An Open Future Is Possible

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ABSTRACT: Pruss (2016) argues that Christian philosophers should reject open futurism, where open futurism is the thesis that "there are no true undetermined contingent propositions about the future" (461). First, Pruss argues "on probabilistic grounds that there are some statements about infinite futures that Open Futurism cannot handle" (461). In other words, he argues that either the future is finite or that open futurism is false. Next, Pruss argues that since Christians are committed to a belief in everlasting life, they must deny that the future is finite. From here, Pruss concludes that Christians must reject open futurism. In practice, Pruss's argument extends to anyone who endorses everlasting life. In this essay, I respond to Pruss's argument on behalf of open futurism: *pace* Pruss, the open futurist can consistently believe in everlasting life while also accepting the basic principles of probability theory.

1. Introduction

Suppose we find ourselves in Heaven. Among its many delights is a bit of indeterministic fun: every day at noon, a fairly weighted coin is flipped. Perhaps we inhabitants of Heaven bet on the outcome. Given basic probability theory, it seems that after every time the coin lands heads, the coin will eventually land heads again. After all, the odds of a fair coin's landing heads are about .5.[1] And since we'll keep flipping this coin every day, it seems a near certainty that we will continue to see heads results.

Such a scenario might seem implausible—depending on your view of Heaven's delights—but it doesn't seem impossible. Some continual series like this seems metaphysically possible. And this possibility, Pruss (2016) contends, is a serious problem for *open futurism*, where open futurism is the thesis that "there are no true undetermined contingent propositions about the future" (461).[2]

[1] To be precise, the odds aren't exactly 50/50: A fairly weighted coin will land on its side in about 1/6000 tosses, and there is a bias of 51/49 favoring the side facing upward before the flip (Diaconis et al., 2007). Further complicating the case, coin flips are governed by the laws of mechanics, and there is a machine that renders a heads result on a fair coin flip every time (see Diaconis et al. for reference to this machine, built by M. Franklin's team). Thus, it's perhaps doubtful that this is truly a case of something indeterministic, let alone fun. But the 1/6000 sideways result doesn't cause difficulties for our current purposes, and the machine demonstrates that any indeterminism regarding the outcome appears due to conditions like the position of the flipping agent's hand, the speed at which she flips, et cetera. I'll thus continue to use the coin case but invite the reader to substitute in their own preferred, repeatable "chancy" process or event; the results of double-slit experiments appear to be an excellent candidate. If you believe that indeterministic processes are truly impossible, then the following debate is moot: for there is presently only one physically possible way things can go in the future.

[2] Strictly speaking, open futurists believe that there are no (determinately or settled) true future contingent propositions. This is most frequently interpreted to mean that there are no settled contingent future truths. The nature of this unsettledness is disputed—some open futurists (such as Barnes and Cameron 2009) understand the unsettledness in terms of determinacy, while others understand it in terms of what is presently determined. Pruss frames his arguments in terms of indeterminism, though his general argument will apply to any theorist

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Pruss begins by arguing "on probabilistic grounds that there are some statements about infinite futures that Open Futurism cannot handle" (461). From this, he concludes that either the future is finite or that open futurism is false. Next, Pruss argues that since Christians are committed to a belief in everlasting life, they must deny that the future is finite. From here, Pruss concludes that Christians must reject open futurism. But the argument actually extends to any person who wants to endorse everlasting life.

In this essay, I respond to Pruss's argument on behalf of open futurism: *pace* Pruss, the Christian (and open futurists, generally) can consistently believe in everlasting life while also accepting the basic principles of probability theory.

Here is how I will proceed: I will begin with a presentation of Pruss's argument. From there, I will offer a discussion of open futurism, explaining what the view does—and does not—entail. Once the key tenets of open futurism are clear, I will explain how the open futurist can undermine Pruss's argument against this position.

2. Pruss's Argument

Pruss begins his argument against open futurism by asking us to:

> Imagine a possible world with a finite past and an infinite future where the laws of nature and initial conditions determine that (a) the past is finite, (b) the future is infinite and (c) every day an indeterministic and fair coin is tossed. Let *q* be the proposition that the coin lands heads infinitely many times. The Law of Large Numbers implies that with probability 1, the limiting frequency of heads in the coin's tosses is 1/2. Since there will be infinitely many tosses, if the limiting frequency of heads is 1/2, there must be infinitely many heads. Hence, the probability of *q* is one. (461)

He then acknowledges that some will insist that there is an infinitesimally small chance that the coin lands heads only a finite number of times.[3] Either way, he says, "it is clear that the probability of *q* is *nearly 1*, a term I will stipulatively use to mean either 1 or 1 minus an infinitesimal" (462, emphasis his). From here, he presents the alleged problem for the open futurist:

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who thinks there are no determinately true future contingents. So, I will continue to speak in terms of undetermined future contingent propositions.

