From Supervenience to Superdupervenience: Meeting the Demands of a Material World

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The term "supervenience" derives etymologically from the Latin "super", meaning *on*, *above*, or *additional*; and from the Latin verb "venire", meaning *to come*. In non-philosophical contexts the word is used primarily in a temporal way—typically to mean "coming or occurring as something novel, additional, or unexpected". In philosophical contexts it is primarily used non-temporally, to signify a metaphysical and/or conceptual determination-relation; here the etymology appears to be spatially quasi-metaphorical, the idea being that something supervenient comes above—is "grounded by"—that on which it supervenes.

The term in its current philosophical usage evidently entered the analytic philosophy literature in a classic work of twentieth century metaethics, Hare (1952):

> Let me illustrate one of the most characteristic features of value-words in terms of a particular example. It is a feature sometimes described by saying that "good" and other such words are names of "supervenient" or "consequential" properties. Suppose that a picture is hanging upon the wall and we are discussing whether it is a good picture; that is to say, we are debating whether to assent to, or dissent from, the judgment "*P* is a good picture" .... Suppose that there is another picture next to *P* in the gallery (I will call it *Q*).... Now there is one thing that we cannot say; we cannot say "*P* is exactly like *Q* in all respects save this one, that *P* is a good picture and *Q* not" .... There must be some *further* difference between them to make one good and the other not. (1952, pp. 80-81)

Professor Hare has recently written, however, that this use of the term was already current in Oxford, and did not originate with him (Hare 1984, p. 1). And the concept we currently express by "supervenience", although not the word itself, had already been invoked in moral philosophy by G. E. Moore (1922), who held that intrinsic value is (as we would now say) supervenient on non-normative properties. Moore wrote:

> [I]f a given thing possesses any kind of intrinsic value in a certain degree, then not only must that same thing possess it, under all circumstances, in the same degree, but also anything *exactly like it*, must, under all circumstances, possess it in exactly the same degree. Or, to put it in the corresponding negative form: it is not *possible* that of two exactly similar things one should possess it and the other not, or that one should possess it in one degree, and the other in a different one. (1922, pp. 261)

Supervenience, then, is a modal notion. As David Lewis (1986) puts it, "Supervenience means that there *could* be no difference of one sort without difference of the other sort" (p. 15).

Although the concept of supervenience has been employed for a variety of purposes in recent philosophy, a rather dominant tendency since the early 1970's has been to invoke it in efforts to articulate a broadly materialistic, or physicalistic, position in philosophy of mind or in metaphysics generally. Often it has been invoked with the goal of articulating a materialistic metaphysical picture that eschews various strictures on inter-level connections that were sometimes built into earlier formulations of materialism—in particular, the requirement that psychological and other "higher-order" properties be *reducible* to physico-chemical properties.

Lately, however, the wave of relative enthusiasm about supervenience theses has begun to subside. There now seems to be emerging (e.g., Kim 1990; 1993b, ch. 9) an attitude of sober reassessment, accompanied by a suspicion that supervenience theses per se do less work philosophically than some had hoped they would.

I think this change of mood was in many ways inevitable, given certain ironic facts about the history of the notion of supervenience in philosophical thought during the 20th century. There is much to be learned from this history about both the uses and the limitations of supervenience theses, especially with respect to materialism. So the first half of this paper, §§1-4, will be a historical overview, aimed at highlighting some key ironies and drawing some important lessons for materialist metaphysics. The principal moral will be that supervenience relations, in order to figure in a broadly materialistic worldview, must be explainable rather than *sui generis*.

I will next take up some issues that have figured prominently in recent philosophical discussions of supervenience[1]: how to formulate supervenience theses (§5); supervenience and the causal/explanatory efficacy of higher-order properties (§6); supervenience and inter-theoretic reduction (§7). Finally (§8) I will return to the issue whose importance is the central moral of §§1-4, but which has so far gone largely unnoticed in the philosophical literature: the explainability of supervenience relations.

Let me make several preliminary points. First, I take it that the question of what constitutes a broadly materialistic, or physicalistic, worldview is itself a philosophical question.[2] Although many philosophers, myself included, are disposed toward *some* sort of materialistic metaphysics, it is no simple matter to articulate such a view. Much of the philosophical interest of the notion of supervenience lies in its potential usefulness in this respect.

Second, for reasons of simplicity I will generally talk in terms of the basic physical level of description (the level of physics per se) vis-à-vis other levels of description—and often in terms of the physical vis-à-vis the mental. But much of what I will say presumably can be extended to inter-level supervenience relations more generally.

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[1] Several other papers that usefully overview recent issues and discussions are Teller (1984), Kim (1990), and Beckermann (1992a, 1992b).

[2] It is also a philosophical question what constitutes a broadly *naturalistic* worldview, and how (if at all) metaphysical naturalism might differ from materialism.

Third, for reasons of simplicity I will conduct the discussion in a way that presupposes an ontology of properties and facts. The language of properties and facts allows for perspicuous formulation of the central theses and issues I will be concerned with. But analogous theses and issues presumably would arise even under a more nominalistic ontology, although nominalists might seek to reformulate them or might deny that talk of facts and properties carries genuine ontological commitment to these putative entities.[3]

1. British emergentism

It will be instructive to begin by considering supervenience in relation to an account of the special sciences that has been dubbed "British emergentism" in a splendid and fascinating recent paper, McLaughlin (1992). The British emergentist tradition began in the middle of the nineteenth century and flourished in the first quarter of this century. It began with John Stuart Mill's *System of Logic* (1843), then traced through Alexander Bain's *Logic* (1870), George Henry Lewes's *Problems of Life and Mind* (1875), Samuel Alexander's *Space, Time, and Deity* (1920), Lloyd Morgan's *Emergent Evolution* (1923), and finally C. D. Broad's *The Mind and Its Place In Nature* (1925). The latter was the last major work in this tradition, although the tradition continues even today in the work of a few authors, notably the neurophysiologist Roger Sperry.

The British emergentists were not substance-dualists; they held that all particulars are physical entities wholly constituted out of physical entities as their parts. But they were not full-fledged materialists either, because they denied that physics is a causally complete science. They maintained that at various junctures in the course of evolution, complex physical entities came into being that had certain non-physical, "emergent", properties.These properties, they claimed, are fundamental force-generating properties, over and above the force-generating properties of physics; when such a property is instantiated by an individual, the *total* causal forces operative within the individual are a combination of physical and non-physical forces, and the resulting behavior of the individual is different from what it would have been had the emergent force(s) not been operative alongside the lower-level forces.[4] Furthermore, there is no explanation for why emergent properties come into being, or why they generate the specific non-physical forces they do. These facts are metaphysically and scientifically basic, in

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[3] I will occasionally employ talk of possible worlds, in connection with modal locutions used to express supervenience theses. The remarks just made about properties and facts apply, mutatis mutandis, to possible worlds too.

[4] Does this mean that the laws of physics are abrogated when emergent properties are instantiated? According to the emergentists, no. For, the laws of physics do not actually assert that physical forces are always the *only* operative forces in a physical system. So the laws of physics remain true when an emergent property is instantiated: the usual physical forces are present, and these physical forces are still additive in the usual way. It's just that the physical forces are not the only forces present, and hence the total net force in the system is not identical to the net *physical* force.

much the same way that fundamental laws of physics are basic; they are unexplained explainers, which must be accepted (in Samuel Alexander's striking phrase) "with natural piety". Putative examples of emergent properties included (i) chemical-bonding properties of molecules, which were held to be emergent from physical properties of atoms or their constituents; (ii) self-maintenance and reproductive properties of living things, emergent from physical and chemical properties; and (iii) mental properties of creatures with consciousness, emergent from physical, chemical, and biological properties.[5]

There are two reasons I mention British emergentism in connection with supervenience. First, the term "supervenient" was employed by Morgan (1923) in contexts where synchronic inter-level relations among properties were under consideration. Here is a representative passage:

> I speak of events at any given level in the pyramid of emergent evolution as "involving" concurrent events at lower levels. Now what emerges at any given level affords an instance of what I speak of as a new kind of relatedness of which there are no instances at lower levels. The world has been successively enriched through the advent of vital and of conscious relations. This we must accept "with natural piety" as Mr. Alexander puts it. If it be found as somehow given, it is to be taken as we find it.
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> But when some new kind of relatedness is supervenient (say at the level of life), the way in which the physical events which are involved run their course is different in virtue of its presence—different from what it would have been if life had been absent. (1923, pp. 15-16)

The temporal or diachronic meaning of "supervenient" is certainly involved here; in part Morgan is saying, "... when some new kind of relatedness has been arrived upon in the course of evolution ...". On the other hand, synchronic inter-level dependence is evidently involved too; he is talking about higher-level events vis-à-vis *concurrent* lower-level events. In effect, then, Morgan's usage of "supervenient" connotes (as does the term "emergence" itself) both diachronic novelty and synchronic dependence.[6]

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[5] When Broad wrote, "Nothing that we know about Oxygen by itself or in its combinations with anything but Hydrogen would give us the least reason to suppose that it would combine with Hydrogen at all. Nothing that we know about Hydrogen by itself or in its combinations with anything but Oxygen would give us the least reason to expect that it would combine with Oxygen at all" (1925, pp. 62-3), his claim was true. Classical physics could not explain chemical bonding. But the claim didn't stay true for long: by the end of the decade quantum mechanics had come into being, and quantum-mechanical explanations of chemical bonding were in sight. Within another two decades, James Watson and Francis Crick, drawing upon the work of Linus Pauling and others on chemical bonding, explained the information-coding and self-replicating properties of the DNA molecule, thereby ushering in physical explanations of biological phenomena in general. (These kinds of advances in science itself, rather than any internal conceptual difficulties, were what led to the downfall of British emergentism—as McLaughlin (1992) persuasively argues.)

