

Micah Newman

Supervenience, Reduction, “Levels,” and Kim

From the ashes of logical positivism, serious materialist metaphysics began to be articulated in the latter half of the 20th century. Through the 1970s and 1980s, “nonreductive materialism” with regard to the mental began to gain the status of “orthodoxy.” Nonreductive materialism seeks to enjoy the benefits of both a kosher, physicalist ontology as well as the familiar mental properties (which have traditionally required some form of dualism to explain) that are indispensable to folk psychology. Jaegwon Kim’s influential research project of the last couple of decades has been in leveling challenges to this popular point of view. Kim’s stance has it that the “halfway house” of nonreductive materialism is “an inherently unstable position.” (1999: 5) The lesson he has characteristically urged is basically that “you can’t have your cake and eat it too”—trying to do without any nonphysical substances while staving off reduction or elimination of the familiarly mental is supposed to be, at least, much harder work to formulate than nonreductive materialism’s typical proponents have appreciated.

The nub of the problem that Kim has focused on, in a series of influential papers in the 1980s and 1990s (*e.g.*, Kim 1989, 1992, 1993a) and culminating in his 1998 book *Mind in a Physical World*, is the supposed causal efficacy of mental properties even as they *supervene on* (are dependent on and covariant with) physical properties. To say that the mental supervenes on the physical is to say that wherever there is a mental cause, there is a physical cause upon which it supervenes. This means that when keeping track of all the causal relations that there are and have been, including the mental, one can identify every causal nexus in terms of physical causes and effects. And if one is a

physicalist, one will want to, if anything, give pride of place to the physical properties *proper*, at least. The problem then, is: what “causal work” is there “left over” for the mental properties to do?

Kim (1998) notes that, ironically enough, this “exclusion problem” facing the nonreductive materialist with respect to the causal efficacy of the mental is just that which also faced Descartes’ substance dualism, about which he never came to a satisfactory solution. On the other hand, one might suspect that since Kim’s construal of nonreductive materialism makes it essentially equivalent to substance dualism with respect to what generates the exclusion problem, then something may have been overlooked. In fact, if one is only willing to construe nonreductive materialism in this way, then one may also be in danger of effectively begging the question against nonreductive materialism, which is certainly supposed to be not merely substance dualism under a different name.

Kim’s solution to the problem he poses is to urge nonreductive materialists to consider seriously revising their metaphysics in order to escape the exclusion problem, and that they should seriously consider reduction of the mental to the physical as an option. What I want to urge in this paper is that it may well be that something like a revision of our metaphysical notions is required to overcome this problem. But it is toward understanding such notions as “emergence” and “reduction” in a way that neither Kim, nor in fact any other well-known recent writers on the metaphysics of mind, seem to have considered. In effect, as I will contend, Kim’s dilemma of exclusion vs. reduction is a false one. In the philosophy of the special sciences proper, without special regard to the mental, an understanding has emerged (*double-entendre* unintentional) of what it

would mean for a special science to be reduced or not reduced to another science, which provides a template for understanding how, in general, an entity, such as the mental, might be considered as “not reduced” to the mere physical (*i.e.*, not eliminated), but also not excluded from causal efficacy although it does supervene on lower-level properties.

Kim’s (False) Dilemma

Kim’s dilemma for the nonreductive materialist is stated at its starkest as the “supervenience argument” (1998): if the mind supervenes on the physical, then it is excluded from causal relevance; and if it doesn’t, then mental-physical causation is unintelligible. As I’ve suggested above, there is a false dilemma lurking here, but it is not to do specifically with supervenience *per se*: granted, either supervenience obtains or it doesn’t. And it isn’t that there is something wrong with the operative concept of supervenience. As Kim emphasizes, supervenience “is not a mind-body theory” and has no explanatory value in and of itself (1998), but it is certainly a sensible way to formulate a minimal constraint on physicalism, as well to put what seem to be the empirical facts about the mind-body relation. The fallacy involved is simply that supervenience doesn’t entail the competition in causal efficacy that leads to exclusion. As we shall see, it is Kim’s own way of painting the alternatives between reduction and nonreduction that lead to just the dilemmas that he presents for the physicalist. The mental supervenes on the physical, certainly, and this means that the mind is somehow grounded in the physical, but it does not follow that one is saddled with a dilemma between “reduction” and “nonreduction.” The problem, I suggest, is not with the notion of supervenience, but with “reduction.”

In fairly broad terms, one way to see the problem with how Kim constructs his dilemma is in his criticism of anomalous monism (as advanced by Davidson 1970). According to anomalous monism, mental events are identical to physical events, although there are no lawlike connections between certain kinds of mental events and certain kinds of physical events. Kim says that if this is the case, that mental events are token-identical to physical events, then as far the total web of causal connections in the world goes, the mental properties may as well not be there (1998: 34–35). But then, on the other hand, Kim maintains that if they *are* there, and supervene on the physical properties, they get excluded (*ibid.*, *The Supervenience Argument*, esp. p. 45). The way Kim’s criticism of anomalous monism goes, the only way for an anomalous monist to escape the criticism is for supervenience to fail. But if it does, one is straightaway impaled on the other horn of the “supervenience argument” dilemma. The trouble comes in the way in which the supervenience relation is applied, which ensures that, with respect to anomalous monism, the mind can’t be identical to any physical thing, unless of course the former is “reduced” to the latter. Davidson has emphasized (1993) that the very fact that the mental supervenes on the physical is supposed to ensure that mental events have causal efficacy; in particular, in causing physical events. But the only way in which Kim seems to be willing to understand mental properties with respect to anomalous monism to begin with is to consider them just as if they were epiphenomenal—and thereby subject to causal exclusion.