[3] This difficulty arises due to how we're currently measuring probability. It is possible that you toss a fair coin ten times in a row and get a heads result each time. However, the more times you toss the coin under indeterministic conditions, the more likely you are to approach the expected value of .5. The results of a coin tossed 100,000 times should approach the expected .5 value of heads results. While it is possible that the coin lands heads 100,000 times in a row, those chances are ½^100,000. In a large enough series of trials, the results *should* converge toward the expected value, more so the larger the set of trials. But there is debate over the force of this "should" when discussing the expected convergence (see Hájek (2009) for challenges). Assuming the relative frequency interpretation of probability—which Pruss assumes by using the Law of Large Numbers—there is debate about whether it is even possible for a fair coin to fail to land heads given an infinite series of tosses, since the coin should not only land heads, but the heads results should either be or approach the expected value. The largest deviation from our probability expectations is only an infinitesimal chance that a coin fails to land heads in an infinite series of tosses.

> Let *q** be the proposition that an indeterministic and fair coin is tossed on every day of a time sequence that goes on forever and lands heads on infinitely many of these days. Given as background information that some coin is determined to be thus tossed, the probability of *q** will be nearly 1. But on an Open Future view, it is *impossible* that the proposition *q** ever be true. For, necessarily, on every day of every time sequence, *q** is not true, since if *q** were true, there would be a fact about future contingents, namely that the coin will land heads infinitely often (whether the past tosses were heads or tails is irrelevant, as there were only finitely many past tosses). (462-463, emphasis his)

With this, he tells us:

> Thus, we have a conflict: the Law of Large Numbers tells us that *q** is nearly certain, while Open Futurism tells us that *q** cannot ever be true. We shouldn't abandon the Law of Large Numbers. (463)

Next, he notes a complication for Christians: whereas a non-Christian open futurist might be able to reject the possibility of an infinite future, a Christian cannot. After all, Christians are committed to something like:

> *Everlasting Life:* At least some humans will enjoy eternal life in union with God, where such life consists of a non-circular progression of time in which after every day (or other discrete unit of time) there will be another day. (463)

And this complication will arise for anyone with such a belief, not just Christians. Given *Everlasting Life* and God's decree that a fair coin be tossed each day for an infinite number of days, believers in a heavenly bliss that consists of temporal progression must allow for an infinite series of coin tosses. Since the Law of Large Numbers appears incontrovertible and Christians should not deny *Everlasting Life*, Pruss concludes that no Christian should endorse open futurism.

But whether Pruss's critique holds depends on the theoretical commitments of open futurists, the entailments of probability theory, and the demands of everlasting life. As it happens, a mistake has been made on each count, and I will take them in turn.

A general diagnosis of the difficulty is helpful at the outset. It can be difficult to parse probability claims, and issues which may seem mathematically minor—such as the difference between certainty and near certainty—can have great bearing on the truth values of propositions. We must also exercise care when discussing the probability *of* propositions, since that phrasing is ambiguous between the truth value of a proposition in a world *w*, the probability of the proposition's being true across probability or possibility space, and the probability of the *content* of the proposition.

Initially, Pruss's argument seems quite powerful: we expect there to be a continual series of heads in such a scenario, and the largest deviation from the expectations provided by probability theory is only an infinitesimal chance that a coin fails to land heads in an infinite series of tosses. You might think that the difference between a mathematical certainty and a *near* certainty doesn't amount to much. But here it makes all the difference when determining the truth value, and thus the probability, of *q,* and whether we think it's plausible that *q** is true.

If [the limiting frequency of heads in a coin's tosses is ½][4] is true, then, like all true propositions, it has a probability of 1. And if the limiting frequency is ½, then *q* is true and also has a probability of 1. But if the limiting frequency is not ½ due to the infinitesimal chance, then *q* is not implied by the Law of Large Numbers with a probability of 1. Since the proposition is false, the proposition has a probability of 0. And while *q** might be *about* something, perhaps a state of affairs, that is nearly certain, whether the proposition *q** itself has near certain probability is another matter entirely. I will return to these points in section four. In either case, the open futurist can affirm the relevant mathematics and propositional entailments.[5]

Parsing future-oriented statements is also tricker than it might initially seem, and there is debate over whether statements about the future are to be understood indicatively or in terms of openness or unsettledness. It is to that difficulty that I now turn.