[6] Kim (1990) goes so far as to say, "Lloyd Morgan, a central theoretician of the emergence school, appears to have used "supervenient" as an occasional stylistic variant of "emergent", although the latter remained the official term associated with the philosophical position, and the concept he intended with these terms seems surprisingly close to the supervenience concept current today" (p. 4).

A second reason I mention British emergentism is in order to pose two questions well worth asking about emergentism and synchronic inter-level dependence relations. (1) Could the British emergentists have held, consistently with their other principal doctrines, that emergent properties are *supervenient* (in the contemporary philosophical sense) on lower level properties—i.e., that individuals cannot differ in their emergent properties without also differing in their lower-order properties? (2) *Did* they hold this view?

As regards the second question, I think the textual evidence supports an affirmative answer, although not decisively. For instance, Broad wrote:

> [N]o amount of knowledge about how the constituents of a living body behave in isolation or in other and non-living wholes might suffice to enable us to predict the characteristic behaviour of a living organism. This possibility is perfectly compatible with the view that the characteristic behaviour of a living body is completely determined by the nature and arrangement of the chemical compounds which compose it, in the sense that any whole which is composed of such compounds in such an arrangement will show vital behaviour and that nothing else will do so. (1925, pp. 67-8)

Given the remarks in the wider context in which this passage occurs, it is fairly clear that Broad actually advocated the determination thesis here mentioned. Moreover, it is plausible that the sort of determination he had in mind is full-fledged supervenience, rather than a weaker kind of dependence in which the nature and arrangement of a body's constituent chemical compounds only figures as a *precondition* for the instantiation of a given emergent vital property, without *guaranteeing* its instantiation. But Broad and the other emergentists were not totally unambiguous about which of these two kinds of synchronic dependence they believed in.[7]

In any event, the first question is the more important one for our purposes here. The answer to this question, as far as I can see, is affirmative. Certain higher-level properties could be supervenient on lower-level ones (ultimately on physical ones) and also possess the two key features the emergentists stressed: (i) the supervenient higher-order properties could be fundamental causal properties, generating causal forces over and above physical causal forces; and (ii) the connections between lower-order and higher-order properties—supervenience connections—could be metaphysically fundamental, hence unexplainable.

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[7] Arthur Lovejoy (1927) distinguished two kinds of emergentism:

> [W]e must first of all distinguish between indeterminist and determinist theories. The former declare that there are instances of emergence which are reducible to no causal law; no fixed occasions can be formulated upon which they invariably occur. The hypothesis of "undetermined evolution" to which Professor Dreisch has referred is, I take it, a theory of this sort.... The determinist kind of theory declares that whenever certain specific occasions appear a specific variety of emergent uniformly arises. (pp. 25-6).

Determinist emergentism, I take it, in effect says that emergent properties are supervenient on lower-level properties; indeterminist emergentism in effect denies this. I have been suggesting that Broad and the other British emergentists are best interpreted as advocating determinist emergentism. Beckermann (1992b) interprets Broad this way too.

There are important lessons in the fact that the thesis of physical supervenience is consistent with the central doctrines of British emergentism, because those doctrines should surely be repudiated by anyone who advocates a broadly materialistic metaphysics. A materialist position should surely assert, contrary to emergentism, (i) that physics is causally complete (i.e., all fundamental causal forces are physical forces, and the laws of physics are never violated); and (ii) that any metaphysically basic facts or laws—any unexplained explainers, so to speak—are facts or laws within physics itself. So the two principal lessons of British emergentism are these:

(L1)   All properties and facts could be supervenient on physical properties and facts even if physics is not causally complete; for, certain non-physical properties could be supervenient on physical properties and yet causally basic (in the sense that they generate fundamental causal forces over and above physical forces). Yet a materialistic metaphysical position should assert the causal completeness of physics.

(L2)   All properties and facts could be supervenient on physical properties and facts even if certain supervenience facts are metaphysically *sui generis*, unexplainable in more fundamental terms. Yet a materialistic metaphysical position should assert that all supervenience facts are explainable—indeed, explainable in some materialistically acceptable way.

I take it that any supervenient properties whose supervenience is materialistically explainable would not be causally basic properties in the sense of (L1). On the other hand, a metaphysical position affirming that there are supervenient properties whose supervenience is not materialistically explainable would not deserve the label "materialism", not even if it did affirm the causal completeness of physics.

2. Moore and meta-ethical non-naturalism

The classic articulation of meta-ethical non-naturalism in the 20th century was given by G.E. Moore (1903). Moore held that there are objective moral properties and facts, and that these are not *natural* properties and facts of the sort that are investigated in the sciences; rather, moral goodness and moral rightness are simple, unanalyzable, non-natural, properties. As already remarked, although Moore did not use the word "supervenience", he quite clearly held that moral properties are supervenient on natural properties—specifically, that certain propositions of the form "Anything that has natural property P also possesses the property of intrinsic goodness" are (*synthetic*) necessary truths. He also maintained that these propositions do not depend for their truth (or their necessity) upon anything else; the synthetic necessary connections they express are metaphysically rock bottom, and thus are not explainable by any other facts.

The thesis that all properties and facts are supervenient on physical properties and facts is consistent with a non-materialist metaphysical position; this is a general moral we have already extracted from British emergentism. The moral is strongly reinforced by the fact that Moore's non-naturalist metaphysical position

is consistent with—and indeed, incorporated—the thesis that moral properties and facts are supervenient on natural properties and facts. Surely no materialist or naturalist metaphysical position could embrace Moore's meta-ethics. For one thing, Moore's putative non-natural moral properties are just intolerably queer, from a broadly naturalistic perspective. Moreover, the metaphysical queerness is only worsened by the contention that there are unexplainable, synthetic, necessary connections linking natural properties to moral ones. Both points were well stated by J. L. Mackie (1977):

> If there were objective values, they would be entities or qualities or relations of a very strange sort, utterly different from anything else in the universe ... An objective good would .... [have] to-be-pursuedness built into it. Similarly, if there were objective principles of right and wrong, any wrong (possible) course of action would have not-to-be-doneness somehow built into it. Or we should have something like Clarke's necessary relations of fitness between situations and actions, so that a situation would have a demand for such-and-such an action somehow built into it. (1977, pp. 37-40)

> What is the connection between the natural fact that an action is a piece of deliberate cruelty—say, causing pain just for fun—and the moral fact that it is wrong? It cannot be an entailment, a logical or semantic necessity. Yet it is not merely that the two features occur together. The wrongness must somehow be "consequential" or "supervenient": it is wrong because it is a piece of deliberate cruelty. But just what *in the world* is signified by this "because"? (1977, p. 44)

The first of these passages nicely expresses why Moorean moral properties are so hard to stomach.[8] The second passage is plausibly construed as pointing out the metaphysical oddness, from a broadly naturalistic perspective, of non-analytic, inter-level, necessitation relations that are *sui generis* and unexplainable (cf. also Horgan and Timmons (1992)).

3. Hare and meta-ethical non-cognitivism

Although supervenience is typically regarded nowadays as an inter-level relation between properties or facts, it was not so regarded by the analytic philosopher who first used the term in print, Professor Hare. Hare was one of the principal advocates in this century of the meta-ethical position commonly called non-cognitiv-

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[8] This passage from Mackie is sometimes interpreted (e.g., in Brink 1984) as presupposing ethical "internalism", the view that if there were objective, non-natural, moral properties or facts, then they would have to be intrinsically motivating or reason-providing. But it seems to me that in context, the phrases "to-be-pursuedness" and "to-be-doneness" are more plausibly construed as adverting to a *demand* that is supposed to be somehow built into moral properties and facts, rather than to some kind of desirability or reason-generation. On this interpretation, Mackie is not assuming internalism. (It is possible to judge that I am confronted by a demand without thereby having either a motive or a reason to do what is demanded of me, even if I do not consider the demand illegitimate.) So on this interpretation, Mackie's objection applies to Moore even if, as is often claimed, Moore himself was not an internalist.

ism; and on this view, there *are* no moral properties or moral facts. For Hare, supervenience in morals is a conceptual/semantic constraint on moral discourse and moral judgment; it is part of the "logic" of value-words (as was said in Oxford in the 1950's). Thus, if one uses moral language in a way that violates the supervenience constraint, one thereby abuses the very meaning of moral terms; and if one professes moral beliefs whose linguistic expression would violate the supervenience constraint, then either one misunderstands what one claims to believe, or else one's moral beliefs manifest a certain sort of inconsistency.

