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Predictive Metaphysics: A Quantum Consciousness Model of the Physical Universe

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Abstract

This paper demonstrates that ontology and the study of consciousness, long thought by physicists to be unapproachable metaphysical subjects, can indeed be studied as physics, leading to testable predictions about the physical universe. The paper presents a model of the physical universe that is based on a nonphysical independent reality: consciousness. The model is unique in that it not only provides a precise model of consciousness, but also connects consciousness with the rest of reality. The universe is shown to be a natural consequence of consciousness, beginning with a "big bang." Consciousness is identified with existence, and the relation between existence and the self is explored using concepts of quantum mechanics.

Where did the universe come from? Why does it seem so regular, so intelligently designed? Is there an independent reality or a God that is responsible for the regularities observable in the universe? If there is such an independent reality, what is its nature, and how did it create the universe? What is consciousness, and what is its role in the universe? Is there free will? These questions have puzzled philosophers, theologians, and scientists throughout history. This paper and a companion paper[1] present, respectively, the metaphysics and physics of a model of the universe that gives answers to these and many more of nature's puzzles. The model is based on a nonphysical independent reality: consciousness. This reality can be described precisely and the universe can be shown to be a natural consequence of it, beginning with a "big bang." As a result, metaphysical concepts long thought by physicists to be inaccessible to them become part of physics, continuing the historical trend of physics expanding its envelope, gradually taking over areas that were previously the exclusive territory of religion and philosophy.

Many scientists, including some physicists, having reached the limits of current theories without pinning down an ultimate physical reality, have speculated that the universe may turn out to be a colossal consciousness. Having said that, however, they forget about it, since until now, no one has known how to deal with such a notion. Scientific attempts to

deal with consciousness are almost all based on the premise that it is simply a pattern of electrical activity in the brain. This explanation satisfies no one, since our experience of consciousness seems to be so much more. As it turns out, this is only part of the story. The model presented here is unique in that it not only connects consciousness with the rest of reality, but also provides a precise model of consciousness. The model reveals that ultimate reality is a universal consciousness, and a separate physics paper[1] shows how the universe arises from this reality.

In this paper I sketch out the basic ideas. The ideas you will encounter in the first part are new and will seem strange. Remember that consciousness has never before been described precisely, so some new ground must be broken if we are going to be able to describe how the universe we see arises from consciousness. The full story of how this happens requires physics, of course, and you will find that not in this paper, but in my physics paper.[1] In this paper we will deal with metaphysics as if it were physics, using the concepts and methods of physics, especially quantum mechanics. At the end of this paper, the main conclusions are summarized in the form of answers to questions with which philosophers like to struggle.

The Nonphysical Universe

In the quantum consciousness model of the universe, we postulate that only concepts are real, all real entities are concepts, and the universe is the set of all concepts. A concept is a quantum of consciousness or thought. In the quantum consciousness model described here, the universe is a thought process. It is composed of nothing but thoughts, or concepts. Some scientists have tentatively and reluctantly suggested that theory and experiments are pointing to this conclusion. We will show it to be a viable conclusion.

Keep in mind that what is described here is a *model* of the universe. In building a model, I am free to assume or postulate anything I want to, without proof, as long as it is not obviously false. The proof of a model lies in testing its predictions. A model should make testable predictions. If any of a model's predictions turn out to be false, the model and its assumptions are falsified, since the universe clearly does not work as the model says it does. On the other hand, if all of a model's predictions turn out to be correct, then it may be a useful model, at least until one of its predictions proves false. The universe may actually work as the model says it does, and there is some basis for concluding that the assumptions of the model may actually be true, even though they were stated without proof and may not be obvious. Most of the predictions of the quantum consciousness model are physical and will be found in my physics paper,[1] where the *concepts* we will speak of here are identified with quantum entities called *spacetime points*. These points are treated as *quantum states* that are described by *intrinsic quantum numbers*, including position, time, and spin.

Definition of a Concept

What is a concept? We need a precise definition, and we choose one expressed in set-theoretic terms. *A concept is the characteristic function of a set of concepts*. A function

has three elements: (1) a domain, (2) a range, and (3) a relation, mapping, or rule of correspondence between the domain and the range. The domain of all concepts is yhe same: it is the entire universe, the set of all concepts. The range of all concepts is also the same. It is a two-valued set: a concept takes the value *true* when applied to any concept in a certain set and it takes the value *false* otherwise. The set on which a concept is true I will call its *generating set* or *generator*. In symbols, if A is a concept and S_A is its generator,

$A = X\{S_A\}$,

Where X{S}is the characteristic function of the set S. If B is an element of S_A,

A(B) = T, where T stands for the value true.

The generator of a concept may or may not contain the concept itself.