3. Open Futurism: The Basics

As stated, the open futurist thinks that there are no true future contingent propositions about the future. That is because they think that if there is a settled fact of the matter about what *will* happen in the future—that is, if a proposition about the future is presently settled true—then the future is fixed with respect to the content of that proposition.[6]

One might be tempted to read statements with 'will' in them as indicative and as thus referring to *the* future—that is, the future among the set of possible futures which is the actual one. But this is exactly what the open futurist denies: they think there is no such thing as *the* future. Similarly, if the future is unsettled with respect to a particular event *e*, it cannot now be the case that *e* will occur.

Why do open futurists think this? Many open futurists think there are no future objects or events.[7] Suppose you deny the existence of future objects and events and think determinism is false—but you also think truth supervenes on being. This combination of views is an easy way to motivate open futurism, since it entails that there are no objects or events for contingent future truths to supervene on! So, future contingent propositions cannot be true (at least, according to these views). Open futurists think there's not *now* a settled fact of the matter about future contingents.

The open futurist is not forced to say, however, that any proposition that seems to

[4] Propositions are in brackets for ease of explication.

[5] Helpfully, there is a potential diagnosis for why Pruss has mistakenly elided these distinctions. Hájek notes that "the law of large numbers itself has several probabilistic references in it, both tacit and explicit" (2009, 223). The Law of Large Numbers generates a "'meta'-probability" over the conjunction of the cases, which has probability 1 (223). And it is unclear how to interpret that meta-probability, let alone apply it in contentious cases. So, Pruss's misapplication is understandable.

[6] Open futurists notoriously disagree about what settles the truth value of future contingent propositions, and also about whether bivalence is true (see Seymour, 2015). Pruss's general argument strategy targets all open futurists, regardless of whether they affirm or deny bivalence. Here's how: Pruss thinks (a) there is a probabilistic proposition which is either certain or nearly certain, and (b) that the open futurist must say, by definition, that such a proposition can never be or become (determinately) true. In section four, I show that Pruss's concerns about propositions becoming true also apply to the closed future theorist.

[7] Notably, open futurists who disagree think there are no *determinate* future objects or events, see Barnes and Cameron (2009).

refer to the future cannot be true. Propositions about what is presently determined to happen can be true, as they supervene on the state of the world at an instant (now) and the laws of nature. Necessary truths are also true, since they are about how things *must* be and thus skip the truth supervenes on being requirement.

A truth supervenes on being requirement is really a requirement that *contingent* truth supervenes on being. Future contingent propositions must supervene on being, according to this requirement, but not all propositions that seem to be about the future are future contingents. Some propositions are about what's presently determined. Others are about what necessary facts will be true in the future (and also are true and were true). The open futurist thinks that our language about what 'will' happen is often imprecise and needs disambiguation. What do 'will' statements mean, when speaking in truth and strictness?

Here's what the open futurist thinks: 'will' acts as a particular kind of modal operator, ranging over possible futures. If the future is open, there isn't one particular future, but rather a set or class of futures that are presently possible. But this doesn't mean there are no facts about this set or class as a whole—or facts about particular members. The WILL operator helps illuminate these facts. The open futurist's WILL operator works like a necessity operator. For helpful illustration, first consider claims about what is (and is not) metaphysically necessary regarding my Mean Cat:

(A) Necessarily, my cat is ill-tempered.
(B) Necessarily, my cat is not ill-tempered.
(C) It is not the case that: Necessarily, my cat is ill-tempered.

(A) and (B) make far stronger claims than (C) regarding Mean Cat (M.C.). (A) claims that M.C. could not have existed without having been ill-tempered. This claim is false, since M.C.'s foul moods appear entirely due to her difficult kittenhood. (B) is obviously false, since she's ill-tempered in the actual world. The contradictory claim of both (A) and (B) is (C), and (C) is true. And note that determining the truth values of (A)–(C) requires witnessing either the entire set or class of possible worlds ((A) and (B)) or some subset (C).

The open futurist capitalizes on this sort of distinction. Now consider WILL claims.[8] According to the open futurist, if [WILL: *p*] is true, then all possible futures are ones in which *p* is true. That is, it is settled that *p* is true; *p* must occur. If [WILL: ~*p*] is true, then all possible futures are ones in which *p* is not true. The contradictory proposition to [WILL: *p*] is ~[WILL: *p*]. ~[WILL: *p*] is now true if not all futures contain *p*. According to the open futurist, these WILL claims are actually about the present: what possible futures there are, what they're like, and, for any *p*, whether it's now the case that *p* must occur.[9] This is the generic move of the open future theorist: propositions that appear to be about *the* future are actually about the range of possible futures.

