

Realization and Multiple Realization, Chicken and Egg

Thomas W. Polger

Abstract. A common view is that the truth of multiple realization, e.g., about psychological states, entails the truth of functionalism. This is supposed to follow because what is multiply realized is *eo ipso* realized. I argue that view is mistaken by demonstrating how it misrepresents arguments from multiple realization. In particular, it undermines the empirical component of the arguments, and renders the multiplicity of the realization irrelevant. I suggest an alternative reading of multiple realizability arguments, particularly in philosophy of psychology. And I explain the proper way to understand the relation between realization and multiple realization.

1. Realization, Multiple Realization, and Functionalism

Which comes first, realization or multiple realization?

Hilary Putnam (1960) invoked the term ‘realization’ to refer to the relation that holds between physical devices and abstract computing machines, such as Turing machines or probabilistic automata. Putnam (1967) hypothesized that the relation between brain and mind is also realization. He contrasted his hypothesis—which he dubbed ‘functionalism’—with the competing hypotheses that mental states are to be identified with syndromes of behavior and behavioral dispositions, or that mental states are to be identified with brain processes. Instead, functionalism proposes that mental states are to be identified with functional states of whole organisms. Importantly, Putnam regarded functionalism as an empirical hypothesis, and one whose explication appeals to some technical notions, particularly to the idea of a probabilistic automaton.

From this familiar story of the origins of functionalism, we can extract two lessons. First, ‘realization’ is a technical term. Second, realization can be the relation between physical systems and computing systems. The paradigm case of the mechanical realization of a probabilistic

automaton, and the subsequent development of the functionalist hypothesis by extension of the computational example, fix the reference of the technical term.¹ Crudely put, hardware realizes software. Generalizing, realization is the relation between physical ('physico-chemical') systems and so-called functional systems. Functional systems include finite state machines and probabilistic automata, as well as numerous other types of systems that are characterized 'functionally.'² As such, realization and functionalism are interdefined. Putnam's hypothesis that mental states are functional states simply is the hypothesis that mental states are realized by physical states of organisms. Functionalism is contrasted with behaviorism and the identity theory, so realization should be understood to contrast with the mind-constituting relations of those theories. To realize a mental state is not merely to have a syndrome of behavior and behavioral dispositions. Nor is realization a matter of physical type-identity.³

Of course some adjustments to our technical jargon and concepts are to be expected. I suppose one may use, introduce, or dispose of bits of jargon as needed. But we cannot simply remind the term 'realization' if we hope to understand the theory that Putnam proposed, that has dominated philosophy of mind and cognitive science for over forty years, and that remains the received view today. For that project, keeping in mind the theoretical or philosophical role that realization is supposed to play can be instructive. This helps us to understand the realization relation itself, and to formulate and evaluate the arguments for and against the functionalist hypothesis that have exercised many philosophers and cognitive scientists.⁴

In this paper I will examine one common claim about realization and argue that it is mistaken, namely: whatever is multiply realized is realized. However obvious this may seem, it is false. Understanding the relation between realization and multiple realization allows us to more clearly understand the force of the multiple realization argument against the type identity

theory. And, as the realization relation comes to play a broader role in metaphysics, we can better assess what resources it provides.

2. Realization and Multiple Realization, a First Pass

Common sense tells us that to understand something called ‘multiple realization’ we had better first understand ‘realization.’ This approach seems only sensible given the systematic way that the English language works to form compound expressions. If I have multiple apples, then I have at least one apple. The basic unit is the single apple. This line of reasoning provides a good heuristic, and may even be the right method if we want to understand etymology. But it can also be misleading, as it would be to insist that someone could not understand what a bearcat is unless they already understand cats.⁵ So it is, I argue, for realization and multiple realization. No account of realization is needed in order to explain and evaluate the claim of multiple realization.⁶ Indeed, attention to the place of these notions in the debate over functionalism reveals that multiple realization is conceptually prior.⁷ This may strike some as paradoxical, but the confusion is easily sorted out.

