support *Completeness*. But this raises the question of how exactly current science is supposed to provide support for *Completeness*, and it is this question that Papineau’s paper is devoted to answering.

Papineau explains that his original thought was that *Completeness* would follow from the laws of conservation of energy and momentum, which are a cornerstone of current physics. According to these laws:

Conservation: Every physical system is conservative or is part of a larger system that is conservative (where a system is conservative if its total amount of energy and linear momentum can be redistributed, but not altered in amount, by changes that happen within it).²

As Papineau comments, «[i]f the laws of mechanics tell us that important physical quantities are conserved regardless of what happens, then doesn’t it follow that the later states of physical systems are always fully determined by their earlier physical states?» (Papineau, 2001, p. 14).

But matters are not quite so straightforward. According to Papineau, the crucial problem with this defence of *Completeness* is that the conservation laws are consistent with the existence of sui generis mental energy, for the conservation laws do not tell us what kinds of energy there are, only that any kind of energy that does exist must operate conservatively. If sui generis mental energy does exist, then provided that it operates conservatively, *Conservation* does nothing to rule out the possibility that the occurrence of some physical effects require the transfer of such mental energy. *Conservation* is therefore consistent with the claim that not every physical effect is fully determined by prior physical events. Hence, *Conservation* does not entail *Completeness*.

As a consequence of this reasoning, in ‘The Rise of Physicalism’ Papineau’s central aim is to provide a rejection of the claim that sui generis mental energy does exist. Papineau provides two detailed arguments – the «argument from fundamental forces» (Papineau, 2001, pp. 28–30) and the ‘argument from physiology’ (Papineau, 2001, pp. 30–32) – to demonstrate that, in light of recent evidence from theoretical physics and physiological research, we can conclude that there is probably no sui generis mental energy. The argument from fundamental forces claims that, given the arguments behind the conservation

² See the *Oxford Dictionary of Physics* (Daintith, 2005) for a formulation of the conservation laws along these lines.

of energy, we can inductively reason that «all apparently special forces characteristically reduce to a small stock of basic physical forces which conserve energy» (Papineau, 2001, p. 28). If all special forces reduce to basic physical forces, there are no *sui generis* mental forces. The Argument from Physiology leads to the rejection of the existence of *sui generis* mental forces because if «there were such forces, they could be expected to display some manifestation of their presence» (Papineau, 2001, p. 31). However, detailed physiological investigation reveals no such thing.³ By demonstrating that there probably is no *sui generis* mental energy, Papineau considers that he has demonstrated that *Completeness* is probably true.

4. The Problem with Papineau's Argument

In this discussion my concern is not with the issue of whether or not Papineau's attempt to establish that there is no non-physical energy is successful. It is instead with the structure of the argument for *Completeness* that Papineau is offering. What prompted Papineau's discussion of whether or not there is *sui generis* mental energy was the idea that if there isn't any such energy, then the conservation laws entail *Completeness*. Having established that there probably is no *sui generis* mental energy, Papineau concludes that *Completeness* is probably true. Hence, the argument that Papineau is offering for *Completeness* is as follows:

1. Every physical system is conservative or is part of a larger system that is conservative (*Conservation*).
2. There is no non-physical energy (*Energy*).

All physical effects are fully determined by law by prior physical events (*Completeness*).⁴

³ Although Papineau's discussion is framed in terms of forces rather than in terms of energy, Papineau's argument can be interpreted as an argument against the existence of *sui generis* mental energy. This is not to misrepresent Papineau's position. In classical contexts, force-based formulations of mechanics and energy-based formulations are arguably interderivable: the terms (and principles) of either theory can arguably be derived from those of the other. Hence, energy (both kinetic and potential) is initially defined in terms of the work done by a force acting on a body, so potential and kinetic energy can be derived from force, and equally, force can be derived from potential energy. Given that *sui generis* mental energy can be defined in terms of the work done by a *sui generis* mental force, evidence against mental forces can also be taken to be evidence against mental energy. (See Goldstein, Poole, & Safko, 2002, §1.1.)

⁴ For further defence of the claim that this is the argument for *Completeness* that Papineau (2001) is wishing to present, see Gibb (2010).

Setting aside the question of whether Papineau's defence of *Energy* is successful, is this argument valid in the first place? Does the combination of *Conservation* and *Energy* entail *Completeness*?

