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# ONTOLOGICAL PHYSICALISM AND PROPERTY PLURALISM: WHY THEY ARE INCOMPATIBLE

BY

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**Abstract:** To earn the title “ontological physicalist,” one must endorse an entailment thesis of the following sort: the physical properties that are had, *together with the causal laws*, determine which higher-level properties are had. I argue that if this thesis is to capture all that is essential to physicalist intuitions, the relevant set of causal laws must be restricted to purely physical laws. But then it follows that higher-level properties are physical properties. The conclusion is that one cannot consistently be an ontological physicalist while endorsing property pluralism.

## 1. *Introduction*

Many philosophers of mind believe that mental properties are not identical with neurological properties. The main reason offered in support of this property dualism is that a mental property can be realized in many different ways at the biological level of internal structure. Suppose, for instance, that some version of functionalism is correct. Then what makes an internal event, *e*, an instance of some mental property, *M*, is that *e* plays the functional role definitive of *M* – e.g., *e* bears the right causal relations to sensory input, behavioral output, and other mental events. What plays the right causal role in us is a neural event of some type. However, since more than one type of neural event might play the same causal role, events of different neural types can instantiate *M*. Many

conclude that there is no one neural property that is both necessary and sufficient for the presence of any mental property.<sup>1</sup> If so, then mental properties are not neural properties.

Of course, multiple realizability is not peculiar to mentality. Just as mental properties are multiply realizable at the level of neurobiology, neural kinds are multiply realizable at the level of molecular biology, and molecular kinds are multiply realizable by the events described by microphysics. One might infer a multi-layered view of reality. There are many different levels of structure, and it is often (if not always) the case that a higher-level property is not identical with any lower-level property. This property pluralism is incompatible with *ontological reductionism*. According to the ontological reductionist, every higher-level property is identical with some property at a lower level of structure. In particular,

(OR) for any higher level property, H, there is a physical property, P, such that  $H = P$ ,

where a “physical” property is a property of the sort mentioned by physics, and the “higher-level” properties are those mentioned by empirical sciences other than physics.<sup>2,3</sup>

Surprisingly, many philosophers who reject OR still claim to accept *ontological physicalism*. They believe that

(OP) all concrete phenomena are ultimately physical phenomena.<sup>4</sup>

I say “surprisingly,” for OP would seem to entail OR. If higher-level properties are not physical properties, then how can concrete, higher-level phenomena qualify as physical?

Non-reductive physicalists have said a great deal to convince us that their position is coherent. Here I wish to argue that we should remain unconvinced. In sections 2 and 3, we will briefly review how the opponents of OR might try to justify their allegiance to OP. In sections 4–6, I argue that no such attempt can succeed – i.e., if one rejects OR, one must also reject OP. More specifically, we shall see that in order to earn the title “ontological physicalist,” one must endorse an entailment thesis telling us how higher-level properties are constrained by physical properties. However, the type of entailment thesis required to capture all that is essential to OP yields the result that higher-level properties are physical properties.

The argument put forth here avoids the messy issues surrounding Kim’s infamous “exclusion argument” for ontological reductionism. Whether higher-level properties are causally efficacious or mere epiphenomena, accepting OP still commits one to OR.

## 2. *Physical exhaustion*

What is it to say that all concrete phenomena are purely physical? Part of what is meant is that every concrete item (object, state, or event) is either a physical item or is comprised entirely out of physical items. As Hellman and Thompson (1975) suggest, with their "*Principle of Physical Exhaustion*," "everything concrete is *exhausted* by basic physical objects," [555] or as Pettit (1993) puts it "[e]verything in the empirical world is composed in some way – composed without remainder – out of (subatomic) entities of the kind that microphysics posits, or is itself uncomposed and microphysical." [215] The Principle of Physical Exhaustion may be expressed as follows:

(PE) necessarily, for any concrete particular,  $x$ , either (i) there is a physical item,  $y$ , such that  $x = y$ , or (ii) there is a spatio-temporal sum,  $z$ , all of whose components are physical items, and  $x = z$ .

