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THE PROBABILITY OF THE POSSIBLE

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ABSTRACT

In "Why is There Anything at All?" Peter van Inwagen argues that even though it was never necessary that concrete beings existed, it was always maximally probable – just short of necessity – that they did (van Inwagen, 1996). I argue that van Inwagen's argument fails, albeit for an interesting reason which has remained so far unnoticed in the literature: there is a critical tension between two of its premises, both essential to its soundness, concerning the nature of comprehensively specified possible worlds. I summarize van Inwagen's argument, develop this objection, and then describe more problems which invariably accrue when we try to ascribe probability values to possible worlds.

Keywords: existence, possible worlds, probability, van Inwagen, Hawking

Introduction

In his paper "Why is There Anything at All?" van Inwagen argues that it is as improbable as improbable can be that the actual world might have been uninhabited by concrete objects (van Inwagen, 1996). Even though this argument fails, it fails for an interesting reason: an unhealthy tension obtains between two of its premises, both essential to its soundness, concerning the nature of fully specified possible worlds. I summarize van Inwagen's argument, develop the aforementioned objection, and then detail a more general objection to the project of ascribing probability values to possible worlds.

Van Inwagen's Argument:

Van Inwagen's argument invokes four premises. (99)

(1) There are some beings
(2) If there is more than one possible world, there are infinitely many.
(3) There is at most one possible world in which there are no beings.
(4) For any two possible worlds, the probability of their being actual is equal (I
will sometimes call this the "equi-probability assumption").
(5) It is "as unlikely as unlikely could be" that the world could have had no concrete
occupiers.

Herein, I treat premises (1) and (2) as unproblematic and deal with them only in passing. My critical scrutiny is reserved for (3) and (4). This scrutiny proceeds in two stages. First, I explicate these premises' meanings and motivations. Second, I explore a joint weakness that arises from an essential tension between them. Brief moralizing then follows.

First, let's consider the two unproblematic premises. Premise (1), the assumption that there are some beings, is certainly "a safe enough assumption," based on empirical observation: we know that the actual world is occupied because we can see that we and other items occupy it. (100) Premise (2), the claim that if more than one possible world exists, then infinitely many do, results from our ability to articulate an infinite number of alternative descriptions of reality, each corresponding to a distinct way that things might be. Van Inwagon writes that it would be "bizarre" to suppose that properties which vary in magnitude or across an indefinite range of dimensions define only a limited number of worlds. He writes, "if there is more than one possible world, then things can vary; and it seems bizarre to suppose, given the kinds of properties had by the things we observe, properties that seem to imply a myriad of dimensions along which these things could vary continuously, that there might be just two or just 17 or just 510 worlds." (56) The shape of my coffee cup, for instance, could presumably vary in an infinite number of ways, and each of these different ways would a difference-making feature of a distinct possible world.

As for the second two, much more problematic, premises, let's first consider (3), i.e., the assumption that there is at most one possible world in which there are no beings. This premise emerges from van Inwagen's contention that any two unoccupied worlds are identical, since all worlds share exactly the same abstract occupiers. Van Inwagen makes this assumption because he takes abstract objects ("numbers, pure sets, 'purely qualitative' properties and relations, possibilities, possible worlds themselves") to be common to all possible worlds, and thus not effective difference-makers between them. Moreover, he takes the actual concerns expressed by "why anything exists" queries to regard concrete, rather than abstract, occupiers of reality. Philosophers worry, he tells us, that there might have been "no physical things, no stuffs, no events, no space, no time, no Cartesian egos, no God [and presumably no fields, forces and the like], etc." It is this possibility, not one in which, say, the number 2 doesn't exist, that fuels our anxieties about existential contingency.[1] It is from this assumption that van Inwagen concludes that there can be but one empty possible world. For if there is only one way in which a world can be empty (by containing no concrete items), and being empty identifies a world as the world that it is, then no two empty worlds can be distinct.