In Gibb, 2010, I argue that it is not valid. In particular, I argue that to move from the combination of *Conservation* and *Energy* to *Completeness*, one must make two causal assumptions without which neither *Conservation* nor *Energy* nor their combination could be used to defend *Completeness*. Here, I provide a summary of my argument.

Conservation is inconsistent with an event determining an effect in a physical system by altering the amount of energy or momentum in it, unless that event is from within a larger conservative system of which the physical system is a part. Given *Energy*, a physical system is not part of a larger conservative system that includes non-physical energy. The combination of *Conservation* and *Energy* therefore entails that non-physical events cannot determine an effect in a physical system by altering the amount of energy or momentum in it – that is, by adding or taking away energy or momentum. This is because, given *Energy*, the energy-momentum gain (loss) would not be compensated by an energy-momentum loss (gain), and, hence, would violate *Conservation*.

Although the combination of *Conservation* and *Energy* rules out the possibility of non-physical events determining an effect in a physical system by altering the amount of energy or momentum in it, this combination does not rule out the possibility of non-physical events determining an effect in a physical system by redistributing the energy and momentum in it – unless the non-physical can only redistribute the energy and momentum in a physical system by supplying energy or momentum to it. The mere combination of *Conservation* and *Energy* is therefore consistent with the claim that the determination of some physical effects requires the redistribution of energy or momentum by non-physical events. To rule this out, Papineau's argument for *Completeness* requires the following causal premise:

Redistribution: Redistribution of energy and momentum cannot be brought about without supplying energy or momentum.

But the combination of *Conservation*, *Energy* and *Redistribution* still does not entail *Completeness*. A second causal premise is required which limits the ways in which an event could determine an effect in a physical system. The combination of *Conservation*, *Energy* and *Redistribution* entails that non-physical

events cannot contribute to determining an effect in a physical system by altering the amount of energy or momentum in it or by redistributing the energy or momentum in it. But the question that this now raises is whether there is some alternative way that a non-physical event might contribute to determining an effect in a physical system. Couldn't it be the case that for some physical effects to be fully determined, non-physical events must play a role, where this role does not involve them altering the amount of energy or momentum in a physical system or redistributing it? If this were the case, then *Completeness* would be false. Papineau's argument for *Completeness* therefore requires the following additional causal premise:

Physical Determinability: The only way that something non-physical could contribute to determining an effect in a physical system is by 1) affecting the amount of energy or momentum in it, or 2) redistributing the energy or momentum in it.

Bringing these premises together, we have the following argument for *Completeness*:

1. Every physical system is conservative or is part of a larger system that is conservative (*Conservation*).
2. There is no non-physical energy (*Energy*).
3. Redistribution of energy and momentum cannot be brought about without supplying energy or momentum (*Redistribution*).
4. The only way that something non-physical could contribute to determining an effect in a physical system is by 1) affecting the amount of energy or momentum in it, or 2) redistributing the energy or momentum in it (*Physical Determinability*).

All physical effects are fully determined by law by prior physical events. (*Completeness*).⁵

Papineau's assumption that one can move easily from the combination of *Conservation* and *Energy* to *Completeness* and, hence, to physicalism is clearly incorrect. There is space for the dualist to provide a model of psychophysical

⁵ Note, I only wish to draw attention to two of the additional premises that Papineau's argument requires. Whether there are other premises that are required to make Papineau's argument valid is a further question that I do not need to engage with for the purpose of this paper.

causal relevance that involves the rejection of either *Redistribution* or *Physical Determinability*.

Are there any such dualist models of psychophysical causal relevance? C.D. Broad's model of psychophysical causal relevance appears to hinge upon the denial of *Redistribution*, for Broad's suggestion is that mental events prompt transfers of energy between physical events without themselves transferring energy (Broad, 1925, p. 109). But far more perplexing is the issue of whether any plausible dualist model of psychophysical causal relevance that denies *Physical Determinability* exists. A common assumption in the contemporary mental causation debate, and a relic of the mechanistic model of psychophysical causal relevance offered by Descartes, is that for mental events to play a role in determining physical effects they must bring about changes in the motion of matter.⁶ If this assumption is correct, then *Physical Determinability* must be true, as all such changes will be explicable in terms of energy and momentum redistribution. Hence, the very idea of a dualist model of psychophysical causal relevance that denies *Physical Determinability* will strike many as strange.

