Weak and Global Supervenience:
Functional Bark *and* Metaphysical Bite?

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Mark Moyer

Abstract

Weak and global supervenience are equivalent to strong supervenience for intrinsic properties. Moreover, weak and global supervenience relations are always mere parts of a more general underlying strong supervenience relation. Most appeals to global supervenience, though, involve spatio-temporally relational properties; but here too, global and strong supervenience are equivalent. *Functionally* we can characterize merely weak and global supervenience as follows: for A to supervene on B requires that at all worlds an individual's A properties be a function of its B properties, where this function varies from world to world. But what are the *metaphysical* commitments of such a relation? We can make metaphysical sense of this functional requirement only if the properties in question are second-order properties, the functionalist theory of the mind being a conspicuous example.

Weak and Global Supervenience

Back in the days of free love, supervenience relations were welcomed as harbingers of peace and joy. "Let one hundred supervenience concepts bloom!" came the prophet's cry.[1] And bloom they did! As a result, supervenience now comes in a plethora of permutations: weak and strong, local and global, multiple- and single-domain, indiscernible and similarity-based, modal and de facto, all appealing to a variety of 'possible's from the familiar metaphysical, nomological, and epistemic to the rarer historical and temporal — a flavor to fit every palate!

But, alas, the heyday of supervenience has come and gone. Now, surveying this surfeit of superveniences, we wonder if the multitude of proposed variations are truly useful or rather, in Lewis's words, "an unlovely proliferation of non-equivalent definitions"?[2] Are they aiding us in our quest to unravel the metaphysical mysteries of how one sort of thing can *depend* upon another? Or do they only help "to add mystery to mystery, to cover one obscurantist move with another," as Schiffer insists?[3] Kim sees the growing numbers of supervenience concepts in the literature as good evidence that they are useful in philosophy.[4] Cynics might instead think this merely reflects the ease with which one can alter the standard formulations and thereby create yet another supervenience relation — or, worse yet, another family of them.

A thorough house-cleaning would require a careful examination of every supervenience notion that has been proposed, a cure worse than the disease. Rather, I propose to examine the predominant notions of supervenience. Strong supervenience, like all supervenience relations, can be reformulated, more perspicuously I suggest, in

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[1] Kim, "Supervenience as a Philosophical Concept," p. 155.

[2] Lewis, "On the Plurality of Worlds," p. 14.

[3] *Remnants of Meaning*, p. 153-154.

[4] "Supervenience as a Philosophical Concept," p. 133.

terms of functions. But whether this relation is cast in terms of 'supervenience' or a 'function', it is clear that philosophical discourse requires this relation. Claims of metaphysical and semantic necessities are claims of supervenience. The property of being a niece supervenes on the properties of being the daughter of a sibling, goes the story, at least before Quine's "Two Dogmas." The property of thinking a particular thought does *not* supervene on the physical goings on in the head, say Putnam and Burge. The property of being water *does* supervene on a substance's chemical composition, argues Kripke. Thus, I will take for granted that strong supervenience is here to stay.

While many would now agree that the multiplication of supervenience notions has gone too far, most take for granted the usefulness of weak and global supervenience. Yet it is here that I think a re-evaluation should begin. It is all too easy to appeal to weak and global supervenience in an attempt to escape metaphysical commitments, despite the fact that the metaphysics of these relations is itself little understood. To remedy this, I will first investigate what weak and global supervenience relations are functionally and how they relate to strong supervenience. For a large class of properties, weak and global supervenience are *equivalent* to strong supervenience. Moreover, weak and global supervenience claims are merely partial characterizations of relations more fully captured using strong supervenience claims.

I then turn to the metaphysical implications of these two relations. What sort of dependency could underlie weak and global supervenience relations? In their simplest forms, our old familiar dependencies — metaphysical, semantic, and nomological — cannot provide the answer. Despite prima facie difficulties, though, we *can* make sense of these relations. Functionalist theories offer just the sort of dependency that is required for weak and global supervenience relations. Thus, it appears that those appealing to weak and global supervenience are committed to a functionalist theory, or, more generally, to law-dependent relational properties. This,

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then, finally puts metaphysical meat on the functionally specified skeleton of supervenience relations. With this understanding, we can finally assess claims of weak and global supervenience in terms of their metaphysical commitments, rather than treating them as if they make no such commitments.

Characterizing Weak Supervenience

Weak and strong supervenience are standardly defined as follows, where an individual x and an individual y are A-twins iff they have the same A properties:[5]

> **Weak Supervenience**: A properties weakly supervene on B properties $=_{df}$ for any possible world w, B-twins in w are A-twins in w.

> **Strong Supervenience**: A properties strongly supervene on B properties $=_{df}$ for any possible worlds w and w* and any individuals x and y, if x in w is a B-twin of y in w*, then x in w is an A-twin of y in w*.

Strong supervenience says that A properties are a function of B properties, leaving our quantifiers 'wide open.' That is, there is a single function f that for any possible individual maps its B properties to its A properties. In contrast, weak supervenience says that *for each world* an individual's A properties are a function of its B properties; that is, associated with each world w is some function f_w that maps B properties to A properties at that world.

Strong and Weak Supervenience are Equivalent for Intrinsic Properties

Kim points out what he calls an 'obvious' fact about the two relations: "Strong supervenience entails weak supervenience; weak supervenience does not entail strong supervenience."[6] But is the latter so obvious? True, there is no entailment in virtue of

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[5]See, e.g., Kim, "Supervenience as a Philosophical Concept," p. 141; McLaughlin, "Varieties of Supervenience," p. 24.

[6]Kim, "Concepts of Supervenience," pp. 66-7.

logical form, but this hardly decides the matter. One line of reasoning to the contrary goes as follows:[7]

Assume (reductio) that weak but not strong supervenience obtains, i.e. that there are two sets of properties, A and B, such that the A properties of the things in world w_1 are some function f_1 of their B properties, and the A properties of the things in world w_2 are some function f_2 of their B properties, yet $f_2 \neq f_1$. Then, given the lack of limits on the way worlds can be, it seems there must be a world w_3 in which some of the things are like those in w_1, i.e. whose A properties are a function f_1 of their B properties, and others are like those in w_2, i.e. whose A properties are a function f_2 of their B properties. But this contradicts our assumption that weak supervenience obtains, since at world w_3 there is no single function f_3 which maps the B properties of all things to their A properties. Or so it might seem, anyway.

