GOD, FINE-TUNING, AND THE PROBLEM OF OLD EVIDENCE

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Abstract

The fundamental constants that are involved in the laws of physics which describe our universe are finely-tuned for life, in the sense that if some of the constants had slightly different values life could not exist. Some people hold that this provides evidence for the existence of God. I will present a probabilistic version of this fine-tuning argument which is stronger than all other versions in the literature. Nevertheless, I will show that one can have reasonable opinions such that the fine-tuning argument doesn't lead to an increase in one's probability for the existence of God.

1. Introduction.

This paper is about the fine-tuning argument for the existence of God, which runs roughly as follows:

(P1) The fundamental constants that are involved in the laws of physics which describe our universe (such as the masses of the fundamental particles and the strength ratios between the fundamental forces) are finely tuned for life, in the sense that if some of the constants had slightly different values life could not exist. (I will call this "the fine-tuning evidence".)

(C1) It would be very unlikely for the universe to have life-permitting fundamental constants by chance (from P1).

(P2) If God created the universe, we would expect it to be life-permitting.

(C) Thus, probably God created the universe (from C1, P2).

This paper has two main theses. I will argue that the specific version of the fine-tuning argument I will present below is stronger than all other versions in the literature. I will show that the fine-tuning argument is best presented using a subjectivist interpretation of probability; objections to the fine-tuning argument which rely on a frequentist or logical interpretation of probability are flawed. Nevertheless, I am not a proponent of the fine-tuning argument. My second thesis is that one can have reasonable opinions such that the fine-tuning argument doesn't lead to an increase in one's probability for the existence of God. This doesn't count as a full-scale refutation of the fine-tuning argument, since I admit that one can have reasonable opinions such that the argument *does* lead to an increase in one's probability for the existence of God. But I believe that no stronger reply to the fine-tuning argument is successful.

2. Teleological Arguments.

The fine-tuning argument is one version of the teleological argument for the existence of God. I will now present a brief history of teleological arguments, for two reasons. First, the history will help us to better understand the fine-tuning argument, by situating it in context. Second. the fine-tuning argument is, in my opinion, the only viable teleological argument; a review of the history will allow us to see how the other teleological arguments are flawed.

The teleological argument goes back at least to Aquinas's Fifth Way:

"We see that things which lack intelligence, such as natural bodies, act for an end ...

Hence it is plain that not fortuitously, but designedly, do they achieve their end."

Aquinas's argument has some force in the context of Aristotelian physics, where natural bodies move in a goal-directed fashion, such as by going to their natural places. Now that Aristotelian physics has been replaced with a physics that does not involve teleology, Aquinas's argument loses its force.

Probably the best-known version of the teleological argument is given by William Paley (1800). Paley gives an argument by analogy: just as, when one comes across a complex object like a watch, one infers a designer, so when one comes across a complex biological object like the human eye, one should also infer a designer. Paley's argument is generally taken to be refuted by Darwin; it's generally thought that evolution can account for the existence of complex living things.

Creationists have argued against evolution on various fronts. The two I find most prima facie plausible are as follows. One is that evolution can give no plausible account of the origin of life (in the form of self-replicating molecules) from non-life. The other (famously promulgated

by Behe 1996) is that some structures in microbiology are so sophisticated that they would not be expected to arise via gradualistic evolutionary processes.

An important and underappreciated point is that both these objections to evolution can be refuted once one recognizes that the universe is spatially infinite. Empirical measurements of the global curvature of spacetime suggest that spacetime is globally flat, which entails that the universe is spatially infinite. (See for example Bahcall et. al. 1999 for details.) Also, the basic theory of inflationary cosmology is now widely accepted, and inflationary cosmology strongly suggests that the universe is spatially infinite. (See for example Guth 2000, 571 or Garriga and Vilenkin 2001 for details.) There is no reason to think that what exists in distant, unobserved regions of space is substantially different from what exists in this region of space, so it is reasonable to infer that stars and planets exist in those regions of space as well.

Now, let us grant to the creationist that it is very improbable that self-replicating molecules and sophisticated microbiological structures would arise by chance on Earth. With an infinite number of planets, though, as long as the range of initial conditions varies sufficiently across the different planets, one would fully expect life to arise. (In fact, one would fully expect life to arise on an infinite number of planets. For discussion of this point, see for example Ellis and Brundrit 1979.) So even if the steps needed to account for the existence of life are very improbable ones, we should still fully expect them to happen somewhere.

The creationist who appreciates that the universe is spatially infinite might be compelled to respond: what made it the case that the universe is spatially infinite? Why are there stars and planets at all? Why does our universe have fundamental constants that allow for stars, planets, and the existence of life? This brings us to the fine-tuning version of the teleological argument.

There's a sense in which this move to the fine-tuning version of the teleological argument brings us back to Aquinas. While the teleological argument is often understood in a biological context (following Paley), Aquinas presented the argument in a physics context, focussing on natural bodies. I will argue that, just as Aquinas's version of the teleological argument is unsuccessful, so too is the fine-tuning version of the teleological argument.

