MULTIPLE UNIVERSES AND THE FINE-TUNING ARGUMENT: A RESPONSE TO RODNEY HOLDER

BY

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Abstract: In this article I examine a common objection to the fine-tuning argument (an objection which may be referred to as the atheistic many universes (AMU) objection). A reply to this objection due to Roger White has been the subject of much controversy; White's reply has been criticized by Rodney Holder, on the one hand, and Neil Manson and Michael Thrush on the other. In this paper I analyze Holder's work in an effort to determine whether the AMU objection successfully defeats the fine-tuning argument. I conclude that the fine-tuning argument can be reformulated so as to avoid the AMU objection.

Introduction

In this article I will examine the fine-tuning argument, an argument for the conclusion that the universe was designed by an intelligent agent. More particularly, I will be focusing on an objection to the fine-tuning argument. An adequate understanding of this objection (which we may refer to as the atheistic many universes (AMU) objection) requires some background, though, so I will begin by outlining the basic fine-tuning argument (in section one). I will then introduce the AMU objection (section two), and examine a reply to this objection due to Roger White[1] (section three). The reply to the AMU objection that can be developed from White's work has been criticized by Rodney Holder,[2] and in the central

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sections of this article (sections four and five), I will analyze Holder's work in an effort to determine whether the AMU objection successfully defeats the fine-tuning argument. I conclude that on standard conceptions of the atheistic many universes hypothesis, the AMU objection fails to defeat the fine-tuning argument.

I. *The basic fine-tuning argument*

Our universe is "fine-tuned" for life – or so say many (and perhaps most) physicists concerned with the issue.[3] That is, the values of a significant number of fundamental physical parameters (e.g. the strength of gravity, the strength of the strong nuclear force) appear to be "just right" for life; it seems that if these values were even slightly different from what they in fact are, life could not have arisen.[4] As philosopher Peter van Inwagen summarizes:

> Small changes in various of these numbers would result in a cosmos that lasted only a few seconds or in which there were no atoms or in which there were only hydrogen and helium atoms or in which all matter was violently radioactive or in which there were no stars. In no cosmos of these sorts could there be life . . .[5]

So it appears that if any of a large number of parameters were not fine-tuned to an extremely narrow range, our universe would not have been life-permitting. Let FT be the claim that

(FT) Our universe is fine-tuned for life,

and let this claim be understood not merely as the assertion that our universe is life-permitting (which is undeniably true), but as the assertion that it is life-permitting but wouldn't have been if it were not fine-tuned (i.e., if any one of a number of its parameters had been slightly different).

In this paper I shall not try to evaluate this claim (nor am I competent to do so). Rather, I shall examine a certain argument that takes FT as a premise. Some thinkers have used FT, or some similar claim, as the basis of an argument for the conclusion that

(D) Our universe was designed by an intelligent agent (or agents)[6] with the power to bring it about that FT.

In this section I will present such an argument, which I will refer to as the basic fine-tuning argument.

A. EPISTEMIC PROBABILITY

In order to understand this argument, as I shall present it, we will need to make use of the notion of epistemic probability. A thoroughly satisfactory account of epistemic probability is not easy to find, but for the purposes of this paper it will suffice to gesture in the right general direction.[7] Speaking generally, the epistemic probability of some proposition is a measure of the degree of confidence a rational person would have in that proposition. But how much confidence a rational person would have in a proposition will usually depend on what other beliefs that person has; accordingly, the epistemic probability of a proposition is usually considered *relative to* some set of background beliefs. (Letting K be the set of background beliefs, denote the epistemic probability of A relative to K with the expression P_{ep} (A | K).) An example to convey the general point: the epistemic probability of "the sun will rise tomorrow" relative to the total set of my background beliefs (which include the standard beliefs about the nature of the solar system and the uniformity of nature) is very high, since a rational person would place a very high degree of confidence in that proposition if he had my background beliefs (other things being equal).

Very often one proposition will have an evidential relationship to another proposition. For example, suppose A is the proposition "Feike can swim" and B is the proposition "Feike is a Frisian lifeguard and 99% of Frisian lifeguards can swim." Here B is sensibly thought of as evidence for A, and given that one believes B, and has no other relevant information or sources of warrant for A or ~A, the rational thing to do will be to place a high degree of confidence in A. It is in this sort of context that we speak of *conditional* epistemic probability. Let P_{ep}(A | B & K) be the conditional epistemic probability of A on B, relative to background beliefs K, and let this be understood as (very roughly, and other things being equal) a measure of the degree of confidence a rational person will place in A, given that he believes B and has background beliefs K.

B. THE BASIC FINE-TUNING ARGUMENT

We can now turn to the basic fine-tuning argument. FT itself is of course a crucial premise of the argument. Let K be our background knowledge, but let it not include our belief that FT (or, at any rate, our assumption for the sake of argument that FT). Then other key premises of the argument are the claims that

(1) P_{ep}(FT | ~D & K) is extremely low,[8]

while

(2) P_{ep}(FT | D & K) is not so low,

and, in fact,

$$(3) \quad P_{ep}(FT \mid D \,\&\, K) >> P_{ep}(FT \mid {\sim}D \,\&\, K).^{9}$$

Let's examine these three claims in turn.

Why think (1) is true? First, it is commonly thought that the parameters involved in the evaluation of fine-tuning do not have their values of necessity. It seems that the strength of the force of gravity, for example, could have been different. But if this is right, and D is false, then the values these parameters do in fact take is due to chance. (If the determination of the values of the parameters of physics is due neither to design nor necessity, chance seems to be the only option left.) Now suppose physicists determine that there are n parameters whose values are finely-tuned for life (i.e. there are n parameters such that if any one of them had been slightly different, our universe would not have been life-permitting). Consider all the n-tuples of possible parameter values. Given the truth of FT, the proportion of n-tuples which would yield a life-permitting universe among all such n-tuples is extremely low. If we suppose that D is false, and that our universe has the parameter values it does solely due to chance, then it seems reasonable to think that no one possible n-tuple of parameter values would have been much more likely than any other. And this seems to mean that the epistemic probability that our universe instantiates a life-permitting n-tuple, given the falsity of D, is extremely low. But if it were not the case that our universe instantiated a life-permitting n-tuple, then it would not be fine-tuned for life (i.e. then FT would be false). So the epistemic probability of FT, given the falsity of D, is extremely low.[10] Premise (1) therefore has a great deal of initial plausibility.[11]

As regards (2), consider that if D is true, then it is not so unlikely that FT would be true. For if there is/are (was/were) an intelligent agent (or agents) with the power to bring it about that FT, then that agent (or those agents) might very well desire (or have desired) that there be life in our universe, and therefore might very well have brought it about that FT. Therefore $P_{ep}(FT \mid D \,\&\, K)$ is not so low, and, in fact, is much, much greater than the extremely low $P_{ep}(FT \mid {\sim}D \,\&\, K)$.[12] That is, (2) and (3).

