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Is Our Universe a Mere Fluke?
The Cosmological Argument and Spinning the Universes

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Recent discussions about the argument from design have taken into account developments in cosmological theories, most especially the so-called anthropic principle associated with the "Wheeler"– and "Carter"–universes.[1] Part of these discussions can perhaps be summarized as briefly as can be in the following opposition:

1. The world is very unusual, so it must have been made by an intelligent creator.

2. The world is very unusual, but unusual things do occur by chance.

The phrase "the world is very unusual" is short-hand for something like:

3. It is extremely improbable that a random concatenation of the forces, energies, particles, fields of the universe (or whatever we think the building blocks are) should, in a single trial, form into anything orderly, let alone anything that supports our form of intelligent life.

Reference is made in [3] to the status of the big-bang (as distinct from later events such as the emergence of life or consciousness); for by concentrating on that, the notion of chance events can be given concrete interpretation by referring to cosmological theories, in particular:

a. Carter: All logically possible universes (of which there are infinitely many) actually co-exist. Anything remotely similar to a universe like ours *is* logically possible, but highly improbable.

b. Wheeler: There exists a sequence of universes (without memory), each of them extremely improbable; we are in one of them.

Both theories model possible outcomes of classical big-bang theory.

Commenting on this particular discussion implies that I will start by leaving out the following aspects (each of which *might* outrule the relevance of the present discussion):

i. Arguments purporting to show that our universe (or the emergence of life) is a unique event; considerations in terms of probabilities don't therefore apply to it.

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ii. The wider question "Why is an orderly universe possible at all?"

However, we will see that these aspects will pop up again towards the end.

Both [1] and [2], when claimed to be true, have been labelled fallacies, because of an incorrect appeal to probability reasoning to support the claim. Believing that extreme improbability must be due to design has been called the ♣♥♦♠-hand fallacy.[2] Hence, this would seem to support [2]. As formulated above, [2] is not a fallacy; yet it doesn't explain anything much either. It just reiterates that we're talking about a chance event (for us)– which had already been agreed upon by accepting [3] as the antecedent of [1] and [2]. However, [2] is often turned into an explanation by arguing as follows:

2a. the formation of the universe out of a random concatenation of forces, etc., is indeed extremely improbable;

2b. but why think of a roll with a myriad dice? think instead of indefinitely or infinitely many chance events;

2c. then, somewhere or sometime, mere chance would give an organization like ours;

2d. hence, it is sufficient to invoke chance to explain order.

This summary of "the popular objection" against the argument from design derives from Hacking who has raised the objection that such an argument suffers from what he has dubbed the inverse gambler's fallacy. This fallacy is to think that because repetition increases the chances of getting at least one rare event in a sequence of trials, it can explain the particular occurrence of such a rare event.[3] Further, he argues that owing to this fallacy "the confrontation between those who advocate the design argument and those who reject it is of an unusually banal nature."[4] In Hacking's view the whole discussion about the cosmological argument can be reduced to the two opposing statements [1] and [2]. It is *not* therefore possible to give any sort of support for either on the basis of probabilistic reasoning.

In this paper I do not intend to comment further on the (alleged) fallacies supporting the consequent of either [1] or [2], but will concentrate on an ambiguity in the meaning of the antecedent of [1] and [2], which derives from the dual sources of the meaning of such terms as 'unusual,' 'improbable,' 'unlikely,' and 'chance event:'[5]

a. the concept of absolute chance; and

b. the concept of the limited belief in chance.

I will first explain these two concepts and then apply them to the argument from design and the difference between Carter and Wheeler universes.