3. The Fine-Tuning Argument.

The basic version of the fine-tuning argument I will be discussing in this paper is as follows. (The fine-tuning argument is presented in this sort of way by for example Swinburne (1990, 155), Le Poidevin (1996, 47-8), Collins (1999, 57), Holder (2002, 298-9), and Manson (2003, 7). There are other versions of the fine-tuning argument in the literature, but I will be focussing on this one.)

Let *L* be the proposition that the universe is life-permitting, and let *G* be the proposition that God exists.[1] According to proponents of the fine-tuning argument, *L* provides epistemic support for *G*. A standard way of understanding the claim that *L* provides epistemic support for *G* is to say that learning that *L* increases one's probability for *G*: $P(G|L) > P(G)$. Proponents of the fine-tuning argument argue that this inequality holds, since $P(L|G) > P(L)$, and by Bayes' Theorem:

[1]If one prefers, the proposition *G* can be taken to include the possibility that some supernatural designer exists, without that designer having all the attributes we would attribute to God. I mention this possibility because some proponents of intelligent design are at pains to maintain that they are not arguing for the existence of God, but just for the existence of a designer. In the case of the fine-tuning argument, that designer would be a designer of the universe, so would presumably have to at least be supernatural.

$P(G|L) / P(G) = P(L|G) / P(L)$.

Why is it that case that $P(L|G) > P(L)$? That claim is equivalent to:

$P(L|G) > P(L|G)\, P(G) + P(L|{\sim}G)\, P({\sim}G)$.

Proponents of the fine-tuning argument maintain that $P(L|G) > P(L|{\sim}G)$, and it follows that $P(L|G) > P(L)$ (because $P(L)$ is a weighted average of $P(L|G)$ and a quantity less than $P(L|G)$).

Why is it the case that $P(L|G) > P(L|{\sim}G)$; why is it more probable that the universe is life-permitting under the supposition that God exists than under the supposition that God doesn't? Here is where proponents of the fine-tuning argument appeal to the evidence of fine-tuning. They argue that, for various fundamental constants, such as the constant representing the strength of the gravitational force, and the constant representing the proton/neutron mass difference, these constants have to have a value in a relatively narrow range in order for life to exist. (For a nice up-to-date discussion of these fine-tuning claims, see Collins 2003.) Proponents of the fine-tuning argument then argue that, if the fundamental constants of the universe were selected naturalistically (via an objectively chancy process, for example), one would expect the constants to be such that the universe is not life-permitting. But if the constants were selected supernaturalistically, one would expect the universe to be life-permitting (because God would pick the constants so as to guarantee the existence of life). It follows that $P(L|G) > P(L|{\sim}G)$, and thus $P(G|L) > P(G)$, as desired.

4. Frequentist vs. Logical vs. Subjective Probability.

In the previous section, I presented the fine-tuning argument utilizing a probability function P, but I did not specify what concept of probability this function was meant to represent. I will now

consider three interpretations of probability, and show that the fine-tuning argument is different depending on which interpretation of probability one chooses. Specifically, I will show that on frequentist interpretation, the fine-tuning argument is clearly unsuccessful; on a logical interpretation, it's an open question whether the fine-tuning argument is successful; while on a subjective interpretation, the fine-tuning argument looks more promising.

First, consider a frequentist analysis of probability, where the probability for an event is determined by the actual frequency with which the event has occurred in past trials. For example, on a frequentist interpretation, the probability of a fair coin landing heads is about 1/2 because out of all coin-flips with these sort of coins in the past, about half of those coin flips landed heads. Elliot Sober (2003, 49) criticizes the fine-tuning argument, saying that "the argument from fine-tuning can't be defended as a claim about probabilities." But his criticism relies on something like the frequentist interpretation of probability, and he gives no argument to defend that choice of interpretation.

Sober's criticism is short and straightforward. He says that "we have neither theory nor data on which to ground" the claim that $P(G|L) > P(G)$. He concludes that the fine-tuning argument "makes claims about probabilities that we have no reason to accept" (2003, 48-9). To justify his claim that we have neither theory nor data to establish the probabilities, he contrasts the fine-tuning argument with the firing squad example (Leslie 1989, 13-15), where a prisoner finds himself alive after the marksmen shoot. Sober maintains that in the firing squad example, when the prisoner finds himself alive, he should increase his probability for the hypothesis that the marksmen intended to miss. The reason this is the case, he says, is that "we have frequency data and our general knowledge of human behavior on which to ground" the probability shift.

The firing-squad example is meant to be analogous to the fine-tuning argument: just as the prisoner's being alive is more likely under the design hypothesis than under the chance hypothesis, so the universe-being life-permitting is ostensibly more likely under the design hypothesis than under the chance hypothesis. But Sober rejects this analogy, because he maintains that we have no such frequency data or general knowledge in the case of the fine-tuning argument.

