

Is Multiple Realizability Compatible With Antireductionism?

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In a rich and provocative paper, Jaegwon Kim offers an ingenious argument for psychophysical reductionism.¹ I take Kim to be posing a dilemma for anyone who would deny reductionism, viz. that one must either advocate the wholesale reduction of psychology to physical science or one must advocate the sundering of psychology into distinct fields, each one of which is reducible to physical science. Supposedly, the denial of psychophysical reductionism is not an option.

My aim is to show that this is not a genuine dilemma. One can reject the wholesale reduction of psychology to physical science without being committed to the view that psychology will undergo numerous domain-specific reductions to physical science.

I. THE CASE FOR ANTIREDUCTIONISM

On the classic account, reduction is a relation between theories.² For the field of psychology to be reducible to physical science, the laws of the mature theory of psychology must be shown to be logical consequences of laws of physical theory. Such a derivation would require bridge laws, statements expressing relations of nomic coextensivity between the kind predicates of psychology and kind predicates of physical theory.

Some functionalists have attempted to refute psychophysical reductionism by arguing that the necessary psychophysical bridge laws cannot be formulated.³ They claim that any given mental property, such as being in pain,⁴ can be realized by distinct physical kinds. If that is so, then any mental property stands in a one-many relation to physical kinds, thereby foiling this classic type of reductionism which requires that the relation be one-one. Instead of being able to form a

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bridge law linking pain to some physical kind, one is forced to admit that pain has a variety of distinct possible physical realizers.

Kim has responded to this antireductionist argument by suggesting that all of the possible⁵ physical realizers of pain can be considered disjunctively as a single physical property which is nomically coextensive with pain.⁶ This nomic coextensivity would supposedly enable the formulation of a psychophysical bridge law. For the sake of simplicity, let us assume that pain has only two physical realizers, A and B. Kim claims that disjoining the predicates referring to these two properties forms a predicate referring to a physical property nomically coextensive with pain, a disjunctive physical property. Accordingly, '(x)[x is in pain \Leftrightarrow (Ax \vee Bx)]' would be the form of a genuine bridge law. This response to the antireductionist argument from multiple realizability has come to be known as the "disjunction strategy."

Several philosophers have responded critically to the disjunction strategy.⁷ An interesting argument emerges from the various considerations which these philosophers raise.⁸ According to the argument, the physical property coextensive with pain, A \vee B, is not a genuinely nomic property. That is to say, it is not fit to be featured in a law. A generalization such as (x)[(Ax \vee Bx) \Rightarrow Cx], according to this argument, violates a necessary condition for nomicity. If this is indeed the case, then reduction is precluded, for reduction requires that the laws of one theory be shown to be logically derivable from the *laws* of another theory. Hence, reductionism requires that psychological predicates be coextensive with nomic physical predicates.

According to this antireductionist argument, any generalization containing a nontrivial use of A \vee B would fail to be confirmed by its instances and so fail to be a law. To use the more technical term, such a generalization would fail to be *projectible*. Supposedly, it fails to be projectible in that evidence for an A being a C is not evidence for a B being a C, and neither is the latter evidence for the former. The culprit is evidently the disjunctive property A \vee B. According to this antireductionist argument, some aspect of this property renders it unfit for any nontrivial role in a law.

By way of illustration, consider a nonformal case of a disjunctive property foiling the projectibility of a generalization:

- (1) Anything which is either jadeite or an emerald is green.

This claim has some of the aspects of a law. For example, it is in the form of a universal generalization and sustains counterfactuals. However, it is not projectible. Consider observations of green jadeite. These observations constitute positive instances of (1) but do not confirm it, for they do not exclude

the possibility of nongreen emeralds.⁹ The source of trouble lies in the disjunctive predicate 'is either jadeite or an emerald.'

It is important to note, as Kim does, that not all disjunctive predicates are nonprojectible. Consider

- (2) Anything which is either an African emerald or a non-African emerald is green.

This generalization is projectible. For observation of a large set of green things which are either exclusively African emeralds or exclusively non-African emeralds would confirm (2).

