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God is a Vacuum Fluctuation

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INTRODUCTION: The physics of our universe seems fine-tuned to support life, which points to a design and a creator. Opponents of this idea have suggested that there are in fact many universes - with differing physical laws - and we just happen to be in one that supports the existence of matter and life. But then how many different universes, with differing laws, are there? If there are an infinite number then we can envisage that with an infinite number of different laws and scenarios - some physical rule sets will produce entities able to create universes at their own initiative and to their own design i.e. Gods. So, **the multiverse concept does not eradicate the idea of a God but in fact points to it**. If the number of universes (rule sets) in the multiverse is not infinite, then what number is it? 28, 100, 5060, 100006? Having an infinite number of universes is actually more parsimonious than having a specific number. Having an indiscriminate "everything" is more parsimonious than having a specific "something". Especially as "everything" may naturally come from "nothing": No rules, laws, constraints, prohibitions or cost is equivalent to nothing but it renders everything possible: an infinite number of different rules in an infinite number of different spaces.

Why is there something – our universe - rather than nothing at all? Some have proposed that the universe could have come from nothing, without breaching our laws of physics [1-4]. But this then begs the question, why are there these laws present rather than none at all? Furthermore, why are these laws as they are rather than taking a different form? Indeed, crucially, why are these laws so predisposed to producing a matter universe that can support life? If the equations and mathematical constants of our physics were just slightly different, the universe could not have developed into its observed place of stars, planets and life. For example, if the mass of the neutron was just 1% lighter, then atoms could not form, and if it was just 1% bigger then only hydrogen could form and no other elements [5]. The existence of Heisenberg's uncertainty principle [6] seems especially paramount. It has prompted some to speculate upon a design and a creator.

I propose an alternative. That instead of something in place of nothing, there is everything in place of nothing. No rules, laws, constraints, prohibitions or cost is equivalent to nothing but it renders everything possible: an infinite number of different rules in an infinite number of different spaces. So, out of nothing comes infinite possibility and complexity. We are in just one of an infinite number of universes – many differing in their governing laws, equations and constants and we happen to be in one that supports matter and life. This is self-selecting: life will always observe a universe governed by rules that can support life.

Note that an infinite multiverse could be satisfied merely by an infinite number of universes that differ infinitesimally in the value of just a single parameter. But when I talk of an infinite multiverse here, I am talking about a broader case. The broadest case: an infinity of infinities. Unlimited possibility: all possible rule sets, with all possible parameter values. An infinite number of these universes will follow mathematical consistency and rules that we could understand with our mathematics; an infinite number will not.

Our observable universe obeys our laws of physics, which preceded it and that permitted it to come into being. So, our universe is more than what we can observe: it is an overarching, encompassing rule set. I suggest that there are an infinite number of such universes with different rule sets. Our observable universe might have come into being because in the rule set (physics) of our universe we have the Heisenberg uncertainty principle. This dictates that the energy at a certain time can never be known absolutely; hence the energy of a system cannot remain at exactly zero. This means that energy and matter, which is a form of energy, can come out of nothing; indeed they absolutely must. The caveat is that they are required to quickly disappear: the bigger the energy/matter that emerges, the quicker it must vanish. This relationship is set by the uncertainty relation, where E is energy, t is time and h is the Planck constant:

$$\Delta E \Delta t \sim h$$

These particles coming out of nothing, before disappearing, are called virtual particles or vacuum fluctuations and their existence has been experimentally demonstrated e.g. [7-9]. Our observable universe may have emerged from nothing in a similar way. Theorists have proposed that the net energy of our observable universe may actually be zero, if the positive energy of its matter is exactly counterbalanced by the negative energy of gravitational attraction between its masses and if this universe is "closed" [1] – and there is some cosmological evidence that this may be the case [4]. So, in this eventuality, it has the potential to last for as long as its internal processes permit, without the uncertainty relation snuffing it out after a short period of time.

If the net energy of our observable universe is *not* zero, I suggest that this may not be problematic. I propose that the uncertainty relation may not hold for all observers. Those inside a particle/matter universe may be able to know its energy at any time precisely whilst those outside cannot – their knowledge is constrained by the uncertainty relation. So, a non-zero energy universe may quickly cease to exist to external observers, in accordance with the uncertainty relation, but continue to endure for internal observers. This idea solves the problems of different universes expanding into one another, and it could be why no compelling evidence of collisions, or external gravitational pulls, have been found in our universe – although some research consortiums have looked [10-11] *(although this problem could be equally solved if we consider that our universe is a bubble universe moving away from other bubble universes because of the inflationary expansion of the parent universe, which may be occurring at a speed greater than that of light [5]).*

To elaborate upon this point, in a different context: the uncertainty relation also extends to position and momentum of a particle, with more knowledge of one detracting from knowledge of the other. The position and momentum cannot both be known exactly at the same time. However, I propose that although this may be true for an external observer it is not true for an internal observer: those inside a transparent "bubble" particle may be able to know both its position/momentum precisely at any one time. They have an added barometer, not available to the external observer, which is that they can feel changes in momentum (accelerations/decelerations) and measure them with inertial navigation systems (accelerometers, gyroscopes). They can look out to see their position. The Schrodinger cat paradox [12] gives a different angle upon how quantum effects may be different to different observers – the cat knows if it alive or dead absolutely but the external observer does not and only has a probabilistic view.