Sober concludes the section of his paper where he discusses these issues by saying that not only do we have no reason to accept the fine-tuning argument's claims about probability, "we cannot even *understand* them as objective claims about nature" (2003, 49). I maintain that the fine-tuning argument is unfairly weakened if it is saddled with the requirement that its probability claims must be objective claims about nature. Sober is clearly right that we have no frequency data on the proportion of life-permitting universes, and perhaps he is also right that we have no theory which can enable us to make objective claims about the probability of a universe being life-permitting. But these considerations are not sufficient to set aside the fine-tuning argument. There is no requirement in the fine-tuning argument that its claims about probability be understood as objective claims about nature.

On the subjectivist interpretation of probability, one's probability for a proposition represents one's personal degree of belief that that proposition is true. On the subjectivist interpretation, the fine-tuning argument would be successful for an agent, as long as that agent's subjective probabilities are such that $P(G|L) > P(G)$. (I will discuss in detail how this reasoning is meant to work in the next section.) Thus, the fine-tuning argument utilizing the subjectivist interpretation of probability is more promising than the fine-tuning argument utilizing the

frequentist interpretation, because on the subjectivist interpretation there is at least hope that one can have probability assignments such that the argument is successful.[2]

I will now show that the fine-tuning argument fares better on the subjectivist interpretation of probability than it does on the logical interpretation. On the logical interpretation of probability, probabilities are determined through a priori reasoning, such as reasoning in accordance with the Principle of Indifference. Timothy McGrew, Lydia McGrew, and Eric Vestrup (2001) (henceforth MMV) treat the fine-tuning argument as utilizing the logical interpretation, and present an emphatic critique of the fine-tuning argument interpreted in this way. They assume that the fine-tuning argument utilizes the Principle of Indifference, and thus attribute to proponents of the fine-tuning argument the view that it is unreasonable to assume that one sort of universe is more probable a priori than any other sort. They then conclude that the fine-tuning argument can't be coherently formulated, since the space of possible values of constants for universes is infinite, and hence non-normalizable. They say that "Probabilities make sense only if the sum of the logically possible disjoint alternatives adds up to one" (MMV, 203), but that's not possible for a non-normalizable space of possibilities where each possibility is treated the same. Either each possibility will be assigned probability 0, in which case the total will be 0, or each possibility will be assigned some fixed positive probability, in which case the total will be infinite. They take this reply to succeed in "demolishing" (MMV, 207) the fine-tuning argument.

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[2]Robin Le Poidevin (1996, 49-57) objects to the fine-tuning argument in a way similar to Sober: Le Poidevin considers only the frequency and propensity theories of probability, and argues that on either theory "it makes no sense to talk of the probability of a life-sustaining universe in the absence of God" (1996, 57). My reply to Sober carries over to Le Poidevin.

In my opinion, MMV are making too much of a technical issue in probability theory. Indeed, work has been done on resolving this technical issue. Peter Vallentyne (2000), for example, has come up with a sophisticated yet natural way of making comparative probability judgements, even when the various possibilities being compared all have probability 0. I won't go into Vallentyne's solution here; I will just note as a potential problem that what motivates Vallentyne's work is simply the intuition that probability judgements should make sense even when the probabilities for the various disjoint possibilities don't sum to one (that is, when countable additivity fails). It follows that it would be open to MMV to reject Vallentyne's solution by rejecting that intuition. I conclude that it is an open question whether the fine-tuning argument on the logical interpretation is promising.

The fine-tuning argument on the subjectivist interpretation has various benefits over the fine-tuning argument on the logical interpretation. One benefit is that on the subjectivist interpretation, one need not rely on the Principle of Indifference. One is open to assign zero probability to some possible values of constants, and non-zero probability to other possible values. It follows that the probabilities assigned to the various disjoint possibilities can sum to one. Another benefit is that on the subjective interpretation, one need not even bother to assign probabilities to the various possible values of constants; one can just assign a probability to the proposition *L* that the universe is life-permitting. There is no need to generate one's probabilities in any sort of foundational way, by for example assigning probabilities to each element in the possibility space. As long as the probability assignments one does make are probabilistically coherent, that is enough to satisfy the constraints of the subjective probability interpretation. The reason it matters that on the subjectivist interpretation, one need not assign probabilities to the

various possible values of constants, is that such probability assignments aren't needed to generate the fine-tuning argument. This can be seen by looking at the presentation of the argument in the previous section.

Once one moves to the subjectivist interpretation, one allows for an agent to have her personal probability function be such that $P(G|L) > P(G)$, but one also allows for an agent to have her personal probability function be such that $P(G|L) = P(G)$. For the strongest defense of the fine-tuning argument, one would have to argue that only probability functions which are such that $P(G|L) > P(G)$ are reasonable ones; all other probability functions are unreasonable. For a weaker defense, one could simply argue that for a wide class of agents, it's actually the case that their probability functions are such that $P(G|L) > P(G)$. I will now discuss MMV's criticism of subjectivist interpretation, which takes issue with these two lines of defense.