I will now turn to Bayes's theorem in order to develop the basic fine-tuning argument. In its simplest form, this theorem states that:

$$P(A \mid B) = [P(A) \cdot P(B \mid A)]/P(B), \quad \text{where } P(B) > 0.$$

Assuming the legitimacy of an application of Bayes's theorem to epistemic probabilities (or to the epistemic probabilities involved in the basic fine-tuning argument, at least), we can use the theorem to formulate the basic fine-tuning argument.

For purposes of clarity and ease of exposition, let's consider a particular person, Agnes the agnostic, and the particular values she assigns to the relevant epistemic probabilities.[13] Later we can generalize the argument.

Suppose Agnes accepts FT. Applying Bayes's theorem to the case at hand, and making the presence of background knowledge explicit, she notes that

$$(5) \quad P_{ep}(D \mid FT \,\&\, K) = [P_{ep}(D \mid K) \cdot P_{ep}(FT \mid D \,\&\, K)]/P_{ep}(FT \mid K)$$

and,

$$(6) \quad P_{ep}(\sim D \mid FT \,\&\, K) = [P_{ep}(\sim D \mid K) \cdot P_{ep}(FT \mid \sim D \,\&\, K)]/P_{ep}(FT \mid K).$$[14]

Now, suppose Agnes judges $P_{ep}(D \mid K)$ to be .3 and $P_{ep}(\sim D \mid K)$ to be .7. She's not sure how to estimate $P_{ep}(FT \mid D \,\&\, K)$ and $P_{ep}(FT \mid \sim D \,\&\, K)$, but she reasons that FT is certainly a lot more likely on D than on ~D, and decides (very conservatively) that FT is 100 times more likely on D than on ~D. She therefore lets 100α stand for $P_{ep}(FT \mid D \,\&\, K)$ and α stand for $P_{ep}(FT \mid \sim D \,\&\, K)$.

Because Agnes is interested in the extent to which FT supports the claim that D, she makes these estimates in a particular way: K includes all her beliefs, except for FT. Furthermore, Agnes takes into account any non-inferential warrant that affects her estimates of $P_{ep}(D \mid K)$, $P_{ep}(\sim D \mid K)$, and the ratio of $P_{ep}(FT \mid D \,\&\, K)$ to $P_{ep}(FT \mid \sim D \,\&\, K)$. (For example, suppose that most of the small amount of confidence Agnes puts in D is not due to other beliefs she has (is not due to inference), but is in some way basic. She just finds herself with a (very modest) inclination to believe D. For our purposes, the point is this: Agnes takes this inclination into account when she estimates $P_{ep}(D \mid K)$.) This means that Agnes's estimate that $P_{ep}(D \mid K)$ is .3 is her best estimate of the prior probability of D – her estimate of D's prior probability, *all things considered*.[15] Likewise for her estimates of $P_{ep}(\sim D \mid K)$ and the ratio of $P_{ep}(FT \mid D \,\&\, K)$ to $P_{ep}(FT \mid \sim D \,\&\, K)$.

Next, noting that $P_{ep}(FT \mid K) = P_{ep}(FT \mid D \,\&\, K) \cdot P_{ep}(D \mid K) + P_{ep}(FT \mid \sim D \,\&\, K) \cdot P_{ep}(\sim D \mid K)$, Agnes moves from

$$(5) \quad P_{ep}(D \mid FT \,\&\, K) = [P_{ep}(D \mid K) \cdot P_{ep}(FT \mid D \,\&\, K)]/P_{ep}(FT \mid K)$$

to

$$(7) \quad P_{ep}(D \mid FT \,\&\, K) = \frac{[P_{ep}(D \mid K) \cdot P_{ep}(FT \mid D \,\&\, K)]}{[P_{ep}(FT \mid D \,\&\, K) \cdot P_{ep}(D \mid K) + P_{ep}(FT \mid \sim D \,\&\, K) \cdot P_{ep}(\sim D \mid K)]}$$

From there, with a little calculation, she arrives at

$$(8) \quad P_{ep}(D \mid FT \,\&\, K) \approx .977.$$[16]

What follows from the fact that Agnes accepts (8)? Several things. First, assuming that Agnes is convinced that her reasoning is sound, Agnes now has a good reason to raise her level of confidence in D from .3 to .977, or, more realistically, from "low" to "very high". Second, Agnes now has a good reason to place a very high level of confidence in D. For she believes FT & K, and she believes that the rational degree of confidence to place in D, given FT & K, is very high.

But we can say even more than this. We can say, third, that Agnes *should* place a very high degree of confidence in D. For she estimates $P_{ep}(D \mid FT \,\&\, K)$ to be very high (.977), and this is her best estimate, her estimate *all things considered*. It's not as if she has a good reason to believe D, and also some (different) good reason not to believe D. Any defeaters for D have already been taken into account – this is assured by the fact that K includes all Agnes's beliefs, except for FT, and that she has taken into account any non-inferential warrant that affects her estimates of $P_{ep}(D \mid K)$, $P_{ep}(\sim D \mid K)$, and the ratio of $P_{ep}(FT \mid D \,\&\, K)$ to $P_{ep}(FT \mid \sim D \,\&\, K)$.

Agnes should place a very high degree of confidence in D. What is the force of "should" here? I think the sense is this: given that Agnes estimates $P_{ep}(D \mid K)$, $P_{ep}(\sim D \mid K)$, and the ratio of $P_{ep}(FT \mid D \,\&\, K)$ to $P_{ep}(FT \mid \sim D \,\&\, K)$ as she does, and given that she grasps the above reasoning and thinks it is sound, and given that K includes all her beliefs except for FT, and given that she has taken non-inferential sources of warrant into account – given all these things, the rational thing for Agnes to do is to place a high degree of confidence in D. And that is just to say: given all those conditions, Agnes *will* place a high degree of confidence in D if her cognitive faculties[17] are functioning properly.

We can draw upon the insights gained in examining Agnes's case in order to formulate the basic fine-tuning argument. The first premise is just FT. Drawing upon the considerations given above, we have,

$$(3) \quad P_{ep}(FT \mid D \,\&\, K) >> P_{ep}(FT \mid \sim D \,\&\, K).$$

(Here and throughout the argument, K should include all the beliefs of the person evaluating the argument, except FT. The person evaluating the argument should also take into account any non-inferential warrant relevant to the judgments of epistemic probability made throughout the argument.) Recalling (5) and (6), note that

$$(9) \quad P_{ep}(D \mid FT \,\&\, K) \text{ is much greater than } P_{ep}(\sim D \mid FT \,\&\, K)$$

if and only if

(10) $P_{ep}(D \mid K) \cdot P_{ep}(FT \mid D \& K)$ is much greater than $P_{ep}(\sim D \mid K) \cdot P_{ep}(FT \mid \sim D \& K)$.