But to say that the mental supervenes on the physical is *not*, in fact, to leave us with a dichotomy between “reduction” and “emergence.” Kim discusses this elsewhere specifically with respect to emergence (1999: 31–2), and there it comes to the same thing:

either properties have to be “reduced” to their microstructural bases in order to retain their causal efficacy, but then do not exist per se “over and above” these bases; or they are “emergent” and epiphenomenal, leading to causal redundancy. As I have said, this dilemma is a false one, which means that there is in fact some overlap between what could be called “emergence” and what could be called “reduction.” This may seem counterintuitive, but when the conceptual and metaphysical territory for these concepts is carefully mapped out in terms of special sciences that are fairly well understood (unlike that of the mind), how it goes becomes clearer. This possibility then becomes a counterexample to Kim’s contention that if there are distinct properties that supervene on lower-level properties, the lower-level properties causally exclude the supervening properties.

I want to say that there are, in fact, “emergent” properties—properties in addition to those had by just the smallest physical particles. But this is so even if everything is at bottom made of all and only of those microparticles, and even if there are no gaps in our understanding of how things made of physical microparticles work, at any level. With respect to worries such as those involving causal exclusion, the main task is then to get clear on what “reduction” could amount to even when the world is really as just described.

What Is Reduction? And, Why Reduce?

What does it mean for something to be “reduced to” one or more things? Cases of clearly successful, *bona fide* reduction would seem to involve redundancies in the reduced with respect to the entities it reduces to. In cases in which “reduction” is clearly successful, it is rather trivial and uninteresting, simply because in these cases one is

without any motivation to multiply entities. For example, is a woman's reproductive cycle "reducible" to the pattern of ebb and flow of estrogen and progesterone and the resulting uterine lining changes and other results of the hormone changes? Well, of course. They *just are* it (cf. Kim 1998: 117–8). (If there is ever a time when the magical copula *just is* is appropriate, it is in cases like this.) An ontological assay that included *both* the female reproductive cycle *and* each of its constitutive components would be redundant: it would account for the same things twice under different descriptions. Now that we know what a woman's reproductive cycle consists of biologically, we can still refer to those components collectively as *a woman's reproductive cycle*: a biological name for a biological system. If there is any reason to reduce, it is this.

A further point, though, is that the cases in which the question of reduction normally arises are not those cases when reduction is trivial. The typical reason that the question of reduction comes up is because one starts with a intuitively *bona fide* composed entity, and then wonders if it "reduces" to its smaller-sized, "lower-level" components. (In contrast, the female reproductive cycle is not a *thing* unto itself, over and above its constituents—once the constituents were all properly named and understood, the singular term became mere shorthand for *them*.) Also important is that a typical candidate for reduction seems to be one thing, whereas what it would be reduced to are many; or, at least, the number of entities in the class of a given group of entities-to-be-reduced-to always must exceed the number of the corresponding reduced entities. So there is always a question of composition playing an essential role in the matter. It is here that things get tricky, because if one simply wants to avoid causal redundancy, one *could* end up just going the "mereological nihilist" route and maintain that there are no

composite entities, because they would be causally redundant if they were to exist over and above their components. But this route to reduction is too quick, because what we first would want to know is, is there reason to think that the candidate for reduction would not in fact be ontologically redundant in addition to its components? There are reasons to think this if, for one thing, the candidate for reduction seems to be multiply-realizable. But to go from this motivation to the conclusion that it must be reduced after all because of the threat of causal redundancy is, in fact, a non sequitur; it shouldn't be taken as sufficient to show that there can't be composed or multiply-realizable entities. The nonreductivist can always insist that there are, in fact, such entities, and therefore that there must be something wrong with the claim of causal redundancy: one philosopher's result is another's *reductio*. To avoid begging the question for reduction, then, Kim should not portray the metaphysical outlook as though any entity that supervenes on its smaller constituents either reduces to them or is causally excluded by them; if this were the case, there would be no composition by anything that supervenes on its constituents, but I don't know that Kim, or many others of us either, wants this generalized result.¹

Kim's insistence on construing multiply-realizable and supervenient properties as causally excludable leads to some results that seem to me to be confused. An example he gives is the property of *dormitivity*, causing sleep, which is multiply-realized in the active chemical ingredient of sleeping pills as well as in herbs and in a disparate variety of other things. As Kim says, it would be strange to think that the dormitivity of the sleeping pills,

¹ An exception is Trenton Merricks (2001), who has embraced this result as part of a general metaphysic: he maintains that inanimate objects are causally excluded and eliminated, but conscious minds are not, precisely because they *don't* in fact supervene on their lower-level constituents.

in addition to their chemical properties, caused your going to sleep (1998: 51). But it would also be strange to think that there is no such thing as dormitivity: imagine being told that dormitivity had been consigned to the way of phlogiston and ether since we figured out how sleeping pills chemically work in the brain. Or, imagine that the active ingredient we use in sleeping pills was discovered quite by accident, and its mechanism was not understood. Then, if and when we did learn how they chemically work, *and* everything else that possessed dormitivity were also understood at their underlying level, would that be a time at which *dormitivity* could be said to have been “reduced,” *i.e.*, eliminated? This way of thinking about the matter seems seriously misguided.