MMV are aware that their critique of the fine-tuning argument could be criticized for relying on a non-subjective account of probability, and so they go on the offensive against the subjectivist interpretation. They write:

> in our opinion it is profoundly unsatisfying to stipulate that we can just "tell" which [probability] functions are reasonable and which are not. Reasonable people have conflicting intuitions here. ... If, at a critical point, the [fine-tuning] argument turns on a subjectively variable sense of which assessments of probabilities are reasonable, a sense that cannot be adjudicated in terms of any more fundamental criteria, then the [fine-tuning argument] is effectively forceless. (MMV, 206)

There is something rhetorically strange about this criticism. MMV, by their lights, have just shown that the fine-tuning argument on the logical interpretation is demolished. One is then led

to ask whether the fine-tuning argument would fare any better on a different interpretation of probability. MMV proceed to reject the subjectivist interpretation, because the fine-tuning argument would be weak on that interpretation. But then why not reject the logical interpretation too? If those are the only two interpretations on the table, and one is being charitable to the fine-tuning argument, then one should focus on how the fine-tuning argument fares on the interpretation that is most promising. On the subjectivist interpretation, as MMV implicitly admit, the argument is not demolished; the argument would go through for those agents who happen to have subjective probability functions such that $P(G|L) > P(G)$.

There is a more substantive problem with MMV's criticism too. MMV suggest that we should not expect agreement on which subjective probability functions are reasonable and which aren't. But in fact, for many cases there is widespread agreement about such matters. For example, any reasonable person would reject a probability function which held that the sky being blue provides evidence that the moon is made of green cheese. It would be worth examining whether there is similar widespread agreement that only probability functions which are such that $P(G|L) > P(G)$ are reasonable. This is precisely what I will do later in this paper.

Nevertheless, there is something correct about MMV's criticism. It is the case that, on the subjectivist interpretation, there is no way to ensure that all reasonable, rational agents have the same probability function. But this is just the way the world is; different people have different opinions about things, even when the people are all being reasonable and rational. The point of the subjectivist interpretation is to probabilistically represent rational people's actual opinions; the point is not to see what probabilities are generated when one applies ostensibly a priori principles like the Principle of Indifference.

To sum up: I have argued that the fine-tuning argument utilizing a subjectivist interpretation of probability is more promising than the fine-tuning argument utilizing a frequentist or logical interpretation of probability. My arguments have been parochial ones, in the sense that they have mostly focussed on the implications of the various interpretations for the fine-tuning argument. A different way to debate the merits of the various interpretations for the fine-tuning argument would be to debate the merits of the various interpretations themselves. For example, I believe that the frequentist interpretation should be rejected because we sometimes assign probabilities in the absence of frequency data, and the logical interpretation should be rejected because at least sometimes there are multiple rational yet conflicting ways to apply ostensibly a priori principles like the Principle of Indifference. But these issues are part of a huge debate in the literature, and to engage in that debate is beyond the scope of this paper. This section is simply designed to show that the fine-tuning argument is most promising on the subjectivist interpretation of probability. Nevertheless, the fine-tuning argument on the subjectivist interpretation has a problem of its own; it is to this issue that I now turn.

5. The Problem of Old Evidence.

Given that one takes the subjective probability approach to the fine-tuning argument, there is a simple but prima facie powerful objection to the argument which must be considered. The objection is that we know that we exist, and hence we already fully believe that the universe is life-permitting: $P(L) = 1$. It automatically follows that $P(L|G) = P(L|\sim G)$, and hence $P(G|L) = P(G)$.

This objection is not adequate as a reply to the fine-tuning argument, because it proves

too much. There are many cases where we have some evidence E such that $P(E) = 1$, and yet we think that E provides epistemic support for some hypothesis H. Perhaps the most famous example is E being the (true) proposition that the precession of the perihelion of Mercury is 5600 seconds of arc per century, and H being general relativity. When general relativity was proposed, people already knew what the amount of the precession of the perihelion of Mercury was, and yet the precession was taken to provide epistemic support for general relativity. This is one instance of the problem of old evidence.

Note that problem of old evidence wouldn't arise for an ideal Bayesian agent, because by definition such agents are logically omniscient. An ideal agent would know about the proposition H and would assign some probability to H at the beginning of her reasoning process (such as when she is born). As long as E is evidence in the sense that it wasn't available to her at the beginning of her reasoning process, then there will be some time when her prior probability function is updated by learning E. When she learns E she will immediately see the evidential connection between E and H, so her probability for H would be adjusted accordingly. Because the problem of old evidence doesn't arise for ideal Bayesian agents, it is allowable for a solution to the problem to deviate from the strict Bayesian rules. Indeed, the solution I will utilize below does this.