Existence

The characteristic function of the entire universe is the concept existence, that is,

E = X{U} and

E(A) = T

for all concepts A in the universe U. But E is a concept, and so we must have

E(E) = T.

This is not surprising considering the self-referential, recursive definition of a concept that we have adopted, but it is an important result nevertheless. The concept existence is a member of its own generating set. Moreover, it can exist even if no other concepts exist. If everything else were to disappear, E could be its own generating set. It is well-defined without any other concept. *It generates itself.*

Notice that we couldn't say this about just any concept that is true of itself. Only existence is well-defined without reference to any other concept. Only existence is self-generating.

So we have two facts about existence. It is an abstract concept that is true of everything that exists, and it is a self-generating concept independent of any other. Moreover, because it is self-generating, *existence exists necessarily*. Essentially, the model simply asserts that existence exists in itself and the universe we see is just one of many ways of experiencing it.

The existence of existence flows from the definitions given above. This does not constitute a proof that existence exists in itself, but since this is only a model, logical

proofs aren't necessary. We can suggest some thought experiments to demonstrate the plausibility of this conclusion, and we can show that it leads to a physical model of the universe that can be verified experimentally.

First, the thought experiments:

1. Try to define existence without using the concept of existence. It cannot be done. Existence can only be defined in terms of itself. It is absolutely fundamental and necessary.

2. Try to imagine a state where nothing exists. Such a state is impossible, even contradictory, since the concept existence is necessary to apprehend it. Therefore, existence exists necessarily, even if nothing else exists.

Again, these are not proofs, but thought experiments that make plausible the fundamental assumption that the concept existence exists necessarily.

We can say with certainty that nothing can be logically or temporally prior to existence. If anything exists, existence exists. Temporally, therefore, it is either the first thing that existed in the universe, or it is simply a property of the first thing. As we've seen, we don't need another first thing. Existence by itself will do because it is self-generating.

The definition of a concept that we offered above is recursive or self-referential. As others have shown, self-reference leads to logical paradoxes, circular arguments, and tangled hierarchies in which entities at different levels can be logically prior to each other. Usually, when physicists encounter such things, they conclude that they have gone wrong somewhere and their theories are flawed. The quantum consciousness model (or as I prefer to call it, the *concept model*) does not see such things as problems, but simply as the nature of reality. An inherently paradoxical reality is, unfortunately, not easy to comprehend. Perhaps this is why centuries of effort by philosophers and scientists have failed to produce a satisfying explanation for our existence.

The idea of a concept existing necessarily is quite foreign to our way of viewing the universe. To most people, “Existence exists” is an unintelligible statement. To begin with, there is confusion between the verb “to exist” and the noun “existence.” The verb means to be in a state in which the concept existence is true. The noun can mean either this state, or the concept itself. When I say that existence exists, I mean that the concept itself is in this state. It should be clear from the context which meaning applies. Also counterintuitive is the idea of any concept existing in itself. It is like saying that red can exist independently of any object or mind. But existence is different from concepts like red. The next section will relate this more closely to our experience.

Nature of the Self

There is one and only one thing in the universe that we know exists without question. For each of us, it is "I"—our *self*. But what is "I"? It is not the sum of all our parts, which is

simply a collection of atoms whose independent existence cannot be proved. It is, rather, a concept. It is the characteristic function of all of our parts, all of our actions, and all of our thoughts.

Clearly, a concept is not physical, and yet here is one that exists. It not only exists, it is *conscious* (at least I am, although I can't be sure about you). One can argue that the abstract concept "I" and the "I" that is conscious and aware of its existence are two different things, but some remarkably useful ideas result if they are assumed to be one and the same.

For one thing, the self is a concept that is true of itself, like existence:

I(I) = T.

A concept of my self is part of my definition, part of what I am. Humans are creatures that have selves of which they are aware. Humans are self-aware; they are *conscious*.

From here, we can leap to the conjecture that *concepts that are true of themselves are conscious beings*. Therefore, existence, being true of itself, is a conscious being. It may look to us like a mere idea, concept, or property, but it is more than that. It is a being, and it is conscious, just as I am a conscious being, and presumably, so are you.