The modal operator in PE is crucial. According to the physicalist, the fact that all concrete particulars are exhausted by physical items is not an accidental feature of the world at this moment in time. Physicalists will also want to deny that immaterial souls, for example, might come into existence in the future or have existed at some point in the past. It is probably too much to require that PE hold as a matter of *logical* necessity. The supposition that immaterial souls exist might be terribly mistaken, but it does not appear to be logically contradictory. Our physicalist intuitions seem to require only that the *causal laws* that actually obtain preclude what is not comprised entirely of physical items. So the modal operator in PE is best construed as expressing *nomological* necessity.

PE requires that everything concrete is either a physical item or a spatio-temporal sum of physical items. The concrete items in question include events. So, according to PE, every event is either a physical event or a spatio-temporal sum of physical events. But is this view compatible with property pluralism? It is compatible, assuming that the same event can be an instance of two different properties. The idea that the same event might instantiate different properties is what motivated the rejection of the "*type-identity*" theory in the philosophy of mind. Even if mental properties are not identical with neural properties (i.e., mental types are not neural types), one might still claim that every mental event is a neural event (i.e., tokens of mental types are tokens of neural types). Likewise, one might believe that while higher-level properties in general are not physical properties, every instance of a higher-level property is identical with an instance of a physical property (or at least identical with a spatio-temporal sum of physical property instances). Thus, one can endorse PE while rejecting OR.

While PE seems to be a necessary condition for the truth of physicalism, it is clearly not sufficient. PE is consistent with there being a nomologically possible world that is physically indistinguishable from the actual world, but with a radically different distribution of higher-level properties. In fact, it is consistent with PE that no higher-level properties (mental, biological, chemical, or otherwise) are exemplified at this other world. However, this result is inconsistent with OP. OP entails that

(OP\*) higher-level phenomena depend entirely upon physical phenomena.

But if the scenario described above were possible, then higher-level phenomena would not depend solely on physical phenomena.

While OP\* clearly qualifies as a physicalist intuition, it needs to be made more precise. One might follow Hellman and Thompson and explain OP\* in terms of *truth-determination* (see their “principles of physical determination” (1975), section II). We can insist that the truth-values of sentences expressing higher-level facts cannot vary without a change in the truth-values of sentences expressing physical facts. In other words, higher-level facts *supervene* on physical facts. The same idea may be (and more commonly is) expressed in terms of property supervenience – i.e., higher-level properties supervene on physical properties.

Much has been written on which supervenience thesis best serves the physicalist’s purposes, and I shall not review all the fine details of this well-worn topic. I will review just enough detail to make clear what it would take to capture the physicalist intuitions that underlie OP\*.

### 3. *Supervenience*

According to Haugeland’s (1984) formulation of physicalism, “the world could not have been different in any respect, without having been different in some strictly physical respect.” [1] That is,

(S<sub>1</sub>) necessarily, if a world,  $w_1$ , is physically indistinguishable from a world,  $w_2$ , then  $w_1$  and  $w_2$  are indistinguishable with respect to higher-level properties.

To best serve the non-reductionist’s purposes, a supervenience thesis should also be viewed as expressing nomological necessity. Since mental predicates are not synonymous with physical predicates, there is no reason to think that mental properties supervene on physical properties as a matter of *logical* necessity. Moreover, if mental predicates were synonymous with physical predicates, they would denote the same properties (contrary

to non-reductionism). Might the supervenience relation obtain as a matter of *metaphysical* necessity? The only reason for thinking so is the idea that mental predicates *rigidly designate* physical kinds. But this view, too, is contrary to non-reductionism. So the non-reductionist who appeals to supervenience is most plausibly viewed as making a claim about nomological necessity. The physical properties that are had *together with the causal laws* guarantee which higher-level properties are had.

$S_1$  precludes worlds that are physically indistinguishable from the actual world, and with the same causal laws, but with a radically different distribution of higher-level properties. However, even when conjoined with PE,  $S_1$  is still not enough to secure physicalism.  $S_1$  allows that a world might differ physically in some tiny, innocuous respect, but have a very different distribution of higher-level properties. To use Kim's example (1987, 321), suppose that world  $w$  differs from the actual world only in the following respect: in  $w$  one of Saturn's rings contains an additional ammonia molecule.  $S_1$  allows that  $w$  is completely devoid of mentality. However, all of the physical features that are *relevant* to mentality remain constant. So the great mental difference between  $w$  and the actual world must be due to something other than a physical difference. This result contradicts OP\*.