There is no agreed-upon solution to the problem of old evidence, but one standard type of solution is as follows. (See Glymour (1980, 87-91), Howson (1984, 1985, 1991), Jeffrey (1995), and Barnes (1999) for some discussions of this solution.) Let P^- be one's prior probability function, and let P^+ be one's posterior probability function, once one has taken into account that there is a potential evidential connection between E and H. According to this solution to the

problem of old evidence, once one learns about the potential connection, one should suppose that one does not fully believe that *E*, and revise all one's probability assignments accordingly, to generate an ur-probability function *P**. One should then set $P^{+}(H) = P^{*}(H|E)$. There are many cases where $P^{-}(H) = P^{*}(H)$, since in pretending that one does not fully believe that *E*, that would generally not influence one's probability for *H*. In such cases, as long as $P^{*}(H|E) > P^{*}(H)$, then $P^{+}(H) > P^{-}(H)$, and *E* counts as evidence for *H*.

One of the drawbacks of the ur-probability solution is that it is not always clear what values the ur-probabilities should take, especially when one has to make extreme modifications to one's opinion, by for example supposing that one does not fully believe that one exists. (For example, one much-discussed issue is whether one should suppose that one never fully believed that *E* was true, or whether one should suppose that one forgot that *E* was true.) Nevertheless, we need to have some way of accounting for how propositions like *L* can count as evidence, and the ur-probability solution is the best approach available. As far as I know, though, there is no instance in the literature of a proponent of the fine-tuning argument citing the problem of old evidence in their discussion of the argument, let alone utilizing the ur-probability solution in formulating the argument.[3] As a result, proponents' presentations of the fine-tuning argument are less strong than they could be.

Here is how the fine-tuning argument goes, utilizing the ur-probability solution. One starts with an initial probability for the existence of God, $P^{-}(G)$, and one wants to see whether the fine-tuning evidence is such that the fact that our universe is one of the special life-permitting

[3]There is an unpublished paper by Robin Collins, however, where he does utilize the problem of old evidence approach to the fine-tuning arugment; Collins developed the ideas in his paper independently of this paper.

ones provides evidence for G. In short, one wants to see whether $P^{+}(G) > P^{-}(G)$.

One can start by generating an ur-probability function under the supposition that one does not fully believe that L. One can assume that $P^{-}(G) = P^{*}(G)$, as is standard in cases involving old evidence. (I will come back to this assumption later, however.) To establish a value for $P^{+}(G)$, one can use Bayes' Rule: $P^{+}(G) = P^{*}(G|L) = P^{*}(L|G)\ P^{*}(G) / P^{*}(L)$. To establish a value for $P^{*}(L)$, it helps to note that $P^{*}(L) = P^{*}(L|G)\ P^{*}(G) + P^{*}(L|{\sim}G)\ P^{*}({\sim}G)$. So the crucial question becomes: what are the values for $P^{*}(L|G)$ and $P^{*}(L|{\sim}G)$?

In fact, we don't need to come up with precise values for those quantities. As long as $P^{*}(L|G) > P^{*}(L|{\sim}G)$, we have the desired result that $P^{+}(G) > P^{-}(G)$. This follows because $P^{*}(L)$ is a weighted average of $P^{*}(L|G)$ and $P^{*}(L|{\sim}G)$, so if $P^{*}(L|G) > P^{*}(L|{\sim}G)$, then $P^{*}(L|G) > P^{*}(L)$. If $P^{*}(L|G) > P^{*}(L)$, then $P^{*}(G|L) > P^{*}(G)$ (from Bayes' Rule). It would then follow that $P^{+}(G) = P^{*}(G|L) > P^{*}(G) = P^{-}(G)$, as desired.

At this point, all the proponents of the fine-tuning argument need to show is that $P^{*}(L|G)$ is indeed greater than $P^{*}(L|{\sim}G)$. Here is where they can appeal to the fine-tuning evidence. $P^{*}(L|{\sim}G)$ is low, because it would take a very special selection of fundamental constants for the universe to be life-permitting. $P^{*}(L|G)$, by contrast, is high, because one would expect God to create a life-permitting universe. It follows that $P^{+}(G) > P^{-}(G)$; the fine-tuning evidence does lead to an increase in one's probability for the existence of God.

This is a strong argument for theism. I think that philosophers haven't always appreciated how strong this argument is, because it hasn't been presented in the way that I have presented it above. In lieu of the appeal to the ur-probability solution to the problem of old evidence, the fine-tuning argument has been presented in a way such that it's not clear how probabilities

involving L are generated; specifically, it's not always clear how probabilities of the form $P(L|X)$ can take any value other than 1. (See for example the references cited at the beginning of Section 3.) What I have shown is that, by appealing to the ur-probability solution to the problem of old evidence, one can present a rigorous version of the fine-tuning argument.

6. Against the Fine-Tuning Argument.

Since the above version of the fine-tuning argument relies on a subjectivist interpretation of probability, there's a sense in which the argument is easy to refute. One simply needs to come up with a prior and ur-probability function such that $P^{+}(G) = P^{-}(G)$. For an agent with those probability functions, the fine-tuning argument will not be successful. The important question though is whether such probability functions are reasonable ones to have. Do reasonable people who are opposed to the fine-tuning argument actually have those probability functions, or could they reasonably adopt them?