Returning to the human self, note that the self is not the same as what I will call the ego. The ego is the program running on our computer-brain. It is what talks to us and analyzes our actions. The self is the dot of consciousness at the center of our being. We tend to identify our selves with our egos, but this is only part of the story. Most scientists who study consciousness also make this identification, thereby making consciousness simply an epiphenomenon of brain function. It is that, but it is more than that, because the ego and the self are different. The self is conscious; while the ego is only a pattern of electrical activity in a computer—the brain—that is just a collection of inanimate molecules. The ego cannot be conscious. The self may or may not have free will, but the ego definitely cannot. Along with the ego, the brain forms a concept, I, that is true of itself. This concept is conscious. Thus, consciousness arises from brain function, yes. Evolution has endowed our complex brains with the ability to generate a concept that is true of itself, but as soon as a human brain does this, it hosts within it a conscious idea. It is impossible to separate the self and the ego as long as the brain is alive. Yet consciousness seems to us to be more than physical, and it is. We have within us a conscious *idea*—the self. However, unlike existence, the self doesn’t create itself because it depends for its definition on many other concepts.

The word "conscious" is sometimes used as a synonym for "awake." In this sense it can be applied to animals as well as humans. In this paper, consciousness means the internal experience that seems to be uniquely human. It does not mean simply awake.

Is Nothing Unstable?

It has become generally accepted that the universe began with a big bang, a sudden explosion of an infinitely dense particle. We shall see that at least the big bang part is correct. However, this leaves some sticky questions unanswered. What was there before the big bang? How can something be infinitely dense?

In the concept model, a state of nothingness is unstable, as many physicists have suspected. But the minimal required entity is not some primal particle, as they all think. It is a thought—a single concept: existence. Existence and nothing are two states of a doublet. They are really the same concept and one is meaningless without the other. The concept existence exists necessarily.

It is natural to ask, "But who is thinking this thought? A concept needs a mind to contain it." True. But existence appears to be the essence of mind. It is a thought that is capable of thinking itself, and that is enough. That is the minimum that must exist: a single concept—existence—capable of thinking itself. And, because a concept that thinks itself is a consciousness, we can conclude that existence = consciousness = mind. Consciousness *is* existence. These two words are just names that we give to different aspects of one and the same concept.

We can see more clearly that a concept that is true of itself is a consciousness by looking at our own selves. My self is that dot of consciousness at the center of my being. It is the concept that sums up all of the molecules of my body, all of my thoughts and actions, all of my history. My self and the concept existence have one characteristic in common—they are true of themselves. As we have seen, E(E) = T, necessarily. Also, I(I) = T. This characteristic appears to be necessary and sufficient for consciousness.

We are now in a position to derive the universe.

Generation of the Universe

Let us analyze the concept existence, which we denote E. The necessity of E's existence means that the value of E when applied to itself is true, or T, that is, E(E) = T. (Notice that as a bonus, this equation gives us a definition of truth. Truth is the existence of existence, or truth is the value of existence applied to itself.) Since E(E) = T, E is its own generating set. Yes, the generating set of E also includes everything in the universe, but at this point we have no universe, only E, and as we will see, these two views of E correspond to different *reference frames*.

Let us call Q the relation between the domain and the range of E. So now we have E, T, and Q. But what are these? Why, concepts, of course. The single concept existence is really three concepts in one. And given a set of three concepts, what about the subsets of this set? There are $2^3 - 1 = 7$ nonempty subsets, and each clearly defines another concept.

A set of seven concepts has $2^7 - 1 = 127$ nonempty subsets, and a set of 127 concepts has $2^{127} - 1$, and so on. The number of concepts rapidly becomes astronomical. In other words, starting with the single concept E, one automatically gets an expanding set of concepts. We can look at each of the stages of this expansion as an alternate domain of existence, so existence is seen as a foliation of many, many logical levels, all of which exist at once and all of which contain different numbers of concepts..

We have defined the universe as the set of all concepts. We could just as well define it as *the set of all sets*. Readers familiar with the theory of sets may recall Cantor's paradox. The question, "What is the cardinality of the set of all sets?" or "How many sets are there?" leads to the conclusion, which Cantor proved impossible, that this set has as many elements as subsets. Like many of the paradoxes of self-reference, this paradox can be resolved by the introduction of time. In the concept model, this results in the creation of our universe. One might say therefore that the existence of our universe depends on a paradox. The set of all sets is the universe, and it is a foliation of many logical levels, each of which has a different cardinality. Thus it appears to have many cardinalities at once.

All of these logical levels are simply parts of the logical structure of the concept existence. The progression from one logical level to the next is purely logical; it has nothing to do with time. However, with a change of reference frames, the universe becomes a process in a state of continual expansion, as we will show next. Can this be the *big bang* at the beginning of the universe? Indeed it can.

Before going on, I should emphasize that I am not creating a formal system in which all concepts can be derived from the concept existence by the repeated expansion from a set of N concepts to a set of $2^N - 1$. Sets that span more than one logical level also give rise to new concepts, and relations among the concepts of the expansion are also concepts. Thus, there are many other ways to define a concept in terms of sets of concepts. I will not try to give an exhaustive list. Our objective is to show that our universe can be created out of concepts and nothing else, and the $2^N - 1$ expansion will be more than sufficient.