In the preceding two sections I have emphasized the need for supervenience relations to be explainable, rather than metaphysically *sui generis*. Let me now stress two points about the explanation of moral supervenience, in connection with Hare's views and those of other moral irrealists. First, explanations of moral supervenience appear relatively easy to give for a moral irrealist, and irrealists have in fact given them. For Hare, the primary function of evaluative terms, like "good", "ought", and "right", is not to ascribe properties to objects, but rather to commend (in the case of "good") and prescribe (in the case of "right"); the overarching purpose of value words is to *teach standards*. So the explanation for supervenience, as a consistency constraint on human moral judgments and moral discourse, will advert to this objective. Hare wrote:

> Now since it is the purpose of the word "good" and other value-words to be used for teaching standards, their logic is in accord with this purpose. We are therefore in a position at last to explain the feature of the word "good" which I pointed out at the beginning of this investigation [viz., supervenience]. The reason why I cannot apply the word "good" to one picture, if I refuse to apply it to another picture which I agree to be in all respects exactly similar, is that by doing this I should be defeating the purpose for which the word is designed. (1952, p. 14)

Second, it is substantially easier to explain supervenience as a conceptual/semantic constraint on moral discourse and moral judgment than to explain it as a putative relation between (i) non-moral properties and facts, and (ii) putatively objective, in-the-world, moral properties and facts. For, there are many mutually incompatible pairings of non-normative sentences and predicates with moral sentences and predicates, each of which fully respects supervenience qua conceptual/semantic constraint. Yet according to moral realism, only one of these pairings captures the *objective facts* about the specific natural/moral supervenience relations in the world.[9] So moral realists, insofar as they are not content to regard these supervenience relations as just *sui generis*, face a very demanding explanatory burden, over and above accounting for supervenience qua conceptual/semantic constraint: viz., they must also explain why certain specific claims about supervenience relations are the objectively *true* ones; thus why other such claims are (despite being compatible with the semantic constraint) objectively false. Or, at any rate, they must argue that such explanations are possible in prin-

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[9] This is not to deny that what is good, right, etc., often depends upon certain specific nonmoral situational facts concerning a given person or social group. Such facts, though, would figure among the subvenient facts upon which goodness, rightness, etc., supervene.

ciple, and must say something about the general form such explanations would take.[10]

So not all manifestations of supervenience need necessarily involve genuine higher-order properties or facts; and in general, explaining supervenience relations where there *are* such facts can be a substantially more demanding task than explaining supervenience as a mere constraint on discourse or judgment. For some kinds of discourse, it might turn out that only the less demanding kind of explanation is possible; for such cases, the proper *metaphysical* account of the discourse is likely to be an irrealist account. So here are two further morals concerning supervenience and metaphysics, in addition to those stated in §1:

(L3) A metaphysical position, materialistic or otherwise, can combine supervenience as a doctrine about the terms and concepts in a given body of discourse with ontological irrealism about the discourse.

(L4) For some forms of discourse, it might turn out that although a materialistically acceptable explanation can be given for supervenience as a conceptual/semantic constraint on the discourse, no materialistically acceptable explanation can be given for putative in-the-world supervenience relations between lower-order properties and putative higher-order properties seemingly posited by the discourse.

Let us say that supervenience is *ontological* if it is an objective relation between lower-order properties and facts and genuine, objective, higher-order properties and facts; cf. Klagge (1988). Let us say that supervenience for a given mode of discourse is *robustly* explainable if it is explainable as ontological—i.e., explainable not merely as a conceptual/semantic constraint, but as an objective necessitation relation between lower-order and higher-order properties and facts. The general moral we obtain from lessons (L1)-(L4), then, is this: any genuinely materialistic metaphysics should countenance inter-level supervenience connections only if they are explainable in a materialistically acceptable way, and should countenance *ontological* inter-level supervenience relations only if they are *robustly* explainable in a materialistically acceptable way.

4. Davidson and the materialist appropriation of supervenience

The notion of supervenience made its entrance into discussions of materialism in a seminal paper in the philosophy of mind, Davidson (1970). Here Davidson articulated and defended his "anomalous monism", a position with these key contentions: (i) every concrete, spatio-temporally located, mental event is identical to a concrete physical event; (ii) mental properties (event-types) are not identical to physical properties, and are not reducible to them via definition or law. The claim that physics is causally complete figured explicitly as a premise in his overall argument for this position; so did the claim that there are no strict psycho-

[10] For an argument that this burden cannot be satisfactorily discharged, see Horgan and Timmons (1992).

physical laws, for which he gave a well-known subsidiary argument appealing largely to the allegedly holistic nature of propositional-attitude attribution.

The invocation of supervenience entered, briefly, in the context of emphasizing his rejection of psychophysical type-type identity and reducibility, and also by way of saying something positive about relations between physical and mental characteristics. Here is the key passage, frequently quoted:

> Although the position I describe denies there are psychophysical laws, it is consistent with the view that mental characteristics are in some sense dependent, or supervenient, on physical characteristics. Such supervenience might be taken to mean that there cannot be two events exactly alike in all physical respects but differing in some mental respect, or that an object cannot alter in some mental respect without altering in some physical respect. Dependence or supervenience of this kind does not entail reducibility through law or definition ... (1970, p. 88)

In another paper Davidson not only claimed that the supervenience of the mental on the physical is consistent with anomalous monism, but he went on to explicitly advocate such a dependence thesis. Concerning the theme of "the relation between psychological descriptions and characterizations of events, and physical (or biological or physiological) descriptions", he said:

> Although, as I am urging, psychological characteristics cannot be reduced to the others, nevertheless they may be (and I think are) strongly dependent on them. Indeed, there is a sense in which the physical characteristics of an event (or object or state) *determine* the psychological characteristics: in G. E. Moore's word, psychological concepts are *supervenient* on physical concepts. Moore's way of explaining this relation (which he maintained held between evaluative and descriptive characteristics) is this: it is impossible for two events (objects, states) to agree in all their physical characteristics (in Moore's case, their descriptive characteristics) and to differ in their psychological characteristics (evaluative). (Davidson 1973, pp. 716-7)

Although Davidson was mistaken in attributing the *word* "supervenient" to Moore, he was of course correct in attributing to him the concept. (Note too the *modal* characterization of supervenience in both passages, and the similarity to Moore's own formulation I quoted at the outset.)

Davidson's invocation of supervenience in connection with the mind/body problem resonated strongly among philosophers working in philosophy of mind and metaphysics; there commenced a rapid and fairly widespread appropriation of supervenience into these branches of philosophy.[11] Two features of the above-quoted remarks are especially striking, and both evidently contributed to the subsequent popularity of supervenience among materialistically-minded philosophers. First is Davidson's firm and explicit rejection of the *reducibility* of psychological characteristics to physical ones. In embracing a version of materi-

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[11] E.g., Hellman and Thompson (1975, 1977), Haugeland (1982), Horgan (1981, 1982), Kim (1978, 1979, 1981), Lewis (1983), and the papers collected in Horgan (1984). Although much of this subsequent literature was influenced, directly or indirectly, by Davidson on supervenience, this may not be so for Hellman and Thompson (1975, 1977), who used the word "determination" rather than "supervenience".

alism that does not assert either the identity or the nomic equivalence of mental properties with physical properties, Davidson was evidently loosening the requirements for inter-level "fit" between different levels of description, in particular the physical and mental levels. Many philosophers were attracted by the thought that a broadly materialistic metaphysics can eschew reductionism, and supervenience seemed to hold out the promise of being a non-reductive inter-level relation that could figure centrally in a non-reductive materialism.

Second (and closely related), the passages implicitly suggest that psychophysical supervenience is an inter-level metaphysical determination-relation that renders mental properties *materialistically respectable*, as it were. The idea is that a reasonable materialism need only claim that physical facts and properties are the ontically *basic* ones, the ones that fix or determine all the facts. And supervenience of higher-order properties and facts on physical facts, it seemed, is just this sort of determination.