In fact, given a quite plausible metaphysically necessary recombination principle, such as those Lewis, Armstrong, and others have used, we can give some substance to this line of thought, showing that, for intrinsic properties anyway, weak and strong supervenience *are* equivalent.[8] I will use the following principle, where an individual x at a world w_1 and an individual y at a world w_2 are *duplicates* iff x has exactly those intrinsic properties at w_1 which y has at w_2:

Recombination Principle: For any individual x in world w_1, and for any individual y in world w_2, there is a world w* containing individuals x' and y' such that x' in w* is a duplicate of x in w_1 and y' in w* is a duplicate of y in w_2.

Given the Recombination Principle, we can see that if *in one world* there is an individual whose A properties are a function f_1 of its B properties and *in another world* an

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[7]I have discovered that Blackburn gives a quite similar argument in "Supervenience Revisited," p. 50.

[8]Lewis tells us that "Roughly speaking, the principle is that anything can coexist with anything else, at least provided they occupy distinct spatio-temporal positions." (*On the Plurality of Worlds*, p. 88) According to Armstrong, "Any two distinct existences may be found together, or found one without the other, in a single world." (*A Combinatorial Theory of Possibility*, p. 20)

individual whose A properties are a function f_2 of its B properties, then there must be *a single world* where both sorts of individuals co-exist. But this means that for *intrinsic* properties there can't be weak supervenience without strong supervenience.

For example, one might think that there could be a property G that weakly supervenes on a property F without also strongly supervening on it since there could be both a world w_1 containing only the individual a with property F and property G and a world w_2 containing only the individual b with property F but without property G. However, this sort of reasoning relies on a partial description of logical space, omitting the distribution of properties in possible worlds *other* than w_1 and w_2. In fact, the Recombination Principle shows that if there are worlds w_1 and w_2, then there also must be a world w_3 containing individuals a' and b' that are duplicates of a in w_1 and b in w_2, respectively. And w_3 shows us that G does not, after all, weakly supervene on F, at least if F and G are intrinsic properties.

$$w_1: Fa\ Ga \qquad w_2: Fb\ \ddot{y}Gb \qquad w_3: Fa'\ Ga'\ \ \ Fb'\ \ddot{y}Gb'$$

In short, for all intrinsic properties weak and strong supervenience are equivalent.[9]

Both weak and strong supervenience are generalizations over *possible* worlds. Thus there are as many sorts of weak and strong supervenience as there are sorts of possibility: metaphysical, nomological, historical, epistemic, etc. Since the Recombination Principle is a thesis about what is metaphysically possible, only the equivalence of *metaphysical* weak and strong supervenience relations, among intrinsic properties, has been shown.

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[9]Paull and Sider make a similar sort of argument in their "In Defense of Global Supervenience," pp. 835-841. They are responding to Petrie, who describes two possible worlds that he claims provide a counter-example to the equivalence of strong and global supervenience. Paull and Sider point out that two worlds do not a non-equivalence make and appeal to an isolation principle to show that the two worlds in question necessitate a third world which, in the described case, means that neither strong nor global supervenience holds.

Strong and Weak Supervenience are Equivalent for Local Properties

Kim's reasoning that weak and strong supervenience are not equivalent falls short. Nonetheless Kim's conclusion is correct. The property of being alone (being the only individual of a world) is such that either all or none of the members of a world will have it.[10] Therefore, the property of being alone will weakly supervene on the property of having negative charge (or, for that matter, on *any* property); throughout any world, everything that is alike with respect to charge will be alike with respect to being alone since throughout any world *everything* is alike with respect to being alone. But, clearly, being alone doesn't strongly supervene on having negative charge. Thus weak and strong supervenience cannot, *in general*, be equivalent.[11]

But are they equivalent for most properties, or for those properties that most concern us? If so, then the difference between the two supervenience relations would be inconsequential; a single relation might suffice for our needs.

For some extrinsic properties, the argument for equivalence extends quite naturally. For properties such as "being near a St. Bernard" and "having a brother," e.g., the Recombination Principle also shows that weak and strong supervenience are equivalent. Rather than recombining the individual in question, recombining the mereological sum of the individual *together with* everything near it will guarantee that if there's a world in which x is/isn't near a St. Bernard and another world in which y is/isn't near a St. Bernard, then there will be a world in which duplicates of x and y exist and also are/aren't near St. Bernards. Similarly, rather than recombining only an individual, we can recombine a chunk of space-time that includes the individual from the time in question back through her conception, that includes the lives of her parents

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[10]Cf. Lewis's "Extrinsic Properties."

[11]Note that I am taking the word 'property' in the weakest sense, such that for any satisfiable predicate there will be some corresponding property. Most of the stronger senses of 'property' require intrinsic properties. Thus, using a strong notion of 'property,' weak and strong supervenience *are* generally equivalent.

from their birth forward to the time in question, and includes the lives of any sons of her parents from conception to the time in question. Recombining such chunks guarantees that two individuals can be duplicated to generate a world containing their twins with respect to having a brother.

For many extrinsic properties, however, there is no simple way to extend the application of the Recombination Principle. Consider the property of "being the tallest in the world." If Bob, in world w, is the tallest in the world at 7'-11", and Sue, in w', is the tallest in the world at 8'-5", there is no way to use recombination to generate a world w* containing duplicates of Bob and Sue in which they are both the tallest in the world. There is no local state of affairs that can be included with them to let us use recombination. Even duplicating everyone in Bob's world with him won't generate a world in which Bob's duplicate is the tallest since being the tallest rides on what *else* might be added during recombination, such as a taller individual, e.g. Sue's duplicate. What makes Bob the tallest isn't just the height of Bob, the height of his friend, the height of his neighbor, and so forth for the other 17 people who inhabit his world; it is also the fact that these twenty people are the *entirety* of the world's population. If we wanted to use recombination, we would somehow have to recombine *this* fact or property as well — what Armstrong calls a fact of totality[12] — but, of course, we can't since this fact is not independent of other facts, and this independence is just what is required for the Recombination Principle to apply.