Premise (4), the claim that the probability of any two worlds' obtaining must be equal,

[1] Even though van Inwagen does not claim that this taxonomy of concrete occupiers is comprehensive, it appears to be so. Indeed, it seems redundant. To the extent that we view physical objects relativistically, as extended series of events, or worldbraids, and the properties of space/time as determined by relational configurations of such items, "objects, space, time and stuffs" fail to exist independently of events. The alleged existence of abstract objects in all possible worlds can perhaps best be understood by reference to their contrast with physical objects in this respect. Abstract objects exist outside of spacetime in the sense that they are existentially independent of the worldbraid material occupiers of spacetime. Thus, their existence cannot vary across possible worlds as a function of differences in these worlds' physical (event) occupiers.

is the contention that van Inwagen spends the greatest time and effort defending. It is, he concedes, "the one that people are going to want to dispute" (101). Thus, van Inwagen's defense of (4) is considerably more complicated than those of (1) – (3), requiring more in the way of both setup and explication. By way of setup, he asks us to imagine some system of objects and associated abstract states. which the s is either in or not. These states, he suggests, behave logically very much like propositions, allowing us to treat possible worlds as state sets, the component states of which constitute the various details of the world in question. Van Inwagen asks us to think of possible worlds as sets of "fully consistent and maximal" possible states of affairs which, as a function of their maximality, remain "isolated" beyond the reach of "pre-cosmic selection machines." Let's pause briefly to explicate clarify these locutions.

To do this, let's simplify things, paraphrasing to eliminate technical formulation whenever doing so doesn't distort van Inwagen's fundamental intent. A worlds is "maximal," on his telling, if it consists of fully specified state sets, where said specification guarantees that *any* given possible state of affairs either obtains in that world or doesn't. A world is "consistent" if it does not include states which stand in logical tension with each other; if it involves no states which both do and do not obtain. A world is isolated "if no facts about objects external to it could influence it." Finally, a "pre-cosmic selection machine" (henceforth, "selector mechanism") is a principle which operates from outside all possible worlds, and functions to determine the likelihood of any given world's obtaining over its alternatives. [2] Talk of machines here is ambiguous. On one hand, these items might be construed as statistical laws, just as Turing machines are best construed as abstract programs. On the other hand, they might be construed as concrete machinery which functions to express or enforce such laws, just as (finite approximations of) Turing machines might be construed as desktop computers. For our purposes here, it seems best to understand selector mechanism in the former terms, since translation into the latter terms is always available (e.g., talk of a law which dictates that the best of all possible worlds must be actual can always be paraphrased, if one chooses, into talk about Leibniz' omnibenevolent God).

With these locutions in hand, the rationale behind premise (4) becomes clear. Because possible worlds are maximal, i.e., completely inclusive with respect to all possible yfacts, each is an isolated system in the sense that there are no unspecified details about it yet to be determined by other states that do not already partially constitute it.[3] In particular, no selector

[2] Van Inwagen's choice of locution ("pre-cosmic") is, of course, particularly puzzling when we ask what the tense designation (if that's what it's supposed to be) is intended to tell us, given that possible worlds encompass entire world histories.

[3] Note that in announcing my decision to treat premise (2) as unproblematic I am not committing myself to the claim that it is unproblematic. Jack Macintosh has pointed out a potential problem from which it suffers that we are only now in a position to articulate. As we have seen, van Inwagen argues for an infinitely large class of possible worlds by noting the multitude of descriptions that we can generate by imagining quantitative variations of various magnitudes across an indefinite range of dimensions (again, the shape of my coffee cup could seemingly vary in an infinite number of ways, and each of these different ways seemingly defines a distinct possible world.) Such a class is not merely infinite. It is non-denumerably infinite: it is uncountable because additional members, generated by the same imaginative procedure, always wait in the wings to be included within it. But mightn't this fact suggest that possible worlds cannot be "maximal" in the way that van Inwagen takes them to be? For if an infinity of possible worlds is demonstrable through a procedure which shows them to be non-denumerably infinite, then mightn't the specification of each such world re-

mechanisms exercise such determining influence. This is because selector mechanisms, if there are such, exist (by stipulation) only externally to particular worlds, even though such externality is rendered impossible by the maximality which van Inwagen supposes these worlds to have. For any given state, the maximality of each possible world guarantees that this world either is or isn't in that state. Because possible worlds are inclusive of all the ways the world might be, there is no neutral logical space between them from which selector mechanisms might operate.