In Gibb, 2010, I observed that E. J. Lowe's model of psychophysical causal relevance offers one potential way for the dualist to deny *Physical Determinability* (Lowe, 1993, 1999, 2000, 2008). Lowe claims that if we were to trace the causal chains of neural events that give rise to a bodily movement backwards, we would discover that these causal chains display a highly complex, fractal, tree-like structure. From a purely physical perspective, the fact that these causal chains of neural events converge on a particular event, the bodily movement, looks like a remarkable coincidence. The role of mental events in the physical domain, according to Lowe, is to render the fact that a causal tree of neural events converges on a particular bodily movement non-coincidental. That is, a mental event is responsible for the fact that a set of mutually independent neural events together give rise to a particular bodily movement. Why, according to Lowe, does this amount to a denial of *Physical Determinability*? Well, crucially Lowe holds that mental events do not play this convergence role by acting on any individual neural event or set of neural events, and it is for this reason that he considers his model of psychophysical causal relevance to be a denial of *Physical Determinability*. Indeed, Lowe holds that a mental event

⁶ This certainly appears to be Papineau's 2001 assumption, for he only considers the possibility that the mental might determine the physical by "moving matter".

cannot play this convergence role by transferring energy or momentum to any neural event or set of neural events in the causal tree, for, according to him, there will be no single neural event or set of neural events in the causal tree that the mental event can plausibly be said to transfer energy or momentum to (Lowe, 1999, p. 66).⁷

At the time of writing that paper I was tempted to conclude that Lowe's dualist model of psychophysical causal relevance presented the only way for the dualist to deny *Physical Determinability*. However, since then I have developed my own dualist model of psychophysical causal relevance – the double prevention model. As I shall argue in this paper, it also leads to the rejection of *Physical Determinability* – indeed, the fact that it is a denial of *Physical Determinability* is perhaps more obvious than the fact that Lowe's model is. It is to this dualist model of psychophysical causal relevance that I now turn.

5. The Double Prevention Model

The dualist model of psychophysical causal relevance that I propose has emerged from my acceptance of a powers theory of causation. To explain this model, I therefore need to begin by briefly explaining the key elements of this theory of causation. According to the powers theory of causation, powers or dispositions (I use these terms interchangeably) provide the basis for an account of the causal relation. Two claims are central to this account of causation:

First, intrinsic properties bestow *irreducible* powers on their bearers – to maintain a powers theory of causation, one must be a realist about powers.⁸ Given this stance on powers, the power to break is built into some property of a porcelain vase, and it is because it has this property that the vase is disposed to break when dropped. Note, dispositions are to be held apart from their manifestations. (Although the manifestation of a disposition will itself be a disposition). For a disposition to be real it need not be manifesting any manifestation. Indeed, it need never manifest any manifestation. Thus a porcelain vase that never exists in circumstances that would allow it to manifest its fragility, is still fragile despite never manifesting its fragility.

⁷ For a far more detailed discussion of the claim that Lowe's model of psychophysical causal relevance is a denial of *Physical Determinability*, see Gibb (2010, pp. 371–374).

⁸ To be a realist about powers one need not maintain that properties are exhausted by their dispositionality (for such an account, see Shoemaker, 1980). It is also consistent with accounts that understand every property to be both dispositional *and* qualitative. (For this account, see Martin, 2008 and Heil, 2003.) In this paper, I take a neutral stance on these different forms of realism about powers.

Secondly, causation just is the manifestation of these powers. This claim can be developed in various ways, giving rise to different variations of the powers theory of causation. I shall adopt C.B. Martin's account, according to which causation is the mutual manifestation of reciprocal disposition partners (Martin, 2008). Usually, a particular manifestation of a disposition depends on the presence of other dispositions. Hence, the breaking of a vase when it is dropped depends not only on the vase being fragile, but also on the surface on which it lands being hard. Therefore, when a vase is dropped on a surface and breaks this is not only a manifestation of its fragility, but also of the surface's hardness. Martin describes the vase's fragility and the surface's hardness as «reciprocal disposition partners» and the breaking of the vase as their *mutual* manifestation». Hence, causation is, according to Martin, the mutual manifestation of reciprocal disposition partners.