This confused approach to reduction also applies to Kim’s treatment of anomalous monism. *Pace* Kim, anomalous monism doesn’t, in fact, say that “mental properties are physically irreducible”—at least, not if this means that they “remain outside the physical domain” in some ontological sense (1998: 58). It says, rather, that every mental event is identical to some physical event; more exactly, some plurality of microphysical events: for any event, mental or no, the relata are all and only physical particulars or groups thereof. Just from what Kim says about anomalous monism, it sounds as though it could be compatible with the notion that mental properties are instantiated in something other than physical stuff; but this is simply false, and it should not be flatly assumed that for “mental properties to be physically irreducible” it could only mean that they are not made of anything physical. And for there to be such things as mental events that are piecewise token-identical to physical events although not picked out by any natural class of physical events certainly should not be taken to mean that such mental events “remain outside the physical domain.” Kim seems to use the word

“physical” in such a way that anything that is made of physical microparticles is “physical” in a sense in which it can be “reduced” to microphysics, and this seems flatly question-begging against the nonreductivist.

Another characteristic confusion comes where Kim (1998: 68–9) says that Terry Horgan’s (1997) suggestion that higher-order properties “cross-classify” lower-order ones amounts to a denial of supervenience of the former on the latter. But I cannot see why it does, and Kim does not elaborate. As best as I can tell, the thought may be that a higher-order *classification scheme* is independent of any lower-order classification schemes. (In other words, a higher-order classification scheme may be *anomalous* with respect to a lower-order one.) If this is the case, though, it would not follow that the *entities* treated of in higher-order classification schemes fail to supervene metaphysically on their lower-order realizers.

Nonreduction in the Special Sciences

In fact, what we find is that higher-order properties certainly *do* cross-classify lower-order properties. The actual coexistence of supervenience with this kind of nonreducibility across a variety of domains has been observed at least since Jerry Fodor’s “Special Sciences” (1974) (see also Dupré 1993). Kim may wish to take issue with that outlook and instead claim reducibility for anything made of physical microparticles, but he does not directly confront or even acknowledge that perspective. Instead, Kim says that “[t]he standard view, as I understand it, is that chemistry and macrophysics are reducible, and in fact have already substantially been reduced, to particle physics via quantum mechanics.” (2003: 175) Kim cites McLaughlin (1992) in support of this claim, but the context there is strictly with respect to “emergence” just as the British

Emergentists meant by it, which had as a crucial component that the emergent properties emerged on a basis that could never be deduced in principle strictly on the basis of the lower-level properties (see McLaughlin 1992, Crane 2001). As it turns out, that the emergence of higher-order properties is essentially “inexplicable” with respect to the lower level-properties has been shown to be false by further development of the science itself. But it doesn’t follow from the filling-in of gaps in our explanatory theories that the explananda are “reduced” in some way, and this is because emergence (in some broad sense of nonreduction) needn’t involve inexplicability (Kim himself notes this: 1998: 117–8). In fact, cases in which there is explanation of one set of properties in terms of another in any interesting sense seem to be just those cases in which reduction is *problematic*: trivial reductions tend to be those in which “explanation” doesn’t even enter the picture, since in such cases there’s hardly any explaining to be done.

So to say that biology, chemistry, and physics don’t arise mysteriously from, nor float free of, one from another, *doesn’t* entail, as Kim seems to suggest that, say, chemistry has been “reduced to” physics. It’s simply that the set of kinds recognized by a given special science don’t map onto kinds in another science, even though the two sciences treat of things that are all made of the same physical stuff. One might even put this by saying that *anomalism* is not just of the mental, but is found at every nonreducible level with respect to whatever lower level, although the nonreducible entities supervene on those in the level below it. For example, *hormone* is a biological kind, and although, as it turns out, all actual hormones are made of chemical compounds, there is no *chemical* kind, nor exhaustively-defined set of chemical kinds, corresponding to *hormone*. So there

is, for example, *anomalousness* of the biochemical with respect to the strictly chemical, and between other neighboring special-science levels as well.

But this doesn't at all mean that the workings of hormones are inexplicable in terms of their chemical properties—quite the contrary. *At level of entities described by chemistry*, everything is explicable in terms of chemistry; likewise, at the level of entities described by quantum physics, everything is explicable in terms of quantum physics. Yet there are entities instantiating the kinds described by biological science, just the same, and neither excludes the other causally. So, although Kim thinks that “[m]y causal powers [being] fully explicable not only *in terms of* but also *as* the causal powers of my neural/biological/physical properties” is “part of what generates the problem about mental causation” (1998: 117), it *doesn't* generate a problem about mental causation, because if mental properties are realized in neural subveners in an analogous way in which the biological are in chemical, and chemical are in physical, then there need be no contest.