Recombination will thus guarantee the equivalence of weak and strong supervenience iff the properties involve no facts of totality.[13] Notice that these facts of totality are not properties of anything *in* the world but can at most be considered

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[12] *A Combinatorial Theory of Possibility*, pp. 92f.

[13] Actually, weak and strong supervenience are equivalent iff the properties *or their negations* involve no facts of totality. For supervenience is a claim about individuals that are alike with respect to the having *or* not having of the properties in question.

properties of the world itself. Extrinsic properties can therefore be seen as consisting of two components: 1) an intrinsic property (possibly null) of the individual — or a 'local' property, i.e. a property intrinsic to a chunk of space-time including the individual — and 2) a property of the world. Bob's being the tallest person in the world consists in Bob being 7'-11" *and* of the world containing nobody taller than that. Sue's not being famous consists in nothing intrinsic to her but in the world containing few people that know of her.

Weak Supervenience: A Part of Strong Supervenience

The property of being the tallest in the world weakly, but not strongly, supervenes on the height of the individual. At each world there is a function f_w that maps an individual's height to the fact of whether or not she is the world's tallest (i.e. to the extrinsic property of being the tallest or the extrinsic property of not being the tallest). Of course, in this case it's easy to see that this function is determined by the height of the tallest individual in the world and, more generally, that there is a single function f applicable across all worlds such that x's being the tallest person in a world is a function f of x's height together with the height of the tallest person at x's world. So while the property of being the tallest in the world *weakly* supervenes on an individual's height, it *strongly* supervenes on the height of the individual and the height of the tallest person in the world.

We have seen that there are some pairs of properties that are related by weak, but not strong, supervenience. But from the examples we've seen so far it looks like even if we could find a use for weak supervenience, it would simply be to capture an epistemically important part of a relation more fully characterized in terms of strong supervenience. It looks as though God's blueprint of the world's supervenience relations, being a complete map of logical space, can dispense with weak supervenience. Is this true? That is, are relations of weak supervenience *always*

grounded in more general relations of strong supervenience, relations whose characterization is more informative? The answer is yes. In each of our two examples, we had a relation of weak supervenience only because there was an underlying relation of strong supervenience. And this, I argue, will be true in general.

One set of properties, Γ, weakly supervenes on another set, Δ, just in case at every world the subset G of properties of Γ that an individual has is a function of the subset D of properties of Δ it has — that is, iff for each world w there is a function f_w, such that for every individual i of that world, $G_i = f_w(D_i)$. But what could possibly guarantee this across all worlds? With the endless possible worlds that can be generated with the Recombination Principle, why isn't there a single world with two individuals which have the *same* subset of properties of Δ but *different* subsets of properties of Γ?

One possible answer is that Γ *strongly* supervenes on Δ. That is, if it is impossible to have two individuals *at a single world*, one with properties D and G1, and another with properties D and G2 (where D is a subset of Δ and G1 and G2 are different subsets of Γ), this could be part of a more general impossibility of there even being *an* individual with properties D and G2. Perhaps an individual's having of G1 is *necessitated* by its having of D; the conflict between the having of G2 and the having of D would, in this case, be determined solely by what G2 and D are.

So one reason that would explain why there are never two individuals at the same world, one with D and G1, the other with D and G2, is that the nature of the properties precludes one of these two combinations. You can't have one person who utters "I promise that . . ." and thereby makes a promise and another person with the same intentions uttering the same statement who doesn't make a promise since uttering "I promise that . . ." with certain intentions *just is* to make a promise.

If, though, Γ doesn't strongly supervene on Δ, i.e. if there is nothing contradictory about an individual having D and G2, and similarly for D and G1, then

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why can't a world contain one of each sort of individual? Something must determine that all the individuals at one world having properties D will have properties G1 while all the individuals at another world having properties D will have properties G2. Whatever it is must be something that varies from world to world though across any particular world it remains constant. In short, there must be a determinable totality fact F which explains our puzzle. This, though, is just another way of saying that the Γ properties an individual has are a function of the Δ properties it has plus the value of F at i's world. That is, this is to say that Γ strongly supervenes on Δ *and* F.[14] A description of a weak supervenience relation thus gives a mere partial characterization of some underlying strong supervenience relation. More specifically, it captures that part of the strong supervenience relation which abstracts away from facts of totality.

And this, of course, is just what we've seen in our examples. At some worlds, all individuals who are 7'-11" *are* the tallest individuals of the world, whereas at other worlds, all who are 7'-11" are *not* the tallest in the world, and never do you find a world containing two individuals who are 7'-11", one who is the tallest and the other who is not. This makes sense since to know whether someone is the tallest in the world you have to know not only *their* height but also the height of the tallest person in the world. Similarly, whether a possible individual is famous depends upon how many people at that world know of her. If we wish to abstract away from the fact that being the tallest in the world depends on the height of the tallest person in the world we can instead

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[14]Moreover, if Γ and Δ can be finitely stated, so too can F. For if Γ can be finitely stated, then there must be a finite number of combinations of Γ properties and each must be able to be finitely stated. Likewise with the combinations of Δ properties. And thus any mapping f of the combinations of Δ properties to combinations of Γ properties can be finitely stated. But since Γ weakly supervenes on Δ, this means that for any world, one of these mappings must map the Δ properties to the Γ properties at that world, so we can finitely characterize worlds in terms of which mapping is in effect: "a world in which f is in effect". And so too we can finitely characterize individuals by the totality properties of which world they belong to: "has the property of belonging to a world in which f is in effect". Since there are finitely many such mappings, there will be finitely many totality properties, the set of which is F.

employ the *world-relative* generalization that being the tallest in the world depends solely on one's height.