Van Inwagen makes one final inference before announcing his main conclusion. "For any system of objects with maximal states," he writes, the maximal states of the system should be regarded as equally probable, provided that the system is isolated" (104). Van Inwagen's intended reason for this is also clear: if there can be nothing external to maximal possible worlds which might privilege some of them over others, we should treat them all as having an equal probability of obtaining. "If a system is isolated," van Inwagen tells us, "then any two of its maximal states are of equal probability. But then we have an argument for the conclusion that any two possible worlds are of equal probability: 'Reality' is an isolated system, and possible worlds are maximal states of Reality" (105-6).[4]

As an aside, I doubt that this defense of the equiprobability assumption is cogent. On the face of it, it is difficult to see why different possible worlds are equally probable simply by virtue of their mutual isolation. For, doesn't such equiprobability also require the operation of a selector mechanism able to dictate that isolation ensures equiprobability? Van Inwagen assumes here that equiprobability is a natural *default state* for mutually isolated possible worlds. However it is hard to see why this should be the case. The default state could be one in which, say, our own actual world enjoys probabilistic advantage; to assume that it doesn't requires us to assume that some selector mechanism be operative.

However, let's ignore this complication. For, as noted at the outset, my concern in this paper is not to argue against any of van Inwagen's premises considered in isolation; it is rather to argue for the existence of a critical tension between them.

From his claim that isolation ensures equiprobabity, here van Inwagen proceeds to his

quire us to specify, across a non-denumerable set of state description sentences, whether or not those sentences are true?

Is this a problem for van Inwagen? I am not quite sure. For the mere fact that a non-denumerable set of potential descriptions exist, each picking out a unique possible world, does not in itself imply that we can only specify the character of each such world by assigning truth-values across non-denumerable sets of state description sentences. On the face of it, we would seem to be able to conclude from the fact that the base of my cup might be round or square or oval or slightly differently oval, etc., that a non-denumerably infinite number of worlds exists without concluding anything at all concerning the number of assertions that we must make in order to specify the character of each of these particular worlds. Perhaps this issue is only decided when we take a position on the existence of negative properties (see footnote (6)). This would tell us whether or not we could specify the conditions defining a world as those in which, e.g., the base of my cup is round as opposed to those in which the base of my cup is round, and not square, and not oval, etc.

[4] Premise (1), which maintains that some beings exist, functions in the background of this argument, but in a quiet way. Van Inwagen's is concerned to make it clear from the outset that occupied worlds are possible. This is a reasonable precondition that must be satisfied for the other premises of the argument to do any effective work.

major conclusion. Because possible worlds are infinite in number (premise 2) and all are equally probable (premise 4) and only one of them is devoid of beings (premise 3), the world in which there is nothing gets swamped by the worlds in which there is something. There is only one empty possible world to be actualized; however there are an infinite number of equally probable occupied alternatives. Thus, while it is not impossible that nothing exists, it is as improbable as improbable can be.[5]

Problems

Van Inwagen's argument has been the object of criticism before, generally by way of objection to *either* of premises (3) or (4). Again, however, my strategy here is somewhat different. It exploits a crucial tension that arises *between* (3) and (4). These two premises, I maintain, are in conflict because they are motivated by contradictory intuitions regarding the nature of "maximal" possible worlds.