To avoid this problem, we might require that any two *individuals* that are physically indistinguishable are also indistinguishable with respect to higher-level properties. This idea is often expressed in terms of what Kim (1984) calls "*strong supervenience*." To say that higher-level properties strongly supervene on physical properties is to say that

( $S_3$ ) necessarily, for any higher-level property, H, and any individual, x, that has H, there is a physical property (or set of physical properties), P, such that x has P and, necessarily, for any individual, y, if y has P, then y has H.<sup>5,6</sup>

Suppose that Carla is physically indistinguishable from Marla. Then  $S_2$  entails that Carla is mentally indistinguishable from Marla, even if some distant item in Marla's world differs trivially from its counterpart in Carla's world.<sup>7</sup>

Suppose that Carla physically differs from Marla only by having an additional electron in her left toenail. Assuming that this difference is not one that manifests itself mentally, Carla is physically indistinguishable from Marla in all the ways relevant to mentality. So our physicalist intuitions imply that Carla and Marla have all the same mental properties.  $S_2$  seems to give the same result. Granted, Carla and Marla are not physically indistinguishable. So if we require simply that physically indistinguishable items are indistinguishable in terms of higher-level properties, then we allow that Carla is vastly different from Marla mentally despite their trivial physical difference. But formulation  $S_2$  seems

to preclude this possibility. For each mental property had by Carla, there is a set of physical properties that she shares with Marla, which guarantees the presence of the mental property. So, according to  $S_2$ , it would seem that Carla and Marla cannot differ mentally.

However, Kim (1984) notes a complication. He introduces the notion of a "B-maximal" property, which is defined as the conjunction of all of the individual's base properties (in this case, physical properties). Now, each mental property of Marla supervenes on her B-maximal property. But this B-maximal property is not had by Carla (given their cuticle difference). So if B-maximal properties are included in the supervenience base, then  $S_2$  allows that Carla differs greatly from Marla mentally. But, again, the two are physically indistinguishable in all the ways that are relevant to mentality. So if they differ mentally, they do so by virtue of something other than physical phenomena, contrary to OP\*. Thus, if we allow B-maximal properties in the supervenience base, then the truth of  $S_2$  does not guarantee the truth of OP\*.

The move from  $S_1$  to  $S_2$  was an attempt to isolate those physical properties that are *relevant* to the instantiation of higher-level properties. For a more successful attempt, one might appeal to Kim's notion of a "B-minimal" property. A property is B-minimal when "any property weaker than it is not a supervenience base." [1984, 165] So if P is B-minimal with respect to H, then the presence of P is a *least nomologically sufficient* condition for the presence of H (i.e., there is no proper constituent of P whose presence nomologically suffices for the presence of H). Now suppose that only B-minimal properties are included in the supervenience base. Then the trivial cuticle difference between Carla and Marla mentioned above would not be enough to allow any great mental differences between the two. So let us strengthen  $S_2$  to read:

( $S_3$ ) necessarily, for any higher-level property, H, and any individual, x, that has H, there is a physical property (or set of physical properties), P, such that (i) x has P, (ii) necessarily, for any individual, y, if y has P, then y has H, and (iii) P is B-minimal with respect to H.

We have been focusing on physicalism as an *ontological* thesis. As an *explanatory* thesis, physicalism entails that all concrete phenomena can be fully *explained* in terms of physical phenomena. As Pollard (1994) notes, when viewed as an explanatory thesis, "[p]hysicalism is ultimately concerned not only with what exists and what counts as an objective matter of fact, but also with a deeper *understanding* of how non-physical phenomena arise." [103; emphasis added] Thus, explanatory physicalism is stronger than ontological physicalism (OP), for even if higher-level properties were identical with physical properties, it might be that physical concepts alone do not suffice to enhance our understanding of

higher-level properties. Thus, even when conjoined with PE,  $S_3$  does not guarantee the truth of explanatory physicalism.<sup>8</sup>

On the other hand, when conjoined with PE,  $S_3$  does seem to entail OP. We are guaranteed that mental differences come about by virtue of physical differences in just the way that OP\* requires.<sup>9</sup> We are also assured that all concrete items are identical with physical items or identical with spatio-temporal sums of physical items. However, whether we really do have sufficient conditions for the truth of OP depends on how we clear up an ambiguity that remains in our supervenience theses. In sections 4–6, we shall see that in order to capture the physicalist intuitions that underlie OP\*, a supervenience thesis must be interpreted in such a way that it entails OR.