Let us take multiple realization to be the thesis that systems of indefinitely many physical compositions can have mental states that are exactly similar to human mental states.⁸ Putnam appeals to the claim of multiple realization in order to argue against the physical type-identity theory. He supposes that we have empirical evidence for thinking that multiple realization is true, and he cites as an example the observation that mammals, reptiles, and mollusks can all experience pain (1975: 436). Putnam then argues that it is doubtful that the diversity of animal types capable of having pain will be found to have a common physical basis for their pains. As Lawrence Shapiro (2000) emphasizes, this is a likelihood argument: Given the *prima facie*

diversity of pain-capable species, it is unlikely that the identity theory will be sustained. For the identity theory would require that all pain-capable creatures be found to have pain-mediating mechanisms that are of a single physical kind even though they occur in diverse organisms. And, Putnam believes, this is relatively unlikely.⁹ So Putnam concludes that the best hypothesis is that various pain-capable creatures have physically diverse pain systems, which is incompatible with identity theory. However, the physical diversity of pain systems is compatible with the functionalist hypothesis. Thus functionalism gains empirical support via the low likelihood of its competitor.

Two features of Putnam's argument stand out. One is that, in fact, it does not depend on advancing any specific positive claim about brain-mind relations, such as realization. The argument only claims that it is unlikely that the physical type-identity theory will prove to be compatible with the observed diversity of creatures that can have mental states. Second, and perhaps more surprising, is that the multiple realization argument cannot—in principle—appeal to the realization relation. For if it does, it will turn out to be either question-begging or trivial.

Before we turn to the argument for that conclusion, a clarification is in order. There is a simple sense in which whatever is *multiply realized* is *realized*. If 'realizes' means something like 'instantiates' or 'exemplifies' or 'exists'—arguably some of its ordinary language meanings—then to say that something is 'multiply realized' is just to say that it is exemplified more than once. And if it is exemplified more than once, then it is exemplified. So if this is what we have in mind, then everything is realized and every kind that has more than one distinct member is multiply realized. Apples realize redness, octopus neurons realize pain, diamonds realize hardness. Mark Twain is probably uniquely realized, but redness and hardness are each multiply realized. Pain may be multiply realized, too. All this seems fine. Yet if realization is

taken in this way then claims of multiple realization will lend no extra credibility to the functionalist hypothesis. Realization, in this sense, is fully compatible with type identification. More specifically, the claim that psychological states are multiply realized (in this ordinary sense) is fully compatible with the possibility that each psychological state type is identical to a neurobiological ('physico-chemical') state type. And, it should be noted, neurobiological states will be realized as well. So the 'realization' of psychological states will fail to distinguish their metaphysical status from that of brain states. It would be a mistake to think that multiple realization undermines the identity theory merely because mental states are multiply 'realized' in the ordinary sense—merely because they are exemplified more than once.

So it is plausible to think that if realization is to carry any weight then it is not an ordinary sense of 'realization' that is of interest. The important realization relation is more than an existence predicate or a general exemplification marker. As I indicated above, my view is that the term 'realization' is baptized to refer to the relation between physical devices and abstract automata (Polger 2004, 2007). But all that is crucial at the moment is that there is some technical (non-ordinary-language) notion of realization as a particular metaphysical relation.¹⁰

Take it that realization is a special relation, in contrast to the ordinary language reading given above. Then we should understand the claim of multiple realization as asserting that a single psychological state type is in fact realized, and that it is realized differently in different creatures. Let Ψ be a psychological state type, such as a particular kind of pain; and let R be the realization relation. Then the multiple realization argument proceeds as follows:

- (1) Ψ stands in R to physical state P_1 [in creature C_1 .]
- (2) Ψ stands in R to physical state P_2 [in creature C_2 .]
- (4) Therefore, Ψ is not identical to any single physical state type.

In Putnam's example, Ψ is pain, C_1 is mammals, C_2 is mollusca, and P_1 and P_2 are the neurological states associated with pain in those taxonomic kinds, respectively. Putnam supposes that we have reason to think that P_1 and P_2 are neurologically distinct state types.¹¹ Even if Putnam is right about the empirical claim, this argument is plainly invalid even as a likelihood argument. As far as we are told, realization of Ψ by P_1 and P_2 is compatible with a type identity claim. P_1 and P_2 may be different types according to one taxonomy, but nevertheless fall under a single 'physico-chemical' or neurobiological type P_3 according to a different taxonomy. What is needed is an additional premise to the effect that realization of Ψ by an instance of physical state type is incompatible with its being identical to any physical state type. We need a premise that makes a claim about the incompatibility of realization and identity.¹²

Now there is a modest version of such a claim, according to which:

(3a) If Ψ stands in R to physical state P_n then Ψ is not identical to P_n .