With the Heisenberg uncertainty in energy/time – the bigger the virtual particle that emerges, the shorter the time it can exist for. But as aforementioned, this constraint is just for the external observer. I propose that to an internal observer even a massive, complex entity can emerge and last indefinitely; Maybe one with the intelligence and capability to engineer new universes. God could have been produced by a vacuum fluctuation.

So, God is not a master of the whole system but a function of it, and a God to a sub-set within it. He may live on for infinity and may have even provided an after-life where we too can live on for eternity. But He is not the centre of everything, although He may yet appear to be to us. He is just a small part of an infinite number of universes, differing in an infinite number of different ways. Indeed, there is an infinite number of Gods: each with their own fiefdoms. Some may have been created from vacuum fluctuations, as permitted by our own physics in our own universe, if we postulate that the uncertainty principle is not absolute for all

observers (if this isn't true for our own universe, it will be true for an infinite number of others). Some may have been created from vacuum fluctuations in universes with a much larger Plank constant, wherein bigger virtual entities can emerge and last for longer. Some may have been created spontaneously out of nothing in universes that don't have the first law of thermodynamics and energy *can* be created outright. Some may have existed for infinity in permissive universes. In some cases, Gods may create Gods and in some of these cases: "it could be turtles all the way down".

Our own universe may have been created by a God or come about by itself. Both are possible within my proposal. Which is more likely? Hard to say: both scenarios play out an infinite number of times. A God created universe is the more complicated, and less parsimonious, scenario. But this is irrelevant: both scenarios play out an infinite number of times. In the infinite number of scenarios with a God, there are an infinite number of scenarios with a God-given after-life: an infinite number of these are eternally blissful but an infinite number are hell-like for all.

Many will not feel comfortable with this talk of God(s). But do not underestimate the power of possibility when one is dealing with an infinite number of rules in an infinite number of spaces. Furthermore, if we don't have this "everything", as I have proposed, we only have our "something" – and this is problematic given just how fine-tuned our physical rules seem to be to support life. For example, out of all the possible rules, what are the chances of having the Heisenberg uncertainty principle? It points at a design and a God much more directly than my alternative suggestion here.

In this paper, I have proposed a potential mechanistic reconciliation between physics and theology. To repeat the overarching premise: No rules, laws, constraints, prohibitions or cost is equivalent to nothing but it renders everything possible: an infinite number of different rules in an infinite number of different spaces. Where everything happens, anything is possible. In an infinite number of scenarios, *some* universes will be created by a God and *some* of these will provide an eternal after-life; perhaps even our own. A multiverse concept does not eradicate the notion of God as some have proposed [13]; it can in fact point to it. This paper proposes the existence of God as a logical extrapolation of a theory (multiverse) that has been used previously to "disprove" the existence of God [13].

Notes Added in the light of peer review (for which I thank the reviewer and editor); in the peer review process I was made aware that a similar idea has been published previously by Professor Max Tegmark, working out of MIT [14]. He too suggests that all possible rule sets exist in an unlimited number of universes. However, he doesn't extrapolate this possibility as

fully as I do here. I go further; to suggest that if everything possible exits then a component of this everything will be cosmic intelligences, which can and do produce universes. Dr. Nick Bostrom (University of Oxford) has suggested that our universe may be a computer simulation run by an advanced civilisation, which itself may be in a simulated universe in a hierarchy of computer simulations [15]. Civilisations simulating universes would be a component part of my theory; where anything is possible and it can and does happen, an unlimited number of times. A quantum fluctuation may produce a God directly or, in other cases, it may produce a de Sitter space and then a God arises out of this by an entropy fluctuation; a "Boltzmann God" arising in a similar manner to a "Boltzmann brain" [16]. But with less probability given that its complexity is likely to be greater. A Boltzmann God creating a universe is less probable than a Boltzmann universe emerging *de novo* but then, following this argument, a Boltzmann brain is more probable than a universe; which is a paradox.

In this manuscript I talk of God(s). I use this term to describe an entity that can create a universe(s). My use is generic and I don't think it's helpful to align it with a deity in any of our religions. For those uncomfortable with the term, it can be interchanged with "cosmic intelligence". Although, having said this, there is scope in this multiverse theory of everything for universes to exist under cosmic intelligences with benevolent aims, interventionist capabilities and that facilitate eternal afterlives. This will be true of some universes but not necessarily ours. We will have to wait and see.