If it is not their linguistic form which renders (1) and its ilk nonprojectible, then what does? The answer involves nothing new. In order for a property to be projectible, it must guarantee some degree of similarity among all the individuals possessing it. This similarity is most plausibly viewed as a similarity in causal powers.¹⁰ I.e., a property is projectible insofar as it subsumes individuals falling under a sufficient number of the same causal laws. The rationale motivating this view is clear. Projectibility at least partly depends upon the reliability of a property in making predictions. Moreover, the predictive reliability of a property depends upon the homogeneity of its causal powers. Accordingly, a property is reliable to the extent that it is a unified causal power, and such reliability is the basis of our willingness to make projections.

The trouble with (1) is now clear. The predicate 'is either jadeite or an emerald' fails to subsume only individuals which are sufficiently similar in causal powers. Hence, the fact that one individual satisfying the predicate is green fails to be evidence for just anything satisfying the predicate being green. With (2), however, it is a different matter. African emeralds and non-African emeralds are sufficiently similar in causal powers to define a predictively reliable property.

The antireductionist strategy is manifest. One must show $A \vee B$ to be disunified as a causal power in order to demonstrate its nonprojectibility. That is, one must show A and B to be significantly different as causal powers. Given multiple realizability, the physical realizers of pain are diverse as physical kinds, but what does this indicate as to their diversity as causal kinds? It indicates much. Scientists are interested in properties which are reliable in making predictions. Hence, scientific kinds must be precisely those properties which have some appropriate degree of causal unity, those the mutual possession of which ensures a certain degree of identity of causal power. This is expressed in Jerry Fodor's suggested principle of scientific kind individuation, viz.

Fodor's Principle: Individuals fall under a scientific kind insofar as they have similar causal powers.¹¹

The antireductionist can appeal to Fodor's Principle in claiming that the diversity of A and B as physical kinds implies their diversity as causal powers. Their diversity as causal powers at least suggests that $A \vee B$ is relevantly similar to the property of being either jadeite or an emerald and so is not projectible. The nonprojectibility of $A \vee B$, in turn, implies its nonnomicity. In fact, the claim that a mental property is multiply realizable can actually be understood as the claim that there are distinct physical properties capable of realizing it but which fail to form a physical kind when taken disjunctively.¹² I will use the term 'MR' to refer to the claim that all mental properties are multiply realizable in precisely this sense.

II. KIM'S REDUCTIONIST DILEMMA

In his recent work, Kim can be interpreted as posing a dilemma to the antireductionist. $A \vee B$ must either be a genuine kind or fail to be such. If it is a kind, then the disjunction strategy works and so reductionism follows. On the other hand, if $A \vee B$ is not a kind (i.e., if MR is true), then another sort of reductionist thesis follows, viz. local reductionism. Hence, one is committed to psychophysical reductionism given either possibility. I will give a brief characterization of local reductionism and then explain why Kim believes that MR commits one to espousing it.

Local reductionism is the claim that there are species- or structure-specific bridge laws which can be used to effect multiple reductions of psychology to physical science. Presumably, even though MR precludes the possibility of an unrestricted correlation between pain and some physical kind, it leaves open the possibility that, relative to a given species or structural type, there is a lawlike correlation between pain and some physical kind. If local reductionism is true, then bridge laws have the form ' $S \Rightarrow (M \Leftrightarrow P)$ ', where 'S' refers to a structural type or species, "M" refers to a mental property such as pain, and 'P' refers to a physical kind.

For the sake of granting Kim as much as possible, let us assume that such domain-specific correlations do in fact hold. Local reductionism does not follow from this concession alone, for the domain-specific correlation statements can only serve as *reductive* bridge laws if they enable the logical derivation of psychological laws from physical laws. These domain-specific correlation statements will only serve that end if psychological laws are themselves domain-specific. On the contrary, however, the more reason one has for taking genuine psychological laws to be akin to the platitudinous generalizations of folk psychology, the more one doubts that such laws will turn out to be domain-specific in form.

