For *God and Design: The Teleological Argument and Modern Science*

Too Many Universes

Universes and the multiverse

In his talk, and the book it is based on (Rees 1997), Martin Rees argues that whether there are universes other than our own is a scientific question to which he suspects the answer is 'yes'. To this I could agree, but only up to a point, the point being that there could be scientific evidence for the theories he mentions which postulate other universes. But Martin also has what I shall argue is a spurious non-scientific reason for suspecting that other universes exist, namely that he thinks they would make the fact that our universe supports life less surprising than it would otherwise be. Whether, without that anthropic support, we have enough reason to take these theories seriously I do not know.

Before rebutting Martin's anthropic arguments, I need to settle some terminology. I agree with him that, to avoid trivialising our debate, 'our universe' (as I shall call it) must not mean 'everything there is'. But nor can it quite mean, as he suggests, 'the domain of space-time that encompasses everything that astronomers can observe'. For first, our universe may have parts that we cannot observe, perhaps because (as he himself suggests) the acceleration of our universe's expansion will stop light from them ever reaching us. More seriously, Martin's definition entails that no other universe could contain astronomers, since if it did, that would automatically make it part of our universe! (And we cannot exclude these other-worldly astronomers because they are not in our universe without an independent definition of 'our universe' that will then make Martin's redundant.) So what I propose to call 'our universe', and what I think Martin really means, is everything, past, present and future, in the single spacetime whose earliest point is our Big Bang.

Next, since I shall still need a term for everything that exists in some spacetime or other, and it would beg the question to call that 'the multiverse', I shall call it 'the Universe'. The question then is this: does the Universe contain more than our universe? Specifically, does it contain other spacetimes with different contents, laws and/or initial conditions, most of which would not, unlike ours, permit life as we know it? That is the multiverse hypothesis, which Martin thinks the existence of life in our universe gives us some reason to accept.

His case for this hypothesis rests on the 'fine tuning – in the expansion speed, the material content of the universe, and the strengths of the basic forces – [which] seems to have been a prerequisite for the emergence of the hospitable cosmic habitat in which we live'. To the fact of this 'seemingly special cosmic recipe' Martin offers us three responses: 'we can dismiss it as happenstance; we can acclaim it as the workings of providence; or … we can conjecture that our universe is a specially-favoured domain in a still vaster multiverse.' Setting providence aside, he prefers the last hypothesis because he thinks it does, as happenstance does not, explain the fine tuning of our universe. Is he right?

First, a point about Martin's other universes, which may be understood in two apparently different ways. The first way takes them to be as actual as our universe, thus making it just a part (if not a spatial part, or even a temporal part) of all there actually is. The second way makes them merely *possible* universes, which might have been actual but in fact are not. This may seem wrong, since the multiverse hypothesis says that these other universes exist, which for most of us is the same as saying they are actual. But there is a view, forcefully argued by David Lewis (1986), on which all possible universes exist, just as ours does, and all that our calling ours 'actual' means is that it is the one we happen to be in.

Both readings of Martin's universes seem to me conceivable. Which is right Martin does not say; but then he may not need to say. For both readings make the Universe – i.e. everything that exists in some spacetime or other – include far more universes than ours, and differ only in how inclusive they allow a single universe to be. For on the all-actual reading, one universe can grow out of another (e.g., as Martin suggests, from a black hole), so that two universes can have parts related to each other in time if not in space (or not in our everyday three-dimensional space). Whereas for Lewis, who takes a single universe to include the whole of its time as well as its space, the contents of two spacetimes linked in this way would constitute one universe with a more complex spacetime structure.

Existence, location and ultimate explanations

For our purposes, however, it does not matter how many universes a multiverse contains, given that, by definition, it contains more than one. For that is what enables multiverse theories to replace questions of *existence* with questions of *location*, which is what seems to let them do what Martin wants, and what he thinks one-universe theories cannot do, namely render the fine tuning of our universe unsurprising.

The idea is this. If our universe is all there is, we cannot explain why it has the features that permit life. For example, early conditions in our universe may give physical explanations of later ones; and the very earliest, initial conditions may even explain the later laws and values of physical constants that life requires. But initial conditions themselves can obviously not be explained in this way, since – by definition – nothing is earlier than them. And if there is no physical explanation of our universe's initial conditions, there is no ultimate physical explanation of what they explain, and in particular no such explanation of the emergence of life. Hence the problem, which is of course no news to philosophers or theologians.

But for Martin a multiverse poses no such problem, since it contains all possible features in some universe or other. It is, as he puts it, rather like 'an "off the shelf" clothes shop: if the shop has a large stock, we're not surprised to find one suit that fits. Likewise, if our universe is selected from a multiverse, its seemingly designed or fine tuned features wouldn't be surprising.' In other words, the question now is not why we *exist*, but why we exist *where* we exist, namely in a universe with such-and-such features.