But (3a) will obviously not do to get the anti-identity conclusion (4), for realization of Ψ by P_1 or P_2 is still compatible with Ψ 's identification with P_3 . What is needed is something along the lines of:

(3b) If there is a particular physical state P_n that stands in R to Ψ , then Ψ is not identical to any physical state P_x .

The addition of (3b) makes this version of the multiple realization argument valid. This is achieved because whereas (1) and (2) alone don't say anything substantive about the realization relation, (3b) tells us at least that realization is baldly incompatible with identification. If so, then the fact of multiple realization deductively entails the falsehood of the identity theory.

But if this is the multiple realization argument, then it faces many questions. First, if this is the argument then it would be better called the *realization argument*, for the fact of multiplicity of the realizations is superfluous. Either (1) or (2), combined with (3b), deductively entails (4). All the work is done by the incompatibility of realization with identity, asserted by (3b). The fact of multiplicity plays no role in the argument. This is unexpected, because Putnam's presentation—as well as Fodor's (1974) and many others who followed—put great emphasis on the multiplicity of realization.¹³

Second, this realization argument is vulnerable to the charge of question-begging. By asserting that Ψ is multiply realized we are, on this account, already denying that Ψ is identical to a physical type. Put differently, if (1) and (2) assert the realization of Ψ where that involves substantial commitments to Ψ standing in relation R, then (1) and (2) are at least as controversial as the conclusion (4), that Ψ does not stand in the identity relation. The argument is deductively valid, but it's hard to see why it should worry someone who is not already committed to the conclusion. Yet the multiple realization argument did worry identity theorists, and continues to. This indicates, I think, that the argument should not be interpreted in a way that makes it so susceptible to the charge of question-begging.¹⁴

Moreover, by rendering the multiple realization argument deductively valid this version seems to misrepresent Putnam's reasoning. Putnam's argument was supposed to be empirical in nature, something like an inference to the best explanation or likelihood argument.

3. Realization and Multiple Realization, a Second Pass

We'd like an interpretation of the MR argument that gives a prominent place to the claim of multiplicity, and that is not overtly vulnerable to the charge of question-begging.

One possibility is that the role for multiplicity is in establishing (3b). True, either (1) or (2) is sufficient to entail (4) given (3b). But perhaps (1) and (2) are both required in order to derive (3b). If so, this might also go some way toward insulating the argument against the charge of question-begging, for neither (1) nor (2) alone would presuppose the denial of the identity claim. The idea, I think, would be that (1) and (2), along with some neutral principle along the lines of Leibniz's Law, entail (3b). Ψ is realized by physical state P_1 in creature C_1 , and by physical state P_2 in creature C_2 . Since P_1 and P_2 are distinct, considering the transitivity of identity we conclude that Ψ cannot be identified with both.

But this kind of reasoning does not suggest (3b), but instead a weaker claim:

(3c) If Ψ stands in R to both of distinct physical states P_1 and P_2 then Ψ is not identical to P_1 or P_2 .

This does not get us the full principle we need, that the multiple realization of Ψ rules out the identification of Ψ with any physical state. For that P_1 and P_2 are distinct does not rule out the existence of a P_3 that is type-identical to Ψ . It's hard to see how non-exhaustive observations of the states that realize Ψ could rule out this possibility. If it is not ruled out by a single case, then I don't see how two or three or twenty would help. It seems we'd have better luck with the question-begging version of the multiple realization argument that depends on (3b). There, at least, one case would indeed do the trick.

Even deriving (3c) from (1) and (2) is similarly problematic. After all, Leibniz's Law operates on (1) and (2) to yield (3c) only on the assumption that there is no physical type P_3 that P_1 and P_2 are each members of. And this premise is not one that can be supported merely by observing P_1 and P_2 .

What we are seeing is that if multiple realization is really the two part claim that Ψ is realized and that there is more than one (distinct and incompatible) realizer of Ψ , then two consequences follow. First, we get a deductive argument against the identity theory rather than evidence in support of a hypothesis. This is a stronger argument than Putnam proposed; but perhaps we could decide that was false modesty on Putnam's behalf. Yet this is not compelling because, second, the deductive argument will be open to the charge of question-begging insofar as it is valid only if it assumes that Ψ stands to the physical in some particular and substantive metaphysical relation that is stipulated to be incompatible with identity. On this interpretation, the 'empirical' premises (1) and (2) must presuppose the controversial metaphysical thesis that is at stake in the debate, and the multiplicity of the realizations is entirely incidental. Yet that seems wrong. Multiplicity is not incidental to the significance of multiple realization.