Before moving on, we can apply these ideas by considering Kim's claims that weak supervenience does not qualify as a form of dependence since weak supervenience "works only *within* a single world at a time: [if the mental weakly supervenes on the physical,] *the fact that mentality is distributed in a certain way in one world has absolutely no effect on how it might be distributed in another world.*"[15] This, I take it, is not so. If the mental weakly supervenes on the physical, then an individual's mental properties are a world-independent function of its physical properties and of some totality fact of the world, F. The distribution of physical and mental properties in the other worlds fixes the relevant totality fact and the world-*independent* function f such that any individual's mental properties are a function f of its physical properties and of the value of F at the individual's world. Thus, if the mental weakly supervenes on the physical, how mentality is distributed with respect to the physical in worlds *other than w* fixes how the mental is distributed with respect to the physical *in w*. Weak supervenience *does*, pace Kim, capture this aspect of dependence.[16]

Characterizing Global Supervenience

The intuitive notion of global supervenience was clearly distinguished from other forms of supervenience in Kim's "Concepts of Supervenience."[17] Cashed out in terms of functions, A globally supervenes on B iff an individual's A properties are a function of the world-wide distribution of B properties. How exactly to spell out the

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[15] "Supervenience as a Philosophical Concept", p. 143; see also, "Concepts of Supervenience", p. 61.

[16] Supervenience claims do not capture the aspect of dependency we think of as ontological priority, as Kim points out, though this is a separate issue. See "Supervenience as a Philosophical Concept," pp. 144-147; and "Postscripts on Supervenience," pp. 165ff.

[17] Kim lists several prior uses of this "approach to analyzing supervenience." See "Concepts of Supervenience", p. 68.

idea of a world-wide distribution of B properties has been debated, but it seems there is now some agreement. McLaughlin and Paull have independently touted a definition relying upon the notion of an X-isomorphism.[18] An X-isomorphism between world w and world w* is a one-to-one mapping from all individuals of w to all individuals of w* such that only X-twins are mapped.

> **Global Supervenience**: A properties globally supervene on B properties $=_{df}$ for any possible worlds w and w*, every B-isomorphism between w and w* is also an A-isomorphism.

Contrary to Kim's arguments, global supervenience entails weak supervenience, for each world will be B-isomorphic to itself and, since every B-isomorphism must be an A-isomorphism, at each world every pair of B-twins must be A-twins.[19]

If there are n B properties, then there are 2^n combinations of B properties which any individual can have, since it can either instantiate or not instantiate each of the n B properties. In each world, each of the 2^n combinations of B properties is instantiated by some number of individuals. When I speak of how the individuals at some world w are 'distributed' among the 2^n combinations of B properties, I'm speaking simply of the

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[18]McLaughlin, "Supervenience, Vagueness, and Determination," p. 214; Paull, "Supervenience Relations and Their Significance" (University of Massachusetts Doctoral Dissertation), chapter 5. Both have suggested further discriminations, calling the definition I use 'strong global supervenience.' For 'weak global supervenience' McLaughlin proposes the following: A weakly globally supervenes on B iff for any possible worlds w and w*, if there is a B-isomorphism between w and w*, then there is also an A-isomorphism between them. Because what they call 'strong global supervenience' captures the traditional notion of global supervenience, and because weak global supervenience would likely be deemed useless by many, I will restrict my comments on weak global supervenience to footnotes.

[19]Kim uses a different definition of global supervenience, leaving it unclear whether, on his definition, global supervenience does entail weak. But, as with his argument that weak supervenience does not entail strong, Kim's demonstration consists in finding *worlds* that are compatible with the one sort of supervenience but not with the other. In this case, Kim describes a world that is, on the face of things, compatible with global supervenience but is not compatible with weak supervenience. This neglects the rest of logical space, though, leaving open the question of whether the existence of the world he describes necessitates the existence of other worlds which would be more obviously incompatible with global supervenience. That is, Kim has shown only that his definition of global supervenience does not *formally* entail his definition of weak supervenience. (See his "'Strong' and 'Global' Supervenience Revisited," pp. 83-84.)

number of individuals at w that instantiate each of those combinations (not their *spatio-temporal* distribution). Worlds with three individuals can have any of 16^3 distributions of the 16 (2^4) combinations of properties A, B, C, and D: they can all three have none of these properties, one can have A and the other two have none, all can have C and D, etc. All worlds having the same distribution of individuals to B property combinations form an equivalence class c. Finally, A globally supervenes on B iff for each such equivalence class of worlds c, there is some function f_c such that the A properties of any individual of a world of that class is a function f_c of its B properties.[20]

As With Weak, So Too Global

Much the same reasoning that suggested an equivalence between weak and strong supervenience applies similarly to the equivalence of global and strong supervenience. This time, however, we require an isolation principle:

> **Isolation Principle**: For any individual x in world w, there is a world w*
> containing *only* an individual x' such that x' in w* is a duplicate of x in w.

For global supervenience to obtain yet strong supervenience to fail, it must be the case that for each equivalence class of worlds c having the same distribution of B property combinations (i.e. each class that is B-isomorphic), there is a function f_c which maps B properties to A properties; yet, that function f_c must vary from class to class. This means there must be two individuals a and b with the same B properties yet different A properties. But using the Isolation Principle, this means there is one world containing only a duplicate of a and another world containing only a duplicate of b. These two worlds, however, are B-isomorphic and so belong to the same equivalence class, yet there is no A-isomorphism between them, contrary to the assumption that global

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[20]For McLaughlin's 'weak global supervenience': A weakly globally supervenes on B iff for each class of worlds c, the distribution of combinations of A-properties is a function of the distribution of combinations of B-properties.

supervenience obtains.[21]   Thus, for intrinsic properties global supervenience implies strong supervenience.   And, since the reverse entailment holds, global and strong supervenience are equivalent for intrinsic properties.[22]

We cannot extend the equivalence to local extrinsic properties as before since an attempt to isolate a chunk of space-time may introduce a multiplicity of individuals which will mean the resulting worlds might not be B-isomorphic.