One of the things that is interesting about the powers theory of causation is its analysis of cases of double prevention. Double prevention occurs when an event that would prevent another event from having a certain effect is itself prevented from doing so. To give an example of double prevention, imagine that a barrier is placed in front of a porcelain vase, but that the barrier is wired up to a device which will cause the barrier to explode if a button on the device is pressed. Normally, if a rock is thrown at the vase, the barrier would prevent the rock from coming into contact with and, hence, breaking the vase. But, if the device's button is pressed, this destroys the barrier, hence allowing the rock to hit the vase. This is a case of double prevention. The barrier would have prevented the rock from breaking the vase, but is prevented from doing so by the pressing of the button. Consequently, the vase breaks.

Given the powers theory of causation, one can offer the following account of double prevention. In most cases, the manifestation of a disposition depends not only on certain dispositions being present but also on others being absent. For example, the vase's manifesting its fragility when a rock is thrown at it depends on the absence of the solidity of the barrier. This is because one disposition may be disposed to prevent the manifestation of another – the solidity of the barrier is disposed to prevent the mutual manifestation that is the vase's fragility and the rock's momentum and hardness. According to the powers theory of causation, in the case of *double* prevention, a disposition that is disposed to prevent the manifestation of another disposition, is itself prevented from doing so by the presence of a third disposition. Hence, taking the example of double prevention that I have given, the solidity of the barrier is disposed to prevent the

rock from breaking the vase, but is itself prevented from doing so by the pressing of the device's button.

What is interesting is that, given the powers theory of causation, a double preventer event cannot be counted as a cause of the event that it has prevented from being prevented. An absence is not a cause according to the powers theory of causation – an absence cannot bear powers and hence cannot be disposed to act in any way. But, unless absences are causes, there cannot be a chain of unbroken causation from the double preventer event to the event that it has prevented from being prevented. Hence, taking our example of double prevention, the pressing of the button causes the destruction of the barrier. But, given the powers theory of causation, the barrier's destruction (that is, the barrier's *absence*) cannot, in turn, be a cause of the vase's breaking. Hence, given the powers theory of causation, there cannot be a chain of unbroken causation from the pressing of the device's button (the double preventer event) to the breaking of the vase (the event that is prevented from being prevented).⁹

This fact about the powers theory of causation has led me to introduce a distinction between events that are causes and events that are enablers. Enabling events are not causes, although they enable – or, in other words, permit – events to be caused. Given the powers theory of causation, double preventer events are enabling events. They do not cause the event that they prevent from being prevented. Instead, they enable the event to be caused. They enable the event to be caused by preventing an event from preventing it from being caused.

Despite not being a cause of the event that it prevents from being prevented, a double preventer event *is* causally relevant to the event that it prevents from being prevented, and not just in a merely explanatory sense. In those causal situations involving enabling events, for the effect to be determined, as well as the cause, a further event must occur whose role is to enable the causal relation to occur. Indeed, I hold that in cases of double prevention the role of an enabling event is no less important than the role of a cause.¹⁰

According to my dualist model of psychophysical causal relevance, which is premised upon the acceptance of the powers theory of causation, mental events are enabling events. They are causally relevant in the physical domain, not because they cause physical events, but because they enable physical events to be

⁹ For further defence of the claim that, given the powers theory of causation, a double preventer event cannot be counted as a cause of the event that it has prevented from being prevented, see, for example, Mumford and Anjum (2009).

¹⁰ For defence of this claim, see, for example, Gibb (forthcoming b).

caused. More specifically, my claim is that mental events are double preventers in the physical domain. A mental event enables a certain bodily movement to take place by enabling a neurological event to cause the bodily movement. It enables this causal relation to take place by preventing a mental event from preventing it.

To understand this model of psychophysical causal relevance more clearly, let me give a specific example. Assume that dualism is true and, hence, that mental events are not identical with physical events. Call the event that is neuron 1 firing in Kate’s brain ‘n1’, the event that is neuron 2 firing in her brain ‘n2’ and the event that is Kate’s arm’s raising ‘b1’. Let us say that the firing of neuron 1 is disposed to make neuron 2 fire, which is disposed to make the muscle fibres contract in Kate’s arm and her arm raise. For simplicity, let us suppose that no other dispositions are required for any of these manifestations. Hence, n1 causes n2 and n2 causes b1.