4. Understanding the Multiple Realization Argument

I have argued that when the claim of multiple realization is interpreted as a claim about the multiplicity of realization, where realization is a substantive relation, then the multiple realization argument comes out to be trivial or question-begging. Specifically, if the fact that mental states are realized by brain states is *ipso facto* incompatible with their being type-identical to brain states, then the multiple realization argument turns out to be deductively valid (rather than an inference to the best explanation) or question-begging. But I think that it is a mistake to think that the multiple realization argument is either deductive or question-begging. So it is a mistake to understand multiple realization in terms of the multiplicity of realizations.

I am not here arguing that the multiple realization argument fails. In fact I think that some versions of the argument rely on an equivocation. And there is now considerable controversy over whether the empirical facts support the assertion of multiplicity (Bickle 1998, 2003, 2010; Bechtel and Mundale 1999; Sober 1999; Shapiro 2000, 2004; Clapp 2001; Polger 2009a, 2009b). At the very least, the case is not as clear as Putnam (1967) supposed, nor even as Block and Fodor did (1972; and Fodor 1974). But my interest herein is not so much in the cogency of the argument as in the relation between realization and multiple realization, and how it should operate in the best version of the argument.

Second, I am not arguing that some premise along the lines of (3b) is mistaken, or that realization is compatible with identity. In fact I think that realization is generally understood to be a non-identity relation.¹⁵ This near stipulation is precisely what makes the ‘observation’ of realization controversial when it is built into the observation of multiple realization. This is what raises the concerns about question-begging. Realization is an alternative to type-identity, according to functionalists. But multiple realization is usually thought of as part of an argument for functionalism, rather than merely an elaboration of functionalism. Thus, to avoid charges of question-begging the multiple realization argument should not—after all—depend on the incompatibility of realization with type-identity. The role for that incompatibility is to explain why multiple realization is a problem for identity theory but not for functionalism. But that is all. In particular, the incompatibility is not a premise in the argument against identity theory.¹⁶

Third, I am not arguing that the multiple realization argument is, in fact, question-begging. Rather, I am arguing that the multiple realization argument *would be* question-begging under certain interpretations, and that is reason to reject those interpretations. In particular, it would be question-begging if we understand the assertion of multiple realization in premises (1) and (2) as

the including a claim about realization that is as such incompatible with the identity theory. If multiple realization of Ψ entails (in the sense of assumes) that Ψ is realized, then (1) and (2) are question-begging premises. I don't know that anyone openly endorses the question-begging version of the argument. But many philosophers think that multiple realization is a claim about realization, so they are unwittingly committed to this interpretation.

Perhaps we should say, 'So much the worse for the multiple realization argument' and conclude that it is question-begging after all. But an alternative is to conclude that multiple realization is not a claim about a metaphysical relation of realization. That is the interpretation that I am advocating herein. The multiple realization argument would be question-begging if multiple realization presupposes realization. But—whatever other objections it may face—the multiple realization argument is not question-begging. Therefore, multiple realization does not presuppose realization. Multiple realization is not a claim about the realization relation or its instances.

A clue that the question-begging interpretation of multiple realization is the wrong one, is that the fact of multiple realization is supposed to be an empirical one, the result of observation. This observation is evidence against the identity theory, and thereby in favor of the functionalist hypothesis. This was Putnam's view, for example. But on the question-begging reading, the multiple realization premises—(1) and (2)—would not be good candidates for empirical observations. What sort of ordinary observation would deliver the claim that Ψ stands in metaphysical relation R to P_1 in C_1 ? The observations can only be about the correlation of Ψ and P_1 , from which we may form hypotheses about their metaphysical relation or lack thereof.

I suggest that the source of the trouble is the ambiguity between ordinary and technical notions of realization. The assertion that pain is realized in human beings, and dogs, and mollusks may be given, on the one hand, the metaphysical reading discussed above:

(1) Ψ stands in R to physical state P_1 [in creature C_1 .]

(2) Ψ stands in R to physical state P_2 [in creature C_2 .]

But it may also be given an ordinary reading, which I'll put in terms of a relation of 'mediation' in something like the neuropsychological use. Mediation is a generic relation, maybe stronger than mere correlation or association and involving some spatio-temporal correspondence. Mediation is the kind of correlative relation that might plausibly be empirically observed. In those terms, we can consider:

(1*) Ψ is mediated by physical state P_1 [in creature C_1 .]

