

## Understanding the Dimensions of Realization\*

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21 September 2007

3488words

### I.

Carl Gillett has defended what he calls the “dimensioned” view of the realization relation, which he contrasts with the traditional “flat” view of realization (2003, 2007; see also Gillett 2002). Intuitively, the dimensioned approach characterizes realization in terms of composition whereas the flat approach views realization in terms of occupiers of functional roles. Elsewhere we have argued that the general view of realization and multiple realization that Gillett advances is not able to discharge the theoretical duties of those relations (Shapiro 2004, unpublished manuscript; Polger 2004, 2007, forthcoming). Here we focus on an internal objection to Gillett’s account and then raise some broader reasons to reject it.

According to Gillett, realization is a relation between property instances that obtains in virtue of the causal powers that the realizing property instances contribute to the individual that instantiates the realized properties. Specifically:

Property/relation instance(s)  $F_1$ - $F_n$  realize an instance of a property  $G$ , in an individual  $s$ , *if and only if*  $s$  has powers that are individuating of an instance of  $G$

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\* The position of the authors’ names reflects only their fondness for alphabetical ordering.

in virtue of the powers contributed by F1-Fn to *s* or *s*'s constituent(s), but not vice versa. (2002: 322; also 2003: 594 and 2007: 202)

But from this account of realization and a common assumption that Gillett himself endorses we can produce a *reductio ad absurdum*.

We will first state the argument and then examine its premises:

- (P1) Everything that is realized is a property instance, and at least one property instance is realized. (Gillett's account)
- (P2) Some things that are realized are multiply realized. (assumption)
- (P3) No property instances are multiply realized. (trivial)
- (C1) Some property instances are multiply realized. (from P1 and P2)
- (C2) Not (P1). (*reductio* from P3 and C1)

The argument is plainly valid, so the only question is about its soundness.

On Gillett's account, realization is defined as a relation between property instances. It follows that only property instances can be realized on his view. Premise (P1) says more than what is said by Gillett's definition of realization alone, for it also asserts that some property instances are in fact realized. But because Gillett argues extensively that many special sciences traffic heavily in realized property instances, and as his account of realization would be of little interest unless it applied to some things, attribution of (P1) to him is fair (Gillett 2002, 2003, 2007).

Premise (P2) is a widely shared assumption. One of the chief philosophical interests in the realization relation is precisely that it offers an account of how some entities can be multiply realized (Putnam 1967; Block and Fodor 1972; Fodor 1974; Putnam 1974; Shapiro 2000, 2004; Polger 2004, 2007; Gillett 2002, 2003). Although there is some dispute as to the exact relation between realization and multiple realization,

(P2) makes the fairly weak claim that some things that are realized are also multiply realized. If nothing that is realized were multiply realized, then it would be unclear why realization and multiple realization should be associated.

Premise (P3) says that property instances are not multiply realized. This seems self-evident. Instances are not repeatable. If something is not repeatable, then it is not repeatable in different ways. So property instances are simply not the right sorts of things to be multiply realized.<sup>1</sup> But (C1) follows immediately from (P1) and (P2). Thus, assuming (P3), Gillett's account of realization leads to contradiction.

## II.

We have argued that the idea that property instances can be realized leads to a contradiction. So how does Gillett find himself attracted to the view? Gillett's account, as we noted earlier, is designed to contrast with the traditional "flat" account of realization. Gillett locates examples of the flat view of realization in the work of Jaegwon Kim and Sydney Shoemaker. According to Gillett (Gillett 2002: 317-318), "flatties" are committed to the following:

- (I) A property instance X realizes a property instance Y *only if* X and Y are instantiated in the same individual.
- (II) A property instance X realizes a property instance Y *only if* the causal powers individuated of the instance of X match causal powers

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<sup>1</sup> One might consider the possibility of intra-individual multiple realization, such as variations in the realizers of a particular pain throughout its duration (see, e.g., Horgan 1993). Perhaps in this sense instances could be multiply realized. But an account of multiple realization that covers only such cases, and not the more familiar inter-individual cases would be incomplete at best. Gillett clearly intends to accommodate inter-individual multiple realization, and this is what we say is nonsensical if the realized entities are property instances.

contributed by the instance of X (and where X may contribute powers not individuated of Y).