Remember again the rationale behind (4), i.e., the claim that all possible worlds are equiprobable. Because each possible world is maximal, there are no unspecified details about it that might be determined by other states that do not already help constitute it. This is what makes it isolated, i.e., beyond the influence of any conceivable selector mechanisms able to render some worlds more or less (or equally) probable than others. In contrast with this, however, the rationale behind (3), i.e., the claim that there is at most one empty possible world, is that all that matters to making a world the world that it is are its concrete occupiers. Thus, it is only through the differential existence of such concrete items that differences can accrue between worlds. But possible worlds, so conceived (by (3)), are surely not maximal in the sense required by (4). This is because premise (4)'s conception of maximality is one on which the distinguishing role, not merely of concreta, but of laws, including those very general laws defining selector mechanisms," must be taken into account.

To see why this is the case, let's think more closely about selector mechanisms. If they existed, what would they be like? We have construed them as very general statistical laws rendering some worlds more or less (or equally) probable than others. What might examples of such laws look like? One candidate van Inwagen considers is a variation of Leibniz' simplicity imperative: simpler worlds are more likely than complicated ones. Now, of interest to us here is the fact that in neither Leibniz' nor van Inwagen's hands is the criteria of such simplicity merely ontological; it is nomological also. In Leibniz' case,

[5] Manson, Neil A., 2011, "No Chance for Nothing," American Philosophical Association Pacific Division Conference, San Diego, CA. Manson poses a significant challenge to van Inwagen's argument by objecting to premise (4) on the grounds that it violates countable additivity, the principle dictating that the collective probabilities of each individual world's obtaining must equal the overall probability of some or another of these worlds obtaining. This is a compelling criticism, but not one that I will pursue here. The problem he highlights is simply this. Since these worlds exhaust all the ways that reality could be, the overall probability that one or another of them obtains must be 1. But this poses a dilemma once we note that the sum that we get when we add together the probability values of each individual world's obtaining is either less or more than 1. We cannot ascribe probabilities in such circumstances without giving up the idea that various possibilities sum together to make up 100 percent of the original probability space. Thus, we cannot ascribe probabilities across infinite ranges of possible worlds.

it is arguable that the pertinent criterion of "simplicity" is primarily nomological: there is little significant respect in which the self-probabilifying simplicity of a world consists in its containing fewer constitutive items or fewer types of items than its modal alternatives. Rather, Leibniz' best of all possible worlds is that which is "richest in phenomena," but "simplest in hypotheses," where these hypotheses are best understood as articulating the law-like regularities governing phenomena (Leibniz, 1992, sec. VI).

In van Inwagen's hands, the simplicity imperative assumes a different form. One world is simpler than another, he suggests, if it is fully specifiable by a more minimal description, if we need say less about it in the course of fully specifying its nature (106).[6] But here we also have a criterion of simplicity before us which is primarily nomological in character, since it must surely register the number of assumptions generally which a theory makes about the world, not merely the number of assumptions it makes concerning the number (or kinds) of entities which that theory posits. One theory of the world is not made simpler than another merely by virtue of positing fewer items, it is also made simpler by being regulated by fewer laws governing these items' interaction. Theoretical scope is of value largely for its capacity to simplify various domains of phenomena by unifying them under single, shared explanatory rubrics.

Now, it seems a safe bet that what applies to simplicity in this regard applies to candidate "selector mechanisms" generally. Simplicity stands in close relation to various other vir-

[6] It is worth noting that there may be problems with the very idea that the simplicity of possible worlds can be read off their alleged capturability by or concise descriptions. Van Inwagen's suggestion, once again, is that the simpler worlds are those about which we need say the least in the course of specifying their natures. But what must we presuppose for such a criterion to work? One thing we must presuppose is that we can objectively distinguish between featureless and cluttered regions of the universe. We must presuppose that in specifying the character of a worldly region, we can identify the default state which must obtain in order for that region to count as uncluttered. But why should we assume this? The intuition that motivates the assumption is certainly clear: worlds without concreta are simpler than worlds with concreta by virtue of being less cluttered. But, once again, suppose we approach things relativistically and view physical objects as ordered event sets or worldbraids, the relational configurations between which determine the properties of spacetime itself. On such an account, all of the concreta that van Inwagen posits, "objects, space, time and stuffs" are real, but dependent upon events. Such an account might even offer advantages to van Inwagen's account for its ability to clearly contrast abstracta with concreta, at least in the actual world: abstract objects are those items which exist outside of spacetime in the sense that they are existentially independent of the worldbraid material occupiers of spacetime.

