

PHIL DOWE**Response to O'Connor: Inference to the Best Explanation and Predictive Power**

Introduction

Christian philosophers sometimes offer arguments for the existence of God or the rationality of theistic belief based on a form of argument, inference to the best explanation (IBE), which they claim is a form of argument utilised in science, a fact which thereby legitimises its use in religious justification.

One response to this line of argument is to attempt to identify an essential criterion employed in the utilisation of IBE in science which is not fulfilled in the theistic context and thereby disqualifies this legitimisation strategy (and the arguments themselves). John Mackie, for example, identifies predictive power as such a criterion.¹

Possible replies would obviously include: (1) attempting to show that the use of IBE in science does not or need not always involve the alleged criterion and (2) attempting to show that the alleged criterion is fulfilled in the religious context.

In 'Criteria of Success in Science and Theology'² Robert O'Connor apparently seeks to follow and defend Mackie's predictive power argument against the use of IBE in justifying theism. He writes:

Some Christian philosophers hold that theism is worthy of belief precisely because it meets standards of acceptance mirroring those invoked in science.³

... [Certain] arguments, although compelling in the domain of science, impose theoretical requirements which explanatory theology cannot fulfill. In particular, arguments for realism often demand a degree of predictive power commonly regarded as both inappropriate to, and quite beyond the reach of, theism.⁴

The first part of O'Connor's paper appears to be an attempt to defend Mackie's line of argument. However, in the final sections of the paper O'Connor offers an escape from the predictive power argument, an argument of type (1), attempting to show that the use of IBE in science need not always involve the alleged criterion. He proposes an alternative criterion, that of being successful

1 J. Mackie *The Miracle of Theism*. Oxford: Oxford University Press (1982). p. 138

2 *This Issue*, pp. 21–40

3 *op. cit.* p. 21

4 *op. cit.* p. 23

in explaining new eventualities over a significant period of time ('Criteria of Success').

In my comments I will focus on the first part of O'Connor's paper. In the first section I will offer a simple refutation of Mackie's predictive power argument, by following strategy (1). It will be helpful here and for the second section to have three examples of IBE. In the second part I will then address O'Connor's defence of Mackie's argument. In fact, O'Connor's defence of Mackie completely misses the mark, for two reasons. Firstly it confuses the explanandum (thing to be explained) and explanans (thing explaining) in IBE. Secondly, it addresses not IBE in science but IBE in philosophy of science. In fact, the actual reasoning in that section amounts to a defence of Musgrave's claim⁵ that the only satisfactory argument for scientific realism is one based on the success of science, assessed in terms of predictive power. I try to show why O'Connor thinks this might be relevant.

IBE in Science and Philosophy of Religion

Inference to the best explanation, as its name suggests, recommends that we infer the truth of a theory (the explanans) which best explains a given phenomenon (the explanandum). So the theory must explain the phenomena and do so better than its known rivals. Clearly we need an account of explanation, or at least, a way to decide if and how well a theory explains some phenomena.

A view common in philosophy of science (called 'Bayesianism'), which I will follow here, says (1) that H_1 explains E if $P(E|H_1) > P(E)$ and (2) that H_1 explains E better than H_2 does if $P(E|H_1) > P(E|H_2)$. If E needs explanation, and these two conditions are met then IBE advises us to infer the truth of H_1 . (We may also need to compare the prior probabilities $P(H_1)$ and $P(H_2)$, but we can ignore this here for simplicity's sake.)

It will be helpful to have three examples.

(a) Life on Mars. In *Science* on August 16th 1996,⁶ a team led by David S. McKay and Everett K. Gibson Jr. from NASA/Johnson Space Center presented evidence that a 1.9-kilogram meteorite discovered in 1984 in Antarctica and known as 'ALH 84001' contains vestiges of primitive life that thrived on Mars billions of years ago.