Once again, though, when global supervenience obtains but strong supervenience doesn't, we can ask why it would be that an individual's A properties are a function f of its B properties where this function holds over those worlds that have the same distribution of combinations of B properties but *not* over all worlds. There must be something that holds constant over each such class of worlds but varies from class to class.   That is, there must be some determinable totality fact F that is a

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[21]The Isolation Principle guarantees that there is a world containing only a duplicate of a, but a might have proper parts, complicating the picture considerably. Because of the proper parts that a or b might have, which could be different, the demonstration does not hold with full generality. Taking two people that are identical in the relevant physical (i.e. neurological) aspects, we expect them to be identical mentally as well. But if one of these persons is eight months pregnant and the other not, then the worlds generated using the isolation principle will not be isomorphic with respect to mental properties, and this will be so for reasons *not* having to do with differences in their mental properties, viz. because the world containing the duplicate of the pregnant woman will have two thinking creatures rather than one. Nonetheless, various considerations show that such exceptions are of limited importance.

First, for the cases that concern us, it seems we can limit our domain to non-overlapping individuals. For example, if we are concerned with the mental supervening on the physical, we can simply limit our domain to non-overlapping persons. For most concerns, a failure to generalize to pregnant women and Siamese twins would be irrelevant in our attempt to understand the mental.

Second, we can use the recombination principle to generate two worlds that contain extra parts in these cases and therefore that would still be B-isomorphic. Space limitations, I will not describe the somewhat complex procedure.

Third, note that cases involving spatio-temporally relational B properties, there is an easier demonstration that global and strong supervenience are equivalent (which I show later). Yet these, as we will see, are the cases that have been of interest to philosophers.

[22]The equivalence of weak global and strong supervenience follows suit. If strong local supervenience fails, there must be two individuals a and b that have the same B-properties though different A-properties. Using the Isolation Principle, we can generate two worlds, one containing only a duplicate of a, the other containing only a duplicate of b. But, because there is a B-isomorphism between these two worlds and no A-isomorphism, weak global supervenience cannot obtain. Thus, for intrinsic properties, weak global and strong supervenience are equivalent.

function of the distribution of B property combinations which determines the function f_c. Or, in other words, an individual's A properties must be a function of its B properties plus F. Thus we find that if A globally supervenes on B, then A strongly supervenes on B *together with* some totality fact F (which is a function of the distribution of B property combinations). So, as with weak supervenience, descriptions of global supervenience are also always mere partial characterizations of more general and informative strong supervenience relations.

We have already considered Kim's argument that *weak* supervenience can not capture an important aspect of dependency, viz. that what obtains in one world have implications for what obtains in another. Kim makes much the same argument for *global* supervenience, and this fails for much the same reasons.[23] If A globally supervenes on B, then an individual's A properties are a function f of its B properties together with some totality fact F. But the distribution of properties at *other* worlds fixes both the function f and the totality fact F. Thus, the distribution of A and B properties at *other* worlds dictates how the A properties of *this* world are to be distributed as a function of B properties. Global supervenience *does*, pace Kim, capture this aspect of dependence. Taking his cue from Kim, Shagrir argues that the mental globally supervening on the physical is consistent with non-materialistic cases since "it imposes no intra-world dependency relation," yet this too fails for much the same reasons.[24]

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[23] "'Strong' and 'Global' Supervenience Revisited," pp. 83-84; "The Myth of Nonreductive Materialism," pp. 277-279.

[24] "More on Global Supervenience," p. 697. Shagrir defines global supervenience in terms of the indiscernibility of "two worlds," rather than of worlds x and y. Thus, Shagrir can get the sort of dependency he wants simply by using the more general definition. However, the dependency is already there even using his definition, assuming indiscernibility is spelled in terms of isomorphisms (I am also assuming strong global supervenience, though I believe the point holds even for weak gobal supervenience). We can ask why such a general relation holds and the answer, I have suggested, is that the A-properties are a function of the B-properties and some totality fact.

Using an isolation principle, Paull and Sider also argue that global supervenience imposes an intra-world dependency relation. However, their argument assumes that, e.g., the property of having a mind is in some

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Both Kim's arguments that weak and global supervenience lack "modal force," and my rebuttal are important in understanding supervenience.[25] But Kim is also taking aim at larger game, Davidson's anomolous monism. Famously, Davidson "denies that there are psychophysical laws" yet thinks "that mental characteristics are in some sense dependent, or supervenient, on physical characteristics."[26] Kim argues that strong supervenience entails psychophysical laws yet weak and global supervenience lack the modal force necessary to capture the required sense of dependence. Thus, says Kim, "We must conclude that supervenience is not going to deliver to us a viable form of nonreductive materialism."[27] We can see now, however, that Kim's conclusion is premature. Weak and global supervenience *do* carry modal force, and thus the way is still open for those, like Davidson, seeking some form of nonreductive materialism. As we will see when we turn to the metaphysics of supervenience relations, weak and global supervenience capture what is in fact a quite plausible nonreductive theory of the mind.

Global Supervenience and Relational Properties

Most see global supervenience as a quite useful notion. We can use strong supervenience to capture the idea that fixing *an* individual's B properties fixes *its* A properties. And, similarly, we can use global supervenience to capture the idea that fixing *every* individual's B properties at a world fixes *their* A properties at that world — that is, the idea that we couldn't have two worlds, alike in their distribution of B properties but different in their distribution of A properties. For example, after the

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way an intrinsic property; either it is an intrisic property of the person in question or there is some intrinsic property of some larger portion of the world which entails that this very part (the preson) has a mind. This, however, neglects the very real possibility that having a mind is dependent upon totality facts such as the laws. See "In Defense of Global Supervenience," pp. 843-844.

[25] "Supervenience as a Philosophical Concept," p. 143.

[26] "Mental Events," p. 214.