We believe that conditions (I) and (II) are not in fact principles to which Kim and Shoemaker subscribe. That should be welcome news given our argument that a contradiction follows from the view that realization is a relation among property instances.<sup>2</sup>

Here are the passages on which Gillett relies: From Kim and in support of (I) above, Gillett quotes: “It is evident that a *second-order property and its realizers are at the same level... they are properties of the very same objects*” (Kim 1998: 82. Kim’s emphasis). And, from Shoemaker in support of (II) above: “property X realizes property Y just in case the conditional powers bestowed by Y are a subset of the conditional powers bestowed by X” (Shoemaker 2001: 78).

Neither Kim’s remarks nor Shoemaker’s clearly commit them to (I) and (II). Both (I) and (II) describe a relationship between property *instances*. In contrast, Kim’s claim about the relation of realization is at least ambiguous. He seems to affirm that it is a property and not a property instance that is realized. Admittedly he refers to both the realized and realizing properties as belonging to the same individual, which is suggestive of reference to property instances. Even so, Kim’s remarks do not require, as (I) asserts, that it is a property instance that is realized. Consistent with Kim’s passage is the possibility that the property *pain* is realized by a physical state of kind P, which is to say that a thing that instantiates *pain* also instantiates physical property P. In that case

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<sup>2</sup> Here an admission and clarification is due. Much work on realization—including some of our own previous writings about Gillett’s approach—has been either deliberately non-committal or incautious about whether it is properties, property instances, or whatnot that are the realizing and realized entities. These should be seen as attempts to be neutral or even conciliatory while pursuing more general theses about the nature of realization.

realization remains a relationship between properties rather than property instances—a relation between P and *pain*. Shoemaker leaves no room for doubt: he is explicit that he takes realization to be a relation between properties.<sup>3</sup> On our view, realization cannot easily be a relation between properties but, as we argued in the previous section, it definitely cannot be a relation between property instances.<sup>4</sup>

What is wrong with conceiving of realization as a relation between properties? Consider the familiar example of the realization of a sensation such as a pain by a brain process. One point of appealing to realization, at least as we inherit the notion from Putnam, Lewis, and Fodor, is to explain how functionally individuated kinds like Turing machine states, economic exchanges, and mental events can be physically acceptable despite their absence from the ontologies of the physical sciences. The idea was to show that there is a legitimate way of carving nature at joints other than or in addition to those carved by physics and chemistry. Realization is the special relation by which physical objects like brains can have “non-physical” states, processes, or properties – perhaps those that are computational or mental. Physical objects can be instances of “non-physical” kinds if being so is a matter of what physical objects can do rather than what they are made of. Such “functional” kinds are not “non-physical” in a way that requires the introduction of any new psychical substance.

Of course to explain the realization relation we will need to talk about the properties of brains and the properties of, say, pains. After all, the properties of brains

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<sup>3</sup> In his most recent work, Shoemaker sometimes talks about the realization of property instances, but this appears to be a way of talking about the instantiation of realized properties (e.g., 2007: 12). Unlike Gillett, Shoemaker leaves it open that entities other than properties and property instances can be realized. If Shoemaker insists that property instances are among the things that can be realized, then our critique applies to his view as well.

<sup>4</sup> The cautionary “easily” is necessary simply because our arguments assume standard views of properties. We concede that it might be possible to develop a theory of properties that can make sense of realization in terms of properties.

help explain what brains can do. But that does not entail that realization is a relation between properties themselves. A realizer of a property, state, or process P is a physical token that meets the criteria that serve to identify instances of P, that does the P functions. Properties don't "do" anything, in this sense. So the realization relation cannot have properties as both of its relata. Realizers of properties should be *real*—they should be concrete physical tokens.

There is a way in which talking about a physical entity *realizing a property* can be misleading, and this may create ontological confusion. The claim that an object C realizes *pain* might mean at least two things:

- (1) C has the features that are distinctive of the property *pain*.
- (2) The property *pain* is made of C.

