# Naturally Fine Tuned for Life

## A Defence of Metaphysical Naturalism

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**Abstract**

The Fine-Tuning Argument (FTA) is an argument put forward by proponents of theism, in which they attempt to make a case from Bayesian inference, that the [apparently] fine tuned constants of our universe is more likely given a theistic hypothesis, than a naturalistic one. Some naturalists argue that this is not the case given the Multiverse (MV) hypothesis (that our universe is one of a plurality in a broader multiverse). The MV hypothesis is rejected by theists who argue it commits what Ian Hacking (1987) referred to as "the Inverse Gambler's Fallacy". In this paper I will attempt to demonstrate [what I perceive as] the errors in logic made by theists first in positing that a life-permitting universe (LPU) is improbable under the naturalistic-single-universe (NSU) hypothesis, and subsequently the errors in arguing that the MV hypothesis commits what Ian Hacking (1987) referred to as "the Inverse Gambler's Fallacy". First, I will attempt to demonstrate why an LPU is not improbable under the NSU. Second, I will attempt to demonstrate that if we ascribe a probability value to our LPU, we can directly infer either an MV or the existence of "Deeper Laws" (Barnes, 2020) from that probability value.

**Introduction**

It would seem that this universe, our universe, is delicately fine-tuned for the existence of life; for life to emerge in our universe the fundamental constants could not have been more than a few percent from their actual values (Vuyst, 2020). But what can we infer from this astonishing fact? Can we infer anything at all? Proponents of the Fine-Tuning Argument (FTA) argue that given fine-tuning of the Universe , the existence of a life-permitting universe (LPU) is very unexpected given naturalism (i.e. the view that there is only one world, the natural world . . . which evolves according to unbroken patterns, the laws of nature) but not particularly unexpected given theism (i.e the view that God exists). It thus provides evidence for the existence of God" (Barnes, 2020). Barnes, among others, has attempted to build an argument along the lines of a Bayesian inference[1] to demonstrate why the theistic conclusion is more probable While some naturalists agree that the FTA is the strongest argument in favour of the existence of God, a number of objections have been raised. Among the strongest of these is what Robin Collins refers to as the Naturalistic Single Universe (NSU): "the hypothesis that there is only one universe, the existence of which is an unexplained, brute given" (Collins, 2009). A related objection would be what Luke Barnes refers to as "Deeper Laws", i.e. the view that "the constants and initial conditions simply reflect the unfinished state of current physics". Physics will progress until we find, in the words of Einstein, "such strongly determined laws that within these laws only rationally completely determined constants occur (not constants, therefore, whose numerical value could be changed without destroying the theory)" (Barnes, 2020). In other words, it is the idea that scientists will arrive at a final model of the Universe which doesn't require fine-tuned parameters. An alternative hypothesis, which according to Richard Swinburne characterises as the scientists' objection of choice, is the Multiverse hypothesis: "which Klaas Landsman summarizes as follows: "[T]he claim is that there are innumerable universes (jointly forming a 'Multiverse'), each having its own 'constants' of nature and its own initial conditions, so that, unlikely as the life-inducing values of these constants and conditions in our universe may be, they simply must occur within this unfathomable plurality" (Metcalfe, 2018).

In objection to the NSU and the deeper laws arguments, proponents of the FTA argue that we must consider the question in terms of "epistemic probability" (Collins, 2009) or

[1] Bayesian inference is an important technique in statistics often used in physics. It is a method of statistical inference in which Bayes' theorem is used to update the probability for a hypothesis as more evidence or information becomes available

a "Bayesian fine-tuning argument" (Goff, 2022). In reply to the MV hypothesis, which is often formulated as a Bayesian argument, "Roger White presents the 'This-Universe Reply' ('TUR') to [the Multiverse Objection]: While the existence of a Multiverse might explain why some-universe-or-other permits life, it doesn't explain why this universe (the one we live in) permits life" (Metcalfe, 2018) which is expanded on in Probabilistic Arguments for Multiple Universes (Draper et al, 2007) and Fine Tuning the Multiverse (Metcalfe, 2018).

In this paper I will attempt to defend two positions, firstly that of the the NSU and secondly – given a specific assumption central to the Fine Tuning Argument – that of the MV. These two positions can be classified under the wider umbrella of "Metaphysical Naturalism" (Mahner, 2016). I will attempt to explain how the metaphysical naturalist principle that something cannot come from nothing completely undercuts the FTA, and how the TUR objection to the Multiverse fails to adequately incorporate the selection effect. Further, I will attempt to demonstrate how an MV can indeed be directly inferred —without the need to invoke Bayesian probability — from the idea that the fine tuning of the Universe is highly improbable.