In light of the lessons we have drawn in earlier sections, however, it should be clear that mere supervenience of higher-order properties and facts on physical properties and facts cannot be enough to confer materialistic respectability. Moore in particular comes to mind—which is strikingly ironic, since Davidson actually *cites* Moore when he invokes supervenience. So it is not really surprising that doubts have now begun to emerge about whether supervenience, by itself, can carry as much weight in explicating a plausible materialism as some philosophers initially thought it could. Stephen Schiffer (1987) nicely expresses the reasons for scepticism, and the related irony:

> Tough-minded physicalist types (including many Logical Positivists) agreed [with Moore] that moral properties could not be reduced to natural properties ... but had no sympathy at all with Moore's positive thesis, which postulated a realm of non-natural properties and facts. These properties, it was felt, could not be made sense of within a scientific world view: they were obscurantist and produced more problems than they solved. At the same time, philosophers who abhorred Moore's irreducibly non-natural properties knew he also held this thesis about them: that it was not possible for two things or events to be alike in all physical respects while differing in some moral property .... No one thought that Moore's positive theory of moral properties was in any way mitigated by this further supervenience thesis. How *could* being told that non-natural moral properties stood in the supervenience relation to physical properties make them any more palatable? On the contrary, invoking a special primitive metaphysical relation of supervenience to explain how non-natural moral properties were related to physical properties was just to add mystery to mystery, to cover one obscurantist move with another. I therefore find it more than a little ironic, and puzzling, that supervenience is nowadays being heralded as a way of making non-pleonastic, irreducibly non-natural mental properties cohere with an acceptably naturalistic solution to the mind-body problem. (1987, pp. 153-4)

These remarks reinforce and underscore the negative moral that already emerged in §§1-3. The moral is not that supervenience cannot be an important part of a

broadly materialistic metaphysics, but rather this: putative supervenience rela-
tions that are themselves unexplainable and *sui generis* cannot play such a role.
The corresponding positive moral is that the sort of inter-level relation needed by
the materialist who is also a realist about a given mode of discourse (e.g., mental
discourse) is not bare supervenience, but rather what I hereby dub *superduper-
venience*: viz., ontological supervenience that is robustly explainable in a mate-
rialistically explainable way.[12] Superdupervenience would indeed constitute a
kind of ontic determination which is itself materialistically kosher, and which
thereby confers materialistic respectability on higher-order properties and facts.

I will return to superdupervenience in §8 below, after addressing three issues
that have received substantial recent discussion. For the most part, the points I
will make about supervenience in §§5-7 will apply, mutatis mutandis, to super-
dupervenience as well.

5. Versions of supervenience: weak, strong, global, and regional

As philosophers began to turn in the 1970's to the notion of supervenience in
attempts to articulate broadly materialist positions in philosophy of mind and
metaphysics, there began to emerge a bewildering panoply of alternative ways of
articulating supervenience theses themselves (cf. Teller 1984).

One parameter that can vary from one supervenience thesis to another is the
class of possible worlds that fall within the scope of a given thesis. Some, e.g.,
Moore's thesis that intrinsic value is supervenient on natural properties, are plau-
sibly construed as involving all possible worlds. Supervenience theses of interest
to materialists, however, seem more plausibly construed as involving all *physi-
cally* possible worlds. The question of how best to characterize the notion of
physical possibility, for this purpose, is somewhat delicate, especially if (i) one
holds (as does Lewis 1979, for instance) that actual-world laws often get slightly
violated in "nearby" possible worlds relevant to assessing the actual-world truth
values of counterfactual conditionals, and (ii) one wants one's supervenience the-
sis to include those worlds (cf. Horgan 1982, 1984, 1987; Lewis 1983).

Another much-discussed distinction is between what Kim (1984a) calls
"weak" and "strong" supervenience. Let *A* and *B* be two sets of properties, where
we think of the *A* properties as supervenient on the *B* properties. Using the neces-
sity operator " $\Box$ " of modal logic, the two kinds of supervenience can be
expressed as follows:

> *Weak Supervenience*:
> $\Box \ (\forall x)(\forall F_{\in A})\{x \text{ has } F \rightarrow (\exists G_{\in B})[x \text{ has } G \ \& \ (\forall y)(y \text{ has } G \rightarrow y \text{ has } F)]\}$
> (Necessarily, if anything has property *F* in *A*, there exists a property *G*
> in *B* such that the thing has *G*, and everything that has *G* has *F*.)

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[12] Although the definition is mine, the word is borrowed, with kind permission, from
Bill Lycan (1986, p. 92). I thank him for it.

Strong Supervenience:

$\Box$ ($\forall x$)($\forall F_{\in A}$){x has F $\rightarrow$ ($\exists G_{\in B}$)[x has G & $\Box$ ($\forall y$)(y has G $\rightarrow$ y has F)]}

(Necessarily, if anything has property F in A, there exists a property G in B such that the thing has G, and *necessarily* everything that has G has F.)

Weak supervenience pertains only to things that occupy the same possible world; it says that *within* any world, all things that are B-indiscernible are also A-indiscernible. Strong supervenience pertains across possible worlds; it says that for any worlds w and w' and any things x and y (in w and w' respectively), if x in w is B-indiscernible from y in w', then x in w is A-indiscernible from y in w'. It is sometimes alleged that ordinary-language formulations of supervenience theses, like those of Moore, Hare, and Davidson I quoted earlier, only express weak supervenience; and it is often urged that strong supervenience better reflects the kind of inter-level dependence relation that supervenience theses are intended to capture.

Why should one think that familiar ordinary-language formulations really only express weak supervenience? Evidently the principal reason is an understandable tendency to try translating those formulations into the formalism of modal logic, and to do so in a manner reflecting their surface grammar. Since the ordinary-language formulations typically only exhibit one occurrence of a modal expression like "can" or "could", not two occurrences, one construes them as merely expressing weak supervenience.

But ordinary language is a subtle thing. If we attend carefully to the way modal expressions operate in discourse about supervenience, we find something happening that is not easily and directly expressible using the sentential modal operators of modal logic: viz., the *transworldly* comparison of individuals. This point is nicely illustrated in certain remarks about supervenience in Hare (1952). Although the passage I quoted initially, where Hare first introduces the notion, does not illustrate this phenomenon by concrete example (since the example involves two pictures situated side by side), the following passages clearly involve transworldly comparisons:

> [T]ake ... that characteristic of "good" which has been called its supervenience. Suppose we say "St. Francis was a good man". It is logically impossible to say this and to maintain at the same time that there might have been another man placed in exactly the same circumstances as St. Francis, and who behaved in exactly the same way, but who differed in this respect only, that he was not a good man. (p. 145)

> The actual action couldn't have been right and the hypothetical action not right, unless there had been some *other* difference between the actions, or their circumstances, or their motives, or something else. Actions cannot differ only as regards their rightness, any more than pictures or anything else can differ only as regards their goodness. (p. 153)

Hare is comparing St. Francis as he is in the *actual* world with a hypothetical, non-actual man; and he is comparing an action that is right in the *actual* world

with a hypothetical, non-actual, action. So the first sentence of the second passage, for instance, means this:

> In no possible world w does the hypothetical action differ from the actual action in this respect only: the actual action in the actual world is right but the hypothetical action in w is not right.

And in context the sentence "Actions cannot differ only as regards their goodness" clearly generalizes this transworldly observation. Thus, even though the sentence only contains one occurrence of the modal word "can", it means this:

> In no possible worlds w and w' are there actions x and x' that differ in this respect only: x in w is right but x' in w' is not right.

So it is a mistake to think that ordinary-language formulations of supervenience really only express weak supervenience—a mistake which largely rests on the mistaken assumption that the occurrences of ordinary-language modal words are translatable one-for-one into formal language by occurrences of the sentential necessity or possibility operators of modal logic. David Lewis puts the point nicely:

> Supervenience means that there *could* be no difference of one sort without difference of the other sort .... What we want is modality, but not the sentential modal operator .... [T]he real effect of the "could" seems to be to *un*restrict quantifiers which would normally range over this-worldly things. Among all the worlds, or among all the things in all the worlds (or less than all, if there is some restriction), there is no difference of the one sort without differences of the other sort. Whether the things that differ are part of the same world is neither here nor there. (Lewis 1986, pp. 15-17)

These remarks clearly apply to the two passages lately quoted from Hare. Once this fact is appreciated, it should become apparent that they also apply to the passages I quoted earlier from Hare, Moore, and Davidson.[13] The upshot is that so-called weak supervenience, despite all the attention it has received in the recent literature, is essentially a philosophical red herring. Ordinary-language formula-

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[13] Although Davidson uses modal language (and talk of properties) in the passages quoted above, in more recent writings he sometimes resorts instead to starker, metalinguistic, formulations which are presumably motivated—at least in part—by philosophical scruples about modality (and about properties). Here is an example:

> The notion of supervenience, as I have used it, is best thought of as a relation between a predicate and a set of predicates in a language: a predicate p is supervenient on a set of predicates s if for every pair of objects such that p is true of one and not the other there is a predicate of s that is true of one and not of the other. (Davidson 1985, p. 242)