And, because (3) is true, (10) will be true unless $P_{ep}(D \mid K)$ is much, much less than $P_{ep}(\sim D \mid K)$.[18] Therefore,

(11) Unless $P_{ep}(D \mid K) << P_{ep}(\sim D \mid K)$, (9) is true.

It follows that,

(12) Unless $P_{ep}(D \mid K) << P_{ep}(\sim D \mid K)$, one should place much more confidence in D than in its denial.

Why does (12) follow from (11)? (9) states that the epistemic probability of D, given FT & K, is much greater than the epistemic probability of ~D, given FT & K. But, as we have set things up, FT & K comprise the sum total of one's knowledge. We have also stipulated that one should take into account any non-inferential warrant relevant to the judgments of epistemic probability made throughout the argument. So the epistemic probability of D, given FT & K, is just the rational degree of confidence to place in D, all things considered. And the epistemic probability of ~D, given FT & K, is just the rational degree of confidence to place in ~D, all things considered. So if (9), then the rational degree of confidence to place in D is much greater than the rational degree of confidence to place in ~D, all things considered. Therefore if (9), one should place much more confidence in D than in its denial (~D). And that is sufficient for (12)'s following from (11).

Now, from (12) it follows that

(13) Unless $P_{ep}(D \mid K) << P_{ep}(\sim D \mid K)$, one should place a good deal of confidence in D.

To see this, assume that $P_{ep}(D \mid K)$ is not much, much less than $P_{ep}(\sim D \mid K)$. Then, by (11),

(9) $P_{ep}(D \mid FT \& K)$ is much greater than $P_{ep}(\sim D \mid FT \& K)$.

But it seems that $P_{ep}(D \mid FT \& K) + P_{ep}(\sim D \mid FT \& K) = 1$, since it seems that if one places degree of confidence **r** in D, given FT and K, then the rational thing to do is to place degree of confidence 1 – **r** in ~D, given FT and K. And then it follows from (9) that $P_{ep}(D \mid FT \& K)$ is much higher than .5.[19] But if $P_{ep}(D \mid FT \& K)$ is much higher than .5, then one ought to place a good deal of confidence in D.

If we wish, we can conclude the basic fine-tuning argument here, at (13). But we might also want to add,

(14) It is not the case that $P_{ep}(D \mid K) << P_{ep}(\sim D \mid K)$,

and therefore conclude that,

(15) One should place a good deal of confidence in D.

C. SOME COMMENTS ON THE BASIC FINE-TUNING ARGUMENT

Two comments. First, I have used indefinite phrases (like 'much, much greater than') rather than definite numbers and ratios to express certain relationships between the epistemic probabilities involved. On the one hand, this serves to keep the argument general, and thus directly applicable to different people who estimate the relevant probabilities differently. On the other, it saps the argument of much of its potential strength: compare the force of Agnes's conclusion (she should place a very high degree of confidence in D) and (15). We can recapture the potential force of the argument by inviting the person considering the argument to actually estimate the probabilities (and ratio) involved, and then to follow Agnes's reasoning.

Second, even if the argument is successful, it will have a different impact on different people, since different people may disagree as to the values of $P_{ep}(D \mid K)$ and $P_{ep}(\sim D \mid K)$. Upon considering FT and the above argument, someone who thought $P_{ep}(D \mid K) << P_{ep}(\sim D \mid K)$ would simply reject (14), and so have little reason (on the basis of the argument) to place any significant degree of confidence in D. Someone who, in contrast, firmly believes in the existence of God (as Jews, Christians, and Muslims think of God, anyway) will already believe that $P_{ep}(D \mid K)$ is equal to one, or nearly so. For such a person, the argument might not provide a reason to upgrade the degree of confidence he or she places in D to any significant extent, simply because he or she would already place a very high degree of confidence in D.

But consider a person who judges that $P_{ep}(D \mid K)$ and $P_{ep}(\sim D \mid K)$ are not extremely divergent in value (say .5 each, or .2 and .8). For such a person the basic fine-tuning argument, if successful, provides a powerful reason to upgrade one's confidence in D to a significant extent. Put simply, this argument (if successful and thought to be such) makes it rational to become much more confident in D, for the person who had previously considered D and ~D both to be plausible options. And this is a conclusion of no little importance.

There is, however, a powerful objection to this argument, which we can refer to as the atheistic many universes objection (the AMU objection). It is to this objection that I now turn.

II. The Atheistic Many Universes objection

The AMU objection is most easily introduced via a consideration of the many universes hypothesis (MU). According to the MU hypothesis, "the actual world consists of very many large, more or less isolated sub-regions (universes) either coexisting, or forming a long temporal sequence."[20] Let the *atheistic* many universes hypothesis[21] (AMU) be the conjunction of MU with ~D.

The AMU objection can be developed in different ways, but for our purposes let us put it this way: it is not clear that D is a better explanation of the evidence of fine-tuning than AMU, and therefore it is not the case that we should prefer D to AMU. The crucial premise of the AMU objection is the claim that $P_{ep}(FT \mid AMU \;\&\; K)$ is relatively high. Initially, the idea might be something like this: if there are very many universes, then it is quite likely that at least some among them are fine-tuned for life, and our universe just happens to be one of those.[22]

The objection proceeds as follows: Suppose someone places a good deal of confidence in D not because she has a non-inferential source of warrant for D, but because she thinks $P_{ep}(D \mid FT \;\&\; K)$ is high based on the fine-tuning argument. The objection notes that she should be confident that

$$(16) \quad P_{ep}(D \mid FT \;\&\; K) > P_{ep}(AMU \mid FT \;\&\; K)$$

only if she is confident that

$$(17) \quad P_{ep}(D \mid K) \cdot P_{ep}(FT \mid D \;\&\; K) > P_{ep}(AMU \mid K) \cdot P_{ep}(FT \mid AMU \;\&\; K).$$ [23]

But she should not be confident that (17). For $P_{ep}(FT \mid AMU \;\&\; K)$ is quite high, or even one (if on AMU all possible n-tuples of parameter values are instantiated in some universe). Here we could distinguish between a strong form of AMU and a weak form. The strong form states that all possible n-tuples of parameter values are instantiated, while the weak form states only that there are very many universes. Either way, according to the objection, it seems that, first, $P_{ep}(FT \mid AMU \;\&\; K)$ is as high or even higher than $P_{ep}(FT \mid D \;\&\; K)$, and, second, it is unclear that $P_{ep}(D \mid K)$ is higher than $P_{ep}(AMU \mid K)$. Therefore it is unclear that (17) is true. And so our sample person should not be confident that (16). But then it is not the case that she should put any more confidence in D than in AMU.[24]

The AMU objection raises a number of interesting questions, and perhaps there are several ways in which it might be critiqued. I wish to focus on only one. The objection turns on the claim that $P_{ep}(FT \mid AMU \;\&\; K)$ is relatively high; this claim has been subject to criticism. In the remainder of this article I will examine this claim and the discussion surrounding it.