For example, consider the option of adopting an ur-probability function such that $P^*(L|G) = P^*(L|\sim G)$. One could hold that $P^*(L|\sim G)$ is high, but this would presumably require rejecting the fine-tuning evidence. If one sincerely believed that the fine-tuning evidence was faulty, then it might be legitimate to set $P^*(L|\sim G)$ to be high. Well-known physicist Steven Weinberg could be one of these people: he has said that he is "not impressed with these supposed instances of fine-tuning" (1999, 46). But for those who are moved by the fine-tuning evidence, this is not a live option.

A different way to get the result that $P^*(L|G) = P^*(L|\sim G)$ would be to hold that $P^*(L|G)$ is low. One could hold that – in the absence of belief that the universe is life-permitting – one

sees little reason for God to create a life-permitting universe. This is how Jan Narveson (2003, 97-9), for example, might respond to the fine-tuning argument. Narveson suggests that, if God were to exist, the ways of God would be so mysterious that we couldn't make any reasonable predictions about what God would or wouldn't do. Thus, it would be open to Narveson to say that the ur-probability of a life-permitting universe is the same regardless of whether God exists.

Even though there's a sense in which the fine-tuning argument is easy to refute (in for example the above-described ways), there's a sense in which it's not. To be unmoved by the fine-tuning argument in the ways described above, one actually has to believe that the fine-tuning evidence is faulty, or one actually has to believe that God would not be expected to create a life-permitting universe. Since (in my opinion, at least) belief is not a matter of the will, as long as one does not hold these beliefs, one cannot refute the fine-tuning argument in these ways. In fact, in my opinion most people would reject those beliefs – most people would find the fine-tuning evidence at least somewhat plausible, and most people would find it probable that God would create a life-permitting universe.

The response I will now give to the fine-tuning argument is stronger than those considered above, in that it does not involve rejecting premises of the argument that most people find plausible. The premise of the argument I will question is one that hasn't been questioned before, but that's because the premise isn't salient unless one formulates the argument utilizing ur-probabilities. I maintain that for most everyone it is unreasonable to hold that $P^{-}(G) = P^{*}(G)$, instead $P^{*}(G)$ should be much lower than $P^{-}(G)$. The reason this is the case is that for most everyone, beliefs that entail that the universe is life-permitting are part of the evidence people have taken into account in forming their prior probability for the existence of God, $P^{-}(G)$. (Their

probability is "prior" in the sense that they have not yet taken into account the fine-tuning evidence.) For example, Christians believe in God in part because they believe Biblical accounts about Jesus, but the existence of Jesus entails that the universe is life-permitting. In formulating an ur-probability for the existence of God, one cannot take into account Biblical accounts about Jesus. More generally, one cannot take into account the existence of complex features that Paley appeals to, like the human eye, one cannot take into account the existence of consciousness, and so on. One's ur-probability for the existence of God would have to be founded on the plausibility of a priori arguments for the existence of God, like the ontological argument, and the plausibility of arguments which appeal to general features of the universe that don't entail the universe is life-permitting, like the cosmological argument. The only types of people for whom it wouldn't be the case that $P^{-}(G) > P^{*}(G)$ are those whose sole reasons for believing in God are arguments like the ontological argument and the cosmological argument.

Now, recall that $P^{+}(G) = P^{*}(G|L)$. In the previous section, where it was assumed that $P^{-}(G) = P^{*}(G)$, to establish that $P^{+}(G) > P^{-}(G)$, all we had to do was establish that $P^{*}(G|L) > P^{*}(G)$. Now, we see that matters are more complicated: even if $P^{*}(G|L) > P^{*}(G)$, it still could be the case that $P^{*}(G|L) = P^{-}(G)$, and hence $P^{+}(G) = P^{-}(G)$. What one has to establish is whether the fine-tuning evidence gives one more of a reason to believe in the existence of God, besides all the evidence one had from before which was based on the universe being life-permitting.

It turns out that this depends on the details of *how* one supposes that one doesn't know that the universe is life-permitting. (Here and below, I will assume that when one doesn't know that *P*, one knows that one doesn't know that *P*, and hence one doesn't fully believe that *P*.) I will describe various scenarios for supposing that one doesn't know that the universe is life-

permitting, the first of which is favorable to proponents of the fine-tuning argument, the others of which are not. I will then argue that there is no conclusive reason to favor one scenario over the others.

First, one can imagine that one does not know that the universe is life-permitting by imagining that one knows the form of the fundamental physical laws of the universe, but one does not know the values of the constants that are involved in those laws. Before taking into account the fine-tuning evidence, one might have thought that a wide range of values for the fundamental constants would allow for a life-permitting universe, but the fine-tuning evidence shows that that is not the case. It follows that $P^*(G|L) > P^-(G)$, and the fine-tuning argument is successful.