How close does this seemingly non-modal formulation come to his formulations I quoted earlier? That depends. If we interpret it as quantifying only over *actual* objects, then it turns out to be vastly weaker than even so-called "weak" supervenience; it says nothing at all about any non-actual possibilities. However, if we interpret the universal quantifier as quantifying over pairs of objects both actual and merely possible (i.e., quantifying pairwise over objects in all possible worlds, it being neither here nor there whether the two objects in a given pair are in the *same* world), then the new formulation expresses strong supervenience (for predicates). I think the passage is best interpreted the second way, since the first interpretation yields such a pale ghost of the pre-theoretic notion of supervenience.

tions like those of Moore and Hare really express strong supervenience, not weak supervenience.[14] The charge that these formulations need replacing by stronger ones is mistaken, because the necessitation relation they express *is* strong supervenience.[15]

Another issue in formulating supervenience theses arises from the fact that traditional formulations are what might be called *co-instantiation* theses: they are worded in a way that requires supervenient properties and subvenient properties to be instantiated by the *same individual*. This requirement creates at least two kinds of concern. For one thing, there seem to be numerous higher-order properties of individuals that depend for their instantiation not merely on the lower-order properties of the individual itself, but also on a wider range of lower-order properties and relations involving various other individuals too. For instance, the property *being a bank*, instantiated by the brick building on Main Street, is not supervenient on (intrinsic) physical properties of the bank itself; rather, the building's having this social-institutional property depends on a considerably broader range of physical facts and features, some of which are involved in subserving the social practice of banking.

In addition, some ontologies (arguably, even some broadly *materialist* ontologies) might posit not only supervenient properties, but also supervenient *individuals*. For instance, some philosophers maintain that a statue is distinct from the hunk of matter that composes it, on the grounds that the two entities have differ-

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[14] Simon Blackburn (1971, 1984, 1985) has given an argument against moral realism that goes roughly as follows. A certain supervenience claim, connecting the moral realm to the natural, is true; another stronger claim is false; the moral realist cannot explain why the weaker connection should hold, given that the stronger one does not, whereas the irrealist can easily explain this; so realism accrues an explanatory debt it cannot discharge. Blackburn's argument is sometimes construed as involving weak and strong supervenience, in Kim's sense. But James Dreier (1992) argues persuasively that the argument is better reconstructed as citing two kinds of strong supervenience, involving metaphysical necessity and analytic necessity respectively. (Dreier also replies to Blackburn's argument on the moral realist's behalf—quite persuasively in my view, even though I myself, like Blackburn, am no friend of moral realism.)

[15] The issue gets further complicated, unfortunately, by Professor Hare's recent remark that "what I have always had in mind is not what Kim now calls "strong" supervenience. It is nearer to his "weak" supervenience" (Hare 1984, p. 4). Consider however the *reason* Hare gives for this claim. Concerning the judgement "This is a nice room","he says, "I did not have to like that kind of room or call it nice .... My tastes might have been different" (p. 5). But the fact that one's tastes might have been different is quite compatible with the strong-supervenience use of the modal statement "No room exactly like this one could fail to be nice." For, this statement, even though it quantifies over non-actual scenarios, is firmly tethered to the speaker's *actual* evaluative standards—notwithstanding any differing evaluative standards the speaker himself may have in some of those non-actual scenarios. When one claims that there could not be a room that is just like this one except that it fails to be nice, one is talking modally about rooms *under one's actual-world standards of niceness*, even though one may not have *those* standards in certain other possible worlds in which there is a room just like the room under discussion. (Compare: When one claims that water could not have failed to be H_2O, one is talking modally about water *under the actual-world meaning of "water"*, even though "water" may not have that meaning in certain other possible worlds. A possible world in which "water" means beer would not be a possible world in which *water* fails to be H_2O.)

ing modal and counterfactual properties. Some philosophers take seriously the apparent ontological commitments of discourse about universities, corporations, and nations; and also deny that these entities are literally identical to mereological sums of persons, land-masses, etc. Yet supervenience theses as traditionally formulated typically presuppose that a *single* individual instantiates both the subvenient property and the supervenient property.

One suggestion for accommodating these kinds of considerations is to formulate supervenience theses in terms of entire possible worlds. Kim (1984a, 1987) calls this *global* supervenience, a phrase now widely used. Standardly the idea of global *physical* supervenience, for instance, is expressed in some such way as this:

> *Global Physical Supervenience:*
> There are no two physically possible worlds which are exactly alike in all physical respects but different in some other respect.

As is often pointed out, however (e.g., Horgan 1982; Kim 1984a, 1987), purely global supervenience seems too weak to fully capture the idea that the physical facts determine all the facts. For, the global thesis does not exclude the possibility that there are two spatio-temporal regions, within either the same physically possible world or two different ones, that are exactly alike in all intrinsic physical respects but different in some intrinsic non-physical respect—say, different in the respect that mental properties are instantiated by individuals in one region, but not by their physical duplicates in the other.

A natural strategy for accommodating this problem, proposed in Horgan (1982), is to strengthen global supervenience into what I will here dub *regional* supervenience. Several notions need introducing as a prelude. First, we must distinguish between *intrinsic* and *non-intrinsic* features, relative to a spatio-temporal region of a physically possible world. Roughly, a feature is intrinsic to a given region if its presence does not depend, in a broadly logical sense of "depend", upon what happens outside the region; otherwise it is non-intrinsic. Suppose, for instance, that Oscar suddenly wants a glass of water. Oscar's having this property is not an intrinsic feature of the spatio-temporal region directly occupied by Oscar's body during the time-stretch the token desire episode occurs; for, the property's instantiation depends on the fact that the larger spatio-temporal environment in which Oscar acquired the word "water" contains H_2O rather than XYZ.

Second, we must distinguish between *qualitative* and *non-qualitative* intrinsic features of spatio-temporal regions. Roughly, the latter are those which depend, in the broadly logical sense, on the existence of specific individuals within the specific region. Consider, for instance, the fact that Tommy Flanagan is a jazz pianist. Tommy's having this property is an intrinsic feature of the spatio-temporal region r occupied by our solar system within the past millennium. But suppose our universe contains another region r', a region remote from r and causally isolated from it, and yet indiscernible from it. Tommy's being a jazz pianist is *not* an intrinsic feature of r', because Tommy himself is not even an occupant of r'. Rather, r' has a distinct but qualitatively indistinguishable feature—viz., that

Tommy's *doppelgänger*, who is qualitatively indistinguishable from Tommy himself, is a jazz pianist.

With these distinctions at hand, the thesis of regional physical supervenience can now be stated as follows, letting a *P-region* be a spatio-temporal region of a physically possible world:

> *Regional Physical Supervenience:*
>
> There are no two *P*-regions that are exactly alike in all qualitative intrinsic physical features but different in some other qualitative intrinsic feature.

That is (putting it in the ordinary-language modal idiom), there could not be two spatio-temporal regions that are exactly alike in all qualitative intrinsic physical features but different in some other qualitative intrinsic feature. This is, of course, a thesis of strong supervenience: whether the regions being compared are in the same world or different worlds is neither here nor there. In addition, the thesis of global physical supervenience is just a special case of the regional thesis—the case where the *P*-regions are entire possible worlds.

Regional physical supervenience also avoids yet another problem about standard co-instantiation formulations, which can be formulated as a dilemma (cf. Horgan 1982). Consider the following thesis:

> *Physical Co-instantiation Supervenience:*
>
> Necessarily, for any higher-order property F, if anything has F then there exists a physical property G such that the thing has G, and necessarily, everything with G has F.

(Here the term "necessarily" is to be understood as a sentential modal operator ranging over all physically possible worlds.) The dilemma is this: do we, or don't we, interpret this thesis as saying that property G is an *intrinsic* physical property of the object instantiating F? Suppose we do. Then the thesis is too strong to be credible, because certain higher-order properties of individuals (e.g., wide-content mental properties like *wanting a drink of water*) do not supervene on the individual's intrinsic physical properties. Suppose we don't. Then, without some restriction on what may count as a non-intrinsic physical property, the thesis turns out to be no stronger than mere *global* physical supervenience. This is because we could always let G be some physical property which, by its very construction, is guaranteed to have these features: (i) in some physically possible world, G and F are simultaneously co-instantiated by some single individual; (ii) for any world w, G is instantiated in w no more than once; and (iii) G is instantiated only in physically possible worlds with a particular total physical history h.[16] Assuming the truth of global physical supervenience (which says that physically possible worlds

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[16] For instance, we could let G be a triply conjunctive property G^*, constructed as follows. Given some physically possible world w^* in which some individual i^* instantiates property F at time t, let the first conjunct of property G^* be some physical property instantiated by i^* in w^* at t (and not instantiated, in w^* at t, by any individual that is distinct from i^* but coincides spatially with i^*). Let the second conjunct of G^* be the property *being* at *spatio-temporal location L*, where L is the specific spatio-temporal location of i^* in w^* at t. And let the third conjunct of G^* be the property *being such that ϕ*, where ϕ is a "maximal" physical property that has built into it the entire physical history of the world w^*.

with the same total physical history are exactly alike, and hence are identical), a property G of this kind would be a *degenerate* supervenience base for property F, because G would never be instantiated in any physically possible world except for a single co-instantiation, in a single world, with F. Thus, if such a non-intrinsic physical property G can count as a supervenience base for F, then the thesis of physical co-instantiation supervenience does not rule out any putative possibilities that are not already ruled out by mere global supervenience. So the upshot of the dilemma is that the thesis is either too strong to be credible or too weak to express adequately the idea that the physical facts determine all the facts.