**What could have been.**

The FTA depends entirely on the idea that "the probability that [this] universe would permit life, given naturalism, is very low" (Metcalfe, 2018). Which itself depends on the assumption that the initial conditions of the Universe, could have been different. This clearly evidenced in Barnes's paper "A Reasonable Little Question":

> *Of all the possible ways that a physical universe could have been, is our universe what we would expect on naturalism? What physical universe would we expect to exist, if naturalism were true? To systematically and tractably explore other ways that the universe could have been, we vary the free parameters of the standard models of particle physics and cosmology. This exercise could have discovered that our universe is typical and unexceptional. It did not. This search for other ways that the universe could have been has overwhelmingly found lifelessness.... The fine-tuning of the universe for life shows that, according to the best physical theories we have, naturalism overwhelmingly expects a dead universe (Barnes, 2020) [emphasis mine].*

As we can see from this quote, the idea that the likelihood that a life-permitting universe exists on naturalism is "vanishingly small" (Barnes, 2020) hinges entirely on the idea that the initial (fine-tuned) conditions of this universe could have been different. Of course, this would appear to make sense, since a probabilistic outcome implies that other outcomes were possible.

On the surface, it might appear to be quite rational to talk about how the Universe could have been different. After all, we can imagine a different set of initial conditions. Furthermore, physicists regularly run computer simulations where they vary the free parameters of the standard models of particle physics and cosmology. But just because we can *imagine* that the initial conditions of the Universe could have been different, it doesn't mean that it is physically meaningful to say that they *actually* could have been different from what they were. In fact, a very basic principle of metaphysical naturalism completely undercuts this particular avenue of the theistic argument, a principle which German Biologist and Philosopher of Science Martin Mahner refers to as "the *ex-nihilo-nihil-fit* principle" – the idea things can't simply "pop out of or into nothing". Mahner includes this principle among "the metaphysical – not methodological! – suppositions of the general empirical methods of science" (Mahner, 2016).

This principle means that it is not physically meaningful to talk about how the initial conditions of the Universe could have been different. For this to have been a possibility, we would have to start from a position where the Universe had no initial conditions at all — i.e. that it consisted of absolute nothingness — and that any given initial conditions could simply have "popped" into existence. Since something cannot come from nothing, this is not a real possibility. On first reading, it might not be immediately apparent why this *ex-nihilo-nihilo-fit* principle entails anything in the vicinity of the idea that the initial conditions of the Universe could not have been different, but if we consider it carefully, it becomes obvious why, *under metaphysical naturalism* it, entails precisely this.

If we consider the present state of the Universe, we can contemplate the idea of "playing the movie" of the evolution of the Universe in reverse until we arrive at some hypothetical starting point which represents the initial conditions of the Universe. Given these initial conditions we can ask how, *under metaphysical naturalism*, they could possibly have been different. The fact that we can imagine some other, hypothetical, set of initial conditions doesn't mean such initial conditions were actually a possibility, *under metaphysical naturalism*. The only possible way they could have been different is if they had "popped out of nothing", i.e. popped into existence *ex-nihilo*, where any

hypothetical set of initial conditions could equally have popped into existence. Of course, the *ex-nihilo-nihilo-fit* principle of metaphysical naturalism, as outlined by Mahner, negates this possibility.

Given this principle, naturalism necessitates that the Universe is, in some sense, eternal - it must always have existed.. This would be the NSU as described by Collins (2009) the hypothesis that there is only one universe, the existence of which is an unexplained, brute given[2]. While theists might object that theirs is an argument from epistemic probability, they don't appear to incorporate the key naturalistic principle [that something cannot come from nothing] into their analysis, which should inform any epistemic evaluation of naturalism. Indeed, when the *ex-nihilio-nihilo-fit* principle is considered, it completely undercuts the idea that the initial conditions of the Universe could have been different because, given any set of initial conditions and the principle that something cannot come from nothing, there is no possible way those initial conditions could have been different. This, therefore, undercuts the idea that an LPU is highly improbable under NSU, which forms the entire basis of the theistic argument from fine tuning.

**Objecting to the ex-nilio-nihil-fit Principle**

Contrarians might try to argue that metaphysical naturalists are not compelled to accept the ex-nihili-nihil-fit principle. They are free to propose a hypothesis in which "the Universe had popped out of nothing" (Mahner, 2016). How this would square with metaphysical naturalism would be for such proponents to justify but it is something which Maher (2016) refers to as "magical" (as distinct from natural). Of course, there are some cosmologists who "keep entertaining the idea that the Universe originated from nothing" (Mahner, 2016), seemingly challenging the *ex-nihilo-nihil-fit* principle. Mahner (2016) speaks directly to this notion of "nothing":

*note that 'nothing' really means 'nothing', not some form of radiation or some other massless form of matter. For example, what is called particle annihilation is just a transformation of a particle with mass into one or more massless particles, that is, into some form of radiation. However, it seems that the ex-nihilonihil- fit principle is being challenged by cosmologists, who keep entertaining the idea that the universe originated from nothing (see, e.g., Stenger 2011). In*

[2] The ex-nihilo principle would make the NSU a necessary fact, not a brute one.