Alternatively, one can imagine that one does not know that the universe is life-permitting by imagining that one knows the number of particles in the universe, what types they are, and their intrinsic properties, but one does not know the fundamental laws governing how these particles interact. Or, one can imagine that one knows the density of matter in each region of spacetime, but one does not know what types of particles exist in those regions, or how they interact. (There are many other possibilities as well; I leave it to the reader to generate other options.) On either of these scenarios, there would be many possible universes which are not life-permitting, and hence one would hold that our universe being life-permitting provides evidence for the existence of God, in the sense that $P^*(G|L) > P^*(G)$. But nevertheless, $P^*(G|L) = P^-(G)$, because the fine-tuning evidence doesn't change one's assessment of the various non-life-permitting universes one deems possible. In supposing that one knows that various types of particles in existence, but not the fundamental laws, the fine-tuning evidence doesn't affect one's

assessment of the probability of life-permitting universes. The fine-tuning evidence just focusses on one particular set of fundamental laws, whereas in the scenario imagined we are allowing for all logically possible fundamental laws that are compatible with the existence of those types of particles. Facts about the fundamental constants for our particular laws simply don't matter in that case. Similarly, in supposing that one knows the density of matter in each region of spacetime, the fine-tuning evidence doesn't affect one's assessment of the probability of life-permitting universes. The fine-tuning evidence just focusses on one particular set of fundamental laws, whereas in the scenario imagined we are allowing for all logically possible fundamental laws that are compatible with the actual density of matter. In these scenarios, $P^{+}(G) = P^{-}(G)$, and the fine-tuning argument is unsuccessful.

How should we adjudicate between these various scenarios? The literature on the problem of old evidence is of no help – there are no agreed-upon prescriptions for how to generate one's ur-probability function. The proponent of the fine-tuning argument might attempt to argue that we should hold the laws of physics fixed, and just vary the values of the constants, because that will produce possible universes that are most similar to our actual universe. But this argument is no good – similarity judgements are notoriously context-dependent, and there are important senses in which a universe with the same number and types of particles as ours, or a universe with the same density distribution as ours, is more similar to ours than a universe which differs in the number and types of particles or the density distribution but holds the laws of physics fixed. I conclude that there is no requirement from rationality or considerations of reasonableness which forces one to generate ur-probabilities in the way proponents of the fine-tuning argument want one to. It follows that one is open to generate ur-probabilities via a

scenario that renders ineffective the fine-tuning evidence.

The general point is as follows: when faced with the fine-tuning evidence, it is reasonable to not be surprised. We already knew that there are many possible universes that are not life-permitting, and yet are similar in certain ways to our actual universe. The fine-tuning argument encourages us to focus our attention on those possible universes that have the same laws of physics as ours, but different fundamental constants. But why not focus on those possible universes that have the same types of particles as ours, but different fundamental laws? Or why not focus on those possible universes that have the same density distribution as ours, but different types of particles? Before I was faced with the fine-tuning evidence, I already knew that our universe was special, in the sense that there are many possible universes similar to ours in certain ways and yet not life-permitting. I already knew that, if God existed, God would have to choose to actualize our life-permitting universe from among a sea of similar non-life-permitting universes. I already knew that, if God did not exist, there's a sense in which we are lucky that the universe is life-permitting – there are many possible universes similar to ours which are not. The fine-tuning evidence doesn't change any of that, and hence the fine-tuning evidence doesn't change my probability for the existence of God.

7. The Many-Universes Objection.

I believe that the reply I've given above is the strongest reply one can give to the fine-tuning argument. It is hard to argue this point, since I'd have to consider all possible stronger replies to the fine-tuning argument and show that they are all unsuccessful. Instead, I will consider two prima facie powerful objections to the fine-tuning argument, and I will show that they are

mistaken.

The objections are based on the many-universes version of the fine-tuning argument, so I will start by explaining that version. Sometimes, the fine-tuning argument is construed not as an argument for theism, but as an argument for the existence of many universes. (See for example Rees 2000.) The thought is that the existence of our universe, with just the fundamental constants it has, is highly improbable if there is only one universe, but is highly probable if there are an infinite number of universes, where different fundamental constants obtain in the different universes. Thus, the existence of our universe provides evidence for the existence of many universes.

Now, instead of using the facts about fine-tuning as evidence for the existence of many universes, one might try to use the existence of many universes as a way of rejecting the theistic fine-tuning argument. I will examine two ways that one could attempt to do this.

First, one might try to reject the step in the argument which holds that $P^*(L|G) > P^*(L|\sim G)$. Supposing that many universes exist, one could argue $P^*(L|\sim G)$ is high; even in the absence of a God we would expect there to exist a life-permitting universe. One could argue that the existence of a God wouldn't make it any more likely for a life-permitting universe to exist, so $P^*(L|G) = P^*(L|\sim G)$.