Although Kim is clearly quite unaware of it, the failure of reduction of chemistry to physics is a result that has, in contemporary philosophy of chemistry, come as near to the status of consensus as anything can in philosophy.² The reason is as noted above: even if chemical kinds supervene on physical particles instantiating physical kinds, the chemical entities and kinds *as such* are simply not found within the purview of microphysical science *per se*. If we think of a molecule as composed of quantum-mechanically-described components, and ask *is it reducible to those?*, then if we answer “yes,” we are no longer talking about *a molecule, per se*: we are talking about just the

² See. *e.g.*, Byerly and Vemulapalli 1999, Scerri 2000, Earley 2008.

sum of subatomic particles on which the molecule supervenes. But there is something there, *the molecule*, which appears as an ineliminable term in the chemical theory that predicts and explains *its* behavior, and it does supervene on its micro-level components (see also Newman 2008). Crucial concepts like *chemical bond* remain as indispensable as ever to chemical theory, although there is nothing within the level of description of quantum mechanics that corresponds to it (Scerri and McIntyre 1997: §2). More specifically (as reported in Scerri 2000), about 20 years ago there was no little controversy when one authority on quantum mechanics reported in a chemical education journal that according to the current state of that science, there turned out to be no such things as orbitals (a way of characterizing electron behavior that is indispensable to the explanatory practice of chemical bonding theory). Yet, within *chemistry* proper, treating of chemical entities in terms of orbitals has continued just as it has; news of orbitals' demise seems to have been greatly exaggerated, insofar as the only reason to think of them as eliminated is that they don't appear in quantum physics per se. Indeed, on the contrary, the very fact that orbitals *don't* appear in the quantum-physical description is the primary reason to consider them unreduced, and therefore that they *do* exist. As Scerri (2000) notes, there is some tendency to think of any entities that do not appear in the theories of the most fundamental ontological level as being somehow "derivative," or "unreal." (Scerri notes that in the sciences this is often due to what may be termed "physics imperialism.") Yet, they can continue to be regarded realistically with continuing fruitfulness in terms of the "special science" in which they appear. The systematic scientific philosopher Mario Bunge has portrayed the situation thus:

At first sight chemistry is included in physics because chemical systems would seem to constitute a special class of physical

systems. But this impression is mistaken, for what is physical about a chemical systems is its components rather than the system itself, which possesses emergent (though explainable) properties in addition to physical properties. (Bunge 1982, quoted in Scerri and McIntyre 1997: 219)

The failure of reduction of chemistry to physics has been so deeply taken to heart by philosophers of chemistry that some have taken the result too far, it seems, describing the chemical as having “ontological autonomy” (Lombardi and Labarca (2005)). But this seems too strong, and the nonreducibility of chemistry needn’t amount to this (see Needham 2006, Newman 2008). After all, it’s not as if higher-order properties could do without the lower-order realizers. So the kind of nonreducibility that is manifested in chemistry is not some form of substance dualism, but neither is it the case that “chemistry is a branch of physics.”

Sparse Properties and Reduction

In general, too, independently of causal exclusion worries, reductionism is in fact less well-motivated a point of view than might be initially thought (see, *e.g.*, Markosian 1998, Schaffer 2004). In suggesting that reductionism might be a more fruitful approach than nonreductionism, Kim aligns himself with a “sparse” conception of properties to accord with this approach (1998: 105). The “sparse”/“abundant” distinction is that originally emphasized by David Lewis. *Abundant* properties are those that correspond to any possible predicable, and are “utterly miscellaneous.” Sharing of sparse properties, on the other hand “makes for qualitative similarity, they carve at the joints, they are intrinsic, they are highly specific, their sets of instances are *ipso facto* not entirely miscellaneous, there are only just enough of them to characterize things completely and without redundancy.” (Lewis 1986: 60) So if reductionism is wanted so as ensure ontological

nonredundancy, then cleaving to sparse properties is a way to do this only if keeping to sparse properties is itself a reductive approach. Kim seems to think that this is the case, but there is reason to think that he is just incorrect in this assumption: as Jonathan Schaffer has argued (2004), an ontological restriction to sparse properties does not of itself commit one to reductionism.

Schaffer's contention goes as follows. Science characterizes nature at various "levels" of explanation, with the fundamental physical level consisting of the elementary particles, with each successive level above it explained in terms of the level below. The properties at the fundamental level would certainly be among the sparse properties; but what about the further properties "above" them? Thus, the main question in finding sparse properties in science is: "Are the sparse properties drawn from all the levels of nature, or only the fundamental level?" (*ibid.*, 92) This question can be answered by looking at the general desiderata for locating the sparse properties among the abundant ones. Schaffer identifies three (*ibid.*, 94): *Similarity* (the grounding of objective similarities), *causality* (carving out nature "at the joints on which the causal powers hinge" (*ibid.*, 92)), and *minimality* (serving as a minimal ontological base). "The properties that qualify thereby acquire a real unity, suiting them to perform the remaining responsibilities of intrinsicness, specificity, and non-miscellaneity." (*ibid.*, 94) But given these desiderata, there is a tension between two conceptions of sparse properties one could take: the *scientific* properties, drawn from all levels of nature, fit the similarity and causality roles perfectly, but the minimality role imperfectly. The *fundamental* conception of properties fits the minimality role perfectly, but the other two hardly at all.