Multiple Realizability

Consider the following folk generalization,

$$(3) \quad (x) [(x \text{ fears that } q) \Rightarrow (x \text{ desires that } \neg q)].$$

Is (3) derivable from a physical law via the local reductionist strategy of utilizing domain-specific bridge laws? It is not, for consider what an attempted derivation would look like. A candidate physical law would have the form

$$(4) \quad (x) (P_1x \Rightarrow P_2x),$$

where the P_i refer to physical properties; and the domain-specific bridge laws would have the forms

$$(5) \quad (x)[Sx \Rightarrow (P_1x \Leftrightarrow x \text{ fears that } q)], \text{ and} \\ (6) \quad (x)[Sx \Rightarrow (P_2x \Leftrightarrow x \text{ desires that } \neg q)], \text{ respectively.}$$

Due to its unrestricted form; (3) is not entailed by the conjunction of (4), (5), and (6). One thing which this conjunction does entail, of course, is

$$(3') \quad (x)[Sx \Rightarrow [(x \text{ fears that } q) \Rightarrow (x \text{ desires that } \neg q)]],$$

the domain-specific analogue of (3).

One could perhaps insist that the folk psychological generalization actually does have the form (3') and not (3). Unless, however, 'S' is construed so as to define a very broad class of actual and possible entities,¹³ this is unlikely. Use of the generalization that fear that q causes desire that $\neg q$ in both the prediction and attempted explanation of behavior commonsensically pertains to many nonhuman species.¹⁴ Moreover, given our intuitive responses to much of science fiction, it is also plausibly seen as pertaining to such possibilities as creatures of a physical composition radically different from our own. That is to say, our folk theory, as gauged by our intuitive responses to such stories, shows no signs of being domain-specific to the extent required for local reductionism. Hence, domain-specific correlations do not enable the derivation of folk psychological laws.

This is precisely where MR plays a critical role in Kim's argument. Kim argues that a multiply realizable property cannot be nomic.¹⁵ So if pain is multiply realizable, then the concept of pain must be rejected as scientifically worthless and replaced with finer-grained concepts which are not multiply realizable. More precisely, if the disjunction of pain's physical realizers does not constitute a kind, then pain itself is not a kind. For, according to Kim, any scientific kind must be such that the disjunction of its possible physical realizations is itself a scientific kind.

To say that pain is not a kind or not nomic is tantamount to saying that none of the generalizations in which it appears can be laws. According to Kim, MR plays right into the hands of the local reductionist in showing that folk psychological generalizations must be replaced with finer-grained analogues, e.g., that (3) should be replaced with laws of the form (3'). If MR does indeed have this consequence, then the case for local reductionism is complete; for laws of the form of (5) and (6) in conjunction with the relevant physical laws can be used to derive laws of the form (3').

All of this rests on Kim's claim that the disjunction of a property's physical realizers forms a kind if and only if the property itself is a kind. Kim bases this claim on the following metaphysical principle:

The Causal Inheritance Principle (CIP): If higher-level property M is realized at time t in virtue of physical property P, the causal powers of this instance of M are identical with the causal powers of P.¹⁶

I have no qualms with this principle. Rejection of CIP would commit one to believing that higher-level properties have causal powers which are not derived from physical properties. So Kim is correct in claiming that the functionalist anti-reductionist should not reject CIP. Rejecting it limits one to unattractive options. One could embrace downward causation and hence deny the causal closure of the physical, or one could accept a systematic causal overdetermination. I submit that CIP should be accepted.

Given CIP, the causal powers of any pain-instance are identical to those of the physical property which is realizing it. Consequently, the causal powers of pain as such are identical to those of its physical realizers in general. As Kim points out, this implies that pain is as causally inhomogeneous as the disjunction of its physical realizers. Kim concludes that if $A \vee B$ is too disunified as a causal power to be projectible, then so is pain.

Kim provides a supposed example of how the causal inhomogeneity of folk pain precludes a pain-generalization from being confirmed by its instances. For example, even though humans provide positive instances of the generalization

- (7) Sharp pains administered at random intervals cause anxiety reactions

they do not confirm it, at least not according to Kim. Since pain is realized by a radically different physical property in (e.g.) Alpha Centaurians than it is in humans, (7) is more like

(1) than (2). Therefore, claims Kim, evidence that pain causes anxiety in humans does not confirm (7). Inferring that pain causes anxiety in Alpha Centaurians simply because it does so in humans would be like inferring that jadeite is green simply because one knows emeralds to be green.

