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IS PLATONISM A BAD BET?

Mark Colyvan

In a recent paper in this journal [2] Colin Cheyne and Charles Pigden provide a very interesting challenge for mathematical Platonism.[1] The challenge is directed primarily at those Platonists who rely on the Quine/Putnam indispensability argument. Such Platonists believe the indispensability of mathematics to our best scientific theories gives us good reason to suppose that mathematical entities exist.[2] The Cheyne/Pigden challenge is simply to give an account of how causally inert mathematical entities could be indispensable to science. Failing to meet this challenge, claim Cheyne and Pigden, would place Platonism in a no win situation: either Hartry Field's nominalisation of science[3] is successful, in which case mathematical entities are dispensable to science, or Field's program fails, in which case mathematical entities may indeed be taken to be indispensable to science, but the best explanation for their indispensability is that they are not causally inert as the Platonist assumes. Either way Platonism loses. In what follows I will argue that Platonism is well equipped to meet this challenge—it is not the bad bet Cheyne and Pigden suggest.

Since there is little disagreement that the indispensability argument is without any force if Field's program of nominalising science is successful,[4] we need only consider what follows from the failure of Field's program. Let's suppose, then, that Field's program has failed and that this gives us good reason to believe mathematical entities to be indispensable to our best scientific theories. Cheyne and Pigden are unsatisfied with what you might think of as 'brute fact' indispensability—the view that we ought to believe in any entity which is indispensable to science, and there is no more to be said about it. They would like some account of why it is that mathematical entities are indispensable to science.[5] This much of their challenge seems quite reasonable, but they wish to push the point further.

[1] In fact their challenge is directed at what they call 'standard Platonism'. This is the view that mathematical objects have mind independent existence and that such objects have neither causal powers nor spatio-temporal location. It is to be contrasted with other versions of mathematical realism in which mathematical entities *are* located in space-time *and/or* have causal powers. (For instance, Penelope Maddy once defended such a 'non-standard' position [8].) In this paper I will be considering only standard Platonism, since this was the target of the Cheyne/Pigden challenge. I will simply call it 'Platonism'. (It might be argued that standard Platonism also includes the contention that mathematical entities exist *necessarily*. While this contention may well be part of the orthodox Platonist's view, in the context of the indispensability argument, which is the context of both Cheyne's and Pigden's paper and the present discussion, the view that mathematical entities exist necessarily is *not* orthodox. In any case, Cheyne and Pigden do not include this in their 'standard Platonism' and I follow their usage here.)

[2] See [10] and [11] for further details.

[3] See [5] for details.

[4] Of course there is substantial disagreement over the prospects for the successful completion of Field's program and even over how much Field has shown so far. For example, see [9].

[5] See also [1] and [7, pp. 104–105] for similar worries.

> Why should theories which quantify over certain objects do better than theories which do not? One explanation is ready to hand. If we are genuinely unable to leave those objects out of our best theory of what the world is like [. . .], then they must be responsible in some way for the world's being the way it is. In other words, their indispensability is explained by the fact that they are causally affecting the world, however indirectly. The indispensability argument may yet be compelling, but it would seem to be a compelling argument for the existence of entities *with* causal powers. [2, p. 641]

It is also clear that Cheyne and Pigden think this is not just 'one explanation ready to hand' but the only plausible explanation.

I find the above passage puzzling for two reasons. Firstly, the indispensability of a certain entity to some theory means no more than the entity in question plays an important explanatory role in the relevant theory. If you also believe that all explanation is causal explanation (or at least all explanation *of events* is causal explanation) then it looks as though the entity in question is indeed causally active. But why believe it otherwise? At the very least it seems Cheyne and Pigden have left out a crucial (and controversial) premise from their argument from indispensability to causal activity.[6] On the other hand, if they do not believe that all explanation is causal then their argument has little force.

The second difficulty I find with Cheyne's and Pigden's argument comes from their failure to say anything about what they take causation to be. This might appear to be a harsh criticism, since a discussion of causation is a large task which surely seems somewhat tangential to the main purpose of their paper. This may be, but their tentative conclusion that the indispensability argument is an argument for causally active mathematical entities seems to revolve around a fairly undiscriminating notion of causation. With a more discriminating notion these same mathematical entities may be causally inert as the Platonist claims. It looks as though Cheyne and Pigden obtain their desired conclusion by taking a rather idiosyncratic notion of causation.

Let me elaborate. The point Cheyne and Pigden are making is that the world would be different if there were no mathematical entities, therefore mathematical entities are, in some sense at least, partially a cause of the way the world is. This is clearly some form of counterfactual theory of causation. In a later passage, when discussing how Sherlock Holmes might deduce that Moriarty is the murderer from the fact that there were three cigarettes in the ashtray, they give another clue as to what this notion of causation is.

> If the number two or the number four were in [three's] place, the effects would differ. What more is needed for it to qualify as an object with causal powers? [2, p. 642]

I take it that the 'effects' referred to in this quote are not necessarily the effects of the presence of the number three, otherwise the argument appears circular, since whether the number three has causal power is precisely what is at issue here. Instead, I take it that

[6] See [12] and [3] for some arguments as to why at least some explanations are not causal. For example, in [12] Smart presents the case of explaining time dilation in special relativity by appeal to the geometry of Minkowski space-time (which is, of course, a non-causal explanation).

they mean (something like) the future light cones of the world would be different had a different number of cigarettes been present in the ashtray.