The problem with this reply is that it relies on fully believing that there are many universes. It would seems strange to have such a conviction; to the extent that there is evidence at all in favor of the existence of many universes, the evidence is weak. But as long as one assigns a probability less than 1 to the hypothesis that there are many universes, the theistic fine-tuning argument will still have force. On the supposition that there are many universes, $P^*(L|G)$

= $P^*(L|{\sim}G)$, while on the supposition that there is just one universe, $P^*(L|G) > P^*(L|{\sim}G)$; one's actual ur-probabilities will be a weighted average of the ur-probabilities obtained on those two suppositions, and hence $P^*(L|G) > P^*(L|{\sim}G)$.

The second way to attempt to use the existence of many universes to reject the theistic fine-tuning argument is as follows. One could admit that the fine-tuning evidence seems to provide evidence for the existence of God, but one could hold that that once one considers the many-universes hypothesis, it turns out that the fine-tuning evidence provides evidence for the many-universes hypothesis instead.

The problem with this reply is that this is not how Bayesian confirmation works. If one has two hypotheses, H_1 and H_2, and $P(E|H_1) = P(E|H_2)$, then it follows from Bayes' rule that the ratio of the prior probabilities is preserved: $P(H_1) / P(H_2) = P(H_1|E) / P(H_2|E)$. The ur-probability of the existence of a life-permitting universe is presumably about the same on the supposition that God exists as it is on the supposition that many universes exist: $P^*(L|G) \approx P^*(L|M)$, where M is the many-universes hypothesis. It follows that $P^*(G) / P^*(M) \approx P^*(G|L) / P^*(M|L)$. Thus, if $P^*(M|L) > P^*(M)$, then we would expect that $P^*(G|L) > P^*(G)$; the evidence confirms both hypotheses.

I conclude that the theistic fine-tuning argument is a powerful argument; for example, it cannot be reasonably refuted by an appeal to many universes. Nevertheless, as described in the penultimate section, there are ways of resisting its force. It is reasonable to hold that the fine-tuning evidence does not provide evidence for the existence of God.[4]

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References

Bahcall, N., J. Ostriker, S. Perlmutter, and P. Steinhardt 1999. The cosmic triangle: Revealing the state of the universe, *Science* 284: 1481-1488.

Barnes, E. C. 1999. The quantitative problem of old evidence. *British Journal for the Philosophy of Science* 50: 249-64.

Behe, M. 1996. *Darwin's Black Box: The Biochemical Challenge to Evolution*, New York: The Free Press.

Collins, R. 1999. A scientific argument for the existence of God: the fine-tuning design argument. In Murray, M. (ed.), *Reason for the Hope Within*, Grand Rapids: Wm. B. Eerdmans Publishing Co., 47-75.

Collins, R. 2003. Evidence for fine-tuning. In Manson 2003, pp. 178-199.

Ellis, G. F. R., and Brundrit, G. B. 1979. Life in the infinite universe. *Quarterly Journal of the Royal Astronomical Society* 20: 37-41.

Garriga, J. and Vilenkin, A. 2001. Many worlds in one. *Physical Review D* 64, 043511.

Guth, A. 2000. Inflation and eternal inflation. *Physics Reports* 333-334: 555-74.

Glymour, C. 1980. *Theory and Evidence*. Princeton: Princeton University Press.

Holder, R. 2002. Fine-tuning, multiple universes, and theism. *Nous* 36: 295-312.

Howson, C. 1984. Bayesianism and support by novel facts. *British Journal for the Philosophy of Science* 35: 245-51.

Howson, C. 1985. Some recent objections to the Bayesian theory of support. *British Journal for the Philosophy of Science* 36: 305-9.

Howson, C. 1991. The 'old evidence' problem. *British Journal for the Philosophy of Science* 42:

547-55.

Jeffrey, R. 1995. Probability reparation: the problem of new explanation. *Philosophical Studies* 77: 97-101.

Le Poidevin, R. 1996. *Arguing for Atheism: An Introduction to the Philosophy of Religion*. London: Routledge.

Leslie, J. 1989. *Universes*. London: Routledge.

Manson, N. (ed.) 2003. *God and Design: The Teleological Argument and Modern Science*. London: Routledge.

McGrew, T., L. McGrew and E. Vestrup. 2001. Probabilities and the fine-tuning argument: a sceptical view. *Mind* 110: 1027-37. Reprinted in Manson 2003, pp. 200-8.

Narveson, J. 2003. God by design? In Manson 2003, pp. 88-104.

Paley, W. 1800. *Natural Theology*. Portions reprinted in J. Feinberg (ed.) 1996, *Reason and Responsibility*, Belmont: Wadsworth.

Rees, M. 2000. *Just Six Numbers: The Deep Forces that Shape the Universe*. New York: Basic Books.

Sober, E. 2003. The design argument. In Manson 2003, pp. 27-54.

Swinburne, R. 1990. Argument from the fine-tuning of the universe. In J. Leslie (ed.), *Physical Cosmology and Philosophy*, New York: Macmillan.

Vallentyne, P. 2000. Standard decision theory corrected. *Synthese* 122: 261-290.

Weinberg, S. 1999. A designer universe? *The New York Review of Books* 46(14) (21 October 1999): 46-8.