*particular, according to multiverse cosmology some primordial ''nothing'' keeps randomly popping out universes. But since this 'nothing' has at least one property, namely the propensity to pop out universes, it doesn't seem to be a genuine nothing which should have no properties at all and hence be unable to change.*

For the sake of argument, we can grant this hypothetical group, let's call them *ex-nihil* naturalists, the idea that the Universe originated from absolute nothing (having no properties at all). If such a group exist then theirs would simply represent a distinct hypothesis to be considered in the context of a Bayesian inference. Instead of considering naturalism as a whole, we would have to consider the *ex-nihil* naturalistic hypothesis and the *ex-nihilo-nihil-fit* hypothesis. Since the latter guarantees an LPU and the former is the hypothesis upon which theistic proponents rely, the case for being an *ex-nihilo-nihil-fit* naturalist would be stronger – as we will see from the analysis below.

**What are the odds?**

Proponents of the FTA are not alone in declaring the existence of our fine-tuned universe improbable. "Physicist Lee Smolin's estimation that, taking into account all of the fine-tuning, the chance of life being physically possible in a universe with laws/initial conditions of the general form we find in our universe is 1 in 10229, from which he concludes, 'In my opinion, a probability this tiny is not something we can let go unexplained. Luck will certainly not do here; we need some rational explanation of how something this unlikely turned out to be the case'" (Goff, 2019). Indeed, it is the assumption that an LPU is improbable under NSU that has prompted some naturalists to propose the Multiverse hypothesis as a possible resolution.

According to Draper et al (2007), a "surprisingly large" number of philosophers and scientists believe that there is evidence for the existence of other physical universes, a hypothesis known as the Multiverse hypothesis. One opponent of the Multiverse hypothesis, Philip Goff, articulates the hypothesis as follows: "[T]he multiverse hypothesis postulates an enormous, perhaps infinite, number of physical universes other than our own, in which many different values of the parameters are realised. Given a sufficient number of universes realising a sufficient range of the parameters, it is not so improbable that there would be at least one universe with fine-tuned laws" (Goff, 2019).

There have been several challenges to the MV hypothesis. Hacking (1987) proposed that MV proponents are guilty of committing the Inverse Gambler's Fallacy (IGF). The Gambler's Fallacy is the fallacious reasoning often associated with the compulsive gambler who believes their luck must be about to change because it is unlikely that they could be unlucky for the whole evening. For example, the gambler at a craps table who has failed to roll a double-six believes that they are more likely to roll that lucky combination in their next roll, In reality, of course, the probability of doing so is unaffected by the previous rolls. An example of the Inverse Gamblers Fallacy, as outlined by Goff (2022), is the case of a person who walks into a casino and, having seen someone rolling a double-six (on the first roll that they have witnessed), concludes that that person must have been rolling the dice for a long time previously – or that there are many other rollers in the casino. In the cases of both the gambler and the witness, the inference they draw is indeed an example of fallacious reasoning.

According to Draper et al (2007), Roger White (White, 2000) provided "a powerful defence" of the This Universe Objection (TUO) an argument further developed by Draper et al (2007). The TUO is an argument which says "while the existence of a multiverse might explain why some-universe-or-other permits life, it doesn't explain why this universe (the one we live in) permits life" (Metcalfe, 2018). More recently, Metcalfe (2018) and Goff (2019) have sought to advance this line of argument. As each new paper has appeared, a new analogy has been used in an attempt to clarify the arguments (see Appendix 1 for my own analogy). While these analogies are too numerous to be addressed here, I will propose a greatly simplified approach to developing analogies. I will also attempt to demonstrate why the TUO and the claim that MV arguments commit the Inverse Gambler's Fallacy fail to account for the role of the selection effect. While White offers an explanation of what a selection effect is:

*An observational Selection Effect is a feature of a process which restricts the type of outcomes of an event which are observable. In the case of the Big Bang, had the universe not instantiated T1 then neither we nor anyone else would be around to notice, since the necessary conditions for life would not have been met. So even though big bangs can so easily result in dud universes, no one ever has the misfortune of seeing one.* (White, 2000)

We will see below that he fails to understand the role it plays in the MV argument.

To put what White says about the selection effect into other words, we can say that observers like ourselves are tied to universes which permit life.