Regional physical supervenience avoids both horns of this dilemma. It meets the other goals that motivate turning away from standard co-instantiation formulations of supervenience, viz., allowing for higher-order properties with a "wide" supervenience base, and allowing for supervenient individuals. And it overcomes the excessive weakness of mere global physical supervenience. So it has much to recommend it, as a general articulation of the idea that there could be no difference of a non-physical sort without difference of the physical sort.[17]

6. Mental quausation and the causal completeness of physics

The philosophical issue I call the problem of mental quausation (Horgan 1989) came into recent prominence in philosophy of mind in the wake of Davidson's non-reductive brand of materialism.[18] Since Davidson's anomalous monism asserts that every token mental event is identical to a token physical event, his view obviously allows token mental events to be part of the causal nexus. However, the question arises whether a token event's being *mental*, or its tokening the specific event *type* it does, can play any genuine role in causation or causal explanation, given Davidson's contention that mental properties are not reducible to physical properties. Although token mental events themselves are causally efficacious, are they efficacious qua mental? If not, then it seems we are left with a version of epiphenomenalism, a version hardly less objectionable than versions which deny that mental events are causes at all. The issue of mental quausation arises not only for Davidson's anomalism, but also for any metaphysical position that denies that mental properties are type-identical to physical properties. The question is whether mental properties are causally/explanatorily efficacious, and (if they are) what such efficacy might consist in.[19]

[17] Horgan (1982) is often cited as one source of the idea of global physical supervenience. But for some reason the notion of regional supervenience, which was also broached in that paper, has gone virtually unnoticed in the subsequent philosophical literature.

[18] The issue has a longer history, though. As is pointed out in McLaughlin (1989, p. 109), it was well articulated by Broad (1925, p. 472).

[19] There seems to be no fully non-tendentious way of formulating the issue, unfortunately. I use the term "efficacy" rather than "relevance" because the latter seems too weak to capture the kind of *oomph* that higher-order properties ought to have if they are not epiphenomenal. I use the modifier "causal/explanatory" at the risk of being accused of con-

As I pointed out in §1 (this being one lesson of British emergentism), any broadly materialistic metaphysical position needs to claim that physics is causally complete. This means that non-physical properties cannot be causally basic properties—ones that generate fundamental forces that combine with physical forces to yield net forces different from the net resultants of physical forces. So for a materialist who repudiates psycho-physical property identities, and yet also seeks to vindicate the causal/explanatory efficacy of mental properties, the burden is to develop some kind of *compatibilist* account of mental quausation. On such an account there must be multiple levels of genuine causal/explanatory efficacy; these levels must not be directly in competition, and thus the higher levels must not be "screened off" or "excluded" by more basic levels.

This is a large and active research area in current philosophy, and is intertwined in various ways with issues involving supervenience. For instance, Kim (1984b, 1984c) has suggested that higher-order causal explanations involving non-physical properties can co-exist with physical explanations only if they cite higher-order properties that are supervenient on physical properties that figure directly in underlying physical explanations of the same phenomena. And a number of philosophers have claimed recently that mental properties, in order to be causal/explanatory, must at least be supervenient on physical properties that are *intrinsic* to the cognizer—must supervene, as the slogan goes, "on what's in the head" (e.g., Stich 1978; Fodor 1987, 1991).

Neither of these suggestions is anything like self-evident, however, and I think both deserve to be regarded with suspicion. Consider first Kim's conception of "supervenient causation" (as he calls it). As I understand him, Kim maintains that a higher-order property F, in order to be causally/explanatorily efficacious (when instantiated by an individual i at a time t), must be supervenient on a specific physical property G which (1) *physically realizes F* (in i, at t), and (2) figures centrally in a physical causal explanation of the phenomenon that F itself purportedly explains. This demand may well be excessive, however. Here is a substantially weaker inter-level requirement, which still features supervenience prominently:

> A higher-order property F, in order to be causally/explanatorily efficacious, must be physically realized by a physical property G that (i) figures centrally in a physical causal explanation of the phenomenon that F itself purportedly explains, and (ii) is *part* of a (perhaps conjunctive) total physical property H which is itself a supervenience base for F.[20]

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flating two categories that ought to be kept distinct, in order to emphasize that causal connections among token events, and thus causal efficacy too, involve systematic general relations among the event *types* instantiated—relations that also figure in causal explanation.

[20] The notion of physical realization, which has been widely employed in philosophy of mind for some time, obviously deserves philosophical investigation in its own right. To my knowledge, as yet this project remains to be undertaken in a systematic way. Meanwhile, philosophers certainly should not assume (as I think they sometimes do assume) that realization is just the converse of supervenience. The supervenience base is frequently broader than the realizing property.

Prima facie, there are causally efficacious higher-order properties that meet this weaker condition but do not meet Kim's condition. Take, for example, the *syntactic* properties of those token physical states in a computer which are token symbol strings. These syntactic properties arguably have causal/explanatory efficacy: the state-transitions in the machine are systematically sensitive to syntactic properties, qua syntactic. But although syntactic properties are realized by certain patterns of electrical current, this is only by virtue of the role of those patterns in the whole physical system. Thus the supervenience base for a syntactic property is wider than the property's physical realization.

Consider next the contention that causally efficacious mental properties must be supervenient on what's in the head. This too is far from self-evident, especially since garden-variety mentalistic causal explanations frequently cite wide-content mental properties. Although it seems true enough that *physical* properties of a cognizer must supervene on what's in the cognizer's head in order to figure in causal explanations of behaviour, maybe this requirement does not transmit upward to the mental level. Notice that the necessary condition I proposed above, for higher-order causal/explanatory efficacy, can be satisfied by wide-content mental properties that do not supervene on a cognizer's intrinsic physical properties. And under at least *some* general accounts of higher-order causal/explanatory efficacy (e.g., Horgan 1989, 1993), wide-content properties fare just fine despite not supervening on what's in the head.

So the general point I would like to urge, with respect to the matter of supervenience and mental quausation, is cautionary. Philosophers who claim that causally efficacious mental properties must supervene directly on the physical properties that realize them, or must anyway supervene on physical properties intrinsic to the cognizer, owe us powerful arguments for these contentions; for, under close scrutiny such claims are less credible than they might initially appear to be. Materialists who back away from type-type psychophysical identity claims, but who also seek to vindicate the causal/explanatory efficacy of mental properties, are already committed to some form of compatibilism on the issue of mental quausation. Since they are stuck with this compatibilist commitment anyway, they should take seriously the possibility that the right kind of compatibilism will vindicate the causal/explanatory efficacy of mental properties that do not supervene on the properties that physically realize them, and perhaps will also vindicate the causal/explanatory efficacy of mental properties that do not even supervene on what's in the head.

7. Supervenience and inter-level reduction

I remarked in §4 that one reason why the notion of supervenience caught on, in attempts to formulate a broadly materialistic position in philosophy of mind and metaphysics, was the feeling among many philosophers that traditional formulations of materialism posited an unduly tight, reductive, connection between the

facts and properties posited by physics and higher-order facts and properties. The thought was that inter-level supervenience connections can be looser, and thus that supervenience-based materialism could be a *non-reductive* materialism.

But even among those who have embraced supervenience in connection with materialist metaphysics, there has been an ongoing debate about whether a viable materialism can really be non-reductive. The most ardent defender of the negative position is the philosopher who has perhaps been most active and influential in exploring and advocating supervenience in metaphysics and philosophy of mind, Jaegwon Kim.