According to their report, ALH 84001 crystallized slowly from magma, was then fractured throughout by the shock from a nearby impact 3.8 to 4.0 billion years ago, and later spent some time under water abundantly charged with carbon dioxide. This immersion allowed small 'globules' of carbonate to form along internal cracks.

5 A. Musgrave, 'Constructive Empiricism v Scientific Realism', *Philosophical Quarterly* (1982) 32, 262.

6 *Science* 272: 924-930

McKay and Gibson found three suggestions of life. Firstly, images obtained with a scanning electron microscope show clusters of elongated shapes no more than 100 nanometres long (4 millionths of an inch) in and near the carbonates. Looking like minuscule sausage links, these shapes could simply be flecks of mineral but they also bear a striking resemblance to the earliest micro fossils on Earth.

Secondly, they found that dark rims on the carbonate nuggets are due to very tiny, pure embedded crystals of magnetite (Fe_3O_4) and iron sulfide (FeS). Under most conditions these iron compounds would not coexist, especially in the vicinity of carbonate. But certain bacteria on Earth, particularly anaerobic strains, synthesize them simultaneously with relative ease.

Thirdly, and most compelling was the discovery that the carbonates are infused with organic molecules called polycyclic aromatic hydrocarbons, distributed in a way one would expect when simple organic matter decays.

None of these findings, by itself, offers definitive proof that primitive life once permeated ALH 84001. However, the paper concludes, 'Although there are alternative explanations for each of these phenomena taken individually, when they are considered collectively, particularly in view of their spatial association, we conclude that they are evidence for primitive life on early Mars'⁷.

In other words, what needs explaining is E, the coincidence of these factors. The theory T, that life once evolved on Mars, explains this coincidence because it makes the coincidence very much more likely than it otherwise would be. Therefore we should, for the time being at least, infer the truth of T.

(b) The atomic hypothesis. As a second example, let's look at the discovery of atoms. Towards the end of the nineteenth century there was much debate over whether atoms really existed or were just useful fictions. The positivist Ernst Mach, for example, held the latter, on the grounds that you cannot infer anything about the world beyond the immediately given phenomenal world. In 1913 Frenchman Jean Perrin published a book called *Les Atoms*, arguing that since no less than 13 independent methods for establishing Avogadro's Number had now been developed, we ought to believe in atoms. Avogadro's Number is the number of atoms in one mole of a substance, 6.023×10^{23} . Let me mention just five of those methods⁸.

1. Brownian motion.
2. Alpha decay- rate of decay of radium.
3. X-ray diffraction- measure the wavelength of X-rays diffracting through a crystal.
4. Blackbody radiation- thermal radiation from a black body.
5. Electrochemistry- depositing silver from a solution by electrolysis.

7 *Op. cit.* p. 929.

8 W. Salmon *Scientific Explanation and the Causal Structure of the World*. Princeton: Princeton University Press (1984), p. 218.

Each of these independent methods produces the same value for Avogadro's Number, this cannot be just a coincidence, hence atoms must exist. This reasoning convinced the scientific world, with the exception of Mach, who insisted to his dying day. I believe, that it's just a coincidence. Here the hypothesis H is the existence of atoms, and the evidence E is the fact that each of these independent phenomenon has yielded the particular value for Avogadro's number. The occurrence of the evidence is very much more likely if the hypothesis is true, than if it were not.

(c) Fine tuning of the universe. Some contemporary philosophers and scientists argue that the so-called 'anthropic principle'—the connection between the condition of the universe in the early seconds of the big bang and the development of life in the universe gives us reason to think that the world or part of it had a designer. The evidence to be explained is that the boundary conditions of the universe back in the early seconds of the big bang, plus the values of certain fundamental constants, could not have varied from their actual values by very much for intelligent life to have developed in the universe.⁹

To give a few examples,¹⁰ the exact excess of quarks over antiquarks, the so-called baryon asymmetry, is crucial. If the difference had been less, the present matter density would be too small for galaxies to have formed. If the difference had been greater, virtually all the universe would have burned to helium early on, and life could never have formed.¹¹ The initial inhomogeneity of the universe is critical—any more lumpy and it would have been all black holes, any less lumpy and there would be no galaxies, stars, or planets.¹² The initial rate of expansion is also crucial—too fast and stars, and hence heavier elements, would never have formed. Too slow an expansion rate and the universe would have collapsed long before life could have developed.