We can now apply the open futurist's reasoning to cases of coin-flipping generally. Let us consider a particular coin *c* flipped at some time *t*, where *t* is later than the present moment. We will stipulate that the coin is fair. It is not now true that [WILL: coin *c* lands

[8] The following is a schema for using the WILL operator. The result of the operator applied to the proposition, if a well-formed formula, is also a proposition.

[9] Propositions like [WILL: *p*] can change in truth value, depending on what happens. The possibility of change of this sort is the heart of an open future view. A-theorists about time should not be in principle opposed to propositions with changing truth values. Once the descriptive content of a proposition like [WILL: *p*] is settled, then the proposition will be true thereafter. Suppose a coin *c* lands heads at a time *t*. Then, all possible futures will be such that coin *c* landed heads at time *t*; that is, [WILL: coin *c* lands heads at time *t*].

heads at *t*], because in some possible futures the coin lands heads, while in other possible futures, the coin lands tails. As a result, that proposition is false. *Mutatis mutandis* for propositions regarding the coin's landing tails. What is true is ~[WILL: coin *c* lands heads at *t*].

Here, we might mistakenly think that open futurists have immediate difficulty with probability.[10] Consider the following three propositions:

(D) [~WILL: coin *c* lands heads at *t*]
(E) [~WILL: ~[coin *c* lands heads at *t*]]
(F) *Fairness*: [The probability that coin *c* lands heads is .5, and the probability that coin *c* does not land heads is .5]

The open futurist should endorse (D)–(F). These propositions may appear to be in tension, however, depending on how we understand the entailments of *Fairness*. We've stated that the coin has 50/50 odds of landing heads, but we've also stated that [WILL: coin *c* lands heads at *t*] is false. The open futurist is thus committed to thinking that the probability of the proposition [WILL: coin *c* lands heads at *t*] is 0, since the proposition is false. So, the open futurist seems to have contradicted herself: she thinks that the odds are both 50/50 and zero![11]

This problem is easily defused with some quick disambiguation regarding probability. We must be careful when speaking of probabilities and propositions. The probability of a *proposition's* being true is indeed 1 or 0; this is because a proposition is either true or false. But we might also want to know the general probability of a proposition's *being* or *becoming* true: that is, what is the general probability that the propositional content in question occurs?[12]

Recognizing the difference between the truth values of propositions and general probability defuses the puzzle. Everyone needs to disambiguate general probability from a

[10] An argument of this sort was given by Pruss (2010) and was refuted by Rhoda (2010). Pruss no longer endorses the argument, but the mistake is instructive for our purposes.

[11] The problem is presented most starkly by assuming that a proposition that is not true is false, and thus (in some sense) has a probability of zero. But this style of argument also applies to those who deny bivalence, since the general issue is that *Fairness* initially appears to require the truth of either (D) or (E). After all, the argument frames (D) and (E) as the only two potential outcomes. (It won't help for open futurist to point to the odds of the coin landing on its side, since the open futurist also says it's not true *that* outcome will come about. For any potential unsettled outcome of the coin flip, the open futurist says: "It's not presently true that *that* outcome will occur.") The challenge of infelicities of assertion and propositions never becoming true will apply to all open futurists.

[12] The language of "general probability" hides a vast amount of complexity—there are many interpretations of probability, such as the frequency, logical, propensity, and best-systems interpretations, and I aim to remain as neutral as possible. (I am comfortable side-stepping a purely subjective probability interpretation, since Pruss appears concerned with objective probability space, rather than simply our expectations.) I recognize that this attempt at neutrality risks annoyance, since a primary complaint of the paper is that Pruss has not been perspicuous about probability. However, my language of general probability is in service of a goal. While the Law of Large Numbers is part of a frequency interpretation, idealization of some sort becomes necessary once infinite series are introduced. And the main point of this paper is that probability theory poses no special problem for the open futurist. So, the language of "general probability" is meant to invite the reader to supply the details from their own preferred interpretation, according to their understanding of the nature of probability space. (I have not conflated probability space—or the probability of a proposition's being true across possibility space—with the probability of the *content* of a proposition, since these concepts can theoretically come apart (e.g., if there are probabilistic contents)). So, here I must ask forgiveness of the more mathematically inclined readers, especially a particularly kind referee. In the end, perhaps there is nothing more mathematical than leaving some key details as an exercise for the reader.

particular outcome. Otherwise, we'll be able to raise a silly objection against the closed future theorist. The way of escape is the same for both the open futurist and the closed futurist.