We urge that (1), although not intended as a formal analysis of realization, is the correct way to understand talk about the realization of properties.

Option (2) is a mistake, for if *pain* is a property then it cannot be "made of" some physical object. This is perhaps what leads some theorists to think that realizers must themselves be properties or property instances. But this, as we have said, is a mistake. When one wonders how, if at all, a property P may be realized, one is certainly not wondering what properties are made of. One may just as well ask what numbers are made of. The answer might tell us about properties, but it won't tell us about realization. Rather, to ask about the realization of a property is to ask whether there are any physical tokens that exhibit the characteristics that are individuating of the kind of property, state, or process of interest, *pain* for example.

In terms of ontological categories, the property of having some other property or properties is a “second order” or “functional” property. Accordingly, when we said above that the point of realization is to understand how functional properties can be real, we should be taken to mean that the point of realization is to understand whether anything physical can play the role that characterizes a given functional property. Properties themselves do not play roles. When functional properties are realized it is because there are things that occupy the roles that their functional profiles characterize.

It seems that Gillett has misunderstood the flat view when he says that its proponents see realization as a relation between property instances. In fact, flatties have typically described realization as a relation between properties. This, we have argued, is nevertheless a mistake. But it is not a claim that is central to the accounts of Kim or Shoemaker. Rather, we think the essence of the flat approach is that it takes realization to be an intra-level relation—namely, the relation of occupying or playing a functional role. When thought of in terms of the realization of properties, this entails that realized and realizer properties must be instantiated in the same individual. That claim is Gillett’s (I), without the supposition that realization itself is a relation between property instances. This is an improvement of sorts. But we have now explained why we do not favor an account of properties as the realizing entities.

### III.

Gillett claims that the dimensioned analysis of realization is superior to the flat analysis because it is only the former that “covers all the cases of realization illuminated by the

sciences” (Gillett 2003: 603). In support of this dramatic claim, Gillett cites his discussion of a diamond’s hardness, saying that flatties

must deny that the alignment and bonding of particular carbon atoms realizes the hardness of the diamond. For neither (I) nor (II) is true in this case, since the properties/relations of the carbon atoms are instantiated in different individuals, and contribute distinct causal powers, from the properties of the diamond. The Flat view thus fails to cover a case of realization and it also erroneously classes the vast swathe of cases drawn from the sciences similar to this one. (2002: 319-320)

Among those cases included in this “vast swathe” are, according to Gillett (2007), many from the chemical and biological sciences, including neuroscience and genetics.

From our perspective, claims like that above for the superiority of the dimensioned analysis are doubly problematic. First, Gillett clearly begs the question against the flat view in the passage above. Of course the flat view fails to identify the properties of carbon atoms and their relations as the realizers of hardness because, according to the flat view, instances of these properties and relations are not even candidates to be realizers of hardness. Because the properties and relations of carbon atoms do not themselves have the causal powers that are individuating of *hard*, they cannot (from the flat perspective) be realizers of hardness.

But, secondly, as Gillett seems to recognize in his molecular case studies, the dimensioned account of realization amounts to no more than an analysis of the property-relating relation that parallels the object-relating relation of mereological composition (2007). According to Gillett, if objects O1-On compose an object M, then properties F1-



Fn of O1-On realize property H of M.<sup>5</sup> Repeatedly he illustrates something that we take to be completely familiar: that the property instances of wholes are non-causally determined by the property instances of their parts. For example, Gillett explains that the instantiation of hardness of a diamond is determined by the instances of properties of the atoms that compose the diamond, and that the spatial memory of a rat is determined by the instances of properties of certain molecules in the rat's brain. He stipulates that this variety of non-causal determination among property instances is "realization."