The tension can be resolved by recasting the minimality role as the *primacy* role, instead: “sparse properties serve as the ontological basis for linguistic truths.” (*ibid.*, 100) For, what if nature were infinitely complex, with no fundamental level? We could still make sense of there being sparse properties; the causality and similarity roles would still need to be played by something, but the minimality role would no longer apply. So, the primacy qualification supersedes it:

What is needed for the project of an ontological essay is a principled distinction between what is *primarily* real, and what is merely *derivative*. This is not to suppose that reality comes in degrees, or that “derivatively real” is code for “unreal.” Rather, the idea is to distinguish the ontological structure of reality (the primary) versus the linguistic truths which are “made true” by the existence of such an ontological structure (the derivative). ... So what is needed is a principled distinction between ontological and linguistic structure. ... Indeed, isn’t it plausible *independent of concerns about complexity and redundancy* that macro-properties (such as being a belief, a neuron, an oxygen atom, or a proton) are on the ontological side of the distinction between the ontological and the linguistic? Molecules aren’t merely manners of speaking. (*ibid.*, 100)

So, while keeping to *minimality*, although admitting the sparse properties only at the fundamental level (if there is one) would be sufficient to ensure nonredundancy, it is not necessary. The *primacy* qualification lets sparse properties capture the scientifically-known properties at any level up to and including the directly observable properties in terms of which all scientific theories are ultimately framed, and not just the physically “fundamental” properties. This lets the *scientific* properties be the sparse properties. The characteristic motivations for sparse properties thus do not require reduction of all such properties to the fundamental level.

Generalization's Revenge

Kim (1998: 77–80) notes that others (he cites Tyler Burge and Lynne Rudder Baker) have suggested that since the “problem” of mental causation, if it is a problem, would generalize to all the special sciences, and then since there seem to be no worries about, say, geological causation, then problems about mental causation must be bogus. Kim says that this isn't an attitude toward it that is philosophically to be recommended: we want to be told *how it is* that macro-level properties are causally efficacious/relevant. I think that such as Burge and Baker are right to think that there is enormous presumptive reason to think that even if there were a “problem” about causation in geology, biology, etc., there is certainly a solution to it, and to think that, presumably what they also have in mind, that solution should also apply to mental causation. But Kim is also fair to want an explanation of how such macro-causation works if it is not to be excluded by the microphysical, and I have one to suggest.

Apart from the way Kim frames the problem in the abstract, as exemplified in “the supervenience argument,” in actual practice of the corresponding sciences there's no occasion for worry about whether it's the $n+1$ -order or n -order properties that are “really” doing the causal work. It seems to be not “either/or,” but “both/and.” The reason for this is that the supervenience between entities ensures that there won't be any given chemical entities but for the presence of underlying physical entities upon which they supervene, and vice versa (*i.e.*, they are *not* “ontologically autonomous”). Thus, prior to any causal concerns, there is no question of one “reducing” to the other, nor is there motivation for a dichotomized question of having to choose which entities are “really” doing the work, because just in terms of the each of the given special sciences we can see that *both* sets of entities do.

What actual cases of unreduced special-science entities seem to show is that the fact that they supervene on their lower-level components, far from showing that they can be thereby reduced to their components, helps defuse the problem of overdetermination or causal exclusion. This is because the explanatory relation between such entities and their components ensures that wherever there are the lower-level components arranged in just such a way, the higher-level entity will be present too. One of the ways Kim has put the causal exclusion problem is that it is impossible for two complete and independent explanations of a given phenomenon to be efficacious (1989). The key word here is *independent*, and the reason why different explanations in terms of different special-science entities do not exclude one another is that they are *not* independent, at least not in the big-picture, ontological sense.³ Each special science *can*, and often *does*, operate independently of others, and does not “reduce” to others, and in this sense the entities of one science are ontologically distinct from those of that “below” it. But they are *not* each *ontologically independent*, for just the same reason that the British Emergentists were wrong about the nature of emergence: far from it being inexplicable how the $n+1$ -order entities arise from certain configurations of the n -order entities, we do see thoroughgoing explanatory relations between orders of properties—this is just why prescientifically-known phenomena get explained *in terms of* scientifically-discovered properties. So, once the properties of the n -order entities are fully understood, we can see just *why* that certain configuration of n -order entities necessitates the presence of that particular $n+1$ -order entity. Likewise, if a certain $n+1$ -order entity is there, we can be assured it has n -order

³ This contrasts sharply with some definitions of emergence, such as that proposed by Tim Crane (2001), who suggests understanding emergent properties as “having causal powers which are *independent* of the causal powers of the objects from which they emerge.” (my emphasis)

realizers of a certain kind. So unless there is reason to think that out of physics, chemistry, biology, geology, and so on, only *one* of them is *right* about what kinds of entities actually exist, entities treated of in different special sciences cannot be sensibly thought of as in causal competition. The way the causal story works would be just analogous to what anomalous monism says: a chemical event is identical to a physical event (a physical event involving more physical entities than there are chemical entities in the corresponding chemical event; see above, earlier in this section). The chemical event as described in chemistry involves entities not found in the mere physical description, so the chemical does not reduce to the physical. Yet, there is just the one event, as described by either chemistry or physics (or something else). Lesson: the ontology of events is not the same as, and much more deflationary than, the ontology of entities; and since causation is properly of events, first and foremost, causal exclusion would only follow from there being distinct events, not distinct entities.