#### 4. *Two types of nomic dependence*

Like PE, the supervenience theses are best viewed as expressing nomological necessity. The physical properties that are had *together with the causal laws* guarantee which higher-level properties are had. Thus, each supervenience thesis is equivalent to an entailment claim of the form

$$(1) (P \ \& \ L) \rightarrow H,$$

where P is the set of physical properties, H is the set of higher-level properties, L is the set of causal laws that actually obtain, and the entailment is one of strict implication.  $S_1$ , for example, is equivalent to the following version of (1):

For any worlds, w and w\*, the proposition “w and w\* are physically indistinguishable” together with the causal laws entails that w and w\* are indistinguishable with respect to higher-level properties.

And  $S_2$  may be expressed as:

For any possible item, x, and any higher-level property, H, the proposition “x has H” together with the causal laws entails that:

there is some physical property, P, such that x has P and for any possible item, y, the proposition “y has P” together with the causal laws entails that y has H.

While the notion of causal laws is important to the supervenience theses described above, we must remember that the supervenience relation is not intended to be a relation of *cause to effect*. The claim is not that

the physical properties of an individual at one time causally determine the higher-level properties of that individual at a later time, for one can certainly be a physicalist while accepting causal indeterminacy. Instead, the supervenience relation is *synchronic*; the physical properties of an individual at a time determine the higher-level properties of that individual *at that time*.

If the supervenience relation is not a relation of cause to effect, why does it obtain as a matter of nomological necessity? This question is most easily answered with a functionalist story. Many higher-level features are individuated functionally – especially in terms of the causal roles that they play. Whether an item is a ligament depends on the causal role it plays *vis-à-vis* tendon and muscle, and which inner event qualifies as the belief that lemurs make good pets depends on the causal role the event plays *vis-à-vis* sensory input, behavioral output, and other mental events.<sup>10</sup> Now, the causal dispositions of an item obviously depend upon the causal laws that obtain (e.g., what qualifies as a ligament in the actual world might not qualify as a ligament at a world with different causal laws). So the physical properties of an individual at a certain time together with the casual laws determine the causal dispositions, and therefore the higher-level properties, of that individual at that time. In this way, the supervenience relation is one of nomic dependency even though the relation is synchronic.

But when the physicalist says that physical properties plus the causal laws determine higher-level properties, which causal laws does she have in mind? There are two types of nomic dependence to consider. Does the relevant set of causal laws include *only physical laws*, or does it also include *laws that connect physical properties with higher-level properties*? Let us address both options.

### 5. *Physicalism or property pluralism?*

According to Papineau (1993), “physical characteristics fix mental characteristics at least across all worlds with the same laws of physics.” [21] On this reading, each supervenience thesis is equivalent to a claim that fits the following interpretation of (1):

$$(2) (P \ \& \ L_p) \rightarrow H,$$

where  $L_p$  is the set of purely physical laws. Kirk (1996a, 1996b) also has (2) in mind when he offers his “*Strict Implication Thesis*.” According to Kirk (1996a), “the totality of physical truths strictly implies all truths about the mental states of organisms” [85], where the physical truths include not only facts about the physical properties of particular organisms, but also the physical laws that obtain.<sup>11</sup>



However, it is not difficult to see that any version of (2) entails OR. Consider Steward's (1996) response to Papineau. Papineau (1993, 11) claims that supervenience theses on their own are not enough to secure physicalism, since they are compatible with certain varieties of dualism that are clearly not physicalist.<sup>12</sup> Epiphenomenalists, for example, can endorse mind-body supervenience, even if they also endorse substance dualism. (While epiphenomenalists are more likely to be property dualists, the point remains that if an epiphenomenalist were to endorse substance dualism, she would seem to be endorsing a supervenience thesis even though her view is clearly not physicalist.) In response, Steward notes that whether a supervenience thesis is compatible with epiphenomenalism depends on whether physical laws alone are supposed to secure the supervenience relation.