To change the question in this way is like turning the question of why there are fish (say) into the question of why they live where they do, namely in water: to which the obvious answer is that water, unlike dry land, has what fish need. Similarly with the multiverse: it lets us turn the hard question of why there is life at all into the relatively easy one of why there is life in our universe: to which the obvious answer is that our universe has what life needs.

But one-universe theories can answer *that* question just as well as multiverse theories can, because their answer is the same. Take our fish again. The explanation of why fish live in water (because water has what fish need) is the same whether there is dry land or not, i.e. whether this explanation of fish is locational or existential. Likewise, the features of our universe that explain why it permits life are the same whether there are other universes or not, i.e. whether this explanation of the possibility of life is locational or existential. The only question then is this: can multiverse (water+land) theories meet the need, which one-universe (all-water) theories cannot meet, for an explanation of the fine tuning of our universe (water) that allows life (fish) to exist in it? Martin says they can; I say they cannot.

Explanations and probabilities

The illusion that multiverse theories can explain the fine tuning of our universe rests on a confounding of two kinds of possibility, *epistemic* and *physical*, of which only the latter enables the explanations that physical theories give. To see this, consider in general when and why we take events to need explaining. Generally we want explanations only of events that we think did not *have* to happen, since there seemed to be alternative possibilities. This is why the best explanations are those that eliminate all such alternatives, as when we discover deterministic causes that make it impossible for their effects not to happen.

When the possibility of an event's not happening cannot be eliminated in this way, it may still be reduced. That is how indeterministic causes explain events, by reducing the possibility of their not happening by making the events more probable than they would otherwise have been. That for example is how smoking explains the cancers smokers get: not by making it impossible for them not to get cancer, but by reducing that possibility by raising their chances of getting cancer. And even when an event happens that is as improbable as it can be, as when a radioactive atom decays from its most stable state, it may still be explained, to some extent, by saying what the chance of that event was.

Some of what I have just said about how explanations depend on chances is controversial. What should not be controversial is that whenever chances do explain events, they can only do so because they are real physical probabilities, measuring real possibilities of the events of which they are chances. Merely epistemic probabilities, because they are not real features of our universe, but only measures of our knowledge or ignorance of what is going on in it, can explain nothing of it (although they can and do explain our reactions to it).

Thus suppose for example I am surprised to see a tossed coin land on edge. Suppose also that the lighting and my eyesight are good, I am sober and there are no conjurers around. Then relative to such facts, which are what make my vision reliable, the epistemic probability that the coin did what I saw it do is very high. In other words, relative to the evidence of my senses, there is almost no epistemic possibility of the coin's *not* having landed on edge. Yet this fact in no way *explains* the coin's landing on edge, precisely because it tells us nothing about the real physical probability of that event. That is why the event still surprises me, despite its high epistemic probability, since I still think there was a much lower chance – a much smaller real possibility – of its happening than of its not happening.

Equally, of course, many events which I see clearly, and which therefore have a very high epistemic probability, I know independently to have a very high chance – as when I see a tossed coin *land*. That is an event which, unlike its landing on edge, I find unsurprising, and think needs no explaining, precisely because its physical probability is high. It is only events that I think have low chances, and therefore high chances of not happening, that I find surprising and think need explaining: their epistemic probability, high or low, is irrelevant.

A prerequisite of chances

What then gives an event a chance, a physical probability, that may if it is high enough give the event a physical explanation? The normal answer is that an earlier event (a coin's being tossed, someone's smoking, an atom being in a relatively stable or unstable state), together with laws of nature, gives the event in question its chance, and hence whatever explanation that value of chance can provide. This is why earlier events can explain later ones but not *vice versa*. It is also why an event which, like our Big Bang, seems to have no precursors, seems thereby rendered incapable of physical explanation, since there is, by hypothesis, nothing earlier that could give it any physical probability, high or low.

But suppose our Big Bang did have a precursor, say a black hole in a parent universe. This might indeed give the initial conditions of our universe chances that could, if high enough, explain them and thereby tell us why our universe permits life. But then these conditions would not really be *initial* conditions: the real initial conditions would be those of our parent universe, or those of its parent universe, or … And now we face a dilemma. For on the one hand, there may be a first universe. Then, as its initial conditions can have no physical probability, and hence no physical explanation, they cannot give us any ultimate explanation of whatever later conditions and universes they explain. On the other hand, there may be no first universe: all the universes in the multiverse may have ancestors. Then while the initial conditions of each universe *may* have a physical probability, there are no absolutely initial conditions that could give us a physical explanation of all the others and hence of the emergence of life. So in neither case do we get the ultimate explanation that one-universe theories are criticised for not supplying.

To this Martin might retort that multiverse theories are not trying to give *physical* explanations of the life-friendly features of our universe. But then they must explain these features in some other way. But no other credible way exists, as I now propose to show by looking more closely at the stock argument for multiverses.