The concept of "absolute chance" means that such things as chance events simply exist and no knowledge of the causes of such events is possible–that is all there is to it. Or, alternatively: We do have knowledge about an absolute chance event: it has no causes, neither for God, nor a god, nor relative to any other transcendent or transcendental entity or realm. Confronted with an absolute chance event we throw our hands in the air and exclaim: This is really beyond any explanation! Obviously the event is a *possible* event,[6] but it is impossible (ever) to say anything whatsoever about the causes or lawlikeness or regularity of this particular event. In his arguments against superstition Cicero put it this way: "Surely nothing is so at variance with reason and stability as chance. Hence it seems to me that it is not in the power even of God himself to know what event is going to

happen accidentally and by chance."[7] In the 20th century there has been little interest in the plausibility of such absolute chance events. This contingency might be phrased as follows: the Enlightenment showed there were no absolute chance events. Discussion now concentrates on whether events are deterministic or statistical. Statistical events, however, differ from absolute chance events–the former being governed by statistical laws, the latter by no (humanly accessible) laws.

The concept of "the limited belief in chance" implies that such things as orderly events exist, displaying regularities of the empirical world and which are describable in terms of laws which predict exactly what relationships are determining these regularities (except for a limited amount of "noise"). Some of these laws might be called statistical laws because they identify certain processes and events as random. However, the chance element in these random events is not absolute (as is the one described above) but relative. Such random or statistical events only make sense relative to a higher level orderliness–hence: the limited belief in chance.[8] For example, when Rutherford established that radioactivity was a statistical phenomena, he tested a third order statistical hypothesis, i.e., he observed small samples of radioactive material for a short time, establishing that the fluctuations in the number of disintegrations were neatly distributed along a Poisson distribution (as they should be, assuming that each radio-active atom has a fixed probability to disintegrate).[9] Of course his data didn't fit the Poisson distribution *exactly*, but he didn't therefore draw the conclusion that he'd better carry out some more experiments to check whether such deviations from the Poisson distribution were reproducible, following a proper statistical distribution. For, no matter how well his fourth level experiment would have confirmed a fourth level hypothesis, there would always have been some deviation from the theoretical curve, which would then have forced him to start on a fifth order experiment, leading to a sixth order experiment, and so on. If we *keep* on ascribing the *particular* outcomes of observations to chance, we'll *never* find order.[10] Rutherford was more down to earth in this respect. When he had carried out the third order experiment he didn't even mention the small deviations from the Poisson distribution, but reported to the world: "The agreement between theory and experiment is excellent." This is the limited belief in chance–without it, we would become insane. Hence if we say (invoking "modern probability"), that even the *most improbable* event shouldn't surprise us, this statement is based on the belief in the infinite repetition of the *most probable* event of a particular order; what is left to chance is then only the randomness in the sequence of events of a lower order.[11]

Hence, the distinction I want to draw is between:

a. absolute chance events, which are possible events, but, for the rest, don't fit in anywhere;

b. relative chance events: which are the outcome of a statistical process, identified as such, and subject to a limited belief in chance at a certain level.[12]

I believe interesting things can be said about the possible relationship of these two concepts, but here I will limit myself to the difference between them.

In view of these two concepts of chance, what kind of event is the emergence of our universe after the Big-Bang? Pre-Enlightenment discussions of the argument from design dwelt on the question of how to interpret an absolute chance event: partners in the debate agreed that we had no knowledge of this event. The question was: Is there an absence of cause (is it an ontologically absolute chance event?) or is there a higher being who does know the cause or has even caused it Herself? None of the disputants held that "emerging universes" was actually a statistical phenomenon. For such debates there was no difference between, say,[13]

4. The chance event that, on January 1, 1984, at 0.00 hours GMT, a stone was cleaved in the court-yard of the United Nations building, and an image appeared of President Reagan.

5. The chance event that on January 1, 1984, at 0.00 hours GMT, one particular thorium-232 atom which was kept on display in the show-room of the Greenwich Observatory disintegrated.[14]

The question raised in "the old argument" is whether absolute chance events require a divine explanation or not. That, in modern terminology, [5] but not [4] is an event that, so to say, is part of a statistical phenomena, is irrelevant. On the old interpretation, the emergence of the universe is just another chance event. And I think that for an analysis of the logical nature of the arguments it may be simpler to sort them out for events like [4] and [5]. It might be argued that the universe is a more interesting entity than a radium atom or a stone. However, then we shouldn't consider the emergence of our particular universe as primary, but instead:

6. The chance event that our universe is possible at all.[15]

Now consider the second approach: Spinning the universes is a statistical phenomena. How could we know that in the first place? Clearly, in the sense that Rutherford knew that radioactivity is a statistical phenomena, we cannot know it at all. There are no second order experiments to measure the actual probability of our universe empirically, let alone third order ones to check whether spinning the universes really is a statistical phenomena. The only thing we can do is to refer to Carter- and Wheeler-type models, which contain an *a priori* equal-probability distribution of some sort and see whether there is support for these models which does not demand direct checking of the nature of the alleged statistical parameters.

Let's assume such support is forthcoming. Is this justification any different for the Carter- or Wheeler-model? According to Hacking it is: on the Carter-model our world simply exists; on the Wheeler-model the existence of the world is merely a chance event (unless one adds the inverse gambler's fallacy to the Wheeler hypothesis).[16] However, what would be the empirical significance of this difference? By hypothesis, we do not have access to the other universes, either on the sequential or the concurrent model. Our universe is a four dimensional manifold, at one particular point along a Wheeler- or Carter-type fifth dimension. But there is no way by which we could intervene in this fifth dimension, so there is *nothing* to spray along or with or from.[17]

In making a "logical" distinction between the two models, I believe too much is built on Wheeler's "one-universe-at-a-time" and on Carter's "all logically possible universes exist at the same time" (what sort of time are they talking about?). Passing over general discussions about possible worlds and how we might establish that Carter universes are more real than conceptual possibilities,[18] I suggest that unless some completely new type of model or theory is proposed, either a model is probabilistic or it is deterministic. Both the Carter and Wheeler models say that our universe is very improbable, so it seems reasonable to assume that both provide a statistical model. Then the following story shows there's no logical difference between them.

Assume Kwoth has an urn containing three monads, one red, two black and Kwoth decides to carry out a fifth order experiment to check whether the fluctuations in the fourth order outcomes comply with the laws of probability. The procedure is as follows: Kwoth draws three monads from the urn (with replacement, but after they have been drawn the monads duplicate so that Kwoth also has a simple record of all the monads drawn). This is a second order experiment. Carrying out this experiment $\mathbf{n_2}$ times yields a third order

result; and so on, up to the fifth level. Let's assume that every fourth order distribution corresponds to a universe. So, in doing a fifth order experiment Kwoth is making one universe after another. There might be one particular fourth order distribution which corresponds to our universe;[19] hence She is making Wheeler universes.

Obviously, drawing these monads one at a time is very time consuming, even though She can work fast. Hence one day She decides to use all Her hands[20] (of which She has very many). As it is no problem for Her to arrange to have a very large number of urns (all identical) She does another fifth order experiment, in which She simply makes one draw with $\mathbf{n_4}$ sets of $\mathbf{n_3}$ series of $\mathbf{n_2}$ groups of three hands each. It is obvious that whether She uses the labour-intensive or the capital-intensive method, it makes no difference to what She is testing: Is making universes a statistical process? Our universe, in this example, is simply a fourth order chance event.

Similarly, according to both the Carter and Wheeler models, the emergence of our universe is a chance event of a particular order. However, because we (contrary to She) cannot carry out any experiments to test the statistical nature of this phenomenon, we can raise doubts as to whether we can properly talk about relative chance events (in the way we can in the case of radio-active decay). Really, the only question which then remains is: Are we content with our theory? If we aren't we're forced to drop it. If we are, then that's all there is to it. So nothing's left to chance. In this case, the limited belief in chance works itself, as it were, all the way down to the only available outcome of a first order experiment.[21] We say after one observation, with Rutherford when he had carried out his third order experiment: This is where our spade is turned.

Something has to be orderly before we can talk about chance. If the whole universe is a chance event, there's no room left for order. It's better to keep the order in this universe as the anthropic principle advocates, and leave its' existence for what it is: an event neither probable nor improbable–simply an event which we can explain in one way or another, or not at all.