This suggests an inference to the best explanation: The universe has the *a priori* unlikely property of being just right for the production of intelligent life. There is nothing in the laws of physics that explains this. The theistic hypothesis can explain it: given the strong laws of nature, the probability that all these values are just right seems much greater given God's existence than otherwise. It seems more likely that the universe would exhibit this fine tuning given that a personal God exists (who quite likely would have deliberately designed a world for intelligent habitation); than that this happened by chance. It's no coincidence.

(According to one common alternative explanation, there are many, many universes of random configuration spread out 'next to' each other, and so it is

9 The full details have been set out by J. Barrow and F. Tipler, *The Anthropic Cosmological Principle*. Oxford: Clarendon Press (1986).

10 Here I make use of a summary given in R. Swinburne, *The Existence of God*. Oxford: Clarendon Press (1991).

11 J. Barrow and F. Tipler *The Anthropic Cosmological Principle*. Oxford: Clarendon Press (1986), pp. 402–8.

12 *op. cit.* p. 419.

13 See J. Leslie *Universes*. London: Routledge (1989).

quite likely, if not certain, that some universe will be fine-tuned for life.¹³ But according to IBE as we have considered it, this does not qualify as an explanation at all, because its truth simply does not raise the probability of the evidence.¹⁴)

Notice three things about these three examples. Firstly, IBE is usually invoked when more direct evidence is unavailable. But that doesn't mean its results need be considered dubious; while few would take the life on Mars hypothesis as anything but tentative, no scientist would even think to question the atomic hypothesis. Secondly, the explanandum (the thing to be explained) is in each case a scientific fact: the described features of ALH 84001, the coincidence of various determinations of Avagadro's number; the various actual conditions described as 'the fine-tuning' of the universe.

Thirdly, however, the various explanans (the theory invoked to explain the explanandum) appear to belong to different domains. Life on Mars, despite its alleged implications, is plainly a scientific hypothesis. The entire argument presented above belongs to the domain of science. If there is a clear demarcation between science and philosophy of science then the reality of atoms really belongs to the domain of philosophy of science: note that the alternative explanation is instrumentalism, the view that unobservable theoretical entities in successful scientific theories are useful fictions, rather than hypotheses about what is really there. And if there is a sharp demarcation between science and philosophy of religion, then the existence of a designer would have to belong to the domain of philosophy of religion.

Now we can return to the argument at hand. The general argument is that one cannot point to the use of IBE in science to support its use in justifying theism because there are significant criteria used in science which cannot be fulfilled in justifying theism. In particular, the criterion claimed to fit this bill is predictive power. According to O'Connor (sec. 2) a decent explanation must lead to novel testable predictions. So the argument is that one cannot point to the use of IBE in science to support its use in justifying theism, because predictive power is used as an essential criterion of an acceptable explanation in science but cannot be achieved in justifying theism (Mackie's argument).

But we can now see that this is refuted by our three examples. Example (a) recommends a theory T (life evolved on Mars) which potentially has impressive predictive power. Example (b) recommends a theory T (the reality of atoms) which has no real predictive power (realism can't make any new prediction that instrumentalism, taking atoms as a useful fiction, cannot match). Example (c) recommends a theory T (God) which let us concede for the sake of the argument, has no predictive power. So, unless the inference to the reality of atoms is unjustified, predictive power cannot be a criterion essential for the use of IBE.

14 Contrary to the opinion expressed by P. Davies, *The Mind of God*. London: Simon and Schuster (1992), p. 217. See I. Hacking, 'The Gambler's Fallacy: the Argument from Design. The Anthropic Principle Applied to Wheeler Universes', *Mind* (1987) 96, 331-40.