III. White's reply

Roger White has argued that the existence of many universes does not make it any more likely that our universe should be fine-tuned.[25] If we let ASU (the atheistic single universe hypothesis) stand for the conjunction of ~D and the claim that our universe is the only universe there is and ever was, then White's contention amounts to:

$$(18)\quad P_{ep}(FT \mid AMU \,\&\, K) = P_{ep}(FT \mid ASU \,\&\, K).$$

We can understand White's argument by considering an analogy. Suppose we have a fair, 100-sided die. Before we roll it, the probability (statistical and epistemic) that it will come up showing '37' is .01. If we had 100 such dice and we rolled each of them sequentially, the probability that there would be at least one '37' is of course much higher than .01 (it is close to .634). But the probability that any particular die (say the 81st one rolled) will be a '37' is still just .01, regardless of the fact that we are rolling very many dice. And of course the situation is the same if we roll all 100 dice simultaneously.

On White's view, the situation with fine-tuning is analogous. A particular die corresponds to a particular universe. Assuming that D is false, it is up to chance whether or not a particular universe is fine-tuned, just as it is up to chance whether or not a particular die comes up '37'.[26] And the assignment of parameter values to a particular universe is probabilistically independent of the assignment of parameter values to any other particular universe. So if we consider our universe (this universe, a particular universe), we can see that the prior epistemic probability that *it* is fine-tuned is the same whether or not there are other universes. Thus, while the probability that *some* universe is fine-tuned is much higher on AMU than on ASU, it remains the case that the probability that *our* universe (this universe, a particular universe) is fine-tuned is the same on AMU as it is on ASU. That is, (18). (And, as we might add though White does not, if (18), then the AMU objection fails to defeat the basic fine-tuning argument.)

IV. Holder's criticism of White

As we have seen, White claims that the many universes hypothesis does nothing to raise the epistemic probability of our universe's being fine-tuned.[27] Rodney Holder disagrees.[28] Fundamentally, Holder disagrees with White about the essential properties of our universe, or, better, about the essential properties of the referent of the phrase 'our universe'. In their discussions of fine-tuning and multiple universes both White and

Holder use the phrase ‘our universe’, but they employ this phrase quite differently. Early on in his article, White lets “α be our universe” (p. 262), and in his footnote 6 tells us,

The name ‘α’ is to be understood here as *rigidly designating* the universe which happens to be ours. Of course, in one sense, a universe can’t be *ours* unless it is life-permitting. But the universe which happens actually to be ours, namely α, might not have been ours, or anyone’s. It had a slim chance of containing life at all. [Emphasis in the original.]

So, according to White, our universe could have existed but not been fine-tuned. Indeed, White thinks, it had a very slim chance of being fine-tuned, even given its existence. Suppose a particular die (say, die #81) was rolled and came up showing ‘37’. Just as die #81 could have been rolled but not come up ‘37’, so too our universe could have existed but not been fine-tuned. On White’s view, being fine-tuned is not an essential property of our universe.

It will be helpful to probe a bit deeper into White’s use of the phrase ‘our universe’. On White’s conception of things, we can pick out a particular universe without regard to the parameter values it takes, and then ask about the probability of *that* universe taking a certain set of parameter values, just as we can pick out a particular die (say, the 81st one rolled) without regard to the outcome of its roll, and then ask about the probability of *that* die coming up ‘37’. It is easy to see how we could pick out a die without regard to the outcome of its roll, but how are we to pick out a universe without regard to its parameter values? One possible answer readily suggests itself: If the many universes exist one after another in a long temporal sequence, then we could pick out a particular universe by its order in the sequence; if the many universes exist simultaneously, then we could pick out a particular universe by its location relative to the other universes (no doubt ‘location’ would be used analogously here). Holder interprets White in just this way:

It would seem that White is taking the essential properties of our universe to be its position in a temporal sequence or its location, however measured, amongst the coexisting universes. If these are chosen randomly, then, to repeat, it is most unlikely that the universe which arises at that particular location in time or space, or in that particular branching of space-time, is fine-tuned so as to bring us into existence.[29]

So, again, on White’s view the property of being fine-tuned is not an essential property of the universe in fact designated by ‘our universe’.

On Holder’s view, in contrast, our universe could not have existed without being fine-tuned:

. . . [W]hen and where our universe occurs are not essential properties of it; that it is fine-tuned and produces ourselves are.[30]

According to Holder, given that our universe exists, it must be fine-tuned. So Holder thinks that

$$(19) \quad P_{ep}(FT \mid \text{our universe exists}) = 1.$$

In order to understand how Holder uses (19) to rebut White, we need to look more carefully at Holder's conception of the many universes hypothesis. His initial definition of the many universes hypothesis is similar to White's. Holder writes:

> By the many-universes hypothesis I mean the postulated existence of many distinct space-time regions, characterized by different sets of values of the parameters, and which might be conceived to arise physically in several ways.[31]

But when Holder proceeds to examine the relationship between fine-tuning and the many universes hypothesis, he makes an important change. On Holder's formulation, the many universes hypothesis is not just the hypothesis that there are many universes, but the much stronger hypothesis that *all* possible universes exist. For simplicity's sake, Holder asks us to suppose "that there are exactly 100 possible universes" (p. 297). After making this supposition, Holder then formulates his version of the atheistic many universes hypothesis as the hypothesis that: "There is no designer and all 100 possible universes exist" (p. 297). But this suggests that if we set aside the heuristic assumption that there are exactly 100 possible universes, Holder thinks of the atheistic many universes hypothesis as the hypothesis that there is no designer and all possible universes exist. This interpretation is confirmed when, in the course of concluding his paper, he writes, "We have seen that an hypothesis which postulates the existence of all possible universes entails the existence of ours . . ." (p. 309). Given the context, it is clear that Holder is referring here to his version of the atheistic many universe hypothesis. Holder's version of AMU, then, is:

(AMU_H) All possible universes exist & ~D.[32]

Now, it is clear that

$$(20) \quad P_{ep}(\text{our universe exists} \mid AMU_H) = 1.$$

But (19) and (20) together imply that $P_{ep}(FT \mid AMU_H) = 1$. So, letting K include standard background knowledge (but not FT), we have:

$$(21) \quad P_{ep}(FT \mid AMU_H \ \&\ K) >> P_{ep}(FT \mid ASU \ \&\ K).$$

So in Holder's way of conceiving (i) the atheistic many universes hypothesis and (ii) the phrase 'our universe', the probability that our universe would be fine-tuned given the atheistic many universes hypothesis is much, much greater than the probability that our universe would be fine-tuned given the atheistic single universe hypothesis. And this, in Holder's way of thinking, amounts to a rebuttal of White's key claim that

$$\text{(18)} \quad P_{ep}(FT \mid AMU \,\&\, K) = P_{ep}(FT \mid ASU \,\&\, K).$$