To begin with, it should be noted that the words "reduction" and "reductive" are subject to a range of uses, some more stringent than others. Under fairly liberal (but not necessarily inappropriate) standards of usage, a metaphysical position will count as reductive merely by virtue of asserting (i) the causal completeness of physics, and (ii) the thesis of regional physical supervenience. The debate just mentioned, however, involves a more stringent notion of reduction, a notion linked closely to certain paradigmatic inter-theoretic relations in science, like the relation between classical thermodynamics and molecular statistical mechanics. Parties on one side of this debate, who typically call themselves "non-reductive materialists", hold that a viable non-eliminative materialistic position need not assert that the special sciences generally, and mentalistic psychology in particular, are reducible to physics in the manner in which thermodynamics is reducible to molecular statistical mechanics (e.g., Davidson 1970, 1973; Fodor 1981; Endicott 1989. 1993; Owens 1989; Van Gulick 1992; Horgan 1993; Marras 1993a, 1993b). Their opponents (e.g., Churchland 1986; Kim 1989, 1992a, 1992b, 1993a; Melnyk 1991; Bickle 1992) deny this; they maintain that non-reductive materialism is not a viable metaphysical position, and thus that the serious contenders are reductive materialism and eliminative materialism.

This debate is quite complex, involving a variety of issues that are intertwined in various complicated ways.[21] One broad strand concerns the prerequisites for genuine inter-theoretic reduction itself. Must a genuine reduction involve outright *identities* between higher-order and lower-order theoretical properties (for instance, temperature and mean molecular kinetic energy), or is it enough for reductively related properties to be merely nomically equivalent? Can the reducing properties be disjunctive, even radically or infinitely disjunctive?

Another strand is the matter of quausation. Presumably any adequate account of inter-theoretic reduction must constrain inter-level relations strongly enough to vindicate the causal/explanatory efficacy of higher-order theoretical properties. But there are a variety of philosophical views about the requirements for quausation; and this complex issue thus becomes intertwined with discussions of reduction. For instance, if one is an incompatibilist about quausation, and one also accepts the causal completeness of physics, then one will hold that higher-order theoretical properties can have causal/explanatory efficacy only if they are

[21] For some useful sorting of issues, see Beckermann (1992b) and McLaughlin (1992, §5).

identical to certain physical properties; this will be a reason for claiming that gen-
uine inter-theoretic reduction involves inter-level property-identities, rather than
mere nomic coextensions.

Let me turn briefly to Kim's position, as I understand it. Kim rejects the con-
tention that mental properties in particular, and special-science properties in gen-
eral, are identical to physical properties; he maintains instead that in general,
higher-order theoretical properties are supervenient on lower-level properties,
and ultimately on physical properties. He affirms the causal/explanatory efficacy
of mental properties, and of special-science properties in general; as already
noted in §6, he maintains that supervenience transmits causal/explanatory effi-
cacy from physical properties to higher-order properties that supervene on them.
(As we saw, this is a version of compatibilism about quausation, albeit a rather
restrictive version.) As regards inter-theoretic reduction, he denies that genuine
reductions must involve inter-level property-identities. He maintains instead that
full-fledged reductions can be effected by inter-theoretic "bridge laws" express-
ing the nomic equivalence of lower-level and higher-level properties, provided
that the laws of the higher-level theory are derivable from those of the lower-level
theory plus the bridge laws. Finally, and with these other views as backdrop, he
contends that a viable non-eliminativist position in philosophy of mind will inev-
itably end up committed to the reducibility of mentalistic psychology to natural
science, and ultimately to physics.

Although I cannot here canvass the various arguments that Kim and others
have employed in support of this contention, let me focus on one key argument.
Concerning strong supervenience (as characterized in §5 above) he writes:

> [I]t says that whenever a supervening property P is instantiated by an
> object, there is a subvenient property Q such that the instantiating object
> has it and the following conditional holds: necessarily if anything has Q,
> then it has P. So the picture we have is that for supervenient property P,
> there is a set of properties, $Q_1, Q_2, ...$ in the subvenient set such that each
> Q_i is necessarily sufficient for P. Assume this list contains all the subven-
> ient properties each of which is sufficient for P. Consider their disjunc-
> tion .... This disjunction...is necessarily coextensive with P .... So P and
> UQ_i are necessarily coextensive, and whether the modality here is met-
> aphysical, logical, or nomological, it should be strong enough to give us
> a serviceable "bridge law" for reduction .... Some philosophers will re-
> sist this inference .... There are two questions, and only two as far as I
> can see, that can be raised here: (1) Is disjunction a proper way of form-
> ing properties out of properties? (2) Given that disjunction is a permis-
> sible property-forming operation, is it proper to form infinite
> disjunctions? (Kim 1990, pp. 19-20)

He then takes up arguments that have been given supporting negative answers to
questions (1) and (2), and explains why he does not find them compelling.

Let me enter the dialectic at this point, by posing a third question: Are radically
disjunctive properties *causal/explanatory* properties? Arguably, in general they
are not; rather, on any given occasion when a higher-order theoretical property P
is instantiated, the underlying physical causal/explanatory property that is opera-

tive (on that occasion) will be whichever specific *disjunct* Q_j, from the disjunctive property UQ_i, is instantiated (on that occasion)—and not the property UQ_i itself. Furthermore, a very plausible-looking condition on genuine reduction is that each higher-order causal/explanatory property be nomically coextensive not just with any old lower-order property, but with some lower-order *causal/explanatory* property. For, if this condition is not met, then the higher-order causal/explanatory properties will cross-classify the lower-order ones, and thus will figure in higher-order causal/explanatory generalizations that are not directly mirrored at the lower theoretical level. In paradigmatic inter-theoretic reductions, by contrast, higher-order theoretical properties are not multiply realizable in this way; rather, higher-order theoretical laws *are* directly mirrored by lower-level causal/ explanatory generalizations. (The Boyle/Charles law of thermodynamics, which links a gas's temperature, pressure, and volume, is directly mirrored by the law of molecular statistical mechanics linking a gas's mean molecular kinetic energy, mean surface pressure, and volume). Arguably, this kind of inter-level mirroring is the very essence of genuine inter-theoretic reduction.

Considerations involving multiple realization, along the lines just sketched, are among the reasons why many materialistically-minded philosophers, myself included, deny that reductive materialism is the only viable alternative to eliminativism. But the reductionists remain unconvinced by multiple-realization arguments (e.g., Bickle 1992, Kim 1992b), and meanwhile maintain an active dialectical siege against non-reductive materialism.

8. Superdupervenience

Our conclusion at the end of §4 was that the sort of inter-level relation that would confer materialistic "respectability" on higher-order properties and facts would be not bare ontological supervenience, but superdupervenience—ontological supervenience that is robustly explainable in a materialistically acceptable way. (Recall that *ontological* supervenience is an objective relation between lower-order properties and facts, and genuine, objective, higher-order properties and facts; it is not merely a conceptual/semantic constraint on higher-order discourse. And, to give a robust explanation of supervenience is to explain it qua ontological, rather than explaining it merely as a feature of the "logic" of the higher-order terms and concepts.) Hereafter, unless I indicate otherwise, when I speak of explaining supervenience I will mean robustly explaining ontological supervenience in a materialistically acceptable way.

Although the task of explaining supervenience has been little appreciated and little discussed in the philosophical literature, it is time for that to change. I will conclude this essay with some brief remarks on the matter, set forth in a fairly staccato fashion.

First, in considering how inter-level supervenience relations might be materialistically explained, three interrelated questions arise:

> *The Standpoint Question:* What sorts of facts, over and above physical facts and physical laws, could combine with physical facts and laws to yield materialistically kosher explanations of inter-level supervenience relations, and why would it be kosher to cite such facts in these explanations?
>
> *The Target Question:* What facts specifically need explaining in order to explain a given inter-level supervenience relation, and why would a materialistic explanation of *these* facts constitute an explanation of that supervenience relation?
>
> *The Resource Question:* Do there exist adequate explanatory resources to provide such explanations?

In order to get explanation off the ground, it seems we need to know *something* about the higher-order properties whose supervenience on physical properties is the target of explanation. The standpoint question and the target question, which are largely complementary, both arise from this apparent need for information about higher-order properties. The standpoint question (cf. Horgan 1984) arises because apparently we need *some* facts other than those of basic physics. It is hard to see how one could possibly explain an inter-level necessitation relation without employing, as part of one's explanans, *some* sorts of "connecting statements" in which purely physical properties and facts somehow get linked to higher-order properties. But which such facts are kosher, and why? The target question involves the explanandum: the to-be-explained facts. We need to know which facts are such that explaining *these* facts materialistically would constitute explaining why the higher-order properties supervene on the physical the way they do, and we need to know *why* these facts are the crucial ones. Philosophers need to get clearer about the standpoint and target questions. And they also need to ask, for any given domain of putative higher-order properties, whether there really exist adequate explanatory resources to yield materialistically kosher explanations of specific inter-level supervenience relations involving these properties; this is the resource question.