Fallacies in (seemingly) probabilistic reasoning are often due to introducing arguments from design into the context of deliberations about statistical phenomena. Unfortunately, I haven't space to elaborate that here. As to the fallacies in the arguments for and against design: It is not primarily the (inverse) gamblers and bridgers we've to worry about; it's the confusion between absolute and relative chance events. If we want a Cicero-type discussion about absolute chance events, the question of how probable the event is, on some statistical theory or model, simply doesn't arise. Moreover, we don't need to consider the universe as a chance event in order to discuss the status of absolute chance events. *If* the latter exist at all, then there are lots of them around. On the other hand, if we want to talk about particular statistical phenomena then we can only do so relative to a limited belief in chance of a certain order. This implies, firstly, that we should be able to make some sense of what the limited belief in chance refers to (a point not at all obvious for recent statistical cosmological theories). Secondly, such discussions are irrelevant to the argument from design, as the latter should deal with how unusual it is that a certain higher order statistical hypothesis is true–i.e., why *that* particular belief in limited chance is justified–and not worry about what can and cannot be explained in detail by any such hypothesis.

Notes

[1]See for example, Hebblethwaite (1986) and Hacking (1987). I take the argument from design or the cosmological argument to be an argument along the following lines: The

world's order is too delicate a balance to have arisen by mere chance. There must be a causal explanation. We should therefore infer the existence of an intelligent Creator.

[2]The "bridge hand fallacy" is the following: there *must* be some causal explanation if one is playing bridge and one is dealt a hand of thirteen spades. Applied to the universe the fallacy is to suppose that we can conclude from the world's being the way it is, that such a state of affairs is highly improbable on any account other than that of design. See Mellor (1969) who claims himself that in arguments from design, we cannot appeal to probabilistic reasoning because the concept of chance is inapplicable to the single unrepeatable world process. Mellor's views have been discussed in several books on the philosophy of religion. See Swinburne (1979) and Bartholomew (1984). Quotations from a large number of (astro)physicists who fall for this (alleged) fallacy (including Hawking and Hoyle), can be found in Rolston (1987, p. 68f).

[3]It is called the "inverse gambler's fallacy" because it refers to the situation where somebody enters a room, observes that four dice are rolled which yield four sixes and concludes that many rolls must have been made by the people in the room, *because* he has just observed such a rare event. Hacking has argued that the same fallacy is committed when the existence of the universe is explained in terms of the Wheeler mode. This has been disputed by Leslie (1986). While this article was in press several commentaries appeared, discussing Hacking (1987), in the April 1988 issue of *Mind*.

[4]Although he doesn't quote examples of the wide circulation of this "inverse gambler's fallacy," probably the following quotation would suffice to make the point (from Hebblethwaite 1986): "if all possible permutations are gone through, it should not surprise us that sooner or later on the sequential view (or somewhere on the simultaneous view) random shuffling (like the monkey on the typewriter over infinite time), will produce our Shakespearean habitat. On this hypothesis chance is indeed more probable than design. To think otherwise is indeed to commit the bridge-hand fallacy." The first sentence is true if taken to be about a sequence of events. But observing part of the sequence is irrelevant to estimating the probability of the next event (to assume so would be to commit the gambler's fallacy, to be found in the penultimate sentence of the quotation). The last sentence of the quotation shows that the other side in the argument has also been accused of Bungling the Probabilities. Hebblethwaite himself takes the view that the argument from design should appeal to the nature of the world *including* laws, etc. and not to the improbability of an evolving universe *given* the laws, constants, etc. It is somewhat surprising that Hacking doesn't connect his arguments (or at least indicate the difference) with the extensive discussion in the literature about Mellor's "bridge-hand argument" applied to the argument from design.

[5]I borrow the first notion from Cicero and the second from Ehrenfest-Afanassjewa (1958). For a further discussion of the early history of the notion of absolute chance see van Brakel (1976) and for an elaboration of the notion of limited belief in chance see van Brakel (1985).