Of course, there is such a thing as the “explanatory gap” between the mental and physical: even if we seem to understand everything about the physical, we also seem to have no way of understanding why it is that they should give rise to conscious mental properties. This might be taken to ensure that mental and physical explanations *are* independent, and thus subject to causal exclusion. But an important distinction needs to be made between this problem and the defense just given of the *bona fide* existence of special-science entities. If the supervenience argument in fact generalizes to special-science entities, as it indeed seems to (and as Bontly 2002 argues), then the way in which the problem of causal competition between special-science properties dissolves, generalizes to the mental as well. If there’s a problem with the mental specially, it’s *not*

that general problem of higher-level causation, since as we have seen, it could be that the neural gives rise to the mental in a way exactly analogous to the way the physical gives rise to the chemical, and chemical to the biological, even if conscious mental properties don't themselves appear among the terms proper to neural science, or those of neural science in physical science. Whatever problem about mental causation in particular that we are left with, then, will be due to the explanatory gap about the mental, which we are saddled with anyway independently of causal concerns. And we may well expect there to be an explanatory gap about the mental with respect to the physical, since explaining is done objectively, and since our knowledge of conscious mental properties per se is essentially subjective, they are the one thing that it's quite impossible for us to "see" objectively (see also Tye 1999; Newman 2008: §1).

As well, causal exclusion worries seem to need the counterfactual reasoning that, for instance, if you eliminated all of the mental properties, all of the causation in the world would still go just as before. But the relation between the supervenient and subvenient between classes of entities in general seems to ensure that this counterfactual conditional cannot be satisfied. Whether the counterfactual conditional itself could still generate a causal exclusion problem even if that conditional can never be satisfied is another question. It seems to me, though, that if counterfactual conditionals could be raised to cause trouble of the causal exclusion sort even if they could never in principle be satisfied, this would quickly generalize quite unacceptably. At the very least, the fact that the counterfactual conditional could never in principle be satisfied seems to blunt the main thrust of the problem considerably. And if this solution can generalize from special-science entities to the mental, which could well be the case in spite of the explanatory

gap, then there will be no reason to think that there is a genuine causal exclusion problem for mental causation.

On “Levels” and “Micro/Macro” Distinctions: A Positive Proposal for Understanding Emergence

Kim clearly seems to think that for an existing entity to supervene on its lower-level constituents yet not be “reduced” or otherwise identical with them, is for that entity to be in causal competition with its subveners. The picture that is largely responsible for this view is a stratified view of “levels,” or “domains,” that can be considered independently of one another. For instance, as noted above, he says that for anomalous monism to maintain that mental properties are not reducible to physical properties means that it puts them “outside the physical domain” (1998: 58).⁴ This is a natural enough way to think of things, insofar as the theoretical entities of the special sciences live strictly within their own respective sciences. But with the territory carved out in this way, it can certainly make it seem like the only choice one is left with is between being stuck with causal competition between entities in these stratified domains, or eliminating such properties as reducible to the physical. But theoretical independence needn’t involve ontological independence, as I have urged. Here, finally, I want to suggest a systematic way of thinking about the kind of emergence of novel properties that occurs in nature that clarifies these matters and occasions no bogeys about “reduction.” As adumbrated above, I suggest that the one-many relation that seems to be characteristic of that between a candidate for reduction and its reduction base points toward seeing the matter in terms of

⁴ How it is possible for there to be intertheoretic explanatory connections, as noted in the previous section, even though theoretical entities live strictly within their own special sciences, is somewhat puzzling. But for now, we will have to, like the vanguard British Emergentist Samuel Alexander, accept this result “with natural piety.”

composition. In fact, I mean to assimilate the issue of emergence with that of composition. Kim thinks that the “micro-macro” relation, which holds between a composite and its components, is disjoint to the “hierarchy” of properties, but this, I think, is a source of no small confusion on the matter of reduction and emergence.

In talking of the “*n*-order” “hierarchy” of properties, Kim says that “this hierarchy does not track the micro-macro relation. The reason is simple: both second-order properties and their first-order realizers are properties of the very same entities and systems.” (1998: 82) Well, does a second-order entity “have” first order properties? If you think of it as decomposed into its (necessarily smaller) first-order realizers, then, sure, trivially. But the higher-order properties aren’t layered onto lower orders like layers on a cake; they arise from the lower orders by being *composed* of them. The higher-order entities don’t stack *on top of* the atomic, most fundamental ones—yet this is just the picture that is needed to get the exclusion argument to work. Kim says that “second-order properties and their realizers are all at the same level in the micro-macro hierarchy” (*ibid.*)—but no, they aren’t. As already noted, the micro-macro “levels” aren’t a fully stratified hierarchy in the layer-cake sense: the micro are the smallest things, the macro are the larger things composed of them. The macro properties *contain* micro properties, and they’re all there *together* in the same “level” per what Kim means by “level,” in the layer-cake sense of a “hierarchy.” But the special-science properties had by the *bona fide* composite macro things aren’t those had by the micro-level things that compose them, nor any mere summation thereof. The special-science properties, then, are emergent but aren’t subject to exclusion because it’s not as if they’re layered on top of the lower-order properties and thus independent of them. The present denial of that stratified picture of

“levels” is the only sense in which “reduction” is appropriate, and it staves off causal exclusion.