Now, let us say that n2’s causing b1 would be prevented by Kate’s desire to keep her body still. (Call this mental event ‘m2’). But Kate has a conflicting desire. Although she has the desire to keep still, she also has the stronger conflicting desire to raise her arm – call this mental event ‘m1’ – so she can flick a piece of hair from her eye. Having this stronger desire to raise her arm prevents the manifestation of her desire to keep her body still. That is, m1 prevents m2 from preventing n2 from causing b1. Consequently, she raises her arm. This can be presented diagrammatically as follows:

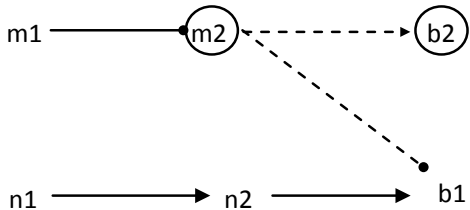


Figure 1

In Figure 1, a solid line ending in an arrow depicts a causal relation; a solid line ending in a dot depicts an inhibitory connection; a broken line ending in an arrow depicts a causal connection that failed to occur; a broken line ending in a dot depicts an inhibitory connection that failed to occur and a circle around a letter signifies the non-existence of the relevant event.

M1 is not a cause in the physical domain, but rather an enabling event. M1 enables the physical event b1 to take place by enabling n2 to cause b1. It en-

ables n_2 to cause b_1 by preventing m_2 from preventing n_2 from causing b_1 . As m_1 is an enabling event in the physical domain, it is causally relevant in the physical domain. I refer to this dualist model of psychophysical causal relevance as ‘the double prevention model’.

Elsewhere, I argue that the double prevention model, like Lowe’s model, has a number of important advantages over standard dualist models of psychophysical causal relevance which take the causal role of mental events in the physical domain to be that of causing a neurological event or set of neurological events that ultimately give rise to some movement of the limbs. These include the fact that a particularly strong version of the causal completeness principle, such as the one that Papineau offers in ‘The Rise of Physicalism’, is required to rule out the double prevention model.¹¹ This is important because, obviously, the stronger the causal completeness principle is the harder it will be to defend. Equally, and relatedly, the ‘no-gap argument’ for the causal completeness principle which is often alluded to by proponents of this principle does not create a problem for the double prevention model as, given the double prevention model, the causal role of mental events in the physical domain is not to fill in gaps in causal chains of physical events.¹² But can the double prevention model offer a response to Papineau’s defence of the causal completeness principle via the conservation laws?

6. The Double Prevention Model and Papineau’s Argument

I argued in §4 that to move from the combination of *Conservation* and *Energy* to *Completeness* one must also accept two causal claims – *Redistribution* and *Physical Determinability*. Without these additional claims, neither *Conservation* nor *Energy* nor their combination provide an argument for *Completeness*. As I will now explain, the double prevention model’s response to Papineau’s defence of *Completeness* is to reject *Physical Determinability*.

First, let us begin by again noting that, given the double prevention model, non-physical events do contribute to determining effects in a physical system. Enabling events contribute to determining the events that they enable to be caused. More specifically, double preventer events – which are one kind of enabling event – contribute to determining the events that they prevent from being prevented. Hence, return to the example of a case of double prevention,

¹¹ See Gibb (forthcoming b).

¹² See Gibb (forthcoming a).

in which a barrier would have prevented a rock from breaking a vase, but is prevented from doing so by pressing a device's button. Quite clearly, the pressing of the device's button – the double preventer event – contributes, along with the throwing of the rock, to determining the vase's breaking. The throwing of the rock was not enough to make the vase break. The button also had to be pressed. If the button had not been pressed, the vase would not have broken. And the same is no less true if, rather than a physical event, a non-physical event serves as a double preventer in the physical domain. Hence, taking the example of double prevention set out in *Figure 1*, Kate's desire to raise her arm (m1) contributes, along with the firing of neuron 2 (n2), to determining Kate's arm's raising (b1). The firing of neuron 2 was not enough to make Kate's arm rise. Kate also had to have the desire to raise her arm. If Kate had not had this desire, her arm would not have raised. Hence, given the double prevention model, non-physical events contribute to determining effects in a physical system.