If we construe our ontology in these terms, however, it becomes less clear that the worlds van Inwagen describes as ontologically Spartan admit of simpler description than the worlds he regards as (relatively) more cluttered. For a natural way to characterize fundamental reality on the model envisioned above is to attribute property exemplifications to either individual space/time points or to regions of space/time. To specify reality, on such a telling, is to describe for each space-time point or region the properties occurrent within it, so that concreta are construable as regions of space-time in which objects' essential and contingent properties are exemplified. But then the question arises as to whether or not negative properties exist. If they do, then our description of a space-time region in which a basketball exists (e.g., a region in which properties P, Q and R are exemplified) can be no less simple than our description of a region in which one does not exist (i.e., a region in which ~P, ~Q and ~R are exemplified). The issue of whether or not negative properties exist has much to do with the question of whether or not they have causal powers, which itself has much to do with the analysis of causation one decides to accept (on counterfactual theories, for instance, it is arguable that negative properties do have causal powers). But this is an issue beyond the scope of the present paper. Nick Zangwill offers a nice primer on these issues (Zangwill, 2011).

tues which we typically prize in theories. Comprehensiveness (construed as a measure of the number of phenomena explained and predicted) and scope (construed as a measure of the number of types of phenomena explained and predicted) both appeal, in part, to deeper simplicity considerations: the idea in the case of each is to unify diverse happenings under as few encompassing explanatory rubrics as possible. Thus, it is no accident that simplicity has generally been the historical poster boy for selector mechanisms, whether the question at issue has been that of determining which possible worlds are most likely, or that of determining which of competing empirically equivalent theories or models of nature are true or provide the "best" available overall explanation of things.[7]

To return to the issue of the tension between van Inwagen's premises (3) and (4), the significance of the above observations is that a world's simplicity (and thus any other candidate probabilifying feature) is most plausibly construed as a function of both its ontological and nomological attributes. Thus, to individuate worlds in terms of such probabilifying features, we must invoke criteria for distinguishing between worlds that mention, not merely the concreta constituting these worlds, but also the laws that govern these concreta. Moreover, premise (4) presupposes that the pertinent individuating laws in operation here include also those very general laws which constitute the pertinent selector mechanisms (so that the features individuating a world as the world it is must include, e.g., not only that world's simplicity, but also the selector mechanism which dictates that simpler worlds are more likely to exist than complicated ones). This is required by the maximality feature that van Inwagen finds it necessary to attribute to possible worlds in order to isolate them from the influence of any *external* selector mechanisms which might disturb their equiprobability with respect to each other.

We now have our essential tension between premise (4), which requires that we individuate worlds in terms of concreta and laws – including those laws which are the selector mechanisms, as required by the maximality condition – with premise (3), which requires that worlds are individuated only by their constitutive concreta, since empty worlds are identical only if this is the case. Without the former individuation criteria, we cannot guarantee the equiprobability of possible worlds. Without the latter individuation criteria, we cannot infer that there is but one empty possible world. We must instead conclude that there are infinitely many empty possible worlds, each distinguished from the others by its regulative laws.

Now, to say this we must make sense of the idea that worlds could remain distinct by virtue of being regulated by distinct natural laws rather than by being inhabited by distinct concrete denizens. To this end, we must presuppose certain features regarding natural laws. In particular, we must eschew Humean (or "systems" or "regularity") accounts on which laws of nature merely articulate uniformities in nature (e.g., actions are followed by equal and opposite reactions, the speed of light is *c*), and thus supervene on items in the world (Mill 1947; Lewis 1983, 1994). Instead, we must adopt some or other necessitarian account on which natural laws actually govern these constancies, effectively *making* them transpire.