(2*) Ψ is mediated by physical state P_2 [in creature C_2 .]

Because what is sought is a metaphysical conclusion, there is a temptation to think that metaphysical premises must be employed. But the beauty and allure of Putnam's argument is precisely that it seems to establish a metaphysical conclusion from ordinary empirical premises.¹⁷ (1*) and (2*) are quite plausible, and relatively unobjectionable. But (1*) and (2*) obviously lend no support to (3b).

The bottom line is that if the claim that mental states are multiply realized entailed that they are realized then multiple realization would not be evidence in an inductive argument against the identity theory. Instead Putnam would have given a deductive argument that is open to the charge of question begging. But this is not Putnam's argument, so multiple realization is not a claim involving any substantive brain-mind relation, realization or otherwise. The bad news is that, without the deductive argument, establishing the fact of multiple realization does not, in

itself, demonstrate that a realization theory (e.g., functionalism) is correct. The good news is that the argument is not question begging, and so is considerably more interesting. This returns us to the question of what, exactly, the structure of the multiple realization argument is, if it is not the question-begging deductive argument.

5. The Multiple Realization Argument as a Likelihood Argument, Again

In fact I think an interpretation along the lines of (1*), (2*),... (4) gets the multiple realization argument basically right. The key is to understand the transitions between the empirical premises and the metaphysical conclusion. As noted earlier, either (1) or (2) along with (3b) will entail the conclusion (4). The trouble, I argued, was that this deductive line of reasoning is open to the charge of question begging. And it seems to me that any premises strong enough to support an interim conclusion about the incompatibility of realization and identification are likely to run into similar problems.

Instead, I suggest that we think of (1*) and (2*) as jointly providing inductive evidence for (4) directly. The force of (1*) and (2*) is not, then, borne by any controversial claim about the metaphysical relation of realization as in (1) and (2) with (3b), but solely by the prima facie distinctness of P_1 in C_1 and P_2 in C_2 . This yields something like the likelihood argument that Shapiro (2000) attributes to Putnam. That is:

(1*) Ψ is mediated by physical state P_1 [in creature C_1 .]

(2*) Ψ is mediated by physical state P_2 [in creature C_2 .]

(4) Ψ is not identical to any single physical state type.

Here (1*) and (2*) are the kinds of things that could be observed, and could stand as evidence in favor of a hypothesis. If the observed difference between P_1 and P_2 is borne out, then we would

have a counterexample to the identity hypothesis. So (1*) and (2*) provide prima facie evidence for (4), the denial of type-identity for Ψ .

On this reading, the claim of ‘multiple realization’ is not question begging, for it only asserts that Ψ is had by C_1 in virtue of P_1 and Ψ is had by C_2 in virtue of P_2 , with no assumption about the nature of the ‘having’ of Ψ occurs. Indeed this interpretation employs no claims about the relation of realization whatsoever. Yet the argument is at least prima facie plausible. If P_1 and P_2 are distinct, their observation in C_1 and C_2 will give us some (defeasible) reason to accept (4). There is no need for any intermediate conclusions about a metaphysical relation of realization. Of course (1*) and (2*) don’t entail (4). And, because (1*) and (2*) are much weaker than (1) or (2), they provide correspondingly weaker grounds for (4). But this likelihood argument also avoids the need for premises as strong as (3c).

But if multiple realization is not a claim specifically about realization, then what sort of claim is it?

The answer is that multiple realization is a claim about the breadth of the distribution of psychological states in nature (Polger 2004, 2009a, 2009b). It is most plausibly thought of as the claim that psychological state kinds are shared in common across at least some physical creature kinds, for example, across species. This may be formulated, as it was in Putnam’s (1967) presentation, as a prima facie claim of commonsense ethology. But it would be a stronger claim—and still at least prima facie plausible—if we understand multiple realization in terms of the taxonomies of different sciences. Mental states are multiply realizable because the science of mental states (psychology) groups together states that are had by physically diverse creature types, as counted by the sciences of creature types, e.g., evolutionary biology or biological anthropology. Of course there is some idealization going on when we talk about ‘the’ way that

various sciences taxonomize their subject matters. But the basic idea is clear enough and it has the added benefit of fitting nicely with Fodor's (1974) subsequent generalization of the argument across the special sciences. The point here is not to assess whether this interpretation of multiple realization makes it true or false, just to notice what kind of claims an advocate of multiple realization is making. Repeatedly, Putnam (1967), Block and Fodor (1972), and Fodor (1974) insist that multiple realization is an empirical claim that they regard as overwhelmingly plausible.