Kim concludes that if MR is true, scientists should reject the causally heterogeneous property of pain-in-general and instead recognize a different type of pain corresponding to each physical realizer. Given my artificially simplified example, this would mean that scientists should recognize two sorts of pain, viz. one coextensive with A and the other coextensive with B. On the other hand, if MR is false, then the disjunction strategy is successful after all. The upshot of Kim's argument is that the antireductionist is faced with a dilemma: one must either recognize that $A \vee B$ is nomic and espouse the classic formulation of psychophysical reductionism or deny that $A \vee B$ is nomic and espouse local reductionism.

III. A CONTEXTUALIST VIEW OF KIND INDIVIDUATION

I claim that the second horn of this supposed dilemma is not genuine. Indeed, the disjunction of pain's physical realizers can be a nonkind even while pain is a kind. I do not have an argument to the effect that only the latter is a kind, but I will attempt to show that this position is a coherent one, even granting the truth of CIP. That is all that the antireductionist needs in order to escape Kim's dilemma. Hence, I am not so much arguing for antireductionism as I am defending its plausibility.

In order to simplify the discussion and to grant Kim as much ground as possible, I will concede that disjunctive type materialism is true, viz. that pain simply is $A \vee B$.¹⁷ This might seem like too much of a concession since the debate over reductionism is sometimes taken to be a debate as to whether type materialism is true. However, the reductionism at issue here is intertheoretical reductionism, not metaphysical reductionism. Kim mentions both forms of reductionism, but seems to be primarily concerned with the issue of whether psychological theory is reducible to physical theory. It is the latter issue that I am addressing. I might also add that disjunctive type materialism is quite plausible given CIP, for if pain and $A \vee B$ have the same causal powers, what is the motivation for insisting that they are distinct properties? But even if type materialism turns out to be false, it should make no difference to the substance of my argument.

This concession makes the task of defending the coherence of antireductionism that much starker. In order to avoid the second horn of Kim's dilemma, the antireductionist must show

that $A \vee B$ both is a kind and is not a kind. In fact, it is quite easy to show that this is a coherent position, for all one needs is the distinction between physical kindhood and psychological kindhood. It is at least coherent to say that $A \vee B$ is a psychological kind while yet failing to be a physical kind.

In order to take Kim's position that the nonkindhood of $A \vee B$ implies the nonkindhood of pain, one must hold a purely context-invariant view of kind individuation. Such an invariantist view follows from one possible reading of Fodor's Principle. One could, that is, interpret Fodor's Principle as the claim that there is an invariant minimal degree of causal homogeneity that must be guaranteed by the possession of any given kind property. If indeed that minimal degree must be invariant, remaining fixed from one field of science to any other, then one must say that kind individuation is invariantist. On such a view, one can take a count of all the world's kinds just by checking to see whether any candidate property passes the test, whether it guarantees the minimally required causal homogeneity. That is to say, one could ascertain all the kinds relative to the world itself and not relative to the interests definitive of any given scientific field. The antireductionist, however, is free to assume that there are distinct criteria for kind individuation in different fields of science. Specifically, one can assume that $A \vee B$ passes muster for kind membership in psychology even though it fails to do so for biology, chemistry, or physics.

I am appealing to Peter Unger's distinction between *contextualism* and *invariantism*,¹⁸ and urging a contextualist interpretation of kind individuation. According to an invariantist interpretation of a predicate, the predicate's satisfaction conditions remain the same regardless of speakers' interests. For example, on an invariantist construal of the predicate 'is flat' (one of Unger's standard examples), whether an object satisfies the predicate is a wholly objective matter. The shape of the surface in question is the only determinant of whether it is flat. However, on a contextualist interpretation, it is possible for the very same surface to count both as flat and as nonflat even without changing shape. All that needs to change are the standards of those using the predicate 'is flat.' (More specifically, what matters is what speakers consider to qualify as a surface irregularity, given that a flat surface necessarily lacks irregularities.)

Kim's argument for reductionism depends upon an invariantist construal of the predicate 'is a natural kind.' His argument requires the assumption that the minimal amount of causal homogeneity which a kind property must possess remains invariant regardless of the contextual interests which define any given scientific field. If, on the other hand, one holds a contextualist view of kind individuation, such that

$A \vee B$ is a kind by psychological criteria while failing to be such by physical criteria, then one would be unmoved by Kim's argument.