An improbable argument

The basic premise of the argument for multiverses is this: it is surprising that a single universe should have the very improbable features, including the initial conditions, that enable it to contain life. But what does 'improbable' mean here? It cannot mean physically improbable, since the initial conditions of a single universe have no physical probability, high or low. So 'improbable' here can only mean epistemically improbable. Yet relative to the empirical evidence which tells us what the relevant features of our universe are, they are not at all epistemically improbable: on the contrary, they are – by definition – epistemically very probable. Only if we ignore this evidence, and take the epistemic probability of these features relative only to logic, and perhaps a few basic assumptions of physics, can they be made to appear improbable. And that, I am willing to grant, for the sake of argument, they are.

Yet even granting this, what does this difference between two epistemic probabilities show? Compare my surprise at seeing a coin land on edge. Relative to my seeing it, this event has a very high epistemic probability. Relative to the coin's geometry, however, I may think its epistemic probability is very low – perhaps because I think that far fewer of a tossed coin's possible trajectories make it land on edge than make it lnd heads or tails, and think with Laplace (1820) that all these trajectories are, *a priori*, equally probable.

But however I derive it, this low *a priori* epistemic probability is not what makes me surprised to see a coin land on edge. What makes that event surprise me is my belief that it had a low *physical* probability, because of how I think the coin was tossed. What *would* remove my surprise, therefore, by explaining the coin's landing on edge better than my assumption that it was fairly tossed does, would be my discovering that it was *placed* on edge: i.e. that, unknown to me, there was a mechanism that gave this event a high physical probability.

But this is not what Martin's multiverse provides. All it provides is a large set of possible initial conditions, and other relevant features of universes, over which something like a flat Laplacean probability distribution yields a very low probability of the subset of features that let a universe support life. But as this low *a priori* probability is merely epistemic, no one should be surprised that, relative to the *a posteriori* evidence provided by physics, the same features have a very high epistemic probability. For to say that such evidence increases an epistemic probability is just to say that it tells us something we did not know before: in this case, what the relevant features of our universe are. But then, as our coin analogy shows, their high *a posteriori* epistemic probability in no way implies a high physical probability, any more than their low *a priori* probability implies a low physical probability. So by the same token, if these features of a single universe seem incapable of explanation, that is not because they have a low *a priori* epistemic probability, but because they include features, like initial conditions, which have no physical probability, high or low, at all.

Facing the firing squad

The fact is that multiverse theories could only explain the fine tuning of our universe by giving it a physical probability high enough to provide a physical explanation of it; yet that, as we have seen, they neither do nor claim to do. To see that this is what they would have to do, take the example of John Leslie's that Martin quotes:

> Suppose you are facing a firing squad. Fifty marksmen take aim, but they all miss. If they hadn't all missed, you wouldn't have survived to ponder the matter. But you wouldn't leave it at that: you'd still be baffled, and you'd seek some further reason for your luck.

Well, maybe you would; but only because you thought the ability of the firing squad, the accuracy of their weapons, and their intention to kill you, made their firing together a mechanism that gave your death a very high physical probability.

So now suppose there is no such mechanism. Imagine, as Russell (1927) did, that our universe (including all our memories and other present traces of the past) started five minutes ago, with these fifty bullets coming past you, but with no prior mechanism to give their trajectories any physical probability, high or low. Suppose in other words that these trajectories really were among the *initial* conditions of our universe. If you thought that, should you really be baffled and seek some further reason for your luck? I say not; and I say also that, if you were still baffled, it should not reduce your bafflement to be told that the initial conditions of many other universes include similar swarms of bullets, the vast majority of which end up hitting people! If that information affected you at all – which I do not think it should – it should make you more baffled, not less, that your swarm missed you.

I think therefore that the anthropic intuitions which have led Martin and others to favour multiverse theories are simply mistaken. They are like the intuitions behind the gambler's fallacy that (for example) the longer an apparently normal coin goes on always landing heads, the more likely it is to land tails next time. That intuition, common though it may be among unsuccessful gamblers, we know is just wrong. For if a coin's repeatedly landing heads tells you anything, what it tells you is that the coin is biased toward heads and so more, not less, likely to land heads next time than you previously thought.

In short, what the intuition behind the gambler's fallacy needs is not an explanation of why it is right, since it isn't. What anyone with that intuition needs is not a theory to justify it but some kind of therapy to remove it. The same goes for anthropic intuitions about the alleged improbability of the features of our universe that enable it to support life. Martin should not be trying to explain and justify these intuitions by postulating other universes. Rather, he should be taking to heart Thomas Carlyle's alleged response to one Margaret Fuller's reported remark that she accepted the universe: 'Gad', said Carlyle, 'she had better'. And so had Martin.

References

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