This account raises two questions. First, why should we accept Gillett's semantic reformation? As we urged earlier, realization was initially introduced as a tool for understanding how functional properties can be instantiated in a physical world. It was not intended to provide an explanation for how composite objects come to instantiate the properties that enable them to be realizers. And second, scientists and philosophers have long known that the properties of big things are a function of the properties of small things. Thus, it is no surprise that philosophers and scientists have availed themselves of concepts like composition, constitution, non-causal determination, and mereological supervenience in order to capture the relationships between wholes and parts. What does Gillett's dimensioned realization add to this collection of relations? Gillett is in the peculiar position of trying to recruit a label with an already established meaning in order to describe various other relations with their own entrenched labels. One is tempted by Alice's famous response to Humpty Dumpty: "'The question is,' Alice said, 'whether you *can* make words mean so many different things.'" (1899: 123).

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<sup>5</sup> Gillett (2007) is clear that he intends realization to be among a family of interdefined compositional relations. He also defines the relation of *comprising* for the powers he takes to be individuating of properties, and the relation *implementing* for the processes at the level of O-entities and the level of M-entities.

More worrisome than these terminological issues, Gillett's dimensioned "realization" relation obscures a useful distinction. As we note, it is uncontroversial that characteristics of big things are frequently dependent on and determined by the characteristics of the little things of which they are made. Just how the little things manage to do this is a matter of great interest for philosophers and scientists alike, and there is no *a priori* reason to suppose that there is only one way. The relationships that mere aggregates have to their components may differ from the relationship that organized wholes have to theirs. Compare how grains of sand contribute to the properties of a pile to how a single gas molecule's kinetic energy contributes to the temperature of a volume of gas to how carbon atoms contribute to the properties of a diamond. And these may differ still from the ways that the constituents of functional entities determine the properties of a mechanism, such as the contributions of a lever and screw to a corkscrew. Gillett's dimensioned account lumps these together and calls them all "realization," and we think this is a mistake.

Notice that Gillett's formulation of realization asserts that the entity in which an instance of property G is realized has the powers individuating G "in virtue of" the properties that it or its constituents have. But this runs together all the different ways—all the different dependence and determination relations—by which the properties of parts may contribute to the property of a whole. Insofar as dimensioned realization gives the appearance of explaining something related to what the "flatties" are trying to explain, it seems to us that other kinds of dependence relations—relations already handy in any metaphysician's toolkit—are in fact doing all the explanatory work. Worse, Gillett replaces these relations with one that is explanatorily empty: to say that the

properties of the atoms of the diamond “realize” the properties of the diamond is for Gillett just to reiterate that the latter depend on the former—that they are instantiated “in virtue of” the former. This is a classic example of *virtus dormitiva* explanation: the properties of the atoms determine the properties of the diamond because the diamond has its properties in virtue of the properties of the atoms. In contrast, our account of realization aims to add to the metaphysicians toolkit: some properties of wholes are composed, some constituted, some realized, and so on. According to us, property, state, or process P is realized when something plays the functional role characteristic of P. Of course each of these dependence relations requires further examination. We, for example, owe an account of functional roles and role playing.<sup>6</sup> But it’s no good to explicate such relations by asserting that they are dependence relations between entities of certain classes—objects, properties, or whatnot. For that is simply to describe the phenomenon that we want to understand.

It may be tempting at this point to say that we and Gillett are simply talking about different relations. The “flat” and “dimensioned” approaches are accounts of two different kinds of realization, one could say. This response has recently attracted some adherents (Wilson and Craver 2007; Shoemaker 2007; Endicott unpublished). But we think this is a mistake akin to allowing that China’s “democracy” is just a different kind of democracy than we have in the West. Gillett says that an account of realization is needed, and we agree. He offers an account. According to us, Gillett is wrong. To respond that he’s simply talking about a different relation than we are is to sugarcoat the serious problems we have identified with his conception of realization. We see no good reason to say that he’s right about something called “realization” if he’s wrong about realization.

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<sup>6</sup> Polger (2004) begins to make good on this debt, for various notions of function and role.

#### IV.

Gillett's dimensioned analysis of realization confronts the following challenges. First, the account is incoherent insofar as it makes multiple realization impossible by holding that property instances are realized. Second, it cannot be a better account of realization than the flat view because it is designed to answer a different question. Third, the question it is designed to answer is one for which scientists and philosophers are already well-equipped. Fourth, the answer he gives is unilluminating.

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