A Defence of Metaphysical Naturalism

Addressing the flaws in the Fine Tuning Argument

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Abstract

This paper offers a defence of metaphysical naturalism, in the context of the Fine Tuning argument. Theistic objections to the Multiverse (MV) hypothesis are considered, specifically the claim that the MV hypothesis commits the Inverse Gambler's Fallacy (IGF) and, as per the This Universe Objection (TUO), that it violates the Requirement of Total Evidence. It is argued that the IGF claim moved the goalposts when it comes to assessing the validity of the MV hypothesis. The Cosmic Slot Machine analogy will be used to demonstrate how the This Universe Objection (TUO), fails to adequately account for the anthropic principle (or selection effect) and how the MV hyptothesis does satisfy the Requirement for Total Evidence.

With respect to the Naturalistic Single Universe (NSU), the implications of the *ex-nihilo-nihil-fit* principle, for evaluating the epistemic probability of a Life Permitting Universe (LPU)under the NSU hypothesis, are considered. It is argued that the *ex nihilo nihil fit* principle entails that an LPU is not improbable under the NSU hypothesis.

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 the 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 [of the Universe] 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 from which the values of the supposedly fine-tuned parameters are necessitated by the model, as opposed to being settled upon through a probabilistic process. An alternative naturalistic hypothesis, which Richard Swinburne characterises as the scientists' objection of choice, is the Multiverse hypothesis: "[summarised by Klaas Landsman 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 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).

[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

In this paper I will attempt to outline how the ex-nihilo-nihil-fit principle (Mahner, 2016) places constraints on the type of universal model which can be used to actually support the (theistic) FTA. A model which, it could be argued (to what I'm sure will be the delight of many theists), would support the account of the process of creation found in the Book of Genesis. While this might be compelling to the theist, I urge caution that this not be taken as confirmation of the FTA or scripture, since it only works when compared to a single, possible, naturalistic model of the Universe. For the logician, it far from settles the debate but it would mean that the FTA is at least compatible with the creation account of the Book of Genesis. I will attempt to introduce (yet another) analogy, which I hope will help demonstrate how the FTA fails with regard to other possible, naturalistic models primarily because they fail to understand the role of the selection effect.

What is Fine-Tuning

In his seminal paper, The Teleological Argument, Robin Collins states, "[w]hen I speak of the 'fine-tuning evidence (data),' or 'the evidence (data) of fine-tuning,' or variations of these, I shall be referring only to claim (i)" "(i) the claim that the laws and values of the constants of physics, **and the initial conditions** of any universe with the same laws as our universe, must be set in a seemingly very precise way for the universe to support life" (Collins, 2009) - emphasis added by me. While in Fine Tuning the Multiverse, Thomas Metcalfe states it as follows, "[a]ccording to the Fine-Tuning Argument ('FTA'), there is a set of laws, constants, **and initial conditions**—call these the "cosmic features"—that jointly permit complex, biological life" (Metcalfe, 2018) - ephasis added by me. For clarity, let us refer to Collins's breakdown of the evidence which he says falls into three categories:

(i) The fine-tuning of the laws of nature.
(ii) The fine-tuning of the constants of nature.
(iii) The fine-tuning of the initial conditions of the universe (Collins, 2009).

The literature, from among the authors cited in this paper, is replete with reference to "the laws and values of the constants of physics**, and the initial conditions".** In his 2020 paper, Astrophysicist Luke Barnes argues "we can and should focus on the fundamental constants **and initial conditions of the universe**" (emphasis mine). This distinction between the *initial conditions* and the laws of nature and the values for the

constants of nature is one I believe is worth making because, as we will see, the *ex-nihilo-nihil fit principle* (Mahner, 2016) has implications for these in the context of the FTA.

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 this universe, could have been different. This idea is clearly articulated 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 apparently fine-tuned parameters 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. However, the principle that something cannot come from nothing constrains how the idea that the different parameters could have been different.

What are the odds of something from nothing?

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).