The attractiveness of Kim's implicit view, that kind individuation is invariantist, probably derives from assuming that the only alternative is to view kind individuation as wholly arbitrary or conventional. But the antireductionist need not be committed to so extreme a view. Rather, he can happily grant that taxonomization is grounded in something purely factual, such as causal homogeneity, while also holding that the minimal degree of such homogeneity which a property must guarantee in order to be a kind varies depending upon the particular science. Hence, the antireductionist need not reject Fodor's Principle, but must advocate a partially contextualist interpretation of it. That is to say, antireductionism is rendered coherent once one recognizes that the different interests which define different scientific fields partially determine how much causal homogeneity is minimally sufficient for kindhood.

A similarly relativized view of kind individuation was anticipated by Willard V. O. Quine some time ago.¹⁹ According to Quine,

Different similarity measures, or relative similarity notions best suit [classification in] different branches of science, for there are wasteful complications in providing finer gradations of relative similarity than matter for the phenomena with which the particular science is concerned. Perhaps the branches of science could be revealingly classified by looking to the relative similarity notion that is appropriate to each.

The only notable difference or lacuna is that Quine speaks of similarity in an unqualified sense rather than of similarity in shared causal powers.

The line of defense available to the antireductionist should be clear. He can grant that pain is as inhomogeneous in causal powers as $A \vee B$ while consistently claiming that the standards for kind individuation in psychology include $A \vee B$ while the standards in physics (or biology or whatever the relevant lower-level science happens to be) exclude it.

In order for this response to be plausible, satisfaction of the predicate 'is in pain' must guarantee *some* similarity in causal powers. Otherwise, (7) could not be construed as a law even by the most lenient standards. The antireductionist, however, should be willing to grant this, for the antireductionist argument from multiple realizability nowhere assumes that the physical realizers of pain show no degree of similarity. In fact, the functionalist construal of pain as a second-order property is plausibly understood as guaranteeing some modicum of causal similarity among its physical realizers. For not just any

physical property could play the causal role definitive of being in pain.

IV. A CONTEXTUALIST VIEW OF PROJECTIBILITY

One might, however, object to this contextualist view of kind individuation. One might, for example, point to the close connection earlier noted between kindhood and projectibility and remind us that since science is concerned with projectible generalizations, scientific kinds are precisely the projectible properties. One might then proceed to affirm that projectible properties are those which are reliable in making predictions. In further developing the objection, one could point out that the predictive reliability of a property and its causal homogeneity are very plausibly viewed as correlative. It is because (e.g.) electrons are so similar to each other in causal powers that one of them behaves so much like any other, and it is because one behaves so much like the other that the property of being an electron is predictively reliable. However, as one would then note, judgments as to causal homogeneity are strictly invariantist. The causal homogeneity of a property is what it is regardless of the interests of those working in any given scientific field. From this it appears to follow that projectibility is entirely an objective matter. Therefore, concludes the objector, kind individuation is wholly invariantist as well, for we have already agreed that projectibility and kindhood coincide.

This objection serves to clarify the contextualist view of kind individuation here recommended. Indeed, a contextualist view of kinds implies a contextualist view of projectibility. Moreover, since predictive reliability is wholly grounded in objective fact, predictive reliability alone is not an index of projectibility. To make the matter more vivid, consider the case of pain and $A \vee B$. Pain and $A \vee B$, as established earlier, share the same causal powers and hence are equally predictively reliable. Accordingly, if projectibility were wholly a function of predictive reliability, then one property's failing to be projectible would imply that the other is nonprojectible as well. However, if, as the antireductionist must insist, pain is projectible (for psychology) and $A \vee B$ is not projectible (for more basic science), that indicates that projectibility is not simply a correlate of predictive reliability.

That projectibility is not simply a matter of predictive reliability has already been noted by David Owens.²⁰ The reasons given by Owens are also pertinent to the present discussion. Owens points out that projection is the converse of explanation. A generalization is projectible just in case it explains its instances.²¹ Accordingly, the projectible properties are precisely

Multiple Realizability

the ones with explanatory efficacy. Moreover, since a generalization can be predictively useful without being explanatory (e.g., lunar phases do not explain high tide even though they can be used to predict it), it should not be surprising that projectibility is not simply a matter of predictive reliability. Specifically, $A \vee B$ is sufficiently predictively reliable for psychologists to find it explanatory while being insufficiently so for lower-level scientists to find it explanatory. Hence, $A \vee B$ is projectible in a psychological context while failing to be so in a physical context.