**Why are the odds?**

Before we begin any analysis of the arguments for the MV and of the counter arguments, we first need to turn our attention to precisely what we mean when we say that, under naturalism, the probability of a life permitting universe is 1 in 10,229.[3] We have already seen that, under naturalism with the ex-nihilo principle, given any set of initial conditions it is not possible that those initial conditions could have been different, so ascribing any sort of probability to their existence would be entirely fabricated and arbitrary. However, if we insist on the idea that they could have been different and insist on ascribing a probability to their existence, then we need a justification for what that probability represents.

To explore this we might refer to an example used by Robin Collins in his 2009 paper:

*suppose that in the last 10 minutes a factory produced the first 20-sided die ever produced (which would be a regular icosahedron). Further suppose that every side of the die is (macroscopically) perfectly symmetrical with every other side, except for each side having different numbers printed on it. (The die we are imagining is like a fair six-sided die except that it has 20 sides instead of six.) Now, we all immediately know that upon being rolled the probability of the die coming up on any given side is one in 20. Yet we do not know this directly from experience with 20-sided dice, since by hypothesis no one has yet rolled such dice to determine the relative frequency with which they come up on each side.*

How do we ascribe a probability of one in 20? We do so because there are 20 actual sides to the dice. To simplify the example slightly, if we have an n-sided dice and state the probability of rolling a six is 1 in 6, we generally tend to infer that it is a legitimate six-sided dice. However, it could equally be a 12-sided dice with two sixes, or an 18-sided dice with three. Either way, we infer from the probability that there is some process whereby a six might be rolled and that there are a minimum of five other possibilities, and the ratio of sixes to other numbers is 1:5. If we were talking about the game of bingo and we said that the probability of a six being drawn was 1 in 75, we would infer that there were 75 bingo balls, among which there is a single ball numbered with six. Similarly, in a raffle, if we hold one single ticket and are told that the probability of our ticket being drawn is 1 in 20, we would infer that there are 19 other

[3] I use Smolin's estimation here as referenced by Goff (2019). The actual probability is irrelevant and we can choose whichever the proponent of the FTA perfers.

tickets in the draw. This is true for the very first iterations of these processes which, by hypothesis, had not yet occurred to determine the relative frequency. This would be more representative of the existence of our universe since we only have a single instance and cannot base our probability on an observed relative frequency.

What, then, can we infer from the probability of an LPU under naturalism being 1 in 10,229? Presumably, the proponent of the FTA would not argue that it means we can infer 10,228 other universes, with this universe being the life-permitting one, since that would simply be to accept the MV hypothesis as true. Similarly, we would not expect a proponent of FTA to infer from the numbers expressing the probability of an LPU that there are two life-permitting universes among 20,458 universes.

While proponents of the FTA might argue that the probability is an epistemic one, based on the possible ways the Universe *could have been* (under naturalism), the principle that something cannot come from nothing would need to inform any epistemic judgement of the NSU; that is, it would need to inform any assessment of the naturalistic single universe hypothesis. To ascribe any sort of meaningful probability to an LPU under naturalism, that is, for the idea [that the initial conditions of the Universe could have been different] to have any epistemic or physical meaning, the probability ascribed to those initial conditions would have to represent some form of universe-generating process (or initial-condition-generating process); otherwise, the initial conditions simply could not have been otherwise, since something cannot come from nothing. That is, if we rewind the process to the initial conditions, we arrive at the initial conditions as they were. For there to exist the possibility that they could have been different, *under naturalism*, there would have to have been a process through which the initial conditions became actualised from a state where those initial conditions didn't exist, or weren't actual. This universe-generating-process, however, would simply represent an example of "Deeper Laws". The reason being, if there were some universe generating process from which the fine-tuned parameters arose, the [supposedly] fine-tuned parameters would not constitute the initial conditions of the Universe, the parameters of the universe-generating-process would constitute the initial conditions; and since something cannot come from nothing, it would mean that the parameters of that process could not have been different and are therefore not improbable.

Of course, we might ask why this universe-generating process didn't produce any more universes. It doesn't seem unreasonable to think that a process which generates universes would continue producing them, unless perhaps there was a finite amount of matter available, which would limit the number of universes that could be generated.

This, however, would return us to the "deeper laws" objection, since the single universe would still be the result of the universe-generating-process which produces the initial conditions and is therefore more fundamental.