On the surface, it might appear to be quite rational to talk about how the Universe could have been different. After all, we can speculate about the idea of there having been a different set of initial conditions, different laws and constants of nature. Furthermore (as Barnes alludes to), 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, or just because we can input these into a computer, 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 places stringent constraints on the parameters in question and restricts the claims the theist can make about the Universe, in such a way that it can be used to support the FTA. That is the 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, 2016). 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, *under naturalism*. 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 set of 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 equivalent to the NSU as described by Collins (2009) "the hypothesis that there is only one universe, the existence of which is an unexplained, brute given"[3]. 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 reasoning equally applies to what we might call the *initial* laws of nature and the *initial* values of the constants of nature. Whatever their *initial* state, the *ex-nihilo-nihil-fit* principle necessitates they could not have been different.

Implications of the ex-nilio-nihil-fit Principle

At the very least, proponents of the FTA should refrain from talking about fine-tuned initial conditions, since the *ex-nilio-nihil-fit* principle entails that these could not have been different. The principle also places severe constraints not only on the type of universe against which the FTA can succeed but also on the type of universe to which theists can appeal. As mentioned, for the FTA to work it relies on the probability of an LPU, *under naturalism*, being "vanishingly small". For the probability to be vanishingly small, it necessitates that either the set of laws, and/or the values of the constants, and/or initial conditions could have been different. As we have seen, the something from nothing principle rules out the possibility that the initial conditions could have been different. So, for the probability of an LPU under naturalism to be very low, the permitting of life in the Universe cannot supervene entirely on the initial conditions. Otherwise, the probability of an LPU, *under naturalism*, would be 1.

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

It further necessitates that the permitting of life in the Universe cannot follow from a combination of the initial conditions and the *initial* laws of the Universe because, again, given the initial state of either could not have been different, the probability of an LPU under naturalism would be 1. Therefore, since the initial conditions are "set in stone", the FTA can only succeed against a naturalistic model which incorporates dynamical laws of nature, or at the very least, a model where the laws have changed from their initial state. Indeed, the idea of dynamical laws of the Universe is an idea that has been explored by some physicists, including Lee Smolin.

With regard to the values for the constants of nature, for the FTA to succeed, these too could not have been set as part of the initial conditions of the Universe. They would have to have changed from their initial values and they could not have been necessitated by the initial conditions of the Universe in conjunction with the initial laws. Instead, they must have come about either as a result of dynamical laws or in a model where the initial laws together with the initial conditions led to them being set randomly. Not only does the FTA require naturalism to postulate such a universe, theism too must postulate such a universe. If theism postulated a universe where God created finely tuned initial conditions, which necessitated the fine tuning of the other parameters, the naturalist could simply invoke the *ex-nihilo-nihil-fit* principle and declare such a universe could not have been different, under naturalism, and so the probability of an LPU would not be vanishingly small.

While this might appear to place overly tightly constraints on the FTA, it is worth nothing that a type of Universe often advocated for in physics seems to pretty neatly fit these criteria. That is, a universe which has its origins in a singularity, while having initial conditions which cannot be changed, is one in which the initial laws of nature do appear to change, at least according to the common claim among physicists that the laws of nature "simply break down" (Sutter, 2021) inside a singularity. Inflation could represent the process by which the values for the universal constants are randomly set.

It is also interesting to note that a universe where the initial conditions are not life permitting, and where the laws and constants of nature are changed to permit life, seems to echo the Biblical account of creation. In the book of Genesis account, God does not simply create the initial conditions of the Universe and let them roll, he actively fine-tunes his creation over a "seven day" period. This means the opponent of the FTA cannot simply invoke the principle that something cannot come from nothing. Against such a model, the FTA wins hands-down. However, before the theist gets too carried away, the FTA also requires that this be the only possible model allowed by naturalism.

As we will see, it isn't the only model allowed, probably isn't the preferred model, and arguably isn't the most reasonable position a naturalist should take.

The Multiverse Hypothesis

As is evidenced by the quote from Lee Smolin above, the fine-tuning problem is one which many physicists and cosmologists take seriously. Indeed, it is the seeming improbability of an LPU under the NSU hypothesis 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.

Ian Hacking (1987) proposed that MV proponents were guilty of committing what he referred to as 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.

Building on the work of Hacking, Roger White (White, 2000) provided, according to Draper et al (2007), "powerful defence" of what they refer to as the This Universe Objection (TUO) - an argument further developed by Draper et al (2007) themselves. 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, in keeping with that tradition, I will offer the analogy of the Cosmological Slot Machine in an attempt to demonstrate why both 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 adequately represent 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.