Without a distinction between truth values and general probabilities, the closed future theorist also contradicts herself regarding probability claims. The closed future theorist thinks there are settled future contingent truths, since there is an actual future among the set or class of possible futures. Suppose it is true now that coin *c* will land heads. If it is true now that coin *c* lands heads at *t*, the probability that coin *c* lands heads at *t* is 1. So, to the uninitiated, it might seem as if the closed futurist faces a fatal probability problem: they've contradicted themselves, as they claim both that the odds are 1 and that the odds are 50/50! Given that the odds are 1 in favor of heads—after all, the proposition that *the coin lands heads* is true—the closed future theorist shouldn't believe that a tails result is possible.

This silly objection also applies to the actual, settled past. Suppose I played the lottery and lost. The proposition [I lose the lottery] now has a probability of 1. When I bought my ticket, the bookie *claimed* that the odds of my winning were 1 in 500, since there were 500 tickets. But now it seems like I should make the absurd complaint that the lottery was completely fixed, and it was impossible for me to win. After all, the odds of my losing are 1.[13] Indeed, fatalism seems to follow—it looks like it is a logical fact that nothing could be otherwise than it in fact is, since all propositions have a probability of 1.

The solution, for both the open and closed futurist, is to uphold a distinction between the probability of propositions or particular outcomes and the general probability of an outcome. If the result of a particular coin-flipping event is heads, then the probability of that *particular* outcome (i.e., the coin *c* flipped in world *w* at time *t* in location *l* by agent *a*) is 1. This is in contrast to the general probability regarding a heads result of a fair coin flip—what the odds are of a heads result for all fair coins of this sort. The general probability, and thus the probability that appears to apply to propositions like [coin *c* lands heads at *t*] or [WILL: coin *c* lands heads at *t*], *seems* like it should be .5, or near enough—for the coin could land heads or it could land tails.

The open futurist can utilize the same distinction. How can the open futurist account for general probabilities? In the same way, I maintain, as the closed future theorist. Both the open and the closed future theorist should look to probability space, or whatever else properly grounds general probabilities, and affirm the same relevant facts. A particularly promising way of doing this is to understand general probabilities as claims about possible worlds—in this case, possible futures generally. *Fairness* can be interpreted in terms of the distribution of outcomes in possible futures: 50% of the possible futures are ones in which the coin lands heads, and 50% are ones in which it lands tails.[14] On this interpretation,

[13] I'd removed a lottery case from an earlier version of this paper, in part because I address this point in Seymour (2023). So, I was delighted when a referee suggested that I include that very case to make this point even more compelling. Thanks, anonymous referee!

[14] There are issues here regarding objective probability, proportionality, and uncountability. One concern is that if there are uncountably many possible futures, this would bar our ability to account for probability claims by using proportionality across possible world space. But see Builes and Wilson (2021) for an argument that entails the cases Pruss describes *don't* require uncountably many futures in which there are infinite heads results. These kinds of issues are significant, and I cannot solve them here. My general point is that both the open and closed futurist should model probability claims in the same way. If you're worried that we cannot accurately model probability according to the proportionality of possibility space, since any individual sequence will (effectively) have probability 0 if there are uncountably many worlds, this worry applies to anyone adopting a relative frequency interpretation (see Hájek (2009, 222)). So, if this is indeed a problem, it applies to Pruss as well and gives everyone reason to reject the Law of Large Numbers. In that case, the demands of mathematics are clear—the open futurist should surrender the law, as should everyone else.

propositions about general probabilities are then about the set or class of possible worlds, and in particular, about what possible futures there are with respect to the appearance of a particular outcome.[15] These general claims are claims about what's presently possible. All possible futures are such that there is a .5 probability that coin *c* lands heads. The open futurist is thus able to make the following claim:

> [WILL: The probability that coin *c* lands heads is .5, and the probability that coin *c* does not land heads is .5]

That is, every possible future *f* is such that there is a 50% general probability that coin *c* lands heads at *t*.[16] Another way of understanding this claim is as [50% of the possible futures include coin *c* landing heads at *t*]. Mathematical claims, such as the distribution of possibility space, are not future contingent propositions—rather, they are present *necessities*. Thus, they can be true.