Kim seems to hold that any property had a physical macro-object is physically reducible, simply because it can be physically described. Any macro-object can be described as having some microphysically-based property simply in virtue of being composed of a sum of micro-objects that will, literally, add up to that property. But, *pace* Kim, this doesn't make it a macro-property, nor does it show that macro-properties can all in principle be reduced to the microphysical.⁵ The example that Kim gives (1998: 113–114) is that “having a mass of one kilogram” is a “macro” property; but of course, it is eminently reducible to the fact that, say, there are 10^{30} microparticles present that have an average mass of 10^{-30} kg. But there being a “macro” property in this (trivially) reducible case doesn't entail that it's identical with a macro property in the special-science sense, and therefore it isn't a case of a special-science property that is reducible to the microphysical. For example, Kim (1998: 114) has it that *being a water molecule* is a “physical property”—but what's meant by “physical”? If he means “made of physical stuff,” well, of course. And in that case, if physicalism is true, everything, regardless of what it's about or how it's explicable, is a “physical property.” Or does he mean “as described by particle physics, as the science of the smallest stuff”? This latter, as I have already urged, is just false: there are no molecules in microphysics. Yet there are molecules in chemistry, and in terms of overall ontology.

⁵ It is in this very same sense that, as noted above, if mental events are identical to (some plurality of) physical events, Kim is only willing to understand the mental properties thus instantiated as if they are really just (reducible to) physical properties.

Near the end of the book, almost in passing, Kim actually seems to come close to the position I have been outlining. He says that

we must grant novel causal powers to micro-based properties at higher levels—novel in the sense that these causal powers are not had by any lower-level properties that constitute them. And, as we saw, the supervenience argument does not apply to them, and their causal roles are not threatened by the supervenience argument.
(*ibid.*, 118)

But what is meant by “micro-based properties at higher levels”? I have tried to suggest that there are no such things; rather, “higher-level” means just “more-macro,” so the “higher-level” properties would be just the macro-properties per se: unlike “weighing one kilogram,” those not reducible to micro-properties. It is quite unclear to me, in fact, how a “micro-based property” could be “higher-level,” unless by “micro-based” we simply mean “anything that supervenes on the microphysical”—but then what *isn't* “micro-based”? But if we think of higher-order properties as just macro-properties, this makes sense of there being nonreducible higher-order properties. A macro-property will not be identical to a conjunction, or other concatenation, of micro-properties: if it were, it would reduce to them and be eliminated. But it isn't, and that would be why it isn't “threatened by the supervenience argument.”

The only cases in which reduction is clearly successful seem to be just when it is trivial: a woman's reproductive cycle is reduced to the hormones and uterine lining and such just because they *are it* (Kim himself actually hints at this idea; 1998: 113–4). The way to think about reduction in terms of the suggested one-many composition relation is that one thing reduces to its components just in case if it did exist, *it* would be identical to *them*: taking ontological account of both would be redundant. And since (*pace* Baxter 1988) one thing cannot in fact be identical to many, *poof!* the one thing per se doesn't

exist and is eliminated. Reduction is *unsuccessful* just when the one is *not* identical to the many: its causal powers are properly described in terms of the special science that treats of *it*, and not of the sum of microparticles that compose it (in contrast with the “weighing one-kilogram” faux “macro-property” that turns out to be a sum of micro-properties).^{6 7}

Here, finally, is how this micro/macro, composition-based conception works with respect to a typical formulation of the exclusion problem. First, with mental events M and physical events P, M is said to cause M* by causing its supervenience base P* (2003: 156). Given the points made earlier about generalizability, let’s frame this story topic-neutrally by replacing “M” with “Q,” where Q is an event that supervenes on a plurality of P-events. P is shorthand for this plurality. Any complete story of the causal event has to say that P and Q cause P* and Q*, respectively. Q is composed of some plurality of P-events; this plurality is not picked out by any one term in a P-theory, but merely by the summation of properties that the P-events collectively instantiate; and neither does that summation of P-properties itself pick out a P-kind proper. And, from within the perspective of the P-theory, there is nothing else going on but the P-events: The P-events *as such* are only captured in terms of the P-theory, so they can’t be said to compete with anything. Likewise, if there are laws that govern Q-events as such (that is, if Q is in the proper domain of some special science, and not the realm of the mental), the Q event will be of a kind that is picked out by some singular term in the Q-theory that does not appear

⁶ Cf. McDaniel 2008, who argues against many-one identity precisely on the basis that it is incompatible with emergent properties.