One might object to the idea that the probability value ascribed to our universe allows us to infer "deeper laws" by making an analogy with a situation in which the winning lottery ticket is drawn in a lottery where the odds are said to be 1 in 15,000,000. It might be argued that such an event wouldn't cause someone to speculate that there are *deeper* lottery laws. However, we would have to examine the analogy to see how it represents the question at hand. With respect to the case in question, the LPU is represented by the winning ticket. In this case, all we have is the winning ticket and the *supposed* odds. It is natural, of course, to question how we arrive at these odds. In the case of a fair lottery, the 1-in-15-million odds represent the number of tickets in the draw, i.e. 15 million. Therefore, the probability that any given ticket would be selected is 1 in 15 million. However, this formulation, where one ticket is drawn from a drum or bag containing many other tickets, would be the analog of the multiverse scenario, where each ticket represents a universe, and there are 14,999,999 other universes, hence the 1-in-15-million probability value.

Alternatively, if one wishes to maintain that there are no other universes, but still insist on a 1-in-15-million probability, they would have to explain what it is that the probability represents *under metaphysical naturalism*. In the context of the analogy, there would have to be a process which produces tickets; otherwise, given the *ex-nihilo* principle, the ticket itself would be a brute fact and not improbable. This ticket-producing process would represent the "deeper laws" which generate the winning ticket, which is the analogue of the initial conditions of the Universe. Simply imagining that there *could* have been a different set of initial conditions is not sufficient since the ex-nihilo principle says precisely that there could not have been, *under metaphysical naturalism.*

This inference of a multiverse, produced by a universe-generating-process is a direct inference from the simple *assumption* that an LPU is improbable under naturalism and so it avoids the objections usually raised by proponents of the FTA, namely the TUO and the IGF.

**The IGF and TUO**

While the above inferential argument avoids the TUO and IGF, it is worth outlining how the selection effect negates those particular objections, as opposed to avoiding them.

First, let us outline the IGF as outlined by Hacking (1987):

The Gambler's Fallacy:

*"A gambler, fully accepting the premise of a fair-rolling device, observed a sequence of, say, 35 rolls without a single double six occurring. He reasons that the chance of a double six occurring in 36 rolls is about 2/3, and that it is therefore shrewd to bet that a double six will occur on the next toss. This is the fallacy of someone who reasons that, relative to the evidence of a string of 35 non-double sixes, it is rather likely that a double six will occur at the next roll. But on the assumption of fairness, which I take to include independence of trials, it is not likely. The probability of double six, relative to the evidence, is still 1/36."*

The Inverse Gambler's Fallacy (IGF):

*A gambler coming into a room, walking to the fair device, and seeing it roll double six. [The croupier] asks, 'Do you think this is the first roll of the evening? Or have there been many rolls?' The gambler reasons that since double six occurs seldom, there have probably been many rolls* (Hacking, 1987).

As pointed out by John Leslie, 'Hacking's story involves no observational selection effect.' (Draper et al, 2007) The scenario as outlined by Hacking, in which a gambler walks into a casino and, observing a "fair device" rolling a double-six would appear to incorporate a selection effect, however, such a scenario isn't representative of the selection effect as it features in the MV hypothesis, which essentially says observers like ourselves are tied to universes which permit life. For Hacking's analogy to be representative of the selection effect involved in the MV hypothesis, the existence of the gambler would have to be tied to the rolling of the double six, such that the gambler can only ever observe a double-six.

As Hacking acknowledges, "the more often the pair of dice is rolled, the greater the chance that, in the sequence of rolls, we will obtain at least one double six. In thirty-six rolls, the chance of getting at least one double six is about 2/3. In a thousand rolls, we are almost certain to get at least one double six" (Hacking, 1987). Proponents of the MV hypothesis have argued that this reasoning can be applied to the MV hypothesis and,

along with the selection effect, is sufficient to favour the MV hypothesis over design (or indeed the NSU).

White (2000) summarises the MV proponent's position as follows:

*"The more universes there are, the more likely it is that some universe supports life. That is, MV raises the probability that some universe is life-permitting, but not that this universe (α) is life-permitting. But now, the response goes, we know that it is true that some universe is life-permitting, since it follows from the fact that this universe is life-permitting. Therefore, the proposition 'Some universe is life-permitting' confirms MV even if the proposition 'This universe is life-permitting' does not. In other words, our knowledge that some universe is life-permitting seems to give us reason to accept the Multiple Universe hypothesis, even if our knowledge that this universe is life-permitting does not."*

White outlines the TUO in objection to the reasoning of the MV proponent on the grounds that "a known proposition, the probability of which *is not* raised by the hypothesis, is being set aside in favour of a weaker proposition, the probability of which *is* raised by the hypothesis. The weaker proposition is then taken as evidence for the hypothesis". (White, 2000)

What has gone wrong, according to White, is that there has been a failure to consider the total evidence available to us. White states that "while the [Multiple Universe hypothesis] may be confirmed by ['Some universe is life-permitting'] alone, it is not confirmed by ['Some universe is life permitting'] in conjunction with the more specific fact that [this universe is life-permitting], which we also know (White, 2000).