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.[4] We can explore why the proponent of the FTA would be advised to avoid any reference to the idea of the *initial conditions* of the Universe being finely tuned.

The odds of What?

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 a proponent of the FTA insists on the idea that they could have been different and insists on ascribing a probability to their existence, then we need a justification for what that probability represents.

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

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 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 life permitting *initial conditions*, under naturalism, being 1 in 10,229? One interpretation might be to argue that it means we can infer 10,228 other universes, with this universe being the life-permitting one, or perhaps the value represents the probability of an LPU given two life-permitting universes among 20,458 universes. Of course, we would not expect the FTA proponent to adopt this interpretation, since doing so would simply be to accept the MV hypothesis.

While proponents of the FTA might argue that the probability is an epistemic one, based on the possible ways the *initial conditions* of 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. Since the ex-nihilo-nihil-fit principle entails the initial conditions could not have been different, and therefore no probability value can be ascribed, and the FTA proponent would not be inclined to accept the above implication of other actualised universes, to ascribe any sort of meaningful probability to life permitting *initial conditions* 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 did not exist, or weren't actual.

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. If the universe generator only generated a single universe then this would represent an instance of 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 (as per the analysis above).

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.*

Collins (2009) attempts a challenge to the idea of the "multiverse generator scenario" by suggesting "the laws of the multiverse generator must be just right – fine-tuned – in order to produce life-sustaining universes." This, however, is just a restatement of the initial FTA but with reference to the universe generator. This has the potential to lead to an infinite regress, however, the ex-nihilo-nihil-fit principle means that we can terminate the process somewhere because it would necessitate that *if* there are indeed a set of initial conditions of the Universe, some *truly initial conditions*, then these could not have been different and would therefore not be improbable – under naturalism.

This inference of a multiverse, produced by a universe-generating-process is a direct inference from the simple claim that the *initial conditions* being life permitting is improbable under naturalism. This direct inference would avoid such objections as the TUO and the IGF usually raised by proponents of the FTA.

Having outlined why the FTA proponent would be advised to avoid any reference to fine-tuned initial conditions, we will consider the TUO and IGF in a more general context, to see how a more accurate treatment of the selection effect negates those.

The IGF and TUO

While the above inferential argument would avoid the TUO and IGF with regard to a claim about the initial conditions, we can consider the TUO and IGF in the broader context where they are taken to refer only to the values for the natural constants.

First, let us present 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. Akin to a genie in a magic lamp, the gambler would have to be summoned to the very table where the double-six is rolled.

Just as other proponents of the IGF have done subsequently, 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 argument.

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 "α" :

"[T]he name 'α' is to be understood here as rigidly designating the universe which happens to be ours. Of course, in one sense, a universe can't be ours unless it is life-permitting. But the universe which happens actually to be ours, namely α, might not have been ours, or anyone's. It had a slim chance of containing life at all" (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 *"α"* or *this* universe, since "this universe" can be any universe which contains life.

This rigid designation of a universe as α 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 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 "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 "α" is the name of this universe. The argument here is "indexical" because it deals with a particular universe, defined indexically: our universe, i.e., α (Metcalfe, 2018).

The key issue with all of these arguments is the insistence on the "rigid designation" of a random universe as "this universe". It is this "rigid designation" which means the selection effect is not adequately accounted for. Rigid designation is equivalent to *a priori* assigning a specific roll of the dice as α 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 LPU-parameter-process as "this universe" because any of the

universes produced by this process 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[6], firing squads[7], and Russian roulette[8], to the many adventures of a woman named Jane[9]. At the risk of saturating the market, I will attempt to employ an analogy myself, the Cosmological Slot Machine.

The Cosmological Slot Machine

I'm sure most of us will be familiar with the classic "One Armed Bandit" slot machines so emblematic of Las Vegas casinos; if not from personal experience then from seeing them on TV. It is a machine where a coin is inserted and a mechanical arm is pulled at the side of the machine, which sets a set of reels turning on the face of the machine. If the reels stop in a winning combination, the player wins money. There is a probability associated with the winning combination. Let's say that in our Cosmological Slot Machine there are five reels with either the letters of the alphabet inscribed on them, or any combination of alphanumeric and/or special characters we prefer. Let's say the winning combination is when the reels spell out the word G-E-N-I-E (in the correct order) and when that happens a genie appears out of the machine to contemplate its own existence.