Orderings of Spacetime

Now let us examine this universe as a mathematical space. Does it have any structure?

First of all, there is a natural ordering that looks like time. The progression from N concepts to $2^N - 1$ can be considered to define a period of time. But how much time? How long a period? That is not defined. We can look at the universe as being entirely contained in the concept existence all at once and at time as a meaningless construct. Or we can look at the universe as expanding in time, which is the way we see it as human beings. These are two different reference frames.

This time ordering is only a partial ordering. The characteristic function of a particular set of concepts is clearly later in time than the concepts in its generator, but less can be said about its time relationship to concepts not in its generator. The relationship "later" is

meaningful, however--for any concept, there is some set that consists of all the concepts that it can be shown to be later than. However, it cannot be assumed that the $2^N - 1$ concepts that arise from a universe of N concepts must arise simultaneously. This is not required.

To make some sense out of this rather disorderly universe, we can use quantum mechanics. Concepts can be thought of as quantum entities or *quantum states*. In quantum mechanics, a state is completely defined by its *quantum numbers*. In the concept universe, time is a quantum number. When I say that one concept is later in time than another, I mean that the time quantum number of the earlier concept is smaller than that of the later concept. These time quantum numbers are *intrinsic to the concepts*. There is *no* external clock ticking away by which time is measured. There is no actual lapse of time between the appearances of any two concepts. All concepts exist at once, but they have different time quantum numbers. It is these intrinsic quantum numbers that we perceive. Although we perceive them to be changing continuously, so that there is a continuous flow of time, this is only an illusion resulting from the very small differences between successive time quantum numbers. Between any two concepts with different time quantum numbers, there doesn't have to be any concept at all with an intermediate time quantum number.

As it extends in time, the universe expands. This expansion is spacelike, and in my physics paper,[1] I call the concepts that make up the universe *spacetime points*. The positions of these concepts are, like time, intrinsic quantum numbers. Thus the apparently continuous space that we seem to live in is, like time, an illusion.

As a mathematical space, the universe is partially ordered, but the ordering is very weak. There is no natural ordering, no natural geometry. A complete ordering would have to specify the relative positions of all points, both in space and in time, at all steps of the expansion. All of these unspecified parameters are degrees of freedom of the universe. Every possible complete ordering of the concepts, or points, in the universe defines a different universe, with a different history and perhaps different physical laws. Since many of the parameters involved are continuous variables, there are an infinite number of possible universes. Many would not support life forms like us, but the number of those that would is probably still infinite. Do all of these universes exist? Some physicists would answer this in the affirmative. My answer is that only one is observed to be real, although others can exist virtually, that is, for too short a time to be observed. These unobserved universes are only possibilities or potentialities, but they are very important quantum mechanically.

The Wave Function of the Universe

Let us look at the concept existence from the two different reference frames I've mentioned. If we look at existence as a single concept, it consists of three concepts: E, T, and Q. Q, you'll remember, is the relation between E and its domain. Now if we look at existence as expanding, then the domain of E, which consists of all of the concepts in the universe, is expanding with time. The relation between E and its expanding domain we

now define as the *wave function of the universe*. The wave function of the universe contains all of the information necessary to order the universe. The wave function of a quantum system that is a superposition of states defines the probability for each of the possible states to be observed. Each possible ordering of the universe of concepts represents a different state of the universe—in effect, a different universe—and until it is observed, the universe is a superposition of these states. The wave function of the universe defines the probability, or more correctly the probability amplitude (a complex number), for observing each one.

Because there is a frame of reference in which existence or consciousness is timeless, its observation of itself takes no time. However, this does not mean that there is no logical structure involved. In the following discussion, I will speak in temporal terms to make the ideas easier to follow. I will use terms like "when," "until," "before, "after," and the like. These terms should be taken in their logical sense rather than their temporal sense. I am not describing a sequence of events, but rather the *logical* structure of the concept existence.

Wave functions are a familiar feature of quantum mechanics. Quantum mechanics tells us that if something is possible, it will have some probability of being observed.[2] Existence is the observer here. What it sees when it looks at itself is what exists, and this can be anything that isn't impossible. *Thus existence is an omnipotent creative force.* This, in fact, is why the universe is quantum mechanical. Anything that can exist, no matter how complex, may exist because existence is the creator of the universe. Let's look at this more closely.