V. The fine-tuning argument undefeated

If Holder is right that P_{ep}(our universe is fine-tuned for life | our universe exists) = 1, then any multiple universes hypothesis which raises the probability that our universe exists will be a hypothesis which raises the probability that our universe is fine-tuned. AMU_H will certainly do the trick, but so, perhaps, will a weaker form of AMU, which merely states that very many universes exist. (For if very many universes exist, perhaps the probability that our universe exists is not so low.) Suppose we grant Holder his use of the phrase 'our universe', and his claim that P_{ep}(our universe is fine-tuned for life | our universe exists) = 1, *and* the claims that $P_{ep}(FT \mid AMU_H) = 1$ and that P_{ep}(FT | a weak form of AMU) is relatively high. Even granting all this, the fine-tuning argument still remains undefeated by the AMU objection, on standard versions of the AMU hypothesis.

How so? Consider that on standard versions of the AMU hypothesis, different universes occupy different locations, whether these be locations in a long temporal sequence of universes, or locations in some sort of 'space' in which many co-existing universes all exist.[33] But if this is so, then we can refer to a universe by its location (supposing there are or have been many universes). And this provides the materials for a reformulation of the fine-tuning argument which can avoid the AMU objection. In the remainder of this paper I'll try to show how such a reformulation could go.

Note that our universe (using that phrase in Holder's sense) has a certain location amongst the other universes (on standard versions of AMU). Call this location 'L'. Now let 'the universe at L' refer (*not* rigidly) to whatever universe happens to occupy L, the location our universe in fact occupies. To reformulate the fine-tuning argument, replace FT with

(FT*) EITHER our universe is the only universe there is and ever was and our universe is fine-tuned for life, OR there are (or have been) multiple universes and the universe at L is fine-tuned for life.[34]

Similarly, replace D with

(D*) EITHER our universe is the only universe there is and ever was and our universe was designed by an intelligent agent (or

> agents) with the power to bring it about that it be fine-tuned for life, OR there are (or have been) multiple universes and they were all designed by an intelligent agent (or agents) with the power to bring it about that they be fine-tuned for life.[35]

The fine-tuning argument depends on the claim that $P_{ep}(FT \mid ASU \ \& \ K)$ is extremely low, and the AMU objection grants this claim. But if $P_{ep}(FT \mid ASU \ \& \ K)$ is extremely low, then so is $P_{ep}(FT^* \mid ASU \ \& \ K)$. For if, given C, A is true iff B is true, and you're aware of this fact, then $P_{ep}(A \mid C) = P_{ep}(B \mid C)$. And here, given ASU, FT is true iff FT* is true. Proof: Assume ASU. Assume FT. ASU entails that our universe is the only universe there is and ever was, which when conjoined with FT yields the proposition that our universe is the only universe there is and ever was and our universe is fine-tuned for life. And *that* proposition entails FT* by disjunction introduction. Going the other way, assume FT*. ASU rules out the second disjunct of FT*, leaving only the first disjunct, viz. our universe is the only universe there is and ever was and our universe is fine-tuned for life, which of course entails that our universe is fine-tuned for life. Therefore if $P_{ep}(FT \mid ASU \ \& \ K)$ is extremely low, then $P_{ep}(FT^* \mid ASU \ \& \ K)$ is extremely low. And for the sorts of reasons given in defense of premise (1) in section one, it seems that $P_{ep}(FT \mid ASU \ \& \ K)$ *is* extremely low.

Next, consider that on standard versions of AMU, either the universe at L has the parameter values it does necessarily, or not. If not, either the assignment of parameter values to the universe at L is random or not. This gives us three cases – let us examine each in turn. First, if the assignment of parameter values to the universe at L is random, then $P_{ep}(FT^* \mid AMU \ \& \ K)$ will equal $P_{ep}(FT^* \mid ASU \ \& \ K)$, and will be extremely low.[36] For suppose the assignment of parameter values to the universe at L is random. Since the proportion of parameter value n-tuples that are life-permitting among the total number of possible parameter value n-tuples is such a low proportion, the epistemic probability that the universe at the particular location L will end up with a life-permitting n-tuple is extremely low – and this is so whether there are very many other universes or not. (For if the assignment really is random, what goes on with other universes cannot raise the chances that the universe at any particular location will get a certain n-tuple.) Incidentally, Holder sees this point (though he doesn't see its ramifications for the fine-tuning argument), as can be seen from his remark that,

> . . . [O]ur universe [i.e. the essentially fine-tuned one in which we find ourselves – MR] is most unlikely to be the 327th universe in a sequence starting at some arbitrary time in the past, or to be centred on particular co-ordinates (x, y, z), measured from some origin in space, or to be any particular randomly chosen branch of an ever-splitting Everett-style 'multi-verse' (whose location might be measured in some system of co-ordinates in a multi-dimensional hyperspace).[37]

The crucial point for our purposes is this: in the present case $P_{ep}(FT^* \mid AMU \& K) = P_{ep}(FT^* \mid ASU \& K)$ and is extremely low; and this is sufficient to dispel the AMU objection (on the case we are now considering).

But what if the assignment of parameter values to the universe at L is not of necessity, but is also not random? Suppose, for example, that there is some probabilistic relationship between a given location and a certain sort of parameter value n-tuple. Perhaps it was quite likely that the universe at L be fine-tuned – due to some sort of objective propensity for the universe at L to take on a life-permitting n-tuple. Perhaps, in other words, the probability of FT* on AMU & K is quite high.

In reply: on such a case, the objective probability (interpreted as some sort of propensity) of FT* on AMU & K would be high, but it does not follow that the epistemic probability of FT* on AMU & K would be high. In fact, $P_{ep}(FT^* \mid AMU \& K)$ would still be extremely low. This is so because we are to evaluate $P_{ep}(FT^* \mid AMU \& K)$ while ignoring our knowledge that FT*. And if we ignore our knowledge that FT*, we have no reason to think that L (the location in fact associated with our universe) is one of the locations which has a propensity to give rise to a life-permitting universe. On standard versions of AMU, the number of fine-tuned universes among the total number of universes is extremely low. This means that for a particular location we select (such as the location associated with this universe), we should assign an extremely low number to the epistemic probability that "the universe arising from *that* location will be fine-tuned," in the absence of other information about that particular location. Given that we are ignoring FT* when we estimate $P_{ep}(FT^* \mid AMU \& K)$, we should estimate this probability to be extremely low, and, in fact, no different than $P_{ep}(FT^* \mid ASU \& K)$.