The likelihood interpretation of the multiple realization argument is intuitively appealing, but it is also defeasible. And I think it can be defeated. It's not my aim to take on all of the evidence here. But it is useful to notice that the likelihood argument moves quickly from the observation of diverse subjects of psychological states to the conclusion that psychological states have correlatively distinct bases among the subjects. From the fact that humans and different from dogs and mollusks, and that our brains differ in their gross anatomy, the argument concludes that it is unlikely that human pains and octopus pains have common neurophysiological mechanisms. This is a shift from a difference in wholes to a difference in parts. One may as well doubt that humans, dogs, and whales have any common physiological features. But we do. As do humans, birds, and turtles—for example, with respect to our eyes (Shapiro 2004). Some of these commonalities are the result of common descent, and others are the result of convergent evolution.¹⁸

One reason that early advocates of multiple realization under-estimated the likelihood of the identity theory is that they thought it would have to be cast in terms of 'physico-chemical' states, which I suppose would be those described in the proprietary languages of physics and chemistry. But this is a red herring. The brain states with which psychological states are to be

identified may be characterized in whatever the appropriate neuroscientific vocabulary turns out to be. Unless we are vitalists—and I, for one, am not—then we can suppose that these will be physical and chemical states of brains in the relevant sense. Similarly, there is no reason to assume that the psychological states with which brain states are identified must be those of folk psychology. How much of folk psychology (much less ‘folksy’ psychological platitudes) will make it into scientific psychology is an open question. Pointing out that there may be no such thing as a singular psychological type *pain* or *memory* misses the point. The functionalist and the identity theorist are not offering competing theories of particular phenomena, and they need not disagree about which bits of tissue are crucial for understanding pain or memory. What they disagree about is the structure of psychological explanations, and whether they pick out kinds that can be type identified with the kinds that are individuated by neuroscientists.¹⁹

6. Multiple Realization and Realization

The next question concerns how realization and multiple realization are related, after all. The answer is that realization is a proposal for a mind brain relation that is compatible with the likely extent of multiple realization of mental states.

According to the multiple realization argument, mental states are distributed across species to an extent that makes it unlikely that the identity theory can be sustained. However, if the various creatures and systems that have mental states are physically diverse but ‘functionally’ similar (on some understanding of functions) then it may be that mental states are realized by the physical states of the various systems. The trick is to find a notion of functional similarity for which multiple realization is true, that is incompatible with type-identity, and that satisfies the requirements for being the mind-constituting relation in an account of the nature of minds. This

is Putnam's hypothesis, and it is a tall order. One can understand a great deal of philosophy of mind and cognitive science from 1970 to the present as a project to characterize just such functional similarities between instances of mental states.

Of course the mere fact of multiple realization does not guarantee that there are any such functional commonalities. It is compatible with multiple realization, for example, that mental states are randomly distributed across physical types. This seems unlikely, to be sure. And it probably requires some sort of dualism that neither functionalists nor identity theories are apt to take seriously. But the plausibility of the random distribution of minds is irrelevant. The point of mentioning such an odd arrangement is to reinforce that multiple realization is only evidence for functionalism, just as it is only evidence against identity theories.

One might object that there must be *some* commonality underlying all the observed cases of a psychological kind such as pain. This commonality, if it is unlikely to be a single kind of brain state and is more than a mere behavioral similarity, must be characterized as a 'functional' state. I suppose that much is undeniable. But if that is all there is to functionalism, then it is precious little. The functionalist hypothesis is reduced to the hypothesis that there must be something, we know not what, that unifies instances of psychological kinds. Likewise, the theory that psychological states are realized by brain states becomes little more than that idea that brains are somehow or other responsible for psychological states in virtue of what they do. I cannot recommend this interpretation of functionalism. Rather, I think that there have been many concrete functionalist hypotheses—some more elaborately developed than others—starting with Putnam's probabilistic automata version. On my view, each of these proposals involves a tacit theory of what it would be to realize a psychological state. Each theory can be measured against the identity theory to see which one provides, all things considered, the best explanation for

psychological phenomena.²⁰ Accommodating the extent of observed multiple realization is one criteria—an important criteria but not the only one.