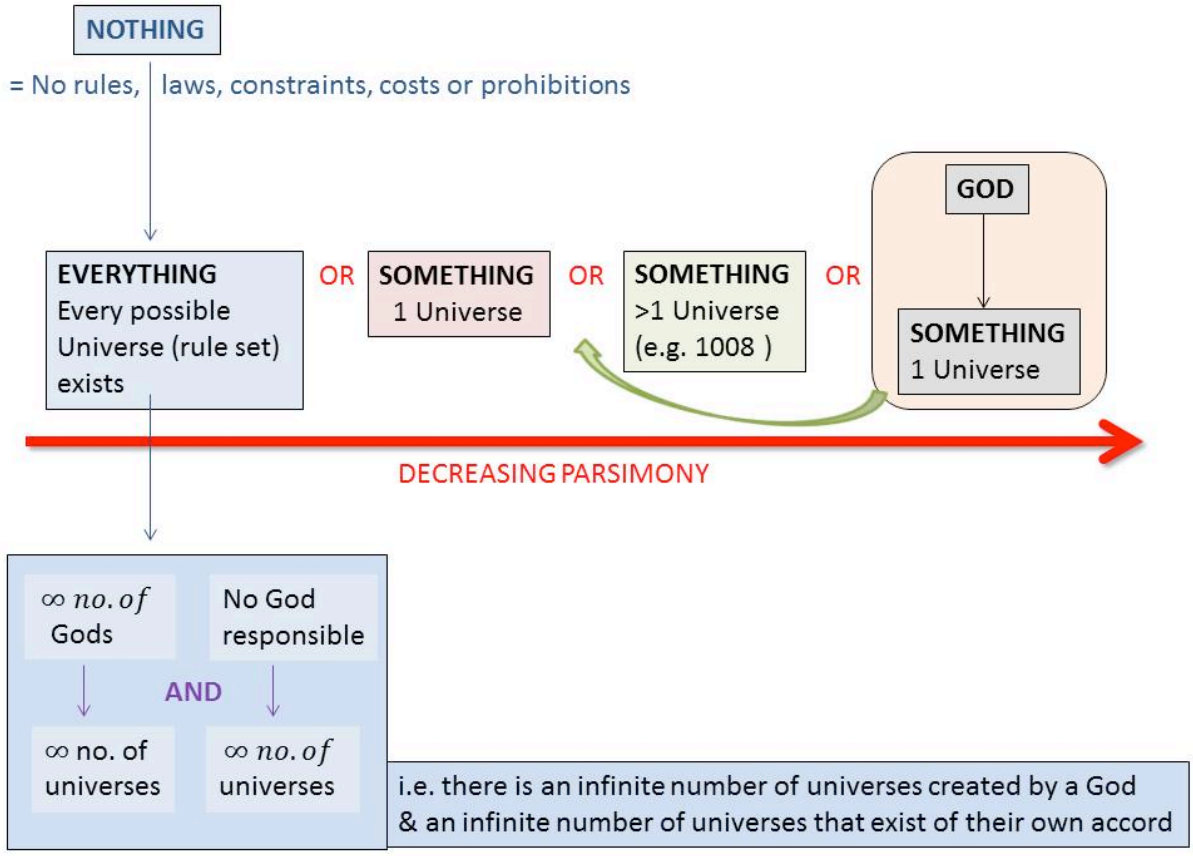

Figure 1. The existence of "Everything" flows naturally from Nothing (Nothing is unstable and unsustainable); this scenario – with its constituent concept of God(s) - is the most parsimonious and therefore, using Occam's Razor, the most probable. Nothing - with its absence of rules, laws, costs, constraints, limitations or prohibitions - leads to "Everything": all possible universes (rule sets) occur. In this infinite and unlimited possibility, an infinite number of universes will be created by a God and an infinite number of universes will exist of their own independent, intrinsic accord. So, the existence and non-existence of God are both infinitely probable. The existence of "Everything" is more parsimonious than the existence of just "Something". "Something" requires rules/information precluding other possibilities and specifying that specific something. "Everything", by contrast, is the product of no rules and has no information burden. In the case of "Something": the greater the number of universes, the greater the information required and the less parsimony. So, a multiverse that is not unlimited (infinite) in character is less parsimonious than a single universe. A single God creating a single universe is less parsimonious than a single universe existing alone. However, this scenario (that can in some sense be thought of as just two universes/rule sets: with one founding the other) may be more parsimonious (lesser information requirement) than some multiverse scenarios if they have significant rule diversity across many universes or small, incremental deviations in rules across a great many universes. This possibility is represented by the green arrow.

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