Open futurism thus offers an attractive way to account for the distinction between general probabilities and particular outcomes. If the probability is truly 1, then the open futurist says the coin *must* land heads. The 'must' is read with the force of present necessity: given the way the world is, all possible futures are ones in which *c* lands heads at *t*. But assuming the outcome of a flip of a fair coin is undetermined, there are possible futures in which the coin lands heads and possible futures in which it lands tails. The distribution of possible futures is indeed roughly .5 heads and .5 tails, and so the general probability and the present probability of the outcome of a particular flip are identical. [17]

Again, the general point is that we can run into seeming discrepancies between probability and what is true if we do not pay appropriate attention to general probabilities, as opposed to particular outcomes or the truth values (and thus probabilities) of propositions themselves. According to closed future theories, it's perfectly settled whether the result of a particular coin-flipping event is a heads event or not. Probability theory does not obviously rule out closed future theories—or deterministic systems—despite these views giving differing answers to questions about general probabilities and particular outcomes. Surely, then, problems shouldn't be generated by pointing out that open future views also seemingly

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[15] This interpretation of general probability is fairly standard, especially on relative frequency interpretations. Each possible future does represent itself as having a particular outcome regarding the coin flip. A particular possible future *f* includes a heads result, and so *f* includes the probability that the coin lands heads in *f* as 1. But since *f* isn't presently determined to be the actual future (the open futurist thinks there isn't presently such a thing as *the* future), the probability of the result of the particular coin flip ranges over all possible futures. The open futurist can say that every possible future witnesses every other possible future, akin to how the Plantingian modal ersatzer thinks that every possible world book witnesses every other possible world book (see Plantinga (1976)). If possible futures witness all other possible futures with respect to the outcome of a coin flip, this view returns a general probability result of roughly .5. That is, possible future space is such that there is a 50/50 distribution.

[16] These probability claims can also be understood in terms of distributions only, rather than as objective probabilities.

[17] The open futurist will agree that after the coin flip, the result has a probability of 1 of having occurred—once the coin has, say, landed heads at *t*, all possible futures are such that the coin landed heads at *t*. The closed future theorist thinks there is a discrepancy between the probability of the actual result and the general probability space. The disagreement between the general probability and the actual outcome is a well-known modeling problem regarding finite frequency or regularity interpretations of probability, such as the Law of Large Numbers. And open futurism offers a way to defuse the puzzles that arise from this kind of disagreement between probability assessments.

have a clash between general probabilities and what particular outcome (if any, given a true infinite series) comes to pass.

But perhaps there is an issue with propositions that can in principle never become true, due to an infinite progression that is entailed by everlasting life.

4. Response to Pruss

Let us now return to Pruss's argument. Pruss says, "Let *q** be the proposition that an indeterministic and fair coin is tossed on every day of a time sequence that goes on forever and lands heads on infinitely many of these days" (462).

But *q** needs disambiguation. One concern, which Pruss notes, is that *q** might commit us to an actual infinite. To avoid this, Pruss says we can formulate the "time sequence that goes on forever and lands heads infinitely many of those days" as "Time is not circular, tomorrow there will be a day, and after every day there will be another day" (463).

This correction doesn't fix all of the ambiguity. According to the open futurist, the proposition under consideration now contains both an 'is' claim and 'will' claims. The scope of these operators is unclear.[18] One way of understanding the proposition is:

> WILL: [The coin lands heads at least once, and after every heads result there is another heads result]

However, this proposition doesn't isolate the conjunct that Pruss thinks causes the trouble. Another way of disambiguating the scope of the proposition is as follows:

> *q***:* WILL: [The coin lands heads at least once] & WILL: [After every heads result there is another heads result]

I propose we consider just the second conjunct, which I label:

> [*Infinite Heads*]: [WILL: After every heads result, there is another heads result]

I will stipulate that the coin lands heads at least once. And the case is such that God has decreed that there will be a coin-flip occurring each day at noon. Thus, both [WILL: The

[18] Hess and Rhoda (2020) note and tackle this difficulty head-on, changing *q** to:

> *q**N*: For any natural number *n*, there will occur some time after the *n*th coin toss another toss which lands heads. (365)

According to the open futurist, this claim still has an embedded WILL operator; to disambiguate as much as possible, open futurists needs something like:

> *q**WN*: WILL: [For any natural number *n*, some time after the *n*th toss results in another toss which lands heads.]

Since Pruss's ultimate concern is about a universal claim rather than natural numbers, I have phrased things in terms of [*Infinite Heads*]. I also wish to avoid quantifying over times. But what I say below applies *mutatis mutandis* to *q**WN*; the reader should thus substitute it if they prefer.

coin lands heads at least once] and [WILL: There is a coin-flipping every day] are true.