Does it now follow that the number three is an object with causal powers? If not, then their argument simply doesn't work, but if it does then we see how undiscriminating their notion of causation is. It implies, for instance, that the angle sum of a triangle *causes* bodies to be accelerated, since if the angle sum of a triangle is π radians, the space is (locally) Euclidean and so massive bodies experience no net force, if the angle sum is not π radians the space would be non-Euclidean and hence any massive body would be experiencing a net force. Thus, if there were a change in the angle sum of a triangle, the future light cone of the world would be different, in that it would contain an accelerated body.

If Cheyne and Pigden take causation to be simple counterfactual dependence, as it seems they do, their conclusion that the indispensability argument gives us good reason to believe in causally active mathematical entities is not nearly as startling as it first seems. Mathematical entities might be causally active, but we are not talking about any common sense of 'causally active' here. (After all we are *not* inclined to think that angle sums of triangles can cause bodies to be accelerated.) Furthermore, this simple counterfactual dependence theory of causation does not agree with current theories of causation where, for instance, exchanges of energy and/or momentum are involved in causal processes.[7] Perhaps their conclusion that mathematical entities are causally active could be less misleadingly stated as 'mathematical entities make a difference'. Platonists will have no disagreement with this!

Although the argument from indispensability to causal activity does not go through, the original Cheyne/Pigden challenge still stands. How could causally inert entities play an indispensable role in our best scientific theories? This question is answered by looking at the role such entities play in the relevant theories. The case is no different to that of other theoretical entities.

We do not conclude that electrons are causally active simply *because* they play an indispensable role in our theories of fundamental particles, we conclude that they are causally active *because of the role* they play in those theories. So too with mathematical entities. We must look at the role they play in our scientific theories. This role is, at least *prima facie*, not causal. What role do they play then? One fairly plausible possibility considered by Cheyne and Pigden is that 'they provide a sort of metaphysical framework' for physics [2, p. 643].

I agree with Cheyne and Pigden that much work needs to be done on this 'framework' theory if it is to be anything more than a metaphor. This, however, is not why Cheyne and Pigden reject the view. They reject the view that mathematical entities are required as a framework to our best scientific theories because they mistakenly believe that it would have to be a framework 'for any possible physics' [2, p. 643]. They believe that Hartry Field's (partial) nominalisation of Newtonian physics shows that mathematical entities are not indispensable to *all* possible physics.

> The new problem that the platonists face is this: how can a set of necessary beings help explain a contingent set of facts (namely, the facts accounted for by Einsteinian

[7] For example, see [4].

> physics), when they would not be needed if the facts were otherwise (i.e., such as to confirm Newtonian physics)? [2, p. 643]

Clearly their point is very telling on any Platonist that holds the 'necessary framework' view, but it completely misses the target of the Quinean indispensabilist who denies that mathematical entities are necessary. As I've mentioned previously (cf. footnote 1) in the context of indispensability theory (which is the context of Cheyne's and Pigden's paper) it is the latter position that is orthodox, since the indispensability argument firmly places mathematical entities on a par with other theoretical entities.[8] A Quinean indispensabilist would *not* claim that mathematical entities are necessary entities or even necessary for any possible physics. He or she could well concede that were we to live in a Newtonian world we would have no reason to believe in mathematical entities,[9] but we don't live in such a world! In this, the actual, world we do need mathematical entities to do our physics (or so we are assuming for the purposes of this paper) and so we cannot dismiss the role mathematical entities play in the actual world because they play no such role in some other possible world. The Quinean indispensabilist believes in contingent mathematical entities because of the role they play in *this* world.[10]

In closing, I should make it quite clear that I have said nothing in this paper with regard to directly answering the Cheyne/Pigden challenge to explain why acausal mathematical entities are indispensable to our best scientific theories. I have been content to clarify what the challenge involves and to point out that the prospects for a Platonist reply are not as bad as Cheyne and Pigden indicate. Indeed, giving a satisfactory reply to their challenge is too large a task to take up here. I have, however, managed to cast doubt on their claim that the best explanation for the indispensability of mathematical entities to science is that those entities do, in fact, have causal powers. This claim, I have argued, is unsupported unless Cheyne and Pigden add some premise to their argument, such as that all explanation is causal. At the very least such a controversial additional premise would require some justification. In any case, given the simple counterfactual model of causation they seem to endorse, it looks as though causally active mathematical entities are the least of the unintuitive consequences. I also reject their assessment of the prospects of Platonists meeting their challenge by way of the 'framework' role of mathematics. On the contrary, I think that once Cheyne's and Pigden's confusion over the modal status of the framework is cleared away, we see that, for the indispensability theorist, mathematical entities are contingent, and this has the makings of a very good reply to the challenge.[11]

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[8] For example, see [11, p. 45], [8, p. 30], [13, p. 76] and [6, pp. 14–20].

[9] Assuming, of course, that Newtonian physics is suitably nominalised.

[10] Actually Quine is so wary of modality that he is as unlikely to agree to an entity's existence being contingent as he is to it being necessary. Perhaps it would be more accurate (although somewhat confusing) to say that the Quinean indispensabilist believes in mathematical entities whose existence is not necessary.

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