The Counter-Revolution over Multiple Realization

Thomas W. Polger and Lawrence A. Shapiro: The multiple realization book. UK: Oxford University Press, 2016, xiv+258pp, $35. PB.

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In philosophy during the 1960s, a revolutionary idea took hold: mental properties are programmable functions that, like computational functions generally, can be multiply realized by physically diverse kinds of engineering. The attraction of this idea led to the dominance of various nonreductive functionalist views, and the mind-brain identity theory became a marginalized position. But Thomas Polger and Laurence Shapiro have become the leading voices of a counter-revolution, and their jointly authored The Multiple Realization Book (2016) stands as an impressive manifesto for that movement. Indeed, their book represents the best of what philosophy should be – a deep questioning, with considered argument, about what was once thought to be a largely settled matter**.** This is not to say that Polger and Shapiro provide an absolutely convincing case for their counter-revolution. But it is a serious case that no philosopher of mind should ignore.

The book draws together and develops Polger and Shapiro's previous work into a comprehensive position that can be defined by two related theses: one, there is much less multiple realization for mental states than philosophers have supposed (p.32); and two, the best model of psychology and neuroscience makes substantial use of property identities that run contrary to multiple realization (pp.34-5). Call this combination of claims: "the minimal multiple realization thesis." The authors defend this thesis on the basis of a specific understanding of multiple realization along with a critical examination of assorted types of evidence that philosophers have cited in support of multiple realization. I will discuss the main details shortly. But, beginning with a broad view, Polger and Shapiro's book divides into three

parts. Part 1 sets the stage with the appropriate history of the subject, and it supplies all the important conceptual work that is utilized throughout the book. Part 2 then turns to the evidence for multiple realization, critically evaluating not only the early Putnam and Fodor arguments in favor of multiple realization, but also more recently discussed evidence from both neuroscientific and computational theories. Part 3 then concludes with a summary discussion regarding how nonreductive functionalist views measure against the proffered identity theory, whether the author's version of the latter counts as an eliminativist position, and in what sense psychology and other special sciences remain autonomous.

To highlight the important details, Polger and Shapiro view realization in terms of a generic functionalist theory (p.22), and they provide an "Official Recipe" for multiple realization as follows, where As and Bs are distinct physical realizers, and where S1 is a functional taxonomy and S2 is a more basic taxonomy:

> (i) As and Bs are of the same kind in model or taxonomic system S1.
> (ii) As and Bs are of different kinds in model or taxonomic system S2.
> (iii) The factors that lead to the As and Bs to be differently classified by S2 must be among those that lead them to be commonly classified by S1.
> (iv) The relevant S2 variation between As and Bs must be distinct from the S1 intra-kind variation between As and Bs (p.67).

Conditions (i) and (ii) express the basic idea regarding same function but different physical realization. Condition (iii) then makes the latter more precise by introducing the notion of *relevant differences*, meaning that a prospective A and B are not just different but "different in ways that are relevant to performing the same function" (p.67). And condition (iv) then adds the idea that the pertinent differences are *not mere differences in the same physical kind* (p.68), for example, a mere difference in the size of wings, smaller and larger, that fly by the same kind of mechanical principles, or a mere difference in the speed of two watches, slow and fast, that tell time by the same kind of mechanism (pp.69-71).

Polger and Shapiro's interpretation of the above Recipe also gives some measure of support for their minimal multiple realization thesis. Thus, mere physical differences are not sufficient to support a claim about multiple realization. For example, two watches that are made from different materials – one made of steel and another made of titanium – do not count as a case of multiple realization for *being a watch* if they otherwise work by same mechanistic principles, at least on some general level of analysis for the parts of the mechanism and what function they perform (the litmus test for multiple realization is whether a different mechanistic explanation applies, p.64). Likewise, contrary to what many philosophers have supposed, two "brains" that work by the same mechanistic principles – one made of neurons and another made of computer chips – would not count as a case of multiple realization, at least not by the author's interpretation of the Official Recipe (cf. their discussion of Ned Block's hypothetical little spaceships that function as atoms, p. 78).

Polger and Shapiro also pay close attention to the wide array of evidence that philosophers have cited in support multiple realization, from Hilary Putnam's example of vertebrate versus cephalopod eyes (pp.42-45, 63) to data about neural plasticity (90-98) to considerations from comparative physiology (pp.11-120) to arguments based upon computational theories (pp.150-167). For example, Polger and Shapiro point out that both mammals and the octopus have camera eyes that work by the same mechanisms. Hence there is no multiple realization of *camera eye* by the Official Recipe. They also present data to show, for a famous case of neural plasticity, that rewired ferret brains fail to function in exactly the same way (it is not the same function), and that the rewired auditory cortexes become organized with columns of orientation-sensitive cells much like the normal visual cortex in a ferret brain (it is not a different mechanism). Hence there is no multiple realization of *ferret visual system* by the Official Recipe.

Finally, although the book is filled with novel insights, Polger and Shapiro also utilize reductive tools developed by others, such as the postulation of more narrow kinds that are better suited for identity, and the treatment of identity as a heuristic to guide neurophysical research. The authors provide a helpful summary

of the entire tool-kit for defending their minimal multiple realization thesis (pp.178-193). Yet, in spite of the impressive effort, I suspect that supporters of the original nonreductive position will not be convinced, and not just because of cognitive biases such as belief entrenchment that unfortunately affect human judgment. But this small review is not the place to develop a detailed response to the many points that Polger and Shapiro have raised. So I will just mention one issue.

To wit, one might be puzzled by the fact that Polger and Shapiro do not advance a number of specific mind-brain identity claims, as one would expect from a minimal multiple realization thesis according to which psychology and neuroscience allegedly make "substantial" use of identity claims (p.34), or that property identities are "closer to the rule than the exception" (p.177). [1] So one does not find anything like past identity claims, for example, specific claims that sharp pains are identical to the activation of delta fibers, or that visual consciousness is identical with reverberations of pyramidal cells that connect lower layers of the visual cortex to the thalamus, or that memory consolidation is identical to a specific type of molecular cascade involved in a neural system's long-term potentiation. Granted, the authors offer a generic model of "anchored" mind-brain identities within a framework that is akin to abstract models of the multiple levels discussed in recent work on mechanistic explanation (see the model at p.218; cf. Craver 2007, p.189). But Polger and Shapiro either leave the anchoring identities empty, which might appear unsatisfying, or, what is more often the case, they allude in a very general way to the kinds of parts and properties highlighted in mechanistic explanations, which might also appear unsatisfying if, as nonreductivists argue, mechanistic explanations are fully compatible with *alternate* mechanistic explanations and hence alternate realizations.

Still, Polger and Shapiro cannot be faulted for clarifying the concept of multiple realization and challenging what they deem to be unjustified inferences based upon scientific data even if they advance no specific empirical identities. One

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[1] Eric Funkhouser made this observation during a conversation we had at the 2017 Pacific Division Meeting of the American Philosophical Association.

should not confuse the duties of philosophy – even the philosophy of science – with the duties of science itself. Moreover, the nonreductive functionalist is likewise obligated to offer many specific cases of multiple realization, which, in light of Polger and Shapiro's comprehensive critique, must now be defended against the kind of strategies that paint a more minimal picture of multiple realization in the world.

References

Craver, C. 2007. *Explaining the brain: Mechanisms and the mosaic unity of neuroscience*. UK: Oxford University Press.