Pruss thinks that the open futurist must say the following two things:

(1) [*Infinite Heads*] is false, and thus has a probability of 0.
(2) The probability of [*Infinite Heads*] is nearly 1.

Even if (1) and (2) are not contradictory, there appears to be something infelicitous about this situation. [*Infinite Heads*] is a proposition about the future. But it can never *become* true in principle. So, how could it have a probability of nearly 1? Shouldn't we instead believe that all these seemingly possible futures are rather impossible ones?

How should the open futurist make sense of the probabilities? In the same way as everyone else. It all depends on what probability theory requires. There are two options: either a finite series of heads is impossible, or it is possible.

On some interpretations of the Law of Large Numbers, it is impossible for [*Infinite Heads*] to be false. That is, it is impossible that there be only a finite series of heads results.[19] If so, the open futurist can assert, along with everyone else, the truth of [*Infinite Heads*]. It is a mathematical necessity, and thus has probability 1. The open futurist does not deny necessary truths.

But suppose that there is an infinitesimal chance that there is only a finite series of heads. In that case, (2) is false. And the probability of [*Infinite Heads*] is not nearly one! For [*Infinite Heads*] is a necessity claim, according to the open futurist. And both open and closed futurists must deny necessity claims when considering infinitesimals, since admitting to an infinitesimal is a *de facto* denial of necessity in terms of possible futures.

There are, however, claims in the neighborhood of [*Infinite Heads*] that we should consider, since we want to focus on the probability of the *content* of the proposition. For instance, instead of [*Infinite Heads*] we could consider merely:

*q****: [After every heads result, there is another heads result]

The open futurist can affirm that this propositional content has a nearly certain general probability because almost every possible future is one in which this occurs. Supposing an infinite series of non-heads results is possible, almost all possible futures are ones in which there is a heads result after every heads result, *ad infinitum*. There is only an infinitesimally small percentage of possible futures in which this is not the case.

According to this understanding of possibility space, all possible futures are thus also ones in which there is only an infinitesimal probability that there is not an infinite series of heads. This is due to the nature of the possibility space itself. Again, the open futurist can assume that all possible futures witness all other possible futures. This understanding of possible futures is the same, *mutatis mutandis*, as the modal ersatzer's account of possible worlds and what is true at versus in a world (see Plantinga (1974) and (1976)). For the open futurist utilizing this sort of account of futures, every possible future witnesses every other possible future, returning a general probability result of roughly .5 regarding individual coin flips. The open futurist can apply this strategy more broadly, to consider an everlasting series of coin flips. What is the general probability, according to all possible futures?

On this interpretation, every possible future is such that [After every heads result, there is another heads result] has a probability of at least nearly one, regardless of the actual

[19] For debate on this, see Williamson (2007).

results of the coin flips. Thus, there is no inconsistency. It is true that WILL(probably): [After every heads result, there is another heads result]. That is, every future is such that it is probable that after every heads result, there is another heads result. The WILL(probably) proposition also has a probability of 1, since it is a mathematical proposition.[20]

If the Law of Large Numbers does not allow for an infinite series of only non-heads results, then open futurists will be able to account for [*Infinite Heads*] having a probability of 1 in the same way as everyone else: It is a fact about the present that accessible probability space (i.e., possible futures) is such that [*Infinite Heads*] has a probability of 1 and thus will occur. Thus, open futurism is consistent with *Everlasting Life* and the Law of Large Numbers assuming that probability theory dictates that [*Infinite Heads*] is true, as well. The general point is that general probability space—and what we are required to affirm about it—is the same, whether one endorses open futurism or not.

However, Pruss's argument extends beyond a charge of simple inconsistency. Suppose there is an infinitesimal chance that we fail to have infinite heads results. He thinks there is something untoward in affirming both:

WILL(probably): *q****

and

It is impossible that *q**** ever become true.

In other words, it is implausible that both [WILLprobably*q****] and [It is impossible that *q**** ever become true] are true—that is, that they both have a probability of 1. If our credences are to be appropriately connected to what we think is possible or impossible, surely we should revise one of the above judgments about probability.

But what does "it is impossible that *q**** ever become true" actually mean? On some disambiguations—those which happen to be friendly to the open futurist—it is not at all implausible to think both this claim and [WILLprobably*q****] are true.

Here's one way of understanding "it is impossible that *q**** ever become true":

[There is no time *t* such that at *t*, *q**** is made true]

Of course, no one should reject this claim, since an infinite series is infinite: for any time *t*, there is a question of whether there will be another heads result, should there be the infinitesimal chances. That is, there is no time *t* such that, at *t*, it is true that after every heads result there is another heads result. To declare *q**** true *at* a particular time would be to contradict *q****, as any arbitrary time we might pick in order to assess the truth of *q**** would be finite. If the concern is that "at no time will *q**** become true," this concern also applies to the closed future theorist.