White offers the 'Drunk Adam' analogy, which attempts to justify the *requirement for total evidence* and to demonstrate why a weaker piece of evidence cannot be substituted for a stronger piece of evidence. This analogy unfolds as follows:

*Suppose I'm wondering why I feel sick today, and someone suggests that perhaps Adam got drunk last night. I object that I have no reason to believe this hypothesis since Adam's drunkenness would not raise the probability of me feeling sick. But, the reply goes, it does raise the probability that someone in the room feels sick, and we know that this is true, since we know that you feel sick. So the fact that someone in the room feels sick is evidence that Adam got drunk. Clearly something is wrong with this reasoning. Perhaps if all I knew by word of mouth,*

*say, was that someone or other was sick, this would provide some evidence that Adam got drunk. But not when I know specifically that I feel sick. This suggests that in the confirming of hypotheses, we cannot, as a general rule, set aside a stronger, specific, piece of evidence in favour of a weaker piece. We must always consider the total evidence available to us* (White, 2000).

I don't think anyone would disagree with White's assessment of the Drunk Adam hypothesis (underlining above by me). The issue, however, is that it is completely unrepresentative of the fine-tuning issue. While it attempts (successfully or not) to include some form of selection effect, the Drunk Adam hypothesis is unrepresentative of the MV hypothesis, since the MV hypothesis involves many trials of something which gives rise to the selected effect whereas the Drunk Adam hypothesis does not.

So, White is correct when he says that "we cannot *as a general rule* set aside a specific piece of evidence in favor of a weaker piece" (my emphasis). In the present case, however, the setting aside of the specific evidence in favour of the more general evidence is not being applied as *a general rule*; it is being applied to a very specific case. As we dissect White's broader objection, referred to as the "This Universe Objection" (TUO) by Draper et al (2007), we will see how the selection effect negates that particular arguemnt.

The TUO, as outlined by White, requires that we "rigidly designate" a specific universe as being "our universe" or *this* universe, which he refers to with the label "$\alpha$" :

*"[T]he name '$\alpha$' 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 $\alpha$, might not have been ours, or anyone's. It had a slim chance of containing life at all"* (White, 2000).

The sentence underlined by me demonstrates that the TUO does not adequately incorporate the selection effect since the universe which happens to be ours must, by necessity, contain life. The role the selection effect plays is that no specific universe needs to be designated as *"$\alpha$"* or *this* universe, since "this universe" can be any universe which contains life.

This rigid designation of a universe as $\alpha$ or as "this universe"is effectively designating a single iteration of the hypothetical universe generating process and declaring it to be "this universe", regardless of whether it is LPU or not. This is also turns out to be the case in Draper et al, who seek to provide a much-simplified thought experiment. They

attempt to outline the Bayesian case using two universes compared to a single universe. In their example, much like White's, one of the pre-existing universes is rigidly designated as $\alpha$ (or "this universe") with the probability of it being LPU given as ½. The matrix of possible scenarios is laid out, and due to the scenario where both universes in the Bi-verse cannot be non-LPU a cancellation leaves the evidence favouring neither the Bi-verse nor the Universe. Metcalfe's (2018) "indexical" argument employs a similar approach, asking us to suppose that "$\alpha$" is the name of this universe. The argument here is "indexical" because it deals with a particular universe, defined indexically: our universe, i.e., $\alpha$ (Metcalfe, 2018). While the treatment of the probability by the above-mentioned authors is not in question, the question is what precisely the probability represents. Does it represent a universe-generating-process, or some other process?

Above I talked about what we can infer from the probability (of an LPU given naturalism), and we saw that to say our LPU universe is improbable implies that there is a process through which universes are generated. In the case of Draper et al, we are *a priori* given two universes and told that the probability that $\alpha$ will be life-permitting is ½. In this case, where we are given two universes to begin with, the probability does not pertain to universe generation or to the generation of the initial conditions of a universe. Instead, the probability represents the likelihood that life will develop in a universe, given certain initial conditions; the given initial conditions could be LPU or not LPU and life might develop in an LPU or it might not – it is a different prospect entirely to the probability that the initial conditions of the Universe would be LPU, *under metaphysical naturalism*. As mentioned above, White's argument and insistence on the "rigid designation" of a random universe as "this universe" amounts to *a priori* assigning a specific roll of the dice as $\alpha$ and designating it as "this universe" regardless of the outcome. The same is an issue for Metcalfe's formulation. Their objections don't accurately consider the role of the selection effect and might be more aptly termed the *That* Universe Objection as opposed to the *This* Universe Objection. We will see below how the selection effect completely side-steps the TUO by rejecting the insistence on "rigid designation" (of a given iteration of the universe generating process).