The 'settling' relation . . . between the physical phenomena and . . . psychological ones – must be one that is not itself capable of being brought entirely within the purview of physics, if we are to retain our right to the epiphenomenalist insistence that the psychological realm is not part of the physical world . . . [670]

Thus,

[t]he epiphenomenalist can believe that the psychological is causally determined by the physical, yes – what she cannot believe is that the psychological is causally determined by the physical in such a way that pure physics alone contains within it the resources to describe and explain this relation of causal determination. For once it is conceded that the laws of physics alone can determine what goes on in the psychological realm, we have lost our grip on the distinctively epiphenomenalist thought that there is something about the psychological which is inscrutable to physics. [670]

If we believe, with the epiphenomenalist, that “there is something about the psychological which is inscrutable to physics,” we will also deny that physics alone determines which psychological properties are had. So, Steward concludes, Papineau's brand of supervenience is not consistent with epiphenomenalism.

Steward's point can be taken much further. Whether or not we are epiphenomenalists, let alone epiphenomenalists who think that “the psychological realm is not part of the physical world” (which seems to imply substance dualism), so long as we concede that “there is something about the psychological which is inscrutable to physics,” we forfeit all versions of thesis (2). If mental properties are not physical properties, then the purely physical laws do not range over mental properties. But if so, then the purely physical laws, by themselves, do not entail anything about how mental properties covary with physical properties.

One might argue that even if we reject OR, we can still endorse an entailment thesis of form (2), for we can hold that the laws connecting

physical and higher-level properties are themselves supervenient upon the physical laws alone. Suppose it is a physical law that

(a) if  $x$  has  $P_1$ , then  $x$  has  $P_2$ ,

and also suppose that the truth of (a) nomologically guarantees the truth of

(b) if  $x$  has  $P_1$ , then  $x$  has  $H$ ,

where  $H$  is a higher-level property. Then the fact that  $x$  has  $P_1$  together with (a) nomologically guarantees that  $x$  has  $H$ . So, the argument concludes, purely physical laws underwrite the supervenience of higher-level properties on physical properties, even though the higher-level properties are not identical with physical properties.

The problem with this line of argument is that it only pushes the initial worry back a step. We are told that the truth of (a) nomologically guarantees the truth of (b). But this would be the case only if  $H$  supervenes on  $P_2$  – i.e., the presence of  $P_2$  guarantees the presence of  $H$  by virtue of the causal laws. But, again, the question arises, “which causal laws”? If the relevant causal laws are confined to purely physical laws, then  $H$  supervenes on  $P_2$  only if  $H$  itself is a physical property. So the problem remains: if we reject OR, we cannot accept an entailment thesis of form (2).

The non-reductionist must opt for a weaker entailment thesis of the form

(3)  $(P \ \& \ L_{p,h}) \rightarrow H$ ,

where  $L_{p,h}$  includes *all* causal laws – physical laws and mixed laws linking physical properties with higher-level properties. An entailment thesis of form (3) allows that higher-level properties are not identical with physical properties. But does it honor physicalist intuitions? Suppose that physical properties secure mental properties only with the help of irreducible psycho-physical laws. Then, as Kirk (1996b, 247) notes, the following scenario is possible: there is a world that is physically indistinguishable from the actual world in every respect (the same physical properties are exemplified by the same individuals, *and all the same physical laws obtain*), but this other world is completely devoid of mental features. This possibility is clearly incompatible with OP\*. OP\* tells us that higher-level phenomena depend entirely upon physical phenomena. But if the deviant world described above were possible, then mental phenomena would depend at least partly on phenomena that are not physical.

Conjoining a supervenience thesis of form (3) with PE (the principle of physical exhaustion) is still not enough to secure OP\*. Suppose that at every nomologically possible world, each concrete particular is either a physical item or a spatio-temporal sum of physical items. If the mental properties of these items are determined only with the help of irreducible

psycho-physical laws, then the scenario described above is still allowed, contrary to OP\*.