Let us stick with the aforementioned probability value of 1 in 10229. Let's imagine that there is a single slot machine which we rigidly designate as α. Obviously, the probability of an LPU here (getting the winning combination) is "vanishingly small" and such a universe would favour the theistic argument. This might even represent the type of universe we considered earlier.

Now, let us consider a scenario where we have 10,229 (or more) slot machines. The arm is pulled on all of them, the reels spin and the winning combination does not appear on α. Instead the word G-E-N-I-E appears on the machine rigidly designated as γ and a

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

genie magically appears from the machine. How do we think this genie will refer to the machine rigidly designated as α? Will they refer to it as "*this* slot machine"? Of course they won't, the indexical term "this" will be reserved for their own slot machine; the one rigidly designated as γ. Note, the probability of γ being life permitting was still 1 in 10229, however, the selection effect meant that it didn't matter which rigidly designated slot machine displayed the winning combination, it simply meant that whichever did would become "this universe".

Cyclical

The Slot machine example above represents a multiverse model of parallel universes (PMV). There is, however, another alternative where universes are sequential, or rather, cyclical (CMV). While the idea of cyclical and indeed parallel universes is "entirely natural in Indian traditions" (Joshi, 2017), the Conformal Cyclic Cosmological (CCC) model developed by Roger Penrose attempts to put it on a more rigorous scientific footing.

We can consider the case for a cyclical cosmology either by considering our cosmological slot machine on its own or in the context of the Bi-verse example provided by Draper et al (2007 to demonstrate how a cyclical model is immune from that particular argument. So, lets imagine two slot machines one rigidly designated α. The probability of α displaying the winning combination and our genie appearing are again, 1 in 10229. Now, we can imagine the machine running but the winning combination not being displayed. In a cyclical cosmology, the machine simply goes again, and again, and again, until eventually the winning combination is displayed and our genie appears to contemplate its own existence. Of course, the machine doesn't stop there, it goes again, and again, and again, and eventually the winning combination will appear again. This is all with our slot machine rigidly designated α. It is this application of the selection effect which negates the TUO. It also negates the Inverse Gambler's fallacy objection, when considered in a Bayesian context as we will see.

Bayesian vs Strict Inference

A further claim often made by FTA proponents with regard to the MV hypothesis is that it commits the Inverse Gambler's Fallacy (IGF). FTA proponents claim that the IGF is committed because MV proponents make a strict inference from the evidence. Of course, 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[10], 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; or they magically appear at a table if a 6 is rolled alá our genie above . 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 demonstrate 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 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

[10] 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.

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 α. 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

If proponents of the FTA insist on the idea that the *initial conditions* of the Universe are fine tuned, a Multiverse can be directly inferred, given the assumption of improbability (of life permitting initial conditions) because the probability would have to refer to some sort of universe-generating process which would continue producing universes until it reached some fundamental. For this reason, proponents of the FTA should drop the notion of fine-tuned initial conditions from their argument.

Proponents of the FTA have attempted to object to the Multiverse hypothesis by claiming that it commits the Inverse Gamblers Fallacy. However, that objection, relies on the claim that MV proponents attempt to make a strict inference directly from the evidence. Even if this were the case, which it isn't, FTA proponents argue that the issue should be considered in the context of a Bayesian inference and so they should consider it in that context, even if MV proponents don't – although they do. 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 incorporate

the role of the selection effect, which serves as the mechanism to link the multiplicity of universes with our existence, thereby bridging the gap from a so-called weaker piece of evidence to a stronger piece and satisfy the requirement for total evidence. The Cosmological Slot machine analogy demonstrates why the insistence on rigid designation, by FTA proponents, excludes the selection effect.

So, while the FTA succeeds against a single, specific naturalistic model, it fails when compared to both the PMV and CMV models, where the probability of an LPU is effectively 1. While the TUO fails against the CMV because it is perfectly compatible with "rigid designation", correctly incorporating the selection effect means the TUO also fails in its application to the PMV.

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