Second, the problem of explaining supervenience does not go away if the generalizations of a higher-level theory or explanatory framework happen to be derivable from physics plus some set of "bridge laws" expressing the nomic coextensiveness of higher-order properties with physical properties. For, there remains the need to explain why these bridge laws *themselves* are true in all physically possible worlds (cf. Horgan 1978, Beckermann 1992b, McLaughlin 1992). Bridge laws, after all, are not part of physics; they should not be scientifically and metaphysically rock-bottom, *sui generis* and unexplainable. Furthermore, even if the inter-theoretic bridge laws really express property identities (rather than the mere nomic coextensiveness of higher-order properties and physical ones), an analogous explanatory task arises anyway—although now the key questions are about inter-level linkages between terms and/or concepts. In virtue of what does such-and-such physical property, rather than various other candidate physical properties, count as the property expressed by a given higher-order theoretical predicate?

Third, for at least *some* kinds of properties we seem to have a fairly good idea about what would count as a materialistically acceptable explanation of why such a property is supervenient on a given configuration of physical properties. Consider, for instance, the property *liquidity*. We understand well enough the essential features, or defining conditions, of liquidity: if a quantity of stuff is liquid, then it will neither spontaneously dissipate into the atmosphere nor retain a rigid shape when unconstrained, but instead will tend to flow, and to assume the shape of a vessel that contains it. Thus, explaining why liquidity supervenes on certain microphysical properties is essentially a matter of explaining why any quantity of stuff with these microphysical properties will exhibit those macro-features. (As regards the target question, this suffices to explain the supervenience of liquidity because those macro-features are *definitive* of liquidity. As regards the standpoint problem, it seems explanatorily kosher to assume a "connecting principle" linking the macro-features to liquidity, precisely because those features *are* definitive; the connecting principle expresses a fact about what liquidity *is*.)

Fourth, a variety of recent so-called "naturalizing" projects, in philosophy of mind and elsewhere in philosophy, can be regarded as being, in effect, attempts to articulate the essential or definitive characteristics of certain higher-order properties (e.g., mental properties) in such a way that these properties, as so characterized, are susceptible to materialistic explanations of their supervenience. Functionalism in the philosophy of mind provides an example: if mental properties were identical with certain functional properties whose definitive causal roles involve typical-cause relations to sensory stimulation, bodily motion, and one another, then specific physical/mental supervenience relations presumably would be materialistically explainable in terms of causal/dispositional roles of categorial physical properties. Co-variance accounts of intentional content (e.g., Fodor 1987, 1990; Dretske 1981) provide another example: if the instantiating of a given intentional property, with content "that p", were essentially a matter of instantiating some physical property whose occurrence systematically co-varies with the circumstance that p, then the supervenience of the content-property could be explained by citing the fact that the realizing physical property P covaries with the circumstance that p.

Naturalizing projects are thus *reductive* in a certain sense, even though they are not committed to the kinds of type-type inter-level connections that make for inter-theoretic reduction in science. Their goal is to give a tractable specification, in non-intentional and non-mental vocabulary (although not necessarily in the vocabulary of physics), of sufficient conditions (or sufficient and necessary conditions) for the instantiation of mental properties. To the extent that this could be done, it would pave the way for physicalistic explanations of supervenience connections.

But fifth, there are a variety of reasons for being sceptical about such naturalizing projects. For one thing, reductive accounts of this kind usually end up susceptible to counterexamples of one sort or another; inductive evidence, based on past failures both in this arena and in other philosophical arenas where attempts

at reductive analyses have been pursued, suggests that there always *will* be coun-
terexamples to such proposals. In addition, it seems likely that human concepts
of mental states, and indeed most human concepts, just do not have reductive suf-
ficient conditions at all (or reductive sufficient and necessary conditions), not
even vague ones; this general claim about the structure of human concepts is
strongly suggested by work in cognitive science on concepts and categories.[22]

So sixth, it makes sense to rethink what might count as philosophical "natural-
ization" of higher-order properties. Maybe there are ways of construing higher-
order properties which (i) do not provide reductive sufficient conditions, but nev-
ertheless (ii) render the physical supervenience of these properties materialisti-
cally explainable anyway. If so, then such accounts would still make room for the
higher-order properties as part of the physical world, and thereby would natural-
ize them. (Rethinking naturalization would go hand in hand with investigating
the standpoint, target, and resource questions mentioned above.)

But seventh, we should be sensitive to the possibility that for many kinds of
higher-order discourse, it will not be possible to give an account of putative
higher-order properties under which their ontological supervenience on the phys-
ical could be successfully explained. Consider mental properties, for example.
With respect to the target problem, a fairly plausible-looking contention is that
for any creature that instantiates mental properties, the generalizations of com-
mon-sense intentional psychology must be by-and-large true of that creature.
With respect to the standpoint problem, it seems fairly plausible that the con-
straint just mentioned reflects the very *nature* of mental properties, and thus can
be legitimately cited in explaining psychophysical supervenience relations. But
now the resource problem arises: since there evidently will always be vastly
many incompatible ways of assigning propositional attitudes to someone over the
course of his lifetime, all of which satisfy the given constraint, it appears that the
constraint does not suffice to yield *determinate* supervenience connections
between physical properties and facts and mental ones (cf. Quine 1960).[23]

Eighth, we should keep well in mind the reasons for metaphysical scepticism
about in-the-world *normative* facts, a kind of scepticism which after all has been

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[22] For further adumbration of these kinds of considerations, including discussions of
relevant psychological literature, see Stich (1992), Tye (1992), and Stich and Laurence
(forthcoming).

[23] There are also the "phenomenal" or "what-it's-like" mental properties to deal with,
the so-called "qualia". Prima facie, it is enormously hard to see how one could possibly
explain why any particular physical or neurobiological property always gets co-instanti-
ated with (or why it *necessarily* always gets co-instantiated with) a particular phenomenal
property—or with any phenomenal property at all. (Appeals to type/type identity seem
only to shift the mystery, rather than eliminating it: why should any given physical or neu-
robiological property be identical to a particular experiential what-it's-like property—e.g.,
the property *experiencing phenomenal redness*—rather than to some other phenomenal
property or to none at all?) This "explanatory gap" problem is well described, specifically
in relation to type-identity treatments of qualia, by Levine (1983). The supervenience ver-
sion of the problem is given a thorough and detailed treatment by Chalmers (1993); he ar-
gues that the explanatory gap cannot be bridged, and he defends a positive theory of
consciousness which in some ways resembles Broad's emergentism.

very prominent in meta-ethics throughout this century. One important reason is the difficulty of seeing how one could possibly give materialistic or naturalistic explanations for putative ontological supervenience-relations between natural properties and facts and putative normative properties and facts. Objective moral values do not appear to be part of the natural order.

But ninth, certain important supervenience relations, including but not limited to those that figure in ethics, evidently involve normativity—and thus an is-ought gap. In particular, there is arguably a normative element involved in intentional content—both the content of public-language expressions and the content of intentional mental properties. The "Kripkenstein problem" (Kripke 1982), for instance, can be seen as a sceptical challenge about whether there are any objective facts or properties, there in the world, that could ground semantic *correctness* (like the putative correctness of answering "125" to the query "68 + 57"). And a parallel problem can be raised about the objective groundability of the correct/ incorrect distinction for the putative intentional content of people's mental states. The task of explaining supervenience facts, including perhaps psychological supervenience facts, therefore apparently includes the task of explaining how certain objective, in-the-world, is-ought gaps get bridged. Metaphysical scepticism about in-the-world normative facts now threatens to spill over into philosophy of mind and philosophy of language (not to mention epistemology, since *epistemic warrant* is a normative concept too.)

Tenth, given the apparent difficulty of materialistically explaining ontological supervenience connections in a way that simultaneously handles the target, standpoint, and resource problems, and given that the challenge becomes all the greater insofar as normativity is involved, materialistically-minded philosophers should be exploring *irrealist* ways of accommodating higher-order discourse. They should keep in mind that one can be an irrealist about a given body of discourse (e.g., moral discourse, or mental discourse) without being an eliminativist—someone who regards the discourse as defective, and needing replacement or elimination. Another broad option is *preservative* irrealism, which would treat higher-order discourse as quite legitimate and perhaps indispensable, while also repudiating its apparent ontological commitments. Instrumentalism, of course, is one form of preservative irrealism; instrumentalist views typically attribute utility to the given body of discourse, but deny that it expresses genuine truths. But the intellectual landscape includes other possible versions of preservative irrealism too—for instance, versions that treat truth itself as a normative notion, and which allow for higher-order discourse to be genuinely true even in the absence of any corresponding properties or facts (cf. Horwich 1990; Horgan 1991, forthcoming; Wright 1992; Horgan and Timmons 1993).

Superdupervenience would render higher-order properties metaphysically respectable. But it is not a relation that comes cheap. Explaining ontological supervenience relations in a materialistically acceptable way looks to be a very daunting task, whose difficulty suggests the need for materialists to consider seriously the prospects for preservative irrealism about much of our higher-order

discourse. It is not easy formulating a metaphysical position that meets the demands of a material world; there is still a lot of philosophical work to do.[24]

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