In an earlier section, I made the assertion that, "existence exists." Now, to say that existence exists may seem like nonsensical new-age drivel, but it isn't. Here's why. Existence is a concept, a thought, but it exists because it is capable of thinking itself. It is the essence of mind. The mind that thinks the thought existence is existence itself. To say that existence thinks itself means that it is self-aware; it is a conscious being. In fact, it is consciousness itself. To say that it is self-aware means that it observes itself. What it sees in the act of self-observation is what exists—everything of which the concept existence is true. Necessarily, that includes everything that is possible given the existence of existence. It is impossible that something not exist if it is possible given the existence of existence. Only things that are logically impossible or impossible for some other reason don't exist.

But what if in some context many results are possible but they are mutually exclusive, so that only one can occur? Enter quantum mechanics. Existence observes only one. But in the original context each possibility will have some probability of being the one that is observed, and it is the wave function that summarizes these probabilities. We can say that the observed fact that the universe is governed by quantum mechanics is evidence for the existence of existence, since that is exactly what we would expect to find in a universe that is created by existence observing itself. What we think of as simply an abstract concept and not something really real is actually an omnipotent creative force and the creator of the universe.

This being the case, all possible universes may be observed. The wave function of the universe assigns to each possible universe a probability of being observed. Observation of a universe by existence is equivalent to creation of that universe. One universe, chosen randomly out of the infinite number of possible universes, can exist. Until that choice is made, all universes have only a *potential* existence. After the choice, one universe is real and the rest remain only unrealized potentialities or virtual universes. Virtual universes can be thought of as existing for so short a time that they are never observed. This is allowed by the uncertainty principle of quantum physics, which also allows such things as virtual particles in the vacuum of spacetime. Such particles are never observed, but they affect wave functions and the probability amplitudes for things to happen.

One of the puzzles of modern cosmology is that the parameters of the universe must be extraordinarily finely tuned to support life. A small difference in any one of the important ones would mean that we wouldn't be here. Yet there is no obvious reason why they should be so finely tuned. The remarkable thing is that the wave function of the universe is dominated by universes like ours, so that it is overwhelmingly likely that when existence observes itself, thereby picking a random universe out of the infinite population of possible universes, that universe will look like the one in which we find ourselves.

Collapse of the Wave Function

The choice of which universe existence observes, and therefore creates, reduces the number of possible universes from infinity to just one. In quantum mechanics, this reduction is known as *the collapse of the wave function*. Outside of time, it happens just once, but inside of time, inside our universe, a wave function collapses every time an observation is made of a quantum system, and we see a process made up of many, many choices. These choices look random to us, since they are not determined or predictable by any physical laws. If free will exists in our universe, it must be in these random wave function collapses. But, as we have seen, from one point of view, all of these choices are really only one choice. Existence simply exists and observes itself. It does not change, so any question of choice is meaningless. This makes the existence of free will a moot point. Free will is really a meaningless idea.

On the other hand, is the choice of which universe to create simply random or might existence freely choose which universe to create? It is impossible to tell the difference, so once again, quantum mechanics says that there is some probability for it to be either way. The temporal equivalent of a free choice made by existence could include free choices by ourselves. Thus, we might have free will after all. Science will never be able to settle this question, since no experiment can distinguish between free will and random choice. We are free to believe either that we have free will or that we don't.

The classic paradoxical example of a wave function collapse is Schrödinger's cat. If a cat is placed in a box with a radioactive substance and a mechanism that releases a poison if the substance radiates a particle, and if the probability is one half that the substance will radiate a particle in one hour, then in an hour is the cat alive or dead? Quantum mechanics says that until an observer looks inside the box, the cat is half alive and half

dead. The wave function of this system is a linear superposition of the two possible states, alive and dead, each having probability one half. When someone looks, the wave function collapses onto one state or the other, depending on the cat's health. This discontinuity of the wave function is distasteful to many physicists because it is different from most physical processes, which don't have discontinuities, and because there is no physical mechanism that can account for such a discontinuity. Therefore, say these physicists, the wave function does not collapse. Instead, they say, what quantum mechanics is saying is that when someone looks in the box, the universe splits into two nearly identical universes, both continuous, and the cat is alive in one universe and dead in the other. Which cat you observe depends on which branch of the universe you happen to be in. This interpretation of wave function collapse is called the “many-worlds” interpretation of quantum mechanics.[3] It was originally formulated rigorously by Hugh Everett III and is thought by many physicists to be the only interpretation that makes sense. In the concept model, all possible universes exist potentially or virtually, but only one is ever observed.

The many worlds interpretation is actually useful in that it does explain why more complex universes, that is, universes with more collapsing wave functions, come to dominate the wave function of the universe. The most complex universes are those that contain a maximum number of conscious beings.

A language that physicists have developed to explain the apparent contradiction of a macroscopic object in a mixed quantum state, like Schrödinger's cat, is called *consistent histories*.[4] With this approach, all quantum states are histories, and there are rules for deciding whether a history is meaningful. Thus, the cat is never both alive and dead at the same time. Instead, at the end of the hour it will be observed to have followed one of two histories, each having probability one half before the observation. It is considered meaningless to speak of its state between observations. Our universe and ourselves are histories.