An analogy to drive home this last point: suppose we have one hundred 100-sided dice, all of which are weighted. Ninety-nine are weighted in such a way that they are unlikely to end up showing '37' upon being rolled. The remaining die is weighted in such a way that it is very likely to end up showing '37' when rolled. Suppose we roll all the dice, and die #81 (we pick it out by its location on the table) comes up showing '37'. Now, given that we know die #81 came up '37', we can have some confidence in the proposition that it was the die weighted to come up '37'. But if we estimate P_{ep}(die #81 comes up '37' | die #81 is rolled), while ignoring our knowledge that die #81 in fact did come up '37', then we should estimate this conditional probability at somewhere around 1/100. (Just imagine that someone else rolls the dice and then asks you to estimate the epistemic probability that the 81st die rolled is a '37', *before* you've looked at the dice.) Ignoring our knowledge about what actually did happen to die #81, we should place a very low level of confidence (.01) in the proposition that die #81 is the dice weighted to come up '37', and thus we should also place a very low level of confidence in the proposition that die #81 comes up '37'.[38]

This leaves the third case: the universe at L has the parameter values it does necessarily. On this case, the objective probability of FT* given AMU & K equals 1. Nonetheless, as in the previous case, the *epistemic* probability of FT* given AMU & K, P_{ep}(FT* | AMU & K), is extremely low, and no different than P_{ep}(FT* | ASU & K). For P_{ep}(FT* | AMU & K) is estimated while ignoring our knowledge that FT*. And while ignoring our knowledge that FT*, we have no reason to think that the universe at L will be one of the ones which must have a life-permitting parameter value set. (And keep in mind that on standard versions of AMU, the number of fine-tuned universes among the total number of universes is extremely low.) An analogy: suppose we have one hundred 100-sided dice, and each one is weighted in such a way that it will always land on a particular number between 1 and 100 – and this is a different number for each die. Now, if we roll all the dice and a particular die, die #81, comes up '37', we know that the objective probability that that die comes up '37' is equal to one. But, while ignoring our knowledge that die #81 did in fact come up '37', we should judge the epistemic probability of die #81 coming up '37' to be .01. For if we ignore our knowledge that die #81 did in fact come up '37', there is no reason to think that that die is any more likely to be the die weighted toward '37' than it is to be one of the other dice.

We have canvassed the three cases exhausting the nature of the relationship between a universe at a particular location and the parameter values it takes. In each case, we have found that

(22) P_{ep}(FT* | AMU & K) is extremely low, and should be no different than P_{ep}(FT* | ASU & K).

Recall that the AMU objection rests on the claim that the epistemic probability of the fine-tuning we observe is raised by the AMU hypothesis. (22) shows that this claim is false, if we describe the evidence for fine-tuning by FT* rather than FT. And this indicates that if we develop the fine-tuning argument in terms of FT* rather than FT (and D* rather than D), we will have an argument that is not subject to the AMU objection, for any standard version of the AMU hypothesis. That is, on standard versions of AMU, the AMU objection fails to defeat the fine-tuning argument.[39]

Conclusion

In closing I wish to make two, more speculative remarks. First, I have developed the above response to the AMU objection in terms of the location of a universe (either in time or in space), but it seems that we could just as well have developed a response in terms of the causal origin of a universe. On the versions of the AMU hypothesis which I have come across in the literature, there is always an event which is either the cause of some universe's coming to be, or which itself just is the coming to be of that universe. This event might be a particular expansion of a singularity, or a particular fluctuation in a "quantum cosmological field," or the inflation of a bubble in hyperspace. It seems that these phrases are meant to refer to particular events which either are the beginning of some universe, or are a cause of the coming to be of some universe. If this is so, then we could let 'the universe with causal origin C' refer (non-rigidly) to whatever universe was brought into being by the event which in fact brought our universe into being. We could then replace occurrences of the phrase 'the universe at L' with the phrase 'the universe with causal origin C', and make arguments parallel to those in the previous section, for the conclusion that $P_{ep}(FT^* \mid AMU \ \& \ K) = P_{ep}(FT^* \mid ASU \ \& \ K)$ and is extremely low.

Second, I have argued only that the AMU objection fails *on standard versions* of the AMU hypothesis. Perhaps there is some other (non-standard) version of the AMU hypothesis which could furnish a successful AMU objection. It is not easy to see exactly what such a version would look like, however, so I leave it to the proponent of the AMU objection to come up with one. Until he or she does so, the AMU objection has failed to defeat the fine-tuning argument.[40]

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NOTES

[1] Roger White (2000). "Fine-Tuning and Multiple Universes," *Noûs* 34, pp. 260–276.

[2] Rodney D. Holder (2002). "Fine-Tuning, Multiple Universes, and Theism," *Noûs* 36, pp. 295–312. Neil Manson and Michael Thrush (2003) have also criticized White's work, along lines similar to Holder's, in "Fine-tuning, Multiple Universes, and the 'This Universe' Objection," *Pacific Philosophical Quarterly*, 84, pp. 67–83. Due to length constraints, I won't directly consider Manson and Thrush's work, though the points I shall make against Holder can be applied to Manson and Thrush as well.

[3] Among those presenting the evidence for fine-tuning are: theoretical physicist Paul Davies (1982) in *The Accidental Universe* (Cambridge: Cambridge University Press); physicists John Barrow and Frank Tipler (1986) *The Anthropic Cosmological Principle* (Oxford: Clarendon Press); astrophysicist Martin Rees (2000) *Just Six Numbers: The Deep Forces that Shape the Universe* (New York: Basic Books); and philosopher John Leslie (1989) *Universes* (New York: Routledge). Other physicists, such as Steven Weinberg and Alan Guth, are skeptical. For a detailed discussion of some of the strongest evidence for fine-tuning, see Robin Collins (2003) "The Evidence for Fine-Tuning," in Neil A. Manson (ed.) *God and Design: The Teleological Argument and Modern Science* (New York: Routledge).

[4] Sometimes discussions of fine-tuning are developed in terms of the fundamental constants of physics and the initial conditions present at the Big Bang. I will use the term

'parameters' to cover both constants and initial conditions, and, indeed, to cover whatever quantities there are that must be fine-tuned for our universe to permit life.

[5] (2002) *Metaphysics*, 2nd edition, (Boulder, CO: Westview Press), p. 146.

[6] As usually presented, the fine-tuning argument doesn't support the hypothesis that the universe was designed by a *single* intelligent agent over the hypothesis that it was designed by a group of intelligent agents. I therefore leave this issue open and formulate D to include either possibility (though I do think there are independent reasons to prefer the hypothesis of a single designer).

[7] For an interesting and insightful discussion of epistemic probability, see Alvin Plantinga (1993) *Warrant and Proper Function* (New York: Oxford University Press), pp. 137–175.