[7] A notable example of this is to be found in Vogel (1990, 658-666). Here Vogel uses a criterion of explanatory comprehensiveness to argue that common skeptical hypotheses must always be worse explanations of experience than our everyday theory of prosaic physical reality.

Note, however, that having committed to a necessitarian view of this sort, we need not commit to any *particular* necessaritarian view. We may need to suppose that natural laws are describable as counterfactual relations between natural items, but we need not identify these relations as obtaining between objects and their properties, or between events, or between property exemplifications.[8]

Fortunately, I think that a necessitarian construal of natural laws is justified. John Carroll assembles a number of thought experiments which speak decisively in favor of such non-Humean accounts of law. (Carroll 2011) For instance, it seems perfectly reasonable to suppose that laws govern the ways in which particles would interact even in worlds in which they don't interact due to merely *contingent* circumstances which keep said interactions from ever occurring (Tooley 1977, 669). Similarly, consider a universe in which a single concrete object moves through otherwise empty space at a constant velocity of one meter/second. Carroll observes that there would seem to be a fact of the matter as to whether or not object velocity in this world is a constant or a non-constant feature of bodies. We can intelligibly pose the question of whether or not this velocity would change, for example, if the object were to collide with other inertial items (at least on an absolute conception of space)? The point is that no unique set of laws supervenes on the original imagined world, despite the fact that there still seems to be a fact of the matter as to what would happen if its circumstances were to vary. Humeanism looks to be false because the laws of a world are not uniquely determined by that world's total physical state. In particular, it is not uniquely determined by its number and kinds of concrete occupiers.

There may be other seeming complications for the account of possible world individuation described above, on which nomology floats free of ontology. But I suspect that in these cases also the problems at issue turn out to be either merely apparent or else easily addressed. For instance, we might worry that things get messy when we adopt a necessitarian view that calls for counterfactual analyses of laws, given that such counterfactual analysis invariably invokes modal alternatives which are likely to cross-entangle possible worlds from the outset in unwelcome and unforeseen ways. But this worry strikes to me illusory. For one thing, it gives us no reason to suspect that such entanglement, even if it did occur, would force us to describe possible worlds in terms of van Inwagen-style selector mechanisms. For another thing, it is at least arguable that any counterfactual assertions we might use to specify natural laws are reducible to claims referring only to the categorical bases which render these counterfactual assertions true, leading us to talk about causal propensities of substances and events. This point holds, I suspect, for most if not all modal claims. For instance, if it is an a posteriori necessary truth that water is H_20, then the modal fact that worlds containing H_20 must contain water is best fleshed out by reference to intrinsic and categorical features of water.

In short, I think it a safe assumption that the conflict between the individuation criteria for

[8] We might be obliged to eschew accounts, however, on which natural laws relate abstract universals like properties (Armstrong 1978, 1983; Dretske 1977, Tooley 1977, 1987). Once again, this is because both properties and relations, on van Ingwagen's account, exist (qua abstracta) across all possible worlds, including whatever relation of non-logical necessitation might serve to associate any two properties related in a law-like fashion.

possible worlds required by (3) and (4), respectively, keep van Inwagen's final conclusion from going through. He cannot depict a single empty possible world as being swamped by an infinite number of inhabited alternatives and claim in consequence that it is as unlikely as unlikely can be that there could have been nothing at all. This would be an arbitrary inference, no less than would be an inference to the conclusion that the probability that the world is empty is 1/2 and the probability that it is not empty is 1/2.

