The multiverse doesn't affect the Anthropic argument

1 Introduction

Often, the possibility of a multiverse is given as a defeater for the anthropic argument: if there are many, possibly even an infinite number of worlds[1], then the probability of having a life-permitting world is no longer low. This article shows that the possibility of a multiverse doesn't defeat the anthropic argument.

2 The anthropic argument

In 2005, Lydia McGrew tried to show that when evaluating the anthropic argument, the most reasonable reaction to the multiverse hypothesis was to ignore it. On the one hand, one could counter it with a God-created multiverse, and on the other, we have (per hypothesis) no information about or interaction with any of the other worlds in the multiverse.

Her proposal was apt, but for a different reason: the possible existence of a multiverse doesn't alter the probabilities involved in the anthropic argument.

Let N be the proposition that worlds occur by chance, with random parameters for the fundamental constants according to some relevant probability distribution that makes life-permitting worlds extremely unlikely, but not impossible[2] – $0<L(N)\lll 1$ being the probability of a chance-generated world being life-permitting. Let G be the proposition that God creates worlds, all of which are life-permitting – i.e. $L(G)=1$.

Let $p(N)>0$ resp. $p(G)>0$ be the prior probability of N resp. G being true. For the purposes of this article we can zoom in such that $p(N\vee G)=1$, i.e. only the relative probabilities are relevant. Also, let #(N) be the number of life-permitting worlds produced under proposition N, and #(G) the number of (life-permitting) worlds produced under proposition G.

The traditional anthropic argument deals with the case that $\#(N)=\#(G)=1$, and states that since $p(N)\times L(N)\lll p(N)$ whereas $p(G)\times L(G)=p(G)$, for any reasonable choice of p(N) and p(G), $p(N)\times L(N)\ll p(G)\times L(G)$ – that is, our world is probably God-created.

3 The naive counterargument

The naive argument from the multiverse is that if God only created one (or relatively few) worlds, and the multiverse is large, it is possible that $p(N)\times\#(N) \gg p(G)\times\#(G)$ – most possible worlds are chance-generated. If so, our world too is probably chance-generated, and not God-created. With the right numbers, the likelihood of our world being chance-generated might be overwhelming

This argument, reduced to standard probability imagery, consists of two processes N and G adding balls to an urn: N adds balls that with probability L are red and with probability 1-L are black, whereas G adds red balls. All balls bear a letter, N or G, depending on the process that added it. Now a ball is drawn, and it is red – what is the probability it bears the letter G? Obviously, if N adds enough balls compared to G, the red ball will most probably bear an N.

The error in the argument is that the two processes are seen as active at the same time. In reality, the anthropic argument assumes that $p(N\wedge G)=0$, so that the urn is filled either with N-balls or with G-balls, but not with both[3].

4 The sophisticated counterargument

The sophisticated argument from the multiverse accepts that $p(N\wedge G)=0$, but claims that if N produces enough worlds, the probability that it produces a life-permitting one approaches 1, and therefore the probabilities that our world is chance-generated or God-created are p(N) and p(G), respectively.

1 In this article, the word "world" refers to a universe, not to a planet.
2 The question whether this makes sense at all, whether worlds with other values are really possible and whether there is a reasonable probability distribution is legitimate, but beyond the scope of this paper.
3 Below we shall see that our main result still goes through if $p(N\wedge G)>0$, as long as $p(G\wedge\neg N)>0$, i.e. as long as possibly God creates worlds but chance doesn't.

Reduced to standard imagery, this argument proposes the following algorithm:

1. Flip a loaded coin, with sides N and G, and associated probabilities p(N) and p(G).
2. Let the process indicated by the coin fill the urn.
   - (i.e. if the coin flip yielded N, let process N fill the urn; if G, let process G fill the urn.)
3. Draw a ball until a red ball is drawn. (In case of a black ball, the ball-drawing failed.)
4. Return the letter on the ball.

Indeed, this procedure will return "N" or "G" with probability p(N) or p(G), respectively, provided process N produces at least one red ball (otherwise the procedure may diverge).

The error here is that the failure of the experiment is kept local, as if a sentient being could keep choosing worlds until it found a life-permitting one. In reality, we get only one chance: if the world is not life-permitting, we won't exist. So the correct algorithm is:

1. Do the following:
   1. Flip a loaded coin, with sides N and G, and associated probabilities p(N) and p(G).
   2. Let the process indicated by the coin fill the urn.
   3. Draw a ball.

   until a red ball is drawn. (In case of a black ball, the whole experiment failed.)
2. Return the letter on the ball.

This procedure corresponds to the actual situation, and if repeated often enough will "N" and "G" in the ratio of p(N)×L(N) : p(G)×L(G)=p(G). The number of worlds produced by N and G doesn't enter into the result – provided that for either process X, if p(X)>0 then the number of worlds produced is also >0.

In other words: the possibility that either or both processes produce more worlds is irrelevant to the probabilities.

5 Objections

1. *But if God, if He exists, only creates one world, whereas some chance process, if it exists, creates endless numbers of worlds, including endless numbers of liveable worlds – each of those worlds could be our world, so in all probability it is not going to be the one created one.*
   That is a restatement of the naive argument. Imagine the probability interval divided into two parts: I(N) for N, and I(G) for G. All chance-created worlds have intervals that form a disjunct covering of I(N), so if there are many worlds, each world will have a really small interval. Likewise for G – all created worlds together will cover G, so if there is only one created world, its probability interval will be I(G) – i.e. the probability that the created world is chosen is much greater than the probability than any one of the chance-generated worlds is chosen. And most of those chance worlds are black, lifeless[4].

2. *Our universe is hardly habitable – for all we know only one small planet contains life. What if chance-generated worlds, if life-permitting, accommodate intelligent life on a massive scale, more than enough to offset the low probability of such worlds being life-permitting?*
   In the case of one world with two planets, one with a large and one with a small population, that would increase the probability of being on the large planet[5], analogous to the naive argument. In the proper set-up, where only one world from a multiverse is chosen, it wouldn't change the result, but only add a vacuous third stage: first select the process (coin), then the world (ball), then the person in that world.

3. *But what if p(N∧G)>0?*
   Provided p(G∧¬N)>0, we do the Christian thing and charitably yield the disputed area to N, i.e. we play p(N) against p(G∧¬N)>0. This will underestimate the probability for G, so if "G" is more probable than "N" in this modified case, it surely will be in the original case.

4. *And what if possibly God also creates non-life-permitting worlds?*
   We take G to be the proposition that God produces only life-permitting worlds. If besides G and N there is a G' where God makes possibly lifeless worlds, again probability of finding "G" on our red ball will be higher than indicated by our process (that ignores G').

5. *But if the potential multiverse is huge, with virtual certainty containing at least one life-permitting world, then with probability p(N) all theists are wrong in claiming God created the world.*
   No – this objection confounds prior and posterior probabilities. G*iven that we are in this life-permitting world* (which is almost certainly God-created), that probability is in the order of to L, i.e. virtually zero.

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4 We can imagine each of these world-intervals as being mostly black, with a minute red segment, or – if the number of worlds is large enough, as most of the intervals being black, and a tiny fraction red.

5 Even though the probabilities don't all have to be equal. In fact, if the number of worlds, or of people in a world, were countably infinite, there would be no uniform probability distribution.