[8] We might initially wonder at the claim that $P_{ep}(FT \mid \sim D \;\&\; K)$ is extremely low. For if we already know that FT (or, at least, if FT has already been assumed for the purposes of the argument), aren't both $P_{ep}(FT \mid \sim D \;\&\; K)$ and $P_{ep}(FT \mid D \;\&\; K)$ equal to one? No – since we have stipulated that K does not include our knowledge that FT. This sort of stipulation is standard practice when using Bayes's theorem to assess the extent to which some piece of evidence supports various hypotheses. So $P_{ep}(FT \mid \sim D \;\&\; K)$ is to be estimated while ignoring our knowledge (or assumption) that FT.

[9] Where '>>' stands for 'is much, much greater than'.

[10] Here I have relied on the inference that if $P_{ep}(A)$ is extremely low, and if ~A entails ~B, then $P_{ep}(B)$ is extremely low.

[11] Comments by Robin Collins have made me aware that one might object to premise (1) at this point, as follows:

> Premise (1) is plausible only if one already thinks that the atheistic many universes hypothesis (see section two below) is extremely improbable. For suppose one thinks the atheistic many universes hypothesis (AMU) is fairly probable. Then one will think that $P_{ep}(FT \mid \sim D \;\&\; K)$ is not so low, *contra* premise (1). For if the universe wasn't designed *but* there's a good chance that there are many universes, then it's not so surprising that our universe is fine-tuned. For if there are many universes, then the probability that our universe will be fine-tuned for life (FT) might be quite high. After all, if there are very many universes, then surely one of them will be fine-tuned for life – and that one is ours.

To reply: the last two statements in this objection are precisely the sort of claims that Roger White's reasoning challenges. In section five I'll try to show that the epistemic probability, given ~D, of an emended version of FT is not any higher if there are many universes than it is if there is only one. If my argument there is successful, then the plausibility of a slightly revised version of premise one won't be threatened by the above objection.

[12] Of course, (1), (2), and (3) can be scrutinized on many fronts. In this paper my main purpose is to examine one particular objection to the fine-tuning argument (the AMU objection), so I will leave other possible objections aside. But perhaps it is worthwhile to simply note here the existence of an important objection to (1), which we might call the inscrutability objection. According to this objection, the epistemic probability that our universe would be fine-tuned, given ~D, is inscrutable (and hence it's not the case that it's extremely low). On this view we should not judge that a fine-tuned universe, given ~D, would be very unlikely; we should instead just abstain from making a judgment about epistemic probability on this issue, since we do not know enough about the ways in which universes come to be to make a warranted judgment. I thank Kent Staley for bringing this objection to my attention. See also Timothy McGrew, Lydia McGrew, and Eric Vestrup (2001) "Probabilities and the Fine-Tuning Argument: a Sceptical View," *Mind* 110, pp. 1027–1037.

[13] It's of course unrealistically precise to pick definite numbers for any of these probabilities, but doing so enables us to get a feel for the sort of relationship had by the different

epistemic probabilities involved. That is, picking particular numbers let's us gauge the extent to which $P_{ep}(D \mid FT \& K)$ varies with changes in the other probabilities involved.

[14] In these formulas, and throughout our discussion, $P_{ep}(D \mid K)$ and $P_{ep}(\sim D \mid K)$ are *prior* epistemic probabilities, which is to say that they are to be estimated while ignoring our belief (or assumption) that FT. This is reflected in our stipulation that K does not include FT.

[15] As just noted (in the previous footnote), to say that $P_{ep}(D \mid K)$ is a prior probability is to say that Agnes estimates it while ignoring her belief that FT. It might then seem strange to speak of a "prior probability, all things considered," as I do in the sentence to which this footnote is appended. My intention in using the phrase "all things considered" here is to emphasize that Agnes takes *everything* relevant into account except FT when she estimates $P_{ep}(D \mid K)$.

[16] If Agnes had estimated $P_{ep}(D \mid K)$ to be .1 (rather than .3), and $P_{ep}(\sim D \mid K)$ to be .9 (rather than .7), then holding all else constant she should put $P_{ep}(D \mid FT \& K)$ at about .917.

[17] More precisely: if her cognitive faculties successfully aimed at truth are functioning properly and are not impeded.

[18] What if $P_{ep}(D \mid K)$ is not much, *much* less than $P_{ep}(\sim D \mid K)$, but is nevertheless much less than $P_{ep}(\sim D \mid K)$ (the difference here is between being much, much less and being much less). Then, I think, (10) will still be true. Here I reason that even if $P_{ep}(D \mid K)$ is much less than $P_{ep}(\sim D \mid K)$, (10) will still be true since $P_{ep}(FT \mid D \& K)$ is *much*, much greater than $P_{ep}(FT \mid \sim D \& K)$. Where x1, x2, y1, and y2 are all positive numbers, if x1 is much less than x2, and y1 is much, much greater than y2, then the product of x1 and y1 will be much greater than the product of x2 and y2.

[19] Let $P_{ep}(D \mid FT \& K) = \mathbf{r}$, and $P_{ep}(\sim D \mid FT \& K) = 1 - \mathbf{r}$. Then by (9), **r** is much greater than $1 - \mathbf{r}$. Adding **r** to both sides of the inequality yields: $2\mathbf{r}$ is much greater than 1. And dividing both sides by 2 yields: **r** is much greater than .5.

[20] White, "Fine-Tuning and Multiple Universes," p. 261. To keep clear on who's where in the conversation: White formulates the many universes hypothesis and then goes on to argue against the cogency of the many universes objection. Also worth noting here is that White uses the phrase 'the actual world' in a way different than that common in modal metaphysics. On a Platonic account of possible worlds, 'the actual world' refers to a certain maximal, possible state of affairs, and not to the totality of existing things (or the totality of past and present things), which seems to be close to the sense in which White is using the phrase.

[21] I take the phrase 'atheistic many universes hypothesis' from Robin Collins (1999) "A Scientific Argument for the Existence of God," in Michael J. Murray (ed.), *Reason for the Hope Within* (Grand Rapids, MI: W. B. Eerdmans), pp. 47–75. For some of Collins' more recent work, see his (2002) "The Argument from Design and the Many-Worlds Hypothesis," in William Lane Craig (ed.), *Philosophy of Religion: a Reader and Guide* (New Brunswick, NJ: Rutgers University Press); and his (2002) "God, Design, and Fine-Tuning," in Raymond Martin and Christopher Bernard (eds.), *God Matters: Readings in the Philosophy of Religion* (New York: Longman Press).

[22] We shall return to this claim shortly.

[23] (17) is obtained by using Bayes's theorem on both sides of inequality (16), and dropping the denominators.

[24] Or, better: she should not place more confidence in D than in AMU given that her reason for placing a high degree of confidence in D is the fine-tuning argument.

[25] White, "Fine-Tuning and Multiple Universes." White tends to use 'life-permitting' where I use 'fine-tuned.'

[26] As we shall see, it is possible to take issue with this claim.