If I am right and we want to understand the hypothesis that realization is the mind-constituting relation, what do we do? First, we find out how widespread minds are, in fact. Next, we find out how physically diverse the creatures with minds are, in fact. Then we will be able to see whether the commonalities among things with minds are best captured by the taxonomies of a neuroscience or by a science that individuates its kinds more ‘abstractly’—i.e., functionally. If we find that psychological states do not fall into neuroscientific kinds, then we have ruled out a type-identity theory. In that case, we may be interested in whether we can craft a realization relation according to which the physically diverse creatures count as realizing the same psychological kind. These tasks of course are not the kinds of things that can be done entirely from the armchair. They are, by and large, tasks for the sciences of the mind—psychology, neuroscience, and the other cognitive sciences. Nor is the decision process one that can be done entirely post hoc or with the cold detachment of an observer. For it is likely to involve the messy give and take that is characteristic of scientific theorizing in the wild.

Notice that the order of operations recommended here reverses that suggested by Carl Gillett (2003). In his critique of Shapiro (2000), Gillett argues that one has to first define the realization relation and then use it to formulate a notion of multiple realization. His favored account delivers different verdicts on some putative examples of multiple realization than those endorsed by Shapiro, and he diagnoses the source of the difference as being Shapiro’s dedication to an alternative account of realization. It may be true that Shapiro’s account of realization differs from Gillett’s. But more to the point, Shapiro’s evaluation of cases of multiple realization proceeds by first determining whether there is taxonomic cross-classification and then asking

whether the classificatory practices are better explained by the hypothesis of multiple realization or by the hypothesis of mental constraints (Shapiro 2000, 2004). If I am right, this is the correct procedure.

This procedure will also have the result that some recent disputes about the nature of the realization relation will need to be reinterpreted.²¹ Those, such as Gillett, who begin with an account of realization and try to use it to understand multiple realization will likely find themselves recommending ontological groupings that do not match the taxonomies of the sciences of the mind. To use the toy example favored by Shapiro: Gillett will have to say that two waiter's corkscrews that differ only in their color are different realizations of corkscrew. But it is plausible that the imaginary science of corkscrews would not treat differently colored corkscrews as different in kind, i.e., as multiple realizations of corkscrews (Polger 2009a). We can now see the problem: Gillett is fitting an account of multiple realization to his theory of realization, rather than fitting his theory of realization to existing scientific taxonomies. His theory of realization identifies many kinds of differences as grounds for taxonomic distinction, so finds ubiquitous examples of multiple realization.

But when we set out to determine how widespread psychological state kinds are, and how physically diverse their instances may be, we must keep in mind that not every physical difference among the creatures that have mental states will be evidence for multiple realization. The differences we care about are what Shapiro (2000) calls the *relevant differences*. The key to understanding this relevance criteria is to keep in mind that the claim of multiple realization is supposed to be incompatible with the type-identity theory. But not every physical variation between tokens of a psychological kind will be a variation that marks a difference in neuroscientific kind.²²

Consider a handful of glass marbles. There are no doubt numerous physical differences among the marbles: slight imperfections, differences in size, bubbles, scratches, asymmetries, and even variations in color. Nevertheless, they may all be marbles of the same kind. Members of a kind or type need not be indistinguishable from one another, they need only share in common the characteristics distinctive of the kind. If the science or folk science of marbles counts these as members of a kind, this shows that the differences among them are not relevant to their kind membership. So too with the brain-mind identity theory. The claim of an identity theorist is not that all psychological states of a kind are indiscriminable from one another. It is only that they are of the same kind, according to the sciences of brains.

From this point of view, then, it is Putnam's observation of multiple realization—rather than the brain state hypothesis—that seems a bit too enthusiastic. If the multiple realization argument is to impugn the identity theory it will have to give us reason to think that there is no biological commonality among pains—that there is no common way to characterize pains in a brain science. And we're supposed to get that just from noticing that the critters we think have pains or memories are biologically diverse. Now it is the identity theorists' turn to say, paraphrasing Putnam, that it is not altogether impossible that no such commonality can be found, but this is certainly an ambitious hypothesis.*

Thomas W. Polger
Department of Philosophy
University of Cincinnati
Cincinnati, OH 45221-0374 USA
thomas.polger@uc.edu

Notes

¹ See my 2004.