⁷ Earlier I gave the example of a hormone that is a chemical but not a chemical kind. Since *a* hormone is coextensive with *a* chemical entity, it might be wondered how, or whether, the one-over-many principle applies here. It does apply, in this way: the hormone’s actions at the chemical level can be understood in and of itself without reference to anything outside it. But the hormone can only be understood *qua hormone* in terms of its role in an overall endocrine system, without which it would not exist.

in the P-theory (if Q is a mental event, its kind will not be picked out by a term in the P-theory simply because it will not appear as a kind term in *any* theory, strictly speaking). So the Q-events *as such* also will not compete with anything. Thus, the Q property instantiated is distinct from P: composed of P, supervenient on P, but not reducible to P. So *does* Q cause Q* *by* causing P*? Well, not really, because Q and P are each proper to their own respective special sciences, so unless the causal closure of the physical were to be violated(!), Q can't cause P*. Rather, P and Q will respectively cause P* and Q* in terms of the causal roles appropriated to the kinds that P and Q fall under in their distinct special sciences. And, if you like, P-and-Q cause P*-and-Q*. It's not the case that the dormitivity caused your going to sleep *and in addition* that the active chemical affected your brain in such-and-such a way, because the two special-science-specific causes are not independent of one another. But nor is it the case that the *dormitivity* affected your brain in such-and-such a way (Q causing P*)—a violation of causal closure, and a category error to boot! Rather, from the overall point of view of event-ontology, although P and Q instantiate different properties, P causing P* and Q causing Q* are the same event: as good a way as any to ensure that neither excludes the other.

References

- Baxter, Donald, "Many-One Identity," *Philosophical Papers* **17** (1988) 193–216
- Bontly, Thomas, "The Supervenience Argument Generalizes," *Philosophical Studies* **109** (2002) 75–96
- Bunge, Mario, "Is Chemistry a Branch of Physics?" *Zeitschrift für allgemeine Wissenschaftstheorie* **13** (1982) 209–223
- Crane, Tim, "The Significance of Emergence," in B. Loewer and G. Gillett, eds., *Physicalism and its Discontents*, CUP: 2001
- Davidson, Donald, "Mental Events," 1970, reprinted in *Essays on Actions and Events*
- Davidson, Donald, "Thinking Causes," in J. Heil and A. Mele, eds., *Mental Causation*, Clarendon Press: 1993
- Dupré, John, *The Disorder of Things*, Harvard University Press: 1993

- Earley, Joseph E., Sr., "Why Philosophy of Mind Needs Philosophy of Chemistry," *Hyle: An International Journal for the Philosophy of Chemistry* **14** (2008) 1–26
- Fodor, Jerry, "Special Sciences, or, the Disunity of Science as a Working Hypothesis," *Synthese* **28** (1974) 97–115
- Horgan, Terence, "Kim on Mental Causation and Causal Exclusion," *Philosophical Perspectives* **11** (1997)
- Kim, Jaegwon, "Mechanism and Explanatory Exclusion," (1989) reprinted in Kim 1993b
- Kim, Jaegwon, "Multiple Realization and the Metaphysics of Reduction," (1992) reprinted in Kim 1993b
- Kim, Jaegwon, "The Nonreductivist's Troubles with Mental Causation," (1993a) reprinted in Kim 1993b
- Kim, Jaegwon, *Supervenience and Mind: Selected Philosophical Essays*, CUP: 1993b
- Kim, Jaegwon, *Mind in a Physical World: An Essay on the Mind-Body Problem and Mental Causation*, MIT Press: 1998
- Kim, Jaegwon, "Making Sense of Emergence," *Philosophical Studies* **95** (1999) 3–36
- Kim, Jaegwon, "Blocking Causal Drainage and Other Maintenance Chores with Mental Causation," *Philosophy and Phenomenological Research* **67** (2003) 151–76
- Lewis, David, *The Plurality of Worlds*, Blackwell: 1986
- Markosian, Ned, "Against Ontological Fundamentalism," *Facta Philosophica* **7** (2005) 69–84
- Needham, Paul, "Ontological Reduction: A Comment on Lombardi and Labarca," *Foundations of Chemistry* **8** (2006) 73–80
- Lombardi, O. and Labarca, M., "The Ontological Autonomy of the Chemical World," *Foundations of Chemistry* **7** (2005) 125–48
- Merricks, Trenton, *Persons and Objects*, OUP: 2001
- McDaniel, Kris, "Against Composition as Identity," *Analysis* (2008) **68** 128–33
- Newman, Micah, "Chemical Supervenience," *Foundations of Chemistry* **10** (2008) 49–62
- Scerri, Eric, "The Failure of Reduction and How to Resist Disunity of the Sciences in the Context of Chemical Education," *Science & Education* **9** (2000) 405–25
- Scerri, Eric R., and Lee McIntyre, "The Case for the Philosophy of Chemistry," *Synthese* **111** (1997) 213–32
- Schaffer, Jonathan, "Two Conceptions of Sparse Properties," *Pacific Philosophical Quarterly* **85** (2004) 91–102
- Tye, Michael, "Phenomenal Consciousness: The Explanatory Gap as Cognitive Illusion," *Mind* **108** (1999) 705–725
- Vemulapalli, G.K., and Henry Byerly, "Remnants of Reductionism," *Foundations of Chemistry* **1** (1999) 17–41