**The role of the selection effect**

The argument advanced by the proponents of the FTA essentially just repeats what we already know from the fact that in statistically independent trials, the probability of an

individual trial remains the same. As White (2000) states, "events which give rise to universes are not causally related in such a way that the outcome of one renders the outcome of another more or less probable. They are like independent rolls of a dice". This fact relating to the statistical independence of individual trials is not disputed. Similarly, proponents of the FTA do not dispute the claim that the MV hypothesis effectively makes at least a single LPU a certainty. Goff (2019), himself an opponent of the MV hypothesis, characterises it as postulating "an enormous, perhaps infinite, number of physical universe other than our own, in which many different values of the parameters are realised. Given a sufficient number of universes realising a sufficient range of the parameters, it is not so improbable that there will be at least one universe with fine-tuned laws" (Goff, 2019). The issue then, is the role played by the selection effect and whether it makes the existence of *this universe* more likely. As White says, "in order for the Multiple Universe hypothesis to render our existence more probable, there must be some mechanism . . . linking the multiplicity of universes with our existence". But, says White, "there is no such mechanism. So the existence of numerous universes does not seem to make it any more likely that we should be around to see one" (White, 2000). This claim is incorrect, however, since the selection effect is this very mechanism. The selection effect is precisely why we cannot insist on "rigid designation" of a random iteration of the (supposed) universe generating process as "this universe" because any of the universes produced by this process – again, we would need justification as to why it would stop at one – could be the one which is LPU, the inhabitants of which would refer to their universe as "this universe".

To echo the words of White (2000), a great many intriguing analogies have been suggested in attempts to show how the selection effect can be crucial to the inference to multiple universes; rom suit shops[4], firing squads[5], and Russian roulette[6], to the many adventures of a woman named Jane[7]. There are far too many to address them all here. Instead, I would like to propose a greatly simplified example to represent the probability in question. Sticking with Smolin's probability figure of 1 in 10,229 we can imagine a 10, 229-sided dice which generates a universe with every roll. This imaginary dice represents our universe-generation process. Imagine that one of the faces of the dice reads 'LPU-"this Universe"- $\alpha$'. Here, we have rigidly designated a Universe as $\alpha$, made it indexical and built in the selection effect, without the need for elaborate

[4] Analogy by Martin Rees "as related in Mellor, "Too Many Universes" (Metcalfe, 2018)
[5] Analogy in Fine Tuning and Multiple Universes (White, 2000)
[6] Analogy in Fine Tuning the Multiverse (Metcalfe, 2018)
[7] Jane is a character who appears in analogies by PJ McGrath, Roger White, and Philip Goff

scenarios. Now, imagine the dice being rolled. Is it more probable that 'LPU-"this Universe"- $\alpha$' would be rolled after one roll or after many, many rolls? To paraphrase Hacking (1987), the more often the dice is rolled, the greater the chance that, in the sequence of rolls, we will obtain at least one 'LPU-"this Universe"- $\alpha$'.

There is a further objection to Hacking's claim that MV proponents are guilty of committing the Inverse Gambler's Fallacy (IGF). This objection is that the MV hypothesis relies on a strict inference from the evidence. It is indeed fallacious to attempt to infer multiple trials from the outcome of a single, independent, improbable trial. This, however, is not what the MV hypothesis attempts to do[8], in the context of a Bayesian inference. Instead of the hypothesis being inferred from the evidence, the direction of inference is reversed and the likelihood of a particular piece of evidence is inferred from the hypothesis. For Hacking's casino-goer, it might be more representative to say that he is standing behind a screen, and that the screen is only lifted if a six is rolled. Upon the screen being lifted and seeing the six on the table, the gambler is asked which of the following is more likely to be the case:

1) The dice was rolled once. The result was a six, and the screen was lifted.
2) The dice was rolled multiple times until a six was rolled, and the screen was lifted.

Now, the casino-goer cannot infer the correct answer from the evidence, since the evidence is compatible with both scenarios. However, Scenario 2) is more likely to result in a six being rolled, not on any given roll, but that isn't necessary since our selection effect – the screen lifting – doesn't discriminate between rolls.