[27] "The Myth of Nonreductive Materialism," p. 279.

discovery of gravitational force, one might have considered the thesis that fixing the mass of every individual of a world fixes the forces on every individual. But we must be careful here. What we actually want to say is that fixing the mass *and spatio-temporal distribution* of all individuals at a world fixes their forces. A world that contains only three particles spaced far apart and a world that contains only three particles very close together will have quite different forces though identical masses. It is not the fact that there are three particles each with a mass of an electron that determines the forces on the particles; rather, it is these facts plus each particle's distance from the other individuals with the specified mass that determines the forces.

We want to say, then, that force globally supervenes not on mass but on mass *and* spatio-temporal relations to other masses. But given this, there really is no need to appeal to global supervenience in the first place. Not only does the mass and spatio-temporal relations to other masses of *all* individuals determine the forces acting on *those* individuals, but the mass and spatio-temporal relations to other masses that *an* individual has determines the forces acting on *that* individual.[28]

In general, then, once spatio-temporally relational properties are introduced into the subvenience base, there is no need to appeal to the global state of the world, for the global state is implicit in the relational state of any individual. Thus, global and strong supervenience are equivalent when relational properties are included in the subvenient base. And yet, for cases of global supervenience that have concerned philosophers, e.g. the mental supervening on the physical, the aesthetic on the physical, the moral on the

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[28]Even if the A properties of an individual depended upon the B properties and spatio-temporal relations *among other individuals*, the A properties of the individual would still have to be entirely determined by *its* B properties and relational B properties. Consider a hypothetical case in which the spatio-temporal relations among *other* charges also has an affect on the force on individual i, e.g. if there's a constant amount of force in the universe and so the less the distance (and, hence, the greater the force) between *other* particles, the less the force on *this* particle. Even in such a case, the force on i is a function of the charge of i and the spatio-temporal relation of i to all other charges, for the fact that i is 50m south of a positively charged particle j and is 50 m west of a negatively charged particle k entails that j, a positively charged particle, lies 70.7m north-west of k, a negatively charged particle.

natural, etc., we *do* want to include the spatio-temporal relations of the B properties in the subvenience base. What sorts of properties could there be such that the A properties of an individual depend upon the number of world-mates instantiating each combination of B properties yet doesn't depend upon how these world-mates are distributed in space and time? We can imagine possible laws like this, but none have suggested that across *all* worlds such a dependency holds. Thus, it seems our practical concerns with global supervenience relations involve spatio-temporally relational properties, and all such cases are equivalent to strong supervenience relations. Rather than entertaining the additional, more complex global supervenience definition, we can get by with the original, simpler notion of strong supervenience.

The Metaphysics of Weak and Global Supervenience

We now have a better understanding of the *functional* relations that must obtain to have a merely weak or global supervenience relation. For A to weakly supervene on B, A must be a function of B and some totality fact F. For A to globally supervene on B, A must be a function of B and some totality fact F that in turn is a function of the distribution of combinations of B properties. Our next step, then, is to consider the *metaphysical* implications of these requirements. Is there any way to make sense of our talk of supervenience relations that stays true to our metaphysical presuppositions that such functional characterizations must be grounded by some sort of *dependence* relation? In this section I will argue that, contrary to first appearances, there *is* a way, and seeing this may help us to understand what the metaphysical commitments of our weak and global supervenience claims are.

As a preliminary, we might ask what the metaphysical implications are of the fact that both weak and global supervenience are mere partial characterizations of strong supervenience. In both cases the relation is underwritten by a more general strong supervenience relation. Doesn't this tell us something? Philosophers once

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viewed supervenience as some new sort of metaphysical dependency relation. And, thus, the 'discovery' of a new supervenience relation might be taken for a discovery of a new kind of dependency. This view is no longer considered plausible, for philosophers no longer consider supervenience relations explanatory in the same sense that a dependency is. Claims of supervenience tell us little, at least directly, about dependencies; they present a mystery, not resolve one. The fact that weak and global supervenience relations are at heart just parts of strong supervenience relations supports this view. Knowledge of a weak or global supervenience relation is but partial knowledge of the strong supervenience relation subsuming it. Thus, if strong supervenience offers no explanation of the underlying metaphysical dependency, so much less will weak or global supervenience give us an explanation. In sum, it seems that the relation of weak and global supervenience to strong supervenience by itself is of little metaphysical import.

A Puzzle: The Metaphysics of Weak and Global Supervenience

It is not difficult to see how the mental can strongly supervene on the physical. There could be metaphysical or semantic dependencies in virtue of which having these physical properties entails having those mental properties. These, in fact, are the lines that identity theorists and logical behaviorists take. So, as far as understanding the metaphysical dependencies involved, strong supervenience relations are unproblematic, or at least present no new problems.

For weak and global supervenience, however, the story is not so easy. How could something's mental properties be a function of its physical properties where this function varies from world to world? Perhaps even worse, how can the mental properties that *this* instantiates be a function of, inter alia, the physical properties that *that* instantiates? The solution may appear obvious, for nomological dependencies seem perfectly suited to these roles. Won't psychophysical laws answer our problem?

Unfortunately, they will not. If there are psychophysical laws, the mental will be a function of the physical at this world; moreover, with psychophysical laws the mental properties of *this* might be a function of, inter alia, the physical properties of *that*. And, in some other world, the mental will be a different function of the physical. Fine so far. But if the laws are contingent, then there will be some worlds where the mental is not a function of the physical, where the mental varies independently of the physical. And this is exactly what weak and global supervenience preclude. For weak supervenience to obtain, it is *metaphysically necessary* that the mental be a function of the physical; i.e. at *every* world the mental must be a function of the physical, though that function can vary from world to world. This, though, is not what nomological dependencies give us. Thus, no simple metaphysical or nomological dependency can possibly underpin a merely weak or global supervenience relation. What we need is something stronger than a nomological dependency yet weaker than a metaphysical dependency. It begins to look as if only some new sui generis dependency will do the trick.