This refutation does not require us to take (b) as unequivocally belonging to the domain of science. If it does belong to that domain, then we have a case of the justified use of IBE in science where the successful theory does not have predictive power. If (b) belongs instead to the domain of philosophy of science, then even if we grant that predictive power is an essential criterion in the use of IBE in science, we still have a refutation of the claim that the fact that predictive power is an essential criterion in the use of IBE in science shows that the absence of that criterion in other domains is fatal to the use of IBE in those domains.

The Success of Science

In section 2 of his paper ('Realism: A Taxonomy of Arguments') O'Connor presents a taxonomy of arguments for scientific realism apparently designed to show that predictive power is an essential criterion for the use of IBE. I say apparently, because the argument is clouded by two misunderstandings.

Firstly, O'Connor persistently confuses the explanandum (thing to be explained) and explanans (thing explaining) in IBE. For example, in a key section O'Connor considers the argument for scientific realism from the predictive success of scientific theories, finding that predictive power is essential in the explanation in a way that theism cannot hope to match. But in the argument for scientific realism, the explanandum is the predictive power of the scientific theory, and the explanans is the reality of the unobserved theoretical entities postulated in the theory. Thus the predictive power is a feature of the explanandum, not the explanans. The explanans, 'scientific realism', as I noted above, does not make any predictions that instrumentalism cannot match. Or to show that it does will take a quite separate argument from the arguments which demonstrate that the scientific theory itself has predictive power.

Thus the argument for scientific realism from the predictive success of science cannot be relevant unless the only allowable IBE for theism is one from the predictive success of theism to the reality of God. In fact this seems to be O'Connor's view. But why should the application of IBE be restricted to a certain kind of explanandum? The confusion behind this is between postulating predictive power as a criterion of the kind of theory which can be the explanans in a scientific explanation (plausible enough although in my view probably false) and postulating predictive power as the only kind of thing that can be explained by scientific explanation (a totally absurd view).

A second confusion is between the use of IBE in science and in philosophy of science. In O'Connor's introduction he plainly says that he is concerned with comparing explanation in science with explanation in theology. When it comes to the argument, though, no examples concern explanation in science; the comparison is between explanation in philosophy of science and explanation in philosophy of religion. My example (b) above might arguably be taken as a borderline case between science and philosophy, since it was developed and adopted by scientists. But the more general arguments for scientific realism

canvassed by O'Connor are more abstract, and clearly fall into the domain of philosophy of science.

This confusion is crucial, because the argument for installing the predictive power criterion turns out to be an argument that the only cogent argument for scientific realism is one from the predictive success of the scientific theory. But that, of course, is no argument for the view that the predictive power criterion is essential for scientific explanations.

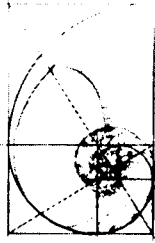
The section in fact provides an argument that the only really cogent argument for scientific realism is the one from the impressive predictive power of science. This of course, even if sound, is no problem for the argument that one can appeal to the use of IBE in science to support its use in justifying theism. It takes a confusion both between the explanandum and the explanans, and between the domains of science and philosophy, to make the possibility seem plausible.

As it happens, I don't think the predictive power argument is the best argument for scientific realism¹⁵. But that is beside the point—at least on this O'Connor offers an argument for his view (an argument due to Musgrave).

I conclude by noting that if my argument is right, then there is nothing in O'Connor's paper that undermines the use of IBE in my third example, an example which is I think typical of how IBE is used by contemporary Christian philosophers to justify theism.

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15 P. Dowe 'JJC Smart and the Rise of Scientific Realism' In P. Dowe, M. Nicholls and L. Shotton (ed) *Australian Philosophers*. Hobart: University of Tasmania Press, (1996), 25–37. See also R. Boyd 'The Current Status of Scientific Realism' In J. Leplin (ed) *Scientific Realism*. Berkeley: University of California Press, (1984).



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