**The Martingale Multiverse**

Perhaps the best way to intuitively understand how the MV hypothesis together with the selection effect side-steps the Inverse Gamblers Fallacy objection is by reference to another gambling phenomenon, namely the Martingale Betting system. A Martingale betting system is one often associated with the game of roulette. Indeed, it is one which

[8] Although we have seen above how an MV can be directly inferred from the claim that the initial LPU conditions are improbable because a universe generating process would not stop at one.

short circuits the IGF. The simplest example involves a player placing a bet on either black or red. For arguments sake, let's say they place one unit on black. If the outcome of the spin is red, then obviously they lose their stake. However, on the next spin, they double their original stake and bet on the same colour. They repeat this until eventually, given a fair roulette wheel, their chosen colour wins and they will have a winning bet and a profit (equal to their initial stake). So, while the probability of getting black on each spin is not increased, they will eventually have a winning bet. So it is with the MV hypothesis. The universe-generating process continues churning out universes until an LPU is produced (and thereafter) – the process doesn't need to keep "doubling its bets" however, since there are no losses to be covered. Any inhabitants of that LPU will refer to it as 'this universe' and will reflect on how that universe originated. The hypothetical inhabitants of the LPU don't necessarily have to be us or even be a specific, predefined 'roll' of the universe-generating process that we arbitrarily label $\alpha$. Indeed, there could be more than one LPU, and (under the MV hypothesis) ours just happens to be one of them. The role played by the selection effect is to bridge the gap from the "weaker" evidence to the "stronger" evidence, and to satisfy the requirement for total evidence. It is the mechanism that links the multiplicity of universes with our existence and avoids the need for the "rigid designation" on which proponents of theism insist.

**Conclusion**

Proponents of the FTA have attempted to object to the Multiverse hypothesis claiming that it commits the Inverse Gamblers Fallacy and cannot account for the fact that *this* Universe is fine-tuned. This objection, however, tends to be grounded in a strict inference directly from the evidence, while FTA proponents argue that it should be considered in the context of a Bayesian inference. Under a Bayesian inference, with the likelihood of the evidence inferred from the hypothesis, the MV hypothesis makes a single fine-tuned universe very probable. The TUO argues that while it makes *a* single fine-tuned universe very probable, the MV hypothesis doesn't make *this* universe more probable. However, the TUO fails to adequately interpret the role of the selection effect, which serves as the mechanism to links the multiplicity of universes with our existence, thereby bridging the gap from a weaker piece of evidence to a stronger piece and satisfy the requirement for total evidence.

Separately, however, a Multiverse can be inferred, given the assumption of improbability (of an LPU) because the probability must refer to some sort of universe-generating process which would continue producing universes until it reached some fundamental limit on the number it could produce. If this fundamental limit restricted the process to producing a single universe, this would imply some deeper, more fundamental model.

Given these more fundamental parameters and the fundamental, naturalist principle that something cannot come from nothing (the ex-nihilo principle), the claim that the fine-tuned initial conditions of our universe could have been different and are therefore improbable (under naturalism) is completely undercut. This is true for frequentist[9] as well as epistemic probability, since the principle that something cannot come from nothing must inform any epistemic judgement of naturalism. Given any set of initial conditions and the ex-nihilo principle, the idea that *under naturalism* those initial conditions could have been different doesn't stand up and so they become a necessary fact, whose probability is 1.

[9] Frequentist probability or frequentism is an interpretation of probability; it defines an event's probability as the limit of its relative frequency in many trials.

**Appendix 1**

**Genie in a Lamp Analogy**

As mentioned, there are numerous analogies attempting to capture the logic of the fine tuning argument and the Inverse Gamblers Fallacy. A critical flaw I perceive in most of them is their failure to tie object of interest to the "winning" outcome. I will attempt to address that by way of a Genie in a Lamp analogy.

Imagine you suddenly appear as a being. It quickly becomes clear to you that you are a Genie and have appeared out of a lamp. Beside your lamp is a 10229-sided dice with the number 6 on it and a scroll saying that whenever a 6 is rolled, the genie will appear from the lamp. As the genie, which of the following scenarios is more likely to result in your appearing from the lamp?

1) The dice was rolled once only
2) The dice was rolled multiple times until a 6 was rolled, and the genie appeared.

Of course the answer is 2. So, from a Bayesian perspective the genie should have more credence in scenario 2.

While this might be suffucient for some to accept the MV hypothesis over the NSU hypothesis, it might be argued that the probability here represents the likeliohood of life emerging in a Universe whose initial conditions are LPU.

We can amend the analogy such that, instead of the roll of a 6 determining the appearance of the Genie, the roll of the 6 can be used to determine whether the Genie is put in the lamp to begin with. Again, which scenario is more likely to result in a genie in a lamp?

1) The dice is rolled once only

2) The dice is The dice was rolled multiple times until a 6 was rolled, and the genie is put in the lamp corresponding to the roll of 6.

Of course, scenario #2 has the greater Bayesian probability of resulting in a genie in the lamp and so should have a higher credence.

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