But, contrary to *Physical Determinability*, given the double prevention model, non-physical events do not contribute to determining physical effects by affecting the amount of energy or momentum in a physical system or by redistributing it. The reason is relatively straightforward. Again consider *Figure 1*. Although m1 contributes to determining b1, quite clearly it does not do so by acting on any physical event or any set of physical events. Rather, it does so by acting on another non-physical event (m2). Because m1 does not act on any physical event or set of physical events, there is no physical event or set of physical events that m1 could possibly be accused of transferring energy or momentum to or redistributing energy or momentum between. Nor is there any physical event or set of physical events that m2 could possibly be accused of transferring energy or momentum to or redistributing energy or momentum between, for the whole point is that m1 *prevents* m2 from preventing n2 causing b1 – that is, m1 *prevents* m2 from acting on any physical event.

Hence, given the double prevention model, m1(a non-physical event) contributes to determining b1 (a physical event) but it does not do so by affecting the amount of energy or momentum in a physical system or by redistributing it. Given the double prevention model, the dualist can therefore reject *Physical Determinability* and, hence, Papineau's argument for *Completeness* via the conservation laws.

7. Objections

In this section I shall briefly raise and respond to some potential objections to the double prevention model's response to Papineau's argument for *Completeness* via the conservation laws. As I hope to make clear, the problem with most of these objections is their failure to properly embed the dualist model of psychophysical causal relevance that I have proposed in the framework of the powers theory of causation.

O1: Although m1 does not act on any physical event, it does act on a mental event (m2). Say that m1 prevents m2 from preventing n2 causing b1 by causing m2 to cease to exist (i.e. upon gaining the desire to raise her arm, Kate loses the desire to keep her body still). How can m1 do this? How can m1, a non-physical event, cause m2 to cease to exist – or, indeed, have *any* affect on m2 at all – in light of the arguments that Papineau presents in 'The Rise of Physicalism'? The combination of Papineau's argument from fundamental forces and his argument from physiology provide a convincing case against the existence of sui generis mental energy. But if there is no sui generis mental energy, how could m1 cause m2 to cease to exist, for surely this causal process must ultimately involve the redistribution of sui generis mental energy?

R1: This objection is a compelling one if one accepts the energy transference theory of causation, according to which causation is the transference of a quantity from cause to effect, where this quantity is energy or momentum. The difficult issue of how the energy transference theory of causation should analyse cases in which the supposed effect is an absence (in this particular case, the absence of m2) is one that we needn't get involved with here.¹³ The point is that, given the energy transference theory of causation, for m1 to have played any causal role in bringing about the non-existence of m2, it must have transferred energy to something, and unless we accept some version of physicalism, we are forced to accept that the energy which it transfers is non-physical. If the energy transference theory of causation is correct but there is no sui generis mental energy, a (non-physical) mental event can no more be a cause in the mental do-

¹³ The difficulty being that absences cannot be, as Fair puts it, the sources or the *sinks* of energy-momentum. See Fair (1979, p. 246).

main than it can be a cause in the physical domain.¹⁴

But the double prevention model is not premised upon the acceptance of the energy transference theory of causation. Nor could it be. The energy transference theory of causation entails *Physical Determinability* for according to the energy transference theory of causation all effects are energy or momentum gains (and all causes, energy or momentum losses). But the double prevention model rejects *Physical Determinability* and, in doing so, it rejects the energy transference theory of causation.

The double prevention model should not be divorced from the theory of causation that it is premised on – the powers theory of causation. Given the powers theory of causation, mental causation is not the transfer of mental energy. Rather, mental causation is the manifestation of a mental entity's powers. In the language of the powers theory of causation, Kate's desire to raise her arm prevents the manifestation of her desire to keep her body still. One disposition may prevent the manifestation of another in one of two ways. The manifestation of the first disposition might lead to the loss of the second disposition (i.e. upon gaining the desire to raise her arm, Kate loses the desire to keep her body still). Or, the second disposition might be retained but its manifestation blocked by the manifestation of the first disposition (i.e. Kate retains the desire to keep still, but the manifestation of this desire is blocked by the presence of her overriding desire to raise her arm). There is, of course, more to be said about how the powers theory of causation should analyse cases of prevention, but none of it should involve talk of energy or forces. Any suggestion that it should involve such talk – that it should analyse cases of prevention in terms of underlying non-causal physical processes – would be to abandon the powers theory of causation for the energy transference theory of causation or some variant of it.