Before trying to solve our puzzle, note that semantic dependencies *are* capable of underpinning weak and global supervenience relations. We've already seen that the property of being the tallest in the world merely weakly supervenes on one's height. Similarly, the property of belonging to an all-male world merely globally supervenes on the property of being male. Simply because of the semantics of '-est', 'belonging to a world of . . .", and other such pieces of our language, it seems that we can generate properties for any sort of supervenience relation. But what we are doing is constructing properties artificially using the combinatorics of our language. These artificially constructed properties show that weak supervenience does not entail strong and that global supervenience does not entail weak. But our present concern is to see if any of the sorts of properties appearing in *interesting* claims of supervenience could stand in weak or global supervenience relations. And *these* sorts of properties do not supervene in virtue of semantic dependencies; or, more accurately, if they do, it is not

merely in virtue of the combinatorics of semantically transparent phrases such as 'belongs to a world of . . .'

What sort of metaphysical dependency could underlie merely weak or global supervenience relations? If these supervenience relations in fact obtain, then they cry out for some explanation. The difficulty in finding such a dependency might lead one to think weak and global supervenience relations are mere definitions which no relations satisfy. Perhaps claims of weak and global supervenience have been made by those hoping to *avoid* various commitments of metaphysical and nomological dependencies, i.e., by those unaware of their actual metaphysical implications.[29] Certainly supervenience claims have been common among those espousing non-reductive physicalism. One can even give a reasonable explanation of why weak and global supervenience have been so popular. Familiarity with laws has given philosophers the idea of a dependence varying from world to world and of relating properties of things to those of spatio-temporally related things. And familiarity with metaphysical and semantic dependencies has given them the idea of a dependence holding across all worlds. Thus, perhaps the notions of weak and global supervenience are simple conflations of the two.

Another possibility is that philosophers paid little attention to metaphysical implications and notions of weak and global supervenience were simply natural ways, given the language of 'possible worlds' or of 'necessity' and 'possibility', to disambiguate the claim that things alike physically *must* be alike mentally. Both ways of accounting for the widespread appeals to weak and global supervenience are plausible. But there *is* a way to make sense of weak and global supervenience, a way to

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[29]Cf. Melnyk, who calls supervenience 'suspicious' and 'an extraordinarily *convenient* notion.'
"Physicalism: From Supervenience to Elimination," p. 579.

reconcile our metaphysical intuitions with the demands of these supervenience relations. Functionalism points the way.[30]

A Solution: Functionalism

According to functionalism, mental properties are second-order properties; more specifically, they are the having of some physical property that is causally connected to other specific mental and physical properties.[31] Thus, the physical properties together with the causal relations between them determine mental properties. And which mental properties *this* has depends upon which physical properties *that* has. Finally, an individual's mental properties are a function of its physical properties and the physical properties to which it is *causally* connected; therefore, since the laws and thus the causal connections vary from world to world, so too will the function from a) an individual's physical properties and how it is spatio-temporally related to other physical properties, to b) that individual's mental properties. In sum, we have exactly what is required for a weak or global supervenience relation.

Earlier we considered whether psychophysical laws might underpin weak or global supervenience relations, and we found a problem. If mental properties are *nomologically* a function of physical properties but *metaphysically* independent of them, then at worlds where there are no laws the mental need not be a function of the

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[30]Troy Cross first suggested to me that functionalism satisfies weak and global supervenience, though this point has also appeared in the literature. Loewer suggested functionalism as a way of making sense of global supervenience (or, more accurately, strong supervenience with relational properties) in "An Argument for Strong Supervenience," p. 223. Melnyk seems to have similar ideas in "Formulating Physicalism: Two Suggestions."

[31]As Adam Wager has reminded me (in conversation), second-order properties are, more accurately, the having of a *first-order* property with the appropriate causal connections. This means that the mental weakly or globally supervening on the physical is not actually compatible with a functionalist theory of mind. More strictly we must say either 1) that a functionalist theory of the mind is compatible with mental properties supervening on the set of *basic* properties, or 2) that the mental supervening on the physical is compatible with a theory saying that mental properties are second-order properties whose realizers are physical.

physical, precluding weak and global supervenience. With functionalism, however, we have no such problem, for what *constitutes* a mental property is the having of a physical property that is causally related in the right ways with other physical properties. That is, if there are no laws at a world, then in virtue of what it is to be a mental property, individuals at such worlds could not have mental properties. So the problem we found with contingent psychophysical laws does not arise. Functionalism avoids the Charybdis of mere metaphysical dependencies and the Scylla of mere nomological dependencies by combining the two, i.e. by *metaphysically* (or perhaps semantically) requiring a mental property to be some physical property having certain *nomological* relations to other physical properties.

If a functionalist theory of the mind is correct, then an individual's mental properties are a world-independent function of its physical properties and its causally relational properties; that is, then the mental strongly supervenes on the physical and the causally relationally physical. Global supervenience is a weaker relation, so an individual's mental properties would also globally supervene on its physical and causally relationally physical properties. But would the mental globally supervene merely on the *non*-relationally physical? That is, would fixing the distribution of physical properties at a world fix the mental properties at that world? According to functionalism, an individual's mental properties would be a function of its physical properties, its spatio-temporal relations to other individuals with physical properties, *and* the physical laws (e.g. a belief about water is, in part, something caused by, or perhaps something that *would* be evoked by, water). But are the physical laws a function of the spatio-temporal distribution of physical properties? One's answer will depend upon one's view of laws. For those that hold the thesis of Humean Supervenience, the answer is yes. This means that the spatio-temporal distribution of physical properties would determine the laws and, thereby, the spatio-temporal distribution of mental properties. Thus, the mental would globally supervene on the

(non-relationally) physical. For those that deny Humean Supervenience, i.e. for those claiming that two worlds can be identical in the spatio-temporal distribution of physical properties yet differ in their laws, this means that there are two worlds alike in their spatio-temporal distribution of physical properties yet, because they have different laws, they differ in their spatio-temporal distribution of mental properties. That is, for those denying the thesis of Humean Supervenience the mental would not globally supervene on the (non-relationally) physical.

