

A note on the completeness of 'physics'

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1. One argument for physicalism states that all physical effects are due to physical causes, and hence that anything having physical effects must itself be physical. Let us call this now familiar style of argument the 'causal argument' for physicalism, and its crucial premiss, that all physical effects are due to physical causes, the 'completeness of physics' (cf. Crane 1995).

But how are we to understand 'physics' in this context? If we tie the meaning of 'physics' to any specific details of present physical theory then it seems unlikely that physics is complete. A short glance at the history of science reveals that proposed lists of fundamental forces and basic entities usually turn out to be wrong. So advocates of the causal argument need to abstract away from current physical theory. But then it seems that they need to say something more about the shape of ideal or future physics, lest their thesis of the completeness of physics lose all substantial content.

This note aims to show that this demand for clairvoyance is misplaced. Users of the causal argument do not need any detailed assumptions about ideal or future physics. All they need is some way of understanding 'physics' which makes it plausible that physics so understood is complete.

We shall make the point by showing that there is more than one way of so understanding 'physics'. In particular, we shall identify two plausible completeness theses. Each such thesis can be plugged into the causal argument, and each then generates its own version of 'physicalism'. Which completeness thesis you ought to be interested in thus depends on the purpose to which you want to put the causal argument.

You should be interested in our first completeness thesis if you want to investigate the relationship between the mental and the non-mental. The relevant completeness thesis is then the claim that the non-mental is complete. If you plug this thesis into the causal argument, it then generates the conclusion that the mental must be identical with the non-mental.

Alternatively, you may be interested in the relationship between manifest qualitative phenomena, like colours and sounds and smells, and the underlying quantitative features of the material world, like size and shape and motion. If so, the relevant completeness thesis is that the quantitative is complete. With this premiss, the causal argument then generates the conclusion that the non-quantitative must be identical with the quantitative.

In effect our aim here is to shift attention away from debates about the meaning of the word 'physics' (cf. Crane, 1991, Papineau, 1991). Tangles

about terminology should not obscure the fact that the causal scheme of argument has various sound uses.

Perhaps this point is best made without using the term 'physics' at all. Consider the following argument schema:

All *X* effects are due to *X* causes. So anything having *X* effects must itself be *X*.

We can now ask whether there are any instantiations of *X* which make the premiss of this argument true. Our suggestion is that there are at least two: that *X* is non-mental, and that *X* is quantitative.

This paper has a limited aim: we are concerned solely with the availability of completeness premisses for the causal argument. Our issue is whether there are ways of filling in *X* which make it true that 'all *X* effects are due to *X* causes'. Other queries that can be raised about the causal argument (Crane, 1995, Papineau, forthcoming) are beyond the scope of this paper.

2. In the course of arguing for physicalism about the mental, Papineau (1993) proposes that the causal argument is best developed by tying the meaning of 'physics' to whatever properties are in fact needed to account for such 'paradigmatic physical effects' as movements of matter. In response to the counter that this open-ended approach makes 'physics' complete by definition, Papineau points out that it would not be a matter of definition that this complete 'physics' excludes the mental. And he observes further that, as long as this complete 'physics' does exclude the mental, then the causal argument can still be used to show that mental causes must be identical with non-mental causes.

This can all be much simplified, in line with the above argument schema. The substantial issue is the completeness of the non-mental: if we list all the essential causes of non-mental effects, including the movements of matter, do we ever have to leave the realm of the non-mental? If not, then 'non-mental' can feature as *X* in our schema, and we have an argument that mental causes must be identical with non-mental ones.

It seems highly plausible that the non-mental is in fact complete in just this way. To deny this is to suppose that some non-mental effects are due to irreducibly mental causes, in the sense that they cannot be fully accounted for in terms of non-mental causes. Leibniz accused Descartes of believing something like this, in holding that irreducibly mental acts could alter the direction (but not the speed) of moving material particles in the brain (cf. Woolhouse 1985). And eighteenth-century Newtonian physiologists, like Albrecht von Haller and Robert Whytt, upheld something similar, in postulating irreducible 'forces of sensibility'.