Moreover, the close link between projectibility and explanation provides indirect support for the contextualist view of kind individuation. The plausibility of pragmatic views of explanation has recently been recognized by philosophers.²² On such views, the explanatory efficacy of a generalization relative to a given explanandum can vary according to the changing interests of those requesting or devising an explanation. Hence, the generalization's projectibility can vary as well. Since the contextualist view of kind individuation yields this same result, pragmatic or contextualist views of explanation lend support to such a view.

A plausibly relativized view of projectibility is that different sciences expect different minimal degrees of predictive reliability from the kinds which they recognize. Accordingly, they incorporate different criteria for determining the degree of predictive reliability necessary for projectibility. Evidently, lower-level sciences demand greater predictive reliability than do higher-level sciences, the lower the science the greater minimal degree of reliability that is expected.²³ A decrease in the predictive reliability of higher-level scientific properties is due to the increasing number of physical realizers corresponding to each property as one ascends the hierarchy. Not only is multiple realizability ubiquitous, it is greater for higher-level properties. The property of being in pain has a greater number of possible physical realizers than does the property of having one's C-fibers fire.

This ontological fact reflects methodological differences among scientific fields. By virtue of recognizing some less predictively reliable properties as kinds, scientists working in higher-level fields can appeal to generalizations which would otherwise be missed. Rephrasing Quine somewhat, there is some truth in the claim that different branches of science can be classified in terms of how much predictive precision the scientists in each branch are willing to sacrifice in order to gain access to such generalizations. Accordingly, scientists in different fields will have different standards for how much causal homogeneity is minimally sufficient for kindhood.

It would be a mistake, however, for psychologists to adopt more stringent standards. If they were to do so and thereby

replace the current concept of pain with a plurality of finer-grained concepts, as Kim recommends, they might indeed be employing properties which are more reliable in making predictions. Since the properties would ensure greater causal homogeneity, the generalizations used by psychologists might become less statistical in nature and more strict or they might remain statistical while yet being more precisely quantifiable. However, psychologists would also be losing the generality found in claims like (7). As Daniel Dennett points out, they would be losing access to real and interesting higher-level patterns.²⁴ The loss in predictive precision is well worth it. Further, there is no need for psychologists to buy greater precision at such a price, for biologists and physical scientists have already done so. This is not to malign psychologists or other scientists. It is only to indicate part of what differentiates their various job descriptions.

V. CONCLUSION

Rejecting Kim's disjunction strategy does not carry a commitment to local reductionism. One can reject $A \vee B$ for being nonnomic while accepting pain as nomic by utilizing a contextualist view of kind individuation. More specifically, the antireductionist is free to view taxa as partly natural and partly conventional, natural in that belonging to a taxon must ensure some degree of causal homogeneity, and conventional in that the degree required can fluctuate from one field of science to the other. Given that psychology is a higher science than physics, it is perfectly conceivable that pain (or $A \vee B$) is too inhomogeneous to be a physical kind while being sufficiently homogeneous to be a psychological kind. This relativized view of taxonomization brings with it relativized views of projectibility and explanation. Since relativized views of explanation have already been persuasively defended, this adds to the plausibility of relativized views of taxonomization.²⁵

NOTES

¹ Jaegwon Kim, "Multiple Realization and the Metaphysics of Reduction," *Philosophy and Phenomenological Research* 52 (1992): 1–26; reprinted in Kim, *Supervenience and Mind: Selected Philosophical Essays* (Cambridge: Cambridge University Press, 1993).

² See Ernest Nagel, *The Structure of Science* (New York: Harcourt, Brace, and World; 1961), Chapter 11.

³ See Hilary Putnam, "The Nature of Mental States," in *Readings in Philosophy of Psychology*, i, ed. Ned Block. (Cambridge: Harvard University Press, 1980), 223–231; and Jerry Fodor, "Special Sciences, or The Disunity of Science as a Working Hypothesis," *Synthese* 28 (1974), 97–115.

⁴ The points made throughout the paper concerning pain are meant to apply to all mental properties including intentional ones.

Multiple Realizability

⁵ Kim means for the notion of possibility here to be understood in terms of physically possible worlds.