Choosing Our Universe

Observation of itself by existence has two requirements. First, there must be a population of all of the universes that potentially exist, and second, one universe must be chosen at random from this population. The chosen universe is the one we live in. Let's examine the structure of this population. Each universe has some set of parameters that define its physical properties. This set of parameters can be represented as a point in a multidimensional parameter space. Saying that the parameters of the universe must be finely tuned to support life is the same as saying that only a very tiny region of parameter space represents the parameters of universes that support life. Thus, it at first appears that the probability that a single universe selected at random from this population supports conscious beings is nearly zero. However, there are billions of conscious beings in a universe like ours, and each one will greatly expand the number of wave function collapses in the history of the universe. If the universe splits into some number of similar universes every time the tiniest wave function collapses, each conscious being will greatly expand the number of universes that support conscious beings. In other words,

each point in the tiny portion of parameter space in which our universe falls represents not just one but an infinite number of similar universes. Thus, the population of potential universes rapidly becomes dominated by universes that support conscious beings, that is, universes like ours. Therefore, a random choice from this population has a very high probability of looking like our universe.

The domination of the wave function of the universe by universes like ours is an example of *parametric resonance*. Outside a small region of parameter space a choice of a point in parameter space represents one universe, or just a few, but within the "magic" region, each point represents an infinite number of universes. This very narrow resonance in the wave function of the universe concentrates most of the probability in a small region of parameter space, so that when existence observes itself, it is overwhelmingly likely that what it sees is a universe like ours. The narrowness of the resonance makes the parameters of our universe appear extraordinarily finely tuned.

We can say more about the uniqueness of our universe. Since there is no end to the generation of new potential universes, eventually the population of potential universes is overwhelmingly dominated by universes that support a maximum number of conscious beings. Still more potential universes will be generated, but these universes can have no more conscious beings (we've said we're at the maximum already), and can only differ in their potential complexity or diversity. As the population of potential universes grows still further, eventually even more diversity becomes impossible. After that, only universes that are maximally fecund and maximally diverse are generated, and the probability is essentially one, or 100%, that a single universe chosen from the population of potential universes will be both maximally fecund and maximally diverse and complex. Hence we can say that our universe is both maximally fecund and maximally complex, and there is virtually zero probability that it could have been otherwise.

The atemporal navigation by existence of the population of potential selves and universes can also be looked at as self-organization. One would then say that a characteristic of existence is that it self-organizes.

Once again, what I have described here is the *logical* structure of the concept existence, not a temporal sequence of events. Existence is atemporal. Time is created along with the temporal universe when existence observes itself.

Existence and the Self

The conscious observer obviously plays an important role in the concept model. By making apparently random choices that collapse the wave function (but really only one self-observation), consciousness—existence—creates the universe. We have seen that there are at least two kinds of conscious concepts: existence and our selves. What is the relationship between existence and the self?

We have established that what we experience as existence is a conscious being. It is the ultimate, necessary, although nonphysical, reality. As my physics paper[1] shows, from

this comes spacetime and physical reality in the form of particles and forces. We know that from these, life forms evolved, including us. In our brains, through processes now being discovered by science, self-aware concepts arise, so that consciousness exists within spacetime in the form of our selves. *Our selves are existence observing itself within time, that is, from the reference frame in which time exists.*

In my physics paper, I show that the particles of which we are made are not hard little balls, but processes. As the universe steps through its logical expansion, at each step a new image of every point is created. Quantum fluctuations occur, so that each point has a different position at each step and therefore seems to vibrate. The amount of this energy is quantized. There is a ground state, or state of lowest energy, and there can be higher energy states. These higher energy states are particles. Thus, a particle is a process that depends on time. Without time there are no particles. Without time, we could not exist, since we are made of particles. Thus, our brains are made of time, and because they are capable of supporting a conscious concept, it is possible for existence to observe itself within time.

Because we are made of time, our selves define paths through spacetime, or *histories*, and can only be observed as such, that is, within time. The particles, atoms, and molecules of which our bodies and brains are made are also histories. *Histories are concepts* within the domain of existence, which is the same as its generator, which is the set of concepts of which existence is true. Histories are not derivable by the expansion from N concepts to 2^N - 1 that we spoke of earlier, but we noted then that there were many other ways to define concepts. The generator of the self, which is the set of concepts of which the self is true, is a set of interacting histories that forms a time-based system capable of supporting a self-generating concept, that is, a concept that is true of itself and therefore conscious. The generator of the self includes the self, just as the generator of existence includes existence. The generator of the self is part of the generator of existence, but the converse is not true. Thus, the self is a mode of existence that is restricted in time and space. It is not existence itself.