Conclusions and Morals

I have argued both that premises (3) and (4) are in conflict. I take this point to be important to the end of critiquing van Inwagen's argument. I have also argued against premise (3): on certain appealing accounts of natural law, van Inwagen can be seen as simply miscounting the number of empty worlds. Beyond these points, however, it is important to note that premise (4) is also questionable, and not merely because van Inwagen settles on the particular distribution of probabilities over possible worlds that he does. Rather, the problem is that invoking objective probability in our dealings with possible worlds is always a mistake. This is because such invocation can be nothing more than a veiled invocation of subjective (or epistemic or conditional) probability instead. The conclusion van Inwagen aims to derive concerns the way that the cosmos (as we may call the collection of all possible worlds) is. But this can hardly be done using the notion of conditional probability that he is working with. For irrespective of whether he construes possible worlds as collections of concreta (as suggested by premise (3)) or as collections of concreta and governing laws (as suggested by premise (4)), he can never be in a position to avow the equiprobability of possible worlds as anything more than a methodological principle of inference. What his reflections tell him is only that he has no a priori reason to privilege the probability of one possible world over that of another. Thus, the judgment that all worlds are equiprobable can reflect little more than a decision on his part. It can reflect nothing more than a procedurally dictated ascription of initial probabilities. This ascription may correctly reflect facts about human ignorance. But it does not reflect (for all we know) the way of the cosmos. This is seemingly the case for any interpretation of probability which is both plausible and potentially applicable to possible worlds.[9] [10] [11] [12]

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[9] Classical interpretations are of no help here, as they would presumably presuppose that the probability of any given possible world's obtaining to be 1/infinity, precisely the kind of procedural assignment of values which, I have suggested, we have no reason to suppose gets at the metaphysical truth of the matter. Frequency interpretations look to be, at best, marginally applicable in this context, since the obtaining of a possible world isn't part of a sequence of events within which the relative frequency of that world's obtaining can be estimated (not that such a relative frequency could be determined in any case). Finally, Carnapian logical interpretations, on which syntactic features of premises generate degrees of confirmation for conclusions are, I take it, no longer regarded as plausible (Carnap 1950). Given the problem I have highlighted, i.e., the fact that the maximality of van Inwagen's possible worlds would seem to require that they include relevant selector mechanism, the interpretation of probability which would seem to be best fitted to entire possible worlds is some or other variant of Popper's, on which the probability of a world would be regarded as an objective feature of that world, i.e., intrinsic features of it which probabilify its obtaining (Popper 1959). But again, such accounts are not without their problems, and it is hard to see how we could know that such features obtain.

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[10] Neil Manson has argued that assumptions like van Inwagen's equiprobability premise (4) are philosophically tempting because the profession is presently so enamoured of Bayesian reasoning, perhaps because such reasoning seems to promise to make epistemology so very easy. (Manson 2011) I concur with this diagnosis.This beguilement has led to an extension of Bayesian aspiration into realms where it doesn't belong. Bayesianism promises us a method through which we can arrive at correct results even when our initial a priori probability assignments are relatively uninformed by evidence because pertinent relevant frequencies or propensities are not known (thus van Inwagen begins with the assumption that all possible worlds are equiprobable).

However, Bayesianism only offers this promise on the condition that we are able to update our initial probability assessments on the basis of incoming data. But when we are endeavouring to assess the probability of entire worlds, no such incoming data is forthcoming. Because no incoming data speaks in favour of the probability of the actual world vis-a-vis its alternatives, nothing we observe in the actual world could ever tell us anything of relevance more than what we originally knew (or didn't know) concerning the probability that this or any other particular world should have obtained. For this reason, the original assumption of possible world equiprobability can never get revised. Bayesianism interprets probability as a measure of perceived epistemic position, rather than as the objective frequency or a propensity that a given phenomenon might have to obtain.

Thus, for all we can ever know (intrinsic or extrinsic) selector mechanisms might very well operate to privilege some possible worlds over others; there might indeed be core elements of a single, or else common to a class of, metaphysically possible worlds that distinguish them from merely logically possible ones. Because we never have access to a broad enough background of statistical law to which we might appeal, it is impossible to make judgments concerning the objective or metaphysical probabilities of entire worlds in order to revise the equiprobability assumption we may have originally made in order to get a leg up on Bayesian reasoning. Objective judgments of probability must always be, to quote Derik Parfit, "grounded on facts about the world, so that such judgments cannot be applied either to how the whole of reality might be, or to how reality might be explained."