O2: m2 has the power to prevent n2 from causing b1. In the causal system represented in *Figure 1*, m2 fails to manifest this power because of the presence of m1. But what if we were to vary the circumstances slightly and imagine that m1 was not present? In these circumstances, m2 would not fail to manifest this power, i.e. m2 *would* prevent n2 from causing b1. This would result in m2 affecting the amount of energy or momentum in the physical system or redistributing it. Hence, we

¹⁴ For further discussion of this point, see Gibb (2010, §3).

revert back to the original problem for interactive dualism that Papineau's argument raises.

R2: This problem is removed if in any case in which we have n_2 and m_2 , m_1 is present to prevent m_2 from preventing n_2 from causing b_1 . This would be the case if some event in the causal chain of neurological events that gave rise to n_2 entailed the existence of m_1 . Hence, for example, if the existence of n_1 entailed the existence of m_1 . This entailment relation between n_1 and m_1 would be explained if whatever neurological event that causes n_1 also causes m_1 . This proposal is wholly consistent with the kind of dualist emergentism that I wish to defend, which takes mental entities to depend on physical entities, but which understands the dependence to be a *causal* dependence. It is set out in the following diagram, where n_0 is some further neurological event.

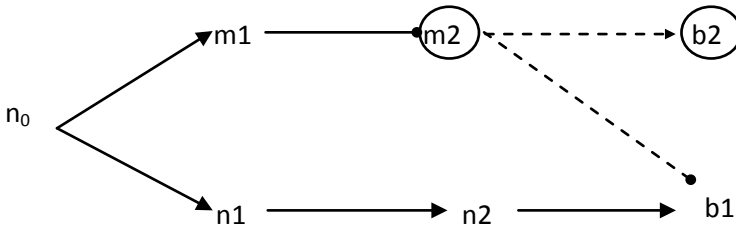


Figure 2

Responding to a similar objection in Gibb 2013, I provide a detailed explanation and defence of this proposal (Gibb, 2013, pp. 204–207). Rather than simply repeating what I say there here, I refer the reader to that paper.

In short, my response to O2 is that, yes, if a mental event ever did prevent a physical event from causing some other physical event, on the basis of Papineau's arguments we would have good grounds to conclude that this would violate *Conservation*. But I would want to hold that a mental event never actually does play this preventative role in the physical domain despite being disposed to do so, because it is naturally impossible for the combination of dispositions which would be required for the mental to manifest this disposition to arise.

O3: In Figure 2, n_0 causes m_1 . But how, given the combination of *Conservation* and *Energy*, can a physical event have a (non-physical) mental effect?

R3: As with O1, this objection is compelling if one accepts the energy transference theory of causation. Given the energy transference theory of causation, for $n0$ to cause $m1$, $n0$ must transfer energy to $m1$. Given the combination of the energy transference theory of causation with dualism, the physical energy which $n0$ transfers to $m1$ must presumably be converted into sui generis mental energy.¹⁵ But according to Papineau there is no sui generis mental energy. Hence, either, contrary to *Conservation*, $n0$'s energy loss is not compensated by an energy gain in $m1$. Or, contrary to dualism, $n0$'s energy loss is compensated by an energy gain in $m1$, but it is a gain in physical energy.

But matters are different if, rather than accepting the energy transference theory of causation, one accepts the powers theory of causation. Given the powers theory of causation, if a physical event causes a mental event then this is not to be analysed as a physical event transferring energy to a mental event. Rather, for a physical entity to cause a mental entity is for a physical entity to manifest one of its powers and for the manifestation to involve a mental entity. Hence, the powers theory of causation provides no reason whatsoever to think that for $n0$ to cause $m1$, $n0$ must experience an energy-momentum loss and $m1$ an energy-momentum gain. Hence, given the powers theory of causation, the claim that the combination of *Conservation* and *Energy* rules out $n0$ from causing $m1$ lacks motivation.