[6]And with respect to any merely possible event, an argument from design might be set up.

[7]*De Div.*, II. vii. 18. The quotation continues: "For if He knows, then the event is certain to happen; but if it is certain to happen, chance does not exist. And yet chance does exist, therefore there is no foreknowledge of things that happen by chance."

[8]The distinction between different orders or levels when talking about statistical phenomena and testing statistical hypotheses is an important but somewhat neglected subject. The notion of order is as follows. Consider an urn containing three balls, two

black and one red. A first order experiment is drawing one ball. The most probable outcome of the first order experiment is a black ball. In a second order experiment a ball is drawn *n* times (with replacement). The most probable outcome of a second order experiment is a relative frequency of red:black as 2:1. A third order experiment consists of making n_2 series of n_1 draws; and so on. Note that the most probable outcome of order k (say: drawing three balls with replacement) contains the least probable outcome of order k-1 (in this case one red ball). This is one reason why it makes no sense to talk about statistical data without saying which hypothesis one is testing.

[9]See Rutherford (1913). The particular experiment is described on p. 189.

[10]The same applies when we neglect the "noise" in observing what is taken to be a deterministic phenomenon. Quantum mechanics too, if taken as a statistical theory at the deepest ontological level, can only make sense relative to some higher order limited belief in chance.

[11]Paraphrasing Ehrenfest-Afanassjewa. In drawing balls (with replacement) from an urn containing two black and one red one, we can formulate a fourth order hypothesis such that drawing, say, 81 red balls one after the other can be the beginning of the outcome of the *most probable* outcome of the experiment testing this fourth order hypothesis.

[12]Moreover there has to be at least some idea of the first order probabilities on which the distributions for all levels depend.

[13]These two chance events are modelled on the examples Cicero discusses. Quintus says (*De Div.*, I. xiii. 23): "'Mere accidents,' you say. Now, really is that so? Can anything be an "accident" which bears upon itself every mark of truth? Four dice [read "astragali"] are cast and a Venus throw results [the chance of this event is about 0.0016]–that is chance; but do you think it would be chance, too, if in one hundred casts you made one hundred Venus throws?" The reply is (II. xxi. 48): "In the first place I do not know why it could not; but I do not contest the point, for you are full of the same sort of examples...You also mentioned that myth from Carneades about the head of Pan–as if the likeness could not have been the result of chance!" Compare Aristotle, *De Caelo*, 292a30.

[14]The half-life of a thorium atom is estimated to be about 6×10^9 years.

[15]Compare Hebblethwaite (1986): Design arguments appealing to the nature of the world including laws, etc. are very different and more relevant to the purpose at hand than arguments which appeal to the alleged improbability of our universe coming into existence or rational beings evolving *given* the laws, universal constants, etc.

[16]Hacking suggests that the Carter model gives a "complete" explanation of the existence of our universe by combining a Principle of Plenitude (all possible universes coexist) and an Anthropic Principle (we can exist only in an orderly universe).

[17]Compare, for example, the discussion in *Analysis*, 1982, 1983, 1986, 1987, on the nature of metaphysical realism which follows Smart's suggestion that our universe might be the cross-section of a five-dimensional manifold, where it is assumed that causal interaction with the fifth dimension is precluded.

[18]In the sense that when I am about to throw two dice I have (at least) 36 conceptually possible worlds in my hand.

[19]It could be the one that starts with the first 81 draws yielding red monads (compare note 11).

[20]Having read about the "Briareus" model in Braithwaite (1968).

[21]This is what is actually happening when Hacking says that Carter models explain deductively the existence of our universe. It is assumed that [i] an experiment of a certain order has been carried out, [ii] the outcome is the most probable outcome of that order: Kwoth has made a fifth order draw and the fourth order distribution of sets of series of groups of draws is *exactly* as predicted by some higher-order analogon of the Poisson distribution. What starts as a statistical model can only lead to a deductive explanation of a particular outcome if, applying the limited belief in chance, the most probable outcome of a certain order is ordained to be certain.

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