[27] That is, the epistemic probability as estimated while ignoring our belief that FT.

[28] See Holder, "Fine-Tuning, Multiple Universes, and Theism."

[29] Holder, p. 305.

[30] Holder, p. 309. I'm inclined to think Holder can't be right in claiming that it is essential to our universe that it produces us. But this point isn't directly relevant to my main argument, so I won't pursue it further.

[31] Holder, p. 295.

[32] We needn't interpret AMU_H as equivalent to the hypothesis that David Lewis is correct about possible worlds. Perhaps all Holder needs for his argument is to think of the atheistic many universes hypothesis as the hypothesis that every possible set (or n-tuple) of parameter-values is instantiated. Regardless, I leave to the side the question of just how we are to interpret AMU_H, since answering this question, as it turns out, will not be crucial to an assessment of Holder's criticism of White.

[33] Henceforth I will use the phrase 'standard versions of AMU' to refer to all versions of the AMU hypothesis on which different universes can be differentiated by their location, in some sense of 'location'.

[34] At this point one might wonder why FT* has to be so complicated. Why not just let FT* be "The universe at L is fine-tuned for life"? The reason has to do with the fact that 'the universe at L' might very well not make any sense if indeed our universe is the only one there is and ever has been. (For the same sorts of reasons that Aristotle thought the whole world wasn't in a place.) So it might be that we can't use the phrase 'the universe at L' to pick out our universe, *on the assumption that ASU*. But then P_{ep}(the universe at L is fine-tuned for life | ASU & K) wouldn't make sense. I have therefore formulated FT* in such a way as to ensure that FT* both makes sense and expresses the same proposition whether we're evaluating its epistemic probability conditional on AMU or conditional on ASU. I thank Robin Collins for alerting me to this problem.

[35] Have we now made D* so complicated that its prior probability is appreciably lower than the prior probability of D? I don't think so, but to explain why will take some doing. Consider that D* is just a disjunction. Now, note that D* = [(r & p) or (s & q)], letting **r** be the proposition that our universe is the only universe there is and ever was, letting **p** be the proposition that our universe was designed by an intelligent agent (or agents) with the power to bring it about that it be fine-tuned for life, letting **s** be the proposition that there are (or have been) multiple universes, and letting **q** be the proposition that the universes were all designed by an intelligent agent (or agents) with the power to bring it about that they be fine-tuned for life. Since r and s are incompatible, (r & p) and (s & q) are incompatible, and so P_{ep}[(r & p) and (s & q)] equals 0. It follows that P_{ep}[(r & p) or (s & q)] equals $P_{ep}(r \& p) + P_{ep}(s \& q)$, which in turn equals $P_{ep}(p \mid r) \cdot P_{ep}(r) + P_{ep}(q \mid s) \cdot P_{ep}(s)$, by commutativity and the multiplication axiom. $P_{ep}(p \mid r)$ is just the prior probability that our universe was designed, assuming there's just one universe, so it shouldn't be much different than the prior probability of D. $P_{ep}(q \mid s)$ is just the prior probability that all the universes were designed, given that there are many universes. But if one already thought that D wasn't so implausible, and now one is assuming that there are many universes, then it seems to me that one wouldn't think that it was so implausible that all the universes were designed (q). After all, if you're willing to grant some plausibility to the claim that there's a being powerful enough to design one physical universe, then it's hard to see why you shouldn't also grant some plausibility to the claim that there's a being with enough power to design any and all of the universes. So $P_{ep}(q \mid s)$ shouldn't be much different then the prior probability of D. And since r and s are incompatible and exhaustive, $P_{ep}(s) = 1 - P_{ep}(r)$. So the fact that neither $P_{ep}(q \mid s)$ nor $P_{ep}(p \mid r)$ are much different than the prior

probability of D means that the prior probability of D* [which equals $P_{ep}(p \mid r) \cdot P_{ep}(r) + P_{ep}(q \mid s) \cdot P_{ep}(s)$] is not much different than the prior probability of D.

[36] Here and henceforth we must let K include the knowledge that this universe exists (i.e. that the universe at L exists (if MU) or our universe exists (if SU)).

[37] Holder, p. 309.

[38] At this point, a proponent of the AMU objection might point out that if we build into the AMU hypothesis the claim that the universe at L had a high objective propensity to be fine-tuned, then $P_{ep}(FT^* \mid AMU \ \& \ K)$ will be high. This is in fact no help to the AMU objection. For if we do build this additional claim into the AMU hypothesis, the prior probability of that hypothesis, $P_{ep}(AMU \mid K)$, becomes exceedingly low. While ignoring FT*, we have no reason to think that the location in fact associated with our universe will be one of the locations with a propensity to give rise to a fine-tuned universe. So if we build that claim into AMU, the prior probability of AMU (which is calculated while ignoring FT*) will be very low. This same point can be argued for in a slightly different way: On standard versions of AMU, and on the case we are now considering, a very small proportion of the total number of universe-locations would have propensities to give rise to fine-tuned universes. It follows that there are many different versions of AMU that we could consider: the version that says that *these* universes (i.e. the ones arising at these few specified locations) have propensities to be fine-tuned, and the version that says that *those* universes (i.e. the ones arising at those few specified locations) have propensities to be fine-tuned, and so on. But no one of these many versions of AMU has a greater prior probability for us than any of the others, since we are estimating the prior probability while ignoring FT*. So the prior probability of the versions of AMU on which the universe at L has a propensity to be fine-tuned will be very low.

[39] In order for the original version of the fine-tuning argument to be successful, we had to have some reason for thinking that the existence of fine-tuning would be more likely given the existence of an intelligent designer than it would be given the non-existence of an intelligent designer. More precisely, $P_{ep}(FT \mid D \ \& \ K)$ had to be appreciably higher than $P_{ep}(FT \mid {\sim}D \ \& \ K)$. A worry: perhaps replacing D with D* makes the analogous claim dubious. Do we still have reason to think $P_{ep}(FT^* \mid D^* \ \& \ K)$ is appreciably higher than $P_{ep}(FT^* \mid {\sim}D^* \ \& \ K)$? I say we do. Forgoing a technical presentation for the sake of space, let me just sketch the intuitions behind my thinking. The idea is this: It's hard to see why God would create very many separate universes. But even if He did it's unlikely that He would go to the trouble of making very many universes if the vast majority of them were just going to contain lifeless matter in motion. So if God did create very many universes, then it's not unlikely that He would fine-tune most or all of them, and so it's not unlikely that He would fine-tune the universe at location L. And if He did only create one, then it's not unlikely that He would fine-tune it. In contrast, $P_{ep}(FT^* \mid {\sim}D^* \ \& \ K)$ is extremely low, since the epistemic probability of FT* is extremely low on ASU *and* on AMU.

[40] I am grateful to Kent Staley and Robin Collins for their comments on an earlier draft of this paper.