Functionalism satisfies the demands of weak and global supervenience while presenting no new metaphysical mysteries. It requires, at most, only our familiar metaphysical and nomological dependencies. According to many, though, metaphysical and nomological dependencies are mysterious enough, for what (short of identity) could explain a dependency that holds across all worlds or, worse, a dependency that holds only across some? Thus, while functionalism may adequately explain weak and global supervenience to many, those of a more conventionalist stripe may wish for more. Following Sidelle's lead, perhaps functionalism does offer more.[32] For we can eschew metaphysical necessities and see functionalism as *semantically* requiring that what has mental property M have some physical property with the right nomological relations to the right physical properties. With one fell swoop we can thus avoid the mysteries of both metaphysical and nomological dependencies. In any case, functionalism allows us to commit to *at most* our old and familiar metaphysical and nomological dependencies.

Weak and global supervenience require one set of properties to be a function of another set *and* some totality fact. Functionalism, as we have seen, is one way to make metaphysical sense of this requirement. According to a functionalist theory of the mind, the mental is a function of the physical and the laws. We have also seen another

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[32]See his *Necessity, Essence, and Individuation.*

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way to make sense of weak and global supervenience claims. Being the tallest in the world *weakly* supervenes upon one's height because being the tallest in the world is a function of one's height *and* the height of the tallest individual in the world. The best way to make metaphysical sense of a claim of weak or global supervenience will therefore vary from case to case. For the cases that have been of interest to philosophers, however, appeal to the laws seems to be essential. Some weak and global supervenience relations might be true in virtue of functionalist theories — e.g. perhaps the ethical globally supervenes on the natural since an act is right insofar as it minimizes the amount of suffering *caused* — while others might not — e.g., perhaps the beauty of a painting weakly supervenes on its physical properties since the dispositional properties of pigments are in part a function of our laws. In either case, though, the way in which one thing can be a world-dependent function of another and yet this dependency not be transparent is to have one thing be a function of the others and the laws.

Functionalism is the most obvious way to make metaphysical sense of weak and global supervenience. Any sort of law-dependent properties could also underlie such supervenience relations. The options for those appealing to weak and global supervenience are thus quite limited. Either they are committing to a functionalist account or, more generally, a dependency between law-dependent properties, on the one hand, or they owe us an explanation of how else they can make metaphysical sense of their claim of a functional relation that varies from world to world yet not from individual to individual within a world.

Conclusion

Weak, global, and strong supervenience are all equivalent for intrinsic properties. In fact, they are equivalent whenever the properties do not involve totality facts, for A weakly or globally supervening on B just is A strongly supervening on B

together with some totality fact F (which, in the case of global supervenience, is a function of the distribution of B properties). Thus, weak and global supervenience are mere parts of more general and informative strong supervenience relations. Further, global supervenience is equivalent to strong supervenience for spatio-temporally relational properties, which seem to be what is involved in cases where supervenience has actually been invoked.

All of this gives us a better picture of what weak, global, and strong supervenience are *functionally*, but what we'd like instead is an understanding of what supervenience relations commit us to *metaphysically*. That is, we'd like to know what sort of dependencies could underlie the various supervenience relations. Our functional characterization of weak and global supervenience shows that these require a metaphysically or semantically necessary dependency that holds across individuals of a world but varies across worlds. Functionalism, and, more generally, accounts appealing to law-dependent properties, give us exactly that. Thus we can make metaphysical sense of weak and global supervenience claims.

In the past, philosophers have appealed to weak and strong supervenience to escape reductionism. But while they thought they were escaping reductions, they had little idea of what they were instead committing to. Willy-nilly they made metaphysical commitments to they knew not what. If the story I have told is correct, we now have a better understanding of these commitments: the skeleton of functional relations is given some metaphysical meat.[33]

Works Cited

Armstrong, D. M. *A Combinatorial Theory of Possibility*. New York: Cambridge University Press, 1989.

Davidson, Donald. "Mental Events," reprinted in *Essays on Actions and Events*. Oxford: Clarendon Press, 1980.

Kim, Jaegwon. "Concepts of Supervenience," *Philosophy and Phenomenological Research* 45 (1984), pp. 153-176; reprinted and quoted from Kim's *Supervenience and Mind: Selected Philosophical Essays*, Cambridge: Cambridge University Press, 1993.

Kim, Jaegwon. "The Myth of Nonreductive Materialism," Proceedings and Addresses of the American Philsophical Association 63 (1989), pp. 31-47; reprinted and quoted from Kim's *Supervenience and Mind: Selected Philosophical Essays*, Cambridge: Cambridge University Press, 1993.

Kim, Jaegwon. "Supervenience as a Philosophical Concept," *Metaphilosophy* 21 (1990), pp. 1-27; reprinted and quoted from Kim's *Supervenience and Mind: Selected Philosophical Essays*, Cambridge: Cambridge University Press, 1993.

Lewis, David. *On the Plurality of Worlds*. Oxford: Blackwell, 1986.

Loewer, Barry. "An Argument for Strong Supervenience," in *Supervenience: New Essays*, eds. Elias E. Savellos and Ümit D. Yalçin. Cambridge: Cambridge University Press, 1995.

McLaughlin, Brian P. "Varieties of Supervenience," in *New Essays on Supervenience*, eds. Savello and Yalein. (Cambridge: Cambridge University Press, 1995), pp. 16-59.

Melnyk, Andrew. "Formulating Physicalism: Two Suggestions," *Synthese* 105 (1996), pp. 381-407.

Melnyk, Andrew. "Physicalism: From Supervenience to Elimination," *Philosophy and Phenomenological Research* 51 (1991), pp. 573-587.

Paull, R. Cranston and Theodore R. Sider. "In Defense of Global Supervenience," *Philosophy and Phenomenological Research* 52 (1992), pp. 833-854.

Sidelle, A. *Necessity, Essence, and Individuation*. Ithaca, New York: Cornell University Press, 1989.

Shagrir, Oron. "More on Global Supervenience," *Philosophy and Phenomenological Research* 59 (1999), pp. 691-701.