## 6. *Conclusion*

So the non-reductive physicalist faces a dilemma. Ontological physicalism entails that concrete, higher-level phenomena depend entirely upon physical phenomena (OP\*). A common way to express this intuition is to say that higher-level properties supervene on physical properties. Alternatively, we might choose to express OP\* in terms of truth-determination (i.e., fact supervenience); the truths regarding physical phenomena determine all the truths about higher-level phenomena. Like the appeal to property supervenience, we are left with options. We might endorse a global version of the thesis (the complete set of physical truths about a world determines the complete set of higher-level truths about that world), or a local version (for any proposition, *p*, of the form “individual *x* has higher-level property *H*,” there is a proposition, *q*, of the form “individual *x* has physical property *P*,” such that the truth of *q* is nomologically sufficient for the truth of *p*). Yet, however we choose to express OP\*, we end up endorsing an entailment thesis of form (1), which tells us that the physical properties that are had together with the causal laws determine which higher-level properties are had.

The causal laws in question might be confined to purely physical laws, which commits us to an entailment thesis of form (2). However, in that case, we must concede that higher-level properties are physical properties. To avoid this conclusion, we must reject claims of form (2) in favor of some weaker entailment thesis of form (3). The weaker thesis allows that physical properties determine higher-level properties only with the help of irreducibly mixed laws. Then it becomes possible that a world is physically indistinguishable from the actual world and has all the same physical laws, but a completely different distribution of higher-level properties (sociological, mental, biological, or otherwise). This is clearly incompatible with the physicalist intuitions that underlie OP\*.<sup>13</sup>

So we can prove that OP entails OR in a just a few, short steps. OP entails OP\*. On any plausible interpretation of OP\*, an entailment thesis of form (2) is true. But entailment theses of form (2) are true only if higher-level properties are physical properties – that is, only if OR is true. So OP entails OR.

To be convinced that “non-reductive physicalism” is a coherent position, we need to be shown where this line of argument goes wrong.

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## NOTES

<sup>1</sup> But some have argued that this conclusion does not follow. See, for example, Kim (1972), Hill (1991, 101–106), Francescotti (1997), and Kim (1999).

<sup>2</sup> One can believe that higher-level properties are physical properties without believing that higher-level predicates are synonymous with physical predicates. So ontological reductionism is weaker than *semantic* reductionism. And one can believe that higher-level properties are physical properties while denying that higher-level phenomena can be adequately *explained* in terms of physical phenomena. So ontological reductionism is also weaker than *explanatory* reductionism.

<sup>3</sup> Is it current physics or some ideal physics that refers to the properties that qualify as physical? As Hellman (1985) notes, the choices are not attractive: “either physicalist principles are based on current physics, in which case there is every reason to think they are false; or else they are not, in which case it is, at best, difficult to interpret them, since they are based on a ‘physics’ that does not exist.” [609] To avoid this dilemma, we might follow Ravenscroft (1997) and “characterize the physical properties as those properties *sufficiently similar* to the properties quantified over by present-day physics.” [423] (Ravenscroft makes the vague expression “sufficiently similar” more precise, and argues that whatever vagueness remains is warranted.)

<sup>4</sup> There is also the *semantic* physicalist, who believes that sentences about higher-level phenomena are equivalent in meaning to sentences stated in the vocabulary of physics. Although semantic physicalism entails OP, few ontological physicalists would or should accept semantic physicalism. Nor does OP entail *explanatory* physicalism. The explanatory physicalist not only accepts OP, but also insists that higher-level phenomena can be fully explained in physical vocabulary. (More is said about explanatory physicalism at the end of section 3.)

<sup>5</sup> The inclusion of the second modal operator distinguishes strong supervenience from *weak* supervenience. Strong supervenience guarantees that physical duplicates are mental duplicates across as well as within possible worlds. Hellman and Thompson (1975, 555) note “the principle of physical indiscernibles,” which states that any two *actual* individuals that are physically indistinguishable are indistinguishable in terms of higher-level properties. Since this principle has no modal implications, it is even weaker than weak supervenience. (Hellman and Thompson realize its weakness (557), which is why they go on to offer their principles of physical determination.)