This might be a good time to stop and clarify another point of confusion about concepts, and that is, how many kinds of concepts are there? Classifying them according to the mind that thinks them, there are two kinds. One kind I will call *elementary* concepts. These are part of the logical structure of the self-generating, necessarily existing concept existence. They are the only things that really exist. Everything else is made out of them, including the second kind of concepts, which are *mental* concepts—those that are generated in the human brain. The brain is made of *particles*, which are *processes* that occur within the logical structure of existence—that is, within the set of elementary concepts—when viewed from a temporal reference frame. Unlike the elementary concepts, the concepts the brain generates don't exist without the brain.

About Time

Time that flows, that is, time that behaves as we perceive it to behave, is a problem for some physicists. Julian Barbour[5] notes that the Wheeler-DeWitt equation, an attempt to

write down the wave function of the universe, *is independent of time*. This shouldn't surprise us, because we know that there is a reference frame in which the universe is atemporal. However, Barbour goes so far as to conclude that time that flows is merely an illusion. Brian Greene[6] points out that Einstein's theory of special relativity *requires* that *all of spacetime*, that is, all of space and all of time, be *present at once*. Since special relativity is well-verified by experiment, Greene, too, concludes that the time we perceive, the time that flows, is merely an illusion. He actually states flatly that there is no justification in the laws of physics for a time that flows. This is a little like the meteorologist stating flatly that it cannot possibly rain, when a look out the window would show that it is already raining quite cheerfully. If the laws of physics cannot accommodate a time that flows, there must be something wrong with them, because the flow of time is also well-verified by experiment, most notably our experience. Both Barbour and Greene imagine time sliced up into "nows" or instants. They imagine that each instant is like a photograph that shows everything that exists at that instant, including the position of every particle and the feelings and memories of every person. Then they imagine mixing up all of these instants randomly, and they point out that at each instant, our memories would still tell us that we had experienced the entire series of instants in correct time order. Moreover, you could put the mixed-up instants back in order just by looking at them. This is supposed to show that the order of time instants and therefore the flow of time are irrelevant. The flaw in this argument is that if you slice spacetime into instants, you will not see particles and persons, but only a spacetime that, except for random fluctuations, looks the same from instant to instant. Since particles are processes, they must be observed over a period of time to be recognized as particles. Thus, slices of spacetime that contain particles and memories cannot be infinitesimally thin, but must be more like slices of bread, spanning some finite period of time. In other words, particles, brains, and memories do not exist without the flow of time. *We are made of time, and that is why we can only experience time as something that flows.*

What is the resolution of this seeming conflict between the "laws of physics" and our experience? We have seen that the universe has a logical structure that seems to say that it has many cardinalities at once. Looked at in another way, the universe seems to expand, with the logical progression from lesser to greater cardinalities playing the role of time. However, there is actually no time between these logical levels. *Time, like spatial position, is an intrinsic quantum number of a spacetime point.* Two points can have different time quantum numbers without there being any point with an intermediate time quantum number. In other words, there is actually no time, just as there is no space. What we perceive is the position and time *quantum numbers* of spacetime points, and since our existence depends on their differences, we see time flowing.

Thus, time either flows or doesn’t flow, depending on how you look at it. The "laws of physics" see it one way, and we see it another way. It is all right to have it both ways. We simply have here an example of *Bohr's principle of complementarity*, the same physics principle that makes wave-particle duality acceptable. From one frame of reference the universe is timeless, and Barbour and Greene are right. Time is an illusion, just as space is an illusion. From another reference frame, the universe expands in time. Our universe is made of time, so the flow of time is real to us.

Atemporal Existence and the Temporal Universe

How can existence be atemporal, eternal, and unchanging and still be the source of the temporal, changing universe in which we find ourselves, a universe that exists in time, has a beginning and an end, and seems to be a one-shot deal? I have said that temporal and atemporal are complementary ways, in the sense of Bohr, for existence to observe itself. Both ways are legitimate, but they are incompatible, just as light can be a particle and a wave at the same time, but we can only see it one way or the other.

What is time? In some fundamental sense, time is change. Change requires time. Something must be a certain way *before* it can change and be different. Conversely, time requires change. If absolutely nothing changes, there can be no perception of time. Such a nonperception is absolutely impossible for us even to imagine, because we are made of time. Not to perceive time, for us, is not to exist.