There is nothing incoherent or absurd in these views. But we take it that

the empirical evidence, especially in the form of nineteenth- and twentieth-century physiological research, now weighs strongly against any such irreducible mental causes.

3. So the completeness of the non-mental argues for the identity of the mental with the non-mental. A natural response to this, however, is to say that this has little to do with any identity between the mental and the physical. The non-mental would be complete even if it made essential appeal to colours, say, or bodily humours, or even astral influences, to account for certain non-mental effects.

This, though, would scarcely be a vindication of the scientific programme instituted by Galileo, Descartes and Newton. Their vision was of a science that deals only in measurable quantities like size, shape, and motion, and which denies any fundamental efficacy to any purely qualitative aspects of the world.

This point is well-taken, but it is not an objection to the use to which the causal argument was put in the last section. One issue is whether the mental is identical with the non-mental. Another is whether the non-quantitative is identical with the quantitative. Provided we don't muddle them up, it doesn't matter which we count as the issue of whether everything is really 'physical'. No doubt the identity of the non-quantitative with the quantitative aspects of the world is closer to what most people understand by 'physicalism'. But this is unimportant, by comparison with the substantial issue of whether the non-quantitative really is identical with the quantitative.

To make this clear, let us suppose we fix on some sensible characterization of the kind of quantitative causes to which the Galileo-Descartes-Newton programme is committed. Then we can address the issue of the completeness of the quantitative. If we list all the essential causes of quantitative effects, will we ever have to leave the realm of the quantitative? If not, then the quantitative is complete. So it can feature as X in our schema, and we have an argument that non-quantitative causes must be identical with quantitative ones.

(It is a nice question how 'quantitative' should be characterized in this context. We know that Descartes' austere restriction to size, shape and motion alone does not yield a 'quantitative' realm which is causally complete. We need extra forces. To maintain that these extra forces are all 'quantitative' presumably implies something along the lines of mathematically simple force laws which compose to explain complex phenomena. Obviously more could be said about this. Let us content ourselves by noting that, as before, we are not concerned here with the terminological issue of what 'physics' means, but with the substantial question of which

categories of phenomena are in fact complete. Any understanding of ‘quantitative’ which makes the completeness of the quantitative both plausible and contentful will generate a significant identity thesis.)

4. The last section argued that there is no incompatibility between the use of causal schema to establish the identity of the mental with the non-mental and its use to establish the identity of the non-quantitative with the quantitative. If the non-mental and the quantitative are both complete, then both completeness theses can be plugged in to the causal schema.

We believe that both these completeness theses are in fact true. Even so, a good way to emphasize the point of this paper is to make it clear that they are quite independent. There are possible worlds in which one completeness premiss is true but the other false.

Imagine, for example, a world in which vital (but not mental) forces affect the movements of matter, yet where these vital forces are not amenable to quantitative treatment (there is no mathematically tractable force law governing their operation). In this world the non-mental would still be complete, and the mental therefore identical with the non-mental. Even so, the quantifiable would not be complete, and the non-quantifiable would therefore not be identical with the quantifiable (in particular, vital forces would not be identical with any quantifiable phenomena).

The converse possibility is also perfectly intelligible.

Imagine a world where there are sui generis mental forces (bits of matter accelerate in otherwise inexplicable ways in the brain), but suppose also that these forces are quite routinely quantifiable (that they obey some inverse square law involving the masses of a certain type of neurotransmitter, say). Now the quantifiable would be complete, and hence the non-quantifiable identical with the quantifiable, but the non-mental would not be complete, so the mental would not be identical with the non-mental (in particular, the sui generis mental forces would not be identical with anything non-mental).

In both cases, the question regarding the completeness premiss is empirical. In both cases, given the appropriate premiss, a perfectly reasonable deployment of the causal argument becomes possible.

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