⁶ Kim, "Concepts of Supervenience," *Philosophy and Phenomenological Research* 45 (1984), 153–176; reprinted in *Supervenience and Mind*, 53–78.

⁷ See Putnam, "Nature of Mental States"; Fodor, "Special Sciences"; David Owens, "Disjunctive Laws?" *Analysis* 49 (1989), 197–202; and William Seager, "Disjunctive Laws and Supervenience," *Analysis* 51 (1991), 93–98.

⁸ Seager, "Disjunctive Laws," is the most explicit proponent of this argument. My interpretation of the argument, however, is derived from Kim, "Multiple Realization and the Metaphysics of Reduction."

⁹ Kim and Owens use similar examples to make this same point about some disjunctive predicates. See Kim, "Multiple Realization," and Owens, "Disjunctive Laws."

¹⁰ Kim makes this point in *Supervenience and Mind*, 319–327.

¹¹ Jerry Fodor, *Psychosemantics: The Problem of Meaning in the Philosophy of Mind* (Cambridge: MIT Press, 1987), 34.

¹² This could be understood as a strong reading of the multiple realizability thesis. The disjunction strategy is incompatible with such a strong interpretation by definition. However, there is a weaker interpretation of the multiple realizability thesis to the effect that distinct physical properties are each nomically sufficient for pain. Whether or not the disjunction of these physical properties forms a physical kind is left open, and so this multiple realizability thesis is compatible with the disjunction strategy. In the remainder of the paper, I use 'MR' to refer to the stronger reading.

¹³ And this would defeat the purpose of accommodating multiple realizability anyway.

¹⁴ If one is uncomfortable in attributing intentional properties to nonhuman animals (which I am not), one may consider a law involving sensations instead, e.g., sensations of anxiety typically follow erratic sensations of pain. The point is perfectly general.

¹⁵ Multiple realizability must be understood here in the strong sense. Kim is claiming that if the disjunction of a property's physical realizers is not itself a kind, then neither can the realized property be a kind.

¹⁶ Kim, *Supervenience and Mind*, 326.

¹⁷ This position requires a distinction between the notions of physical property and physical kind such that a property can be the former without being the latter. One can plausibly take Boolean operations on physical kinds to yield physical properties which are not necessarily physical kinds. What this means is that Boolean operations on physically explanatory properties can yield properties which fail to be physically explanatory. The disjunction of the physical realizers of pain would be an example of such if they are too causally disunified to meet physical standards of kind individuation.

¹⁸ See Peter Unger, *Philosophical Relativity* (Minneapolis: University of Minnesota Press, 1984), 6–11.

¹⁹ W. V. O. Quine, "Natural Kinds," in *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), 114–138. Cf. 137.

²⁰ Quine, "Natural Kinds," 200.

²¹ There is no argument for this position in Owens, but Gilbert Harman has argued that all nondemonstrative inference is inference to

the best explanation. If sound, Harman's argument shows that an inductively confirmed generalization must explain its instances. See Harman, "The Inference to the Best Explanation," *Philosophical Review* 74 (1965), 88–95.

²² For a highly pragmatic or contextualist view of explanation, see David Lewis, "Causal Explanation," in *Philosophical Papers*, ii (Oxford: Oxford University Press, 1986), 214–240.

²³ Physicists sometimes treat biological and psychological properties as though they were as predictively reliable as physical kinds. The physicist Frank J. Tipler, for example, has argued that there is no extraterrestrial intelligence on the following grounds: since any intelligent species would eventually develop technological capacities making interstellar travel relatively easy, if there were extraterrestrial intelligent life it would have already visited us. See his "Extraterrestrial Intelligent Beings Do Not Exist," *Quarterly Journal of the Royal Astronomical Society* 21 (1981), 267–282. However, if one accepts MR and so believes that psychological properties can be realized in creatures with radically different physical constitutions, one should be a bit less sanguine as to our ability to predict how intelligent alien beings would behave.

²⁴ Daniel C. Dennett, *The Intentional Stance* (Cambridge: MIT Press, 1987), 13–42.

²⁵ I would like to thank Shaughan Lavine, Sidney Morgenbesser, and an anonymous referee of this journal for helpful comments on an earlier draft of this paper.