O4: The double prevention model assumes the powers theory of causation, and the powers theory of causation, unlike the energy transference theory of causation, is compatible with the rejection of *Physical Determinability*. But this does not mean that the double prevention model is correct to reject *Physical Determinability*. *Physical Determinability* is supported by the empirical evidence. Consequently, the double prevention model is implausible from an empirical point of view.

R4: *Physical Determinability*, as we have seen, is not entailed by the conservation laws. Nor is the denial of *Physical Determinability* obviously inconsistent with any other law of physics. So what is the empirical evidence that is supposed to establish *Physical Determinability*?

Papineau's discussion provides no clue as to what this empirical evidence might be. His arguments for *Energy* – the argument from fundamental forces

¹⁵ For an advocate of such a view, see Hart's account of physical-mental causation, which is an attempt to combine substance dualism with the energy transference theory of causation (Hart, 1988).

and the argument from physiology – do nothing to establish *Physical Determinability*. According to Newtonian Law, the effect of a force is to bring about proportional changes in the velocities of the bodies it acts on. To deny *Physical Determinability* is to deny that the only way for a non-physical event to contribute to determining a physical entity is by altering its velocity. Hence, it is to deny that the only way for a non-physical event to contribute to determining a physical entity is by exerting a force on it. As a dualist who rejects *Physical Determinability* does not understand mental events to be forces – that is, does not conceive of mental events as pushes and pulls in the physical domain – the issue of whether mental forces reduce to physical forces or whether there is any physiological evidence for mental forces is irrelevant in determining the plausibility of *Physical Determinability*.

However, even though Papineau does not provide it, one might think that an empirical argument for *Physical Determinability* – which is similar in kind to the ‘no-gap argument’ that is sometimes alluded to for *Completeness* – is readily available. It can be expressed as follows: Science has been highly successful in providing an account of how different kinds of effects in a physical system are determined. It does so by appealing to changes in the distribution of energy and momentum. It is, of course, true that current science is not yet able to provide an account of every physical effect. Undoubtedly there are physical events that have not yet been examined, and physical events that have been examined but are yet to be explained. But science provides us with no reason to think that it will not be able to explain the determination of these events in exactly the same kind of way. Hence, on the basis of current physics, it is highly likely that *Physical Determinability* is true.

In reply, this argument simply begs the question against those dualist models of psychophysical causal relevance that reject *Physical Determinability*. Hence, for example, to argue in this way for *Physical Determinability* is simply to ignore the double prevention model. The double prevention model sets out a way in which an event *could* contribute to determining a physical effect without redistributing energy or momentum (or altering the amount of energy or momentum in a physical system). And, precisely because this way of determining a physical effect does not involve affecting the amount of energy or momentum in a physical system or redistributing it, it is a way that an event could determine a physical effect that is likely to go undetected by science.¹⁶

¹⁶ For a discussion of the claim that the causal role that the double prevention model provides mental events with is one that science will be blind to, see Gibb (forthcoming b) and Gibb (2013).

What is needed, and what this argument for *Physical Determinability* fails to provide, is a *reason* why the double prevention model fails to set out a way in which an event could contribute to determining a physical effect without affecting the amount of energy or momentum in a physical system or by redistributing it. But, as I hope this paper goes some way towards demonstrating, it is unclear what such a reason might be.

8. Conclusion

The focus of this paper has been Papineau's attempt to defend the causal completeness of physics via an appeal to the conservation laws. I proposed that even if, as Papineau argues, there is no *sui generis* mental energy, the conservation laws do not establish the causal completeness of physics. Two further causal claims are required. First, the claim that the redistribution of energy and momentum cannot be brought about without supplying energy or momentum (*Redistribution*). Second, the claim that only way that something non-physical could contribute to determining an effect in a physical system is by 1) affecting the amount of energy or momentum in it, or 2) redistributing the energy or momentum in it (*Physical Determinability*). I went on to argue that the double prevention model of psychophysical causal relevance – a dualist model of psychophysical causal relevance that I have recently proposed and which is located within the framework of a powers theory of causation – provides a way for the dualist to reject *Physical Determinability*. In rejecting *Physical Determinability*, the double prevention model rejects Papineau's argument for the causal completeness of physics via the conservation laws.¹⁷

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¹⁷ I'm very grateful to James Clarke for his helpful comments on an earlier draft of this paper.

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