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[11] The sort of story I've told above (in footnote 10) is also illuminating in certain epistemological contexts. In particular, it helps to explain the Cartesian skeptic's conception of knowledge as epistemic certainty. This conception should not be viewed as the result of some unmotivated and irrational decision to impose arbitrarily high standards upon our ordinary epistemic practice. Rather, it is better viewed as a result of the skeptic's attempts to talk about justification even when the generality of his inquiry robs the notion of degrees of justification of any possible purchase. Comprehensive skeptical scenarios are like maximal possible worlds. They jointly exhaust the whole of logical space, leaving no presuppositional material through the use of which one might judge common sense realism to be more likely than its various skeptical alternative scenarios. Thus, for the skeptic knowledge would have to be certainty to be anything at all. The range of epistemic states intermediate between absolute certainty and abject ignorance collapses like a broken accordion.

[12] Baysean issues aside, the problems we encounter whenever we endeavour to determine the relative probabilities of alternatives ways the world might have been are nicely illustrated by a recent and celebrated examples. Without pretending to understand the cutting-edge physics (Thank God), and looking instead merely at certain formal features of the proposal, we can see in Stephen Hawking's recent popular packaging of his "Grand Design" argument an attempt to identify intrinsic self-probabilifying characteristics of the actual world (Hawking and Mlodinow 2010). For his is an account on which the internal features of M-theory (which he alternately treats as a truly unified field theory and as a mere collocation of disparate accounts which collectively explain the whole of nature) breathe life into its own equations in a way that brings our universe into existence. Hawking's fundamental assumption is that the total (positive and negative) energy of the universe must remain constant. Thus, "on the scale of the entire universe the positive energy of matter can be balanced by negative gravitational energy," so that transformations from the latter to the former can create mass from the background energy vacuum alone. The fact of gravity is the thing that brings about such transformation, on Hawking's account. "Because there is a law such as gravity, the Universe can and will create itself from nothing." (Kindel edition, no pagination) Moreover, the universe so brought about must be replete with the fundamental laws and physical constants that characterize our own world. This allegedly follows from the requirement of supersymmetry, the counteractive balance

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between force-making and matter-making particles, and the accompanying fact that M-theory is "the most general supersymmetric theory of gravity" and thus "the only candidate for a complete theory of the universe."

For our purposes, what is intriguing about Hawking's description is, again, not the details, but his summary claim that the genuine miracle in all of this "is that abstract considerations of logic lead to a unique theory that predicts and describes a vast universe full of the amazing variety we see" (Kindel edition, no pagination). For surely the assumption of supersymmetry is not a matter of abstract logic. Nor can M-theory be unproblematically identified as uniquely consistent in any interesting way. John Horgan has noted that M-theory is but one iteration of string theory, which has enjoyed two decades of popularity less for the its actual merits than for lack of decent alternatives (and possibly because of the near-religious enthusiasm of its adherents). Whatever the merits of the approach, no one is in a position to proclaim its logically inevitability. More interestingly, it has also been noted that M-theory comes in an almost infinite number of versions, each of which predicts a different universe. (Horgan 2010) This result is embraced by Hawking, who proclaims that all of these universes exist. But to say this is to seriously muddy the original proposition we set out to defend, i.e., that an examination of the intrinsic features of some particular world (say, the actual one) might provide us grounds for proclaiming its probabilistic privilege relative to its alternatives. What force can there be to the claim that intrinsic features of the actual world privilege its existence if a nearly infinite number of alternative possible worlds also "exist"?

Unrelatedly, the significance of Hawking's assertions is additionally muddled by his avowal of "model-dependent realism." When he asserts, for instance, "there is no model-independent test of reality [and] it follows that a well-constructed model creates a reality of its own," it becomes less than clear even what makes a "final theory of nature" worthy of the designation. It also reminds us that a role yet remains for philosophy to urge clarity on the part of scientists. I would be so bold as to suggest that Hawking's own lack of precision in such matters belies his assertion that "philosophy (i.e., metaphysics, philosophy of science) is dead."