<sup>6</sup> Many higher-level properties are individuated *relationally*. Having a thought about water (as opposed to a thought about twater) requires that one is suitably causally related to H<sub>2</sub>O rather than XYZ, and to be a capillary requires that the blood vessel connect (or at least have the function of connecting) arterioles with venules. The relationality of these higher-level properties might be one reason to prefer the global supervenience of S<sub>1</sub>. However, S<sub>2</sub> can accommodate relationality, if relational properties are included in the supervenience base. (But perhaps the matter is not quite that simple. See Pollard (1994, 94–96) for a nice discussion of the controversy surrounding the choice between global and localized supervenience theses.)

<sup>7</sup> Of course, one might object that Carla and Marla are not physically indistinguishable since Carla has the property of containing some specific microparticle, x, whereas Marla does not contain anything that is numerically identical with x. Horgan (1982, 36–37) deals with this type of objection by suggesting that a supervenience thesis should be viewed as relating *qualitative* properties only.

<sup>8</sup> For a detailed account of what more is needed to secure physicalism as an explanatory thesis, see Pollard (1994, esp. ch. 4). Also see Horgan’s (1993) discussion of “superdupervenience.”

<sup>9</sup> One might wish to strengthen the supervenience thesis even further. Pollard (1994) notes that the appeal to B-minimal properties “appears to handle the problem of isolating only the factors relevant to the instantiation of non-physical properties,” but “fails to do so.” [101] He has the following worry in mind: “Let B be a base property that consists in all and only the relevant properties bearing upon the realization of N, and let us suppose that it is indeed a least nomologically sufficient condition. Let B' be a base property composed of nomic equivalents of those properties that compose B but which do not themselves compose N. Then B' will be a least nomologically sufficient condition for N without being composed of properties that constitute N. That is, being a least nomologically sufficient condition does not guarantee relevance of the sort required by physicalists.” [97]

It seems that physicalism, even when viewed as an ontological thesis, requires an answer to the question: “In virtue of what physical properties did the instantiation of a given non-physical property occur?” [104] But, as Pollard notes, a physical property, P, might qualify as B-minimal with respect to some higher-level property, H, without being the property by virtue of which H is instantiated. So while H supervenes on P, we are not assured that P (or any other physical property) is the property by virtue of which H is instantiated. Perhaps we can answer Pollard's concern by adding the following additional clause to S<sub>3</sub>: (iv) the event that instantiates H is identical with (or is a spatio-temporal sum of) the event (events) instantiating P. (Alternatively, we might endorse Pollard's thesis that “[f]or each non-physical attribute, N, and for each region of space-time, R, if N is actually (or possibly) instantiated in R, then there exists a minimal class of physically-based attributes, P, such that the instantiation of the members of P does (or would) provide a realization of N on that occasion.” [191])

<sup>10</sup> In fact, Melnyk (1996) argues that higher-level properties, in general, are functional properties.

<sup>11</sup> Kirk (1996b, 251) denies that his Strict Implication Thesis is equivalent to a supervenience claim that purports to express *physical* necessity (where “physically necessary” means “is guaranteed by the laws of physics”). He notes that physicalism is committed to the view that (i) “it is *absolutely* impossible that the physical facts should be as they are, and the mental facts other than they are,” from which he concludes (ii) “no physicalism can imply that the mental is linked to the physical by merely physical laws.”

But (ii) does not follow from (i). Since the “physical facts” mentioned in (i) include all the physical laws, (i) may be rephrased as: (iii) facts about the distribution of physical properties *together with the physical laws* logically entail all the facts about the distribution of mental properties. (iii) is not only compatible with, but equivalent to, a supervenience claim that interprets the tie between physical properties and mental properties as one of physical law.

<sup>12</sup> The idea that supervenience theses are compatible with views that are clearly not physicalist was also noted by Kim (1993, 167), and much earlier by Hellman and Thompson (1975, 561) in connection with their principles of physical determination.

<sup>13</sup> As noted at the end of the introduction, the line of reasoning presented here does not hinge on whether higher-level properties are causally efficacious. Whether the non-reductionist views higher-level properties as causally efficacious or as mere epiphenomena, the dilemma above remains. In either case, the question arises whether higher-level properties are determined by physical properties by virtue of purely physical laws or by virtue of mixed laws.

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