The concern can be restated, however, in the following way. Supposing that the Law of Large Numbers only provides *near* certainty, the open futurist thinks propositions like *q**** cannot *in principle* be true. *q**** is the sort of claim that it perhaps seems *should* be true—

[20] The particular outcome of the event(s) it describes are only nearly certain, though, and thus those outcomes have a probability of less than 1. Again, we must be careful to differentiate the probability of a proposition's being true in a particular world from the probability of the content of a proposition (that is, the general probability of a proposition).

it's nearly certain!—and the closed future theorist is able to affirm the truth of *q**** in principle, while the open futurist cannot. The closed futurist can say that not only is *q**** the sort of proposition that can be true; it's one that almost certainly *is* true, given probability theory. And if the inhabitants of Heaven are unsure about its truth value, they can just ask God about it, who will be able to give them a definitive answer.[21] While the open futurist can make claims about general probability, they cannot make claims about the actual results of indeterministic future events.

This complaint, however, is not about probability theory but rather that, on open future views, the future really is open. If the future is genuinely open with respect to a certain outcome, then it cannot be true that every possible future includes that particular outcome.

Further, it's not clear that the closed futurist maintains an advantage here: for it is also possible, according to their view, that *q**** is false! Suppose a closed future theory is correct and we ask God whether *q**** is true, and God tells us no. Then we are in the unenviable position of believing both that *q**** is nearly certain and that *q**** is false (and thus has a probability of 0). By Pruss's reasoning, we should reject either probability theory (the Law of Large Numbers, at the very least), our belief in *Everlasting Life*, or closed futurism.[22]

Something has gone wrong here, and it is not a commitment to open or closed futurism. Rather, there are puzzling issues regarding probability, infinity, and propositions which appear to be the sort of propositions that in principle can never become true. In the end, Pruss's concern appears to be about temporality and infinity, rather than openness. Pruss assumes temporality in Heaven, which is itself debatable given that his arguments against timelessness in Heaven are quite quick.[23] Since he endorses temporality, Pruss also has difficulty regarding propositions which we want to endorse but that never in principle become true. These problems of becoming or achieving aren't unique: They hold even if one endorses a strict B-theoretic temporal view, according to which time is not dynamic and there is no objective passage of time.

If there is *Everlasting Life*, there are related problems in achieving said everlasting life—will it ever become true that we have it?—or in fulfilling our telos (if we have one). Both are problems. At any given moment of everlasting life in Heaven, we will not have lived an eternity. And human beings' telos of glorifying and fully enjoying God never seems to be achieved, given eternity (see Vander Laan (2018)). When discussing future-tensed propositions, Vander Laan points out:

> Surely God does not promise the completion of an impossible task, reaching the end of an endless future. The promise of everlasting life to John, say, is rather the assurance that the duration of John's life has no upper bound. (168)

[21]A definitive answer would be perplexing in other ways, especially if there is a finite result. It might not even be possible, for reasons discussed in the following footnote.

[22] Here I'm assuming inhabitants of Heaven could just ask God whether *q**** is true, and God could give them a definitive answer. This assumption allows us to bypass the need for truth at a time and could perhaps give some advantage to the closed futurist. But this assumption must sidestep concerns about supertasks, God's relationship to time, and questions about theological fatalism. See van Inwagen (2008) for an argument that God would not be able to share such information or even know it without causing problems. So, if the issue is what is *in principle* knowable, the closed futurist does not have an obvious advantage—not without, at least, a lot more argument.

[23] For a discussion on Aquinas and Heaven that shares some of Pruss's concerns, see van Dyke (2015).

And the open futurist can say just that. These concerns can't be solved by assuming that God can atemporally complete an infinite number of tasks. Even if God can perform a supertask, that does not mean God could necessarily perform such a supertask if it involved human beings or our choices.[24]

In the case that generated our discussion, we inhabitants of Heaven bet on the outcomes of daily coin flips. The outcomes of coin flips are open, according to open futurists. And so, we cannot rule out surprising results such as only a finite series of heads. But whence, then, our predictive power? What should we expect at our daily coin-flipping session? We should expect just what the relevant probability theory dictates.[25]

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[24] And if we do have something bounded, and thus a supertask or hypertask, then Pruss has committed himself to an actual infinity (see Craig (1979) for arguments to this effect).

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