² I understand functionalism expansively, so as to include a variety of views according to which mental states are individuated relationally; for a survey see Polger (2004). Some non-reductive physicalist views are not explicitly functionalist or realizationist, for example those based on supervenience. For reasons to think those views will have to make use of something like realization, see Kim 1998 and Melnyk 2003.

³ Sometimes it is useful to think of the behavioral and type-identity views as limiting cases, on opposite poles, of a range of functionalist theories. This is fine for some purposes. But for our present purposes we are thinking of the identity theory, functionalism, and behaviorism as different in kind.

⁴ See my 2004 for discussion.

⁵ A bearcat is a mammal in the family Viverridae, and is neither a bear nor a cat. It is the mascot of the University of Cincinnati.

⁶ But if etymology is wanted, then it is useful to note that in his early papers Putnam uses the term ‘realization’ but not ‘multiple realization’, which seems to originate in Lewis (1972). In particular, Putnam does not speak of ‘multiple realization’ or ‘variable realization’ in ‘The Nature of Mental States’ (1967), where he introduces the idea that those expressions name.

⁷ I have alluded to this line of reasoning previously (2002, 2004), but without developing it.

⁸ This is, approximately, the variety of multiple realization that I and others sometimes call Standard MR (Polger 2004, Shapiro 2004). Elsewhere I argue that weaker claims are not even *prima facie* problems for an identity theory (2009a, 2009b).

⁹ Subsequently Block and Fodor (1972) extended (or replaced) this argument by arguing that in principle we cannot exclude the possibility that pain is had by creatures with physically diverse

pain systems. And Fodor (1974) extended the argument beyond psychological state types to cover all of the types of the so-called special sciences. Again, see Shapiro (2000, 2004, 2008) and Polger (2009b; Shapiro and Polger 2012).

¹⁰ Or, perhaps, a class of metaphysical relations.

¹¹ This is the empirical claim that has been disputed by, among others, Bickle 1998, Bechtel and Mundale (1999), Shapiro (2000, 2004), and Polger (2009b).

¹² The missing premise is needed for the likelihood argument, not merely for deductive validity. As we shall see, it is a defect of thinking that the multiple realization argument depends on a technical sense of realization that it ends up rendering the likelihood argument as a deductive argument.

¹³ In some cases it would make a great difference whether the argument begins with the premise that a mental state is (in fact) multiply realized or is (in principle) multiply realizable. Putnam's (1967) argument begins with the former. But I am not depending on this distinction in this paper. My interest here is in the validity of the argument rather than the soundness, and thus not so much in the actual world truth of the multiplicity claim (cf. Shapiro 2004; Polger 2009a, 2009b).

¹⁴ You might think that the reconstruction of the multiple realizability argument that I have just considered is obviously implausible. If so, then you are on your way to reconsidering whether the right way to understand multiple realization is in terms of the technical notion of realization at all.

¹⁵ But I don't think that it is analytic that identity is not a realization relation. There may be some purposes for which it is useful to think of identity as a limiting case, just as it is sometimes useful to think of identity as a limiting case of correlation or supervenience. However this does not present any obstacle to distinguishing the limiting cases from all the others, as we may need.

¹⁶ One could of course argue from the truth of functionalism to the falsity of the identity theory. But that is not the multiple realization argument and certainly not Putnam's argument.

¹⁷ Indeed, as a reading of Putnam it would be more accurate to try:

(1') Ψ is had by creature C_1 .

(2') Ψ is had by creature C_2 .

From these premises one could then hope to establish (1*) and (2*). But that transition is precisely the one questioned by, among others, Bechtel and Mundale (1999), Shapiro (2000), and Polger (2009b).

¹⁸ Block and Fodor (1972) misleadingly think of the convergence only in terms of common function, rather than common morphology. Both varieties can be found in nature. Shapiro (2004) considers some of the natural constraints that lead to these commonalities.

¹⁹ Another reason for the under-estimation of the likelihood of the identity theory was the influence of the Lashleyan doctrine of neuronal equipotentiality (Putnam 1967, Block and Fodor 1972, Fodor 1974). This now seems a bit quaint; and even in 1972 Block and Fodor were qualifying their mentions of equipotentiality. For more on this question, see Polger (2009b).

²⁰ This is the strategy of Polger (2004).

²¹ Thanks to the urging of an anonymous referee to make this consequence explicit.

²² For more on relevant differences and the empirical evidence for them, see Shapiro (2000, 2004, 2008), Polger (2009b), Shapiro and Polger (2012).

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