So time requires change and change requires time. Moreover, all observations require change and therefore time. Because time does not exist for atemporal, unchanging existence, I think we can conclude that when it observes itself atemporally, existence sees itself for zero time, that is, not at all. Of course, in a quantum mechanical universe, such absolute statements have to be qualified. The uncertainty principle says that the concept of "zero time" is meaningless. Instead we have to say, "too short a time to be observed." Something that exists for too short a time to be observed is said to have a *virtual* existence. Thus, the pure state of existence, that is, the atemporal, unchanging aspect, does exist, but in our temporal view, it exists only virtually.

In a quantum mechanical universe like ours, virtual existence is not nilpotent. We know that spacetime is full of virtual particles that must be accounted for in calculations. Failure to do so results in wrong answers. Likewise, we can't say that atemporal existence really doesn't exist, because without this pure state of existence, our temporal universe wouldn't exist, either. However, just as we can't observe virtual particles even though we know they're there, we can't observe the atemporal aspect of existence.

The atemporal, unchanging aspect of existence is what people usually call *God*. Therefore, God exists, but is a virtual being and unobservable to us. Yet were this aspect of existence not there, we would not exist, and were it not a conscious being, we would not be conscious beings, either. So God really creates the universe with us in it.

We have to be careful not to mix up the two aspects of existence by mixing the two aspects of time. Remember, only one aspect can be observed at a time, and we humans can never see the atemporal aspect. For example, we can't ask, "If God exists for too short a time to be observed, at what instant in the history of our universe does God exist?" Questions about God, the atemporal aspect of existence, cannot refer to our time. The temporal aspect of existence is our selves. We are existence observing itself in time, but we are not pure existence, we are not God. To us, existence seems to exist all the time, but the existence we see is temporal existence, not God. It is probably true to say

that there is no God in this temporal universe, but there is a God, without question. It's just that we can't observe virtual beings or virtual particles.

An interesting question is whether God can observe God. I think the answer, surprisingly, may be "No." Since atemporal existence is a virtual being, it seems likely that existence can *only* observe itself temporally. So perhaps even God would say, wrongly, "There is no God."

About Consciousness

There are many people in this universe besides me, and they are all conscious. How can consciousness—existence—exist in many places? The answer is that existence is a concept, an idea, so it cannot be subdivided logically, spatially, or temporally. Wherever consciousness exists, existence exists. Our brains are capable of supporting a concept that is true of itself—the self. This concept is a mode of existence. Existence can exist anywhere a conscious concept can exist, with no limit on the number of such places. One such place is outside of time, another is my brain, another is your brain, and so on. Bohr's principle of complementarity applies here. Our selves are all existence, but our brains have different, incompatible views of it. The view from outside of time is another incompatible view, and as such it is impossible for us to know what it is like, just as it would be impossible for a wave to know what it is like to be a particle. None of these views is more correct or any closer to the real existence than any other. They are all the real existence. It is important to realize that, as a pure concept, existence (that is, consciousness) *has no memory*. Memory is a physical thing, and all memory is associated with physical objects, such as our brains. Existence is me, existence is you, existence was Caesar and Cleopatra, but outside of time, existence remembers none of this, and inside of time, when existence is me, it doesn't remember ever having been you, or Caesar, or Cleopatra. Thus, we think we are different people, but we are only different bodies, brains, and memories. We are all modes of the same person, the same consciousness.

When I die, consciousness continues to exist outside of time. However, it doesn't remember ever having been me, so it doesn't know it has survived my death, that it has survived millions of deaths, or indeed, that anything has happened at all. Inside of time, when I die, I cease to exist. Consciousness still exists in the brains of people who survive me, but it no longer identifies with me. Death is the end of our individual personalities. When I die, Dick Dolan ceases to exist. I do not see any way in which my memories or my personality can survive death.

Our personalities are embodied in the ego. The ego is a computer program running on the brain. It thinks it has free will, but it is really the universal consciousness manifest in us that makes choices by collapsing wave functions on the quantum level. These choices look random to us, and we have been speaking of them as if they were random, but we could just as easily think of them as free choices of existence or consciousness, since the exercise of free will would look random to anyone else. Ultimately, as we have seen, all of these choices come down to just one choice or self-observation by existence, and we cannot know whether it is a free choice or a random one.

Summary: The Universe Is a Consciousness

I'll close this paper with a summary of its main conclusions in the form of answers to questions that have always puzzled philosophers. The physics of this model of reality is developed and related to current theoretical and experimental results in [1]. In that paper, concepts are called *spacetime points*.

1. What is ultimate reality? The ultimate reality and the source of the universe is the abstract concept we call existence. We often think that abstract concepts only exist in our minds. However, existence is unlike other abstract concepts in that it is capable of thinking itself. It is the essence of mind. Because it thinks itself, it creates itself and it exists necessarily, that is, existence always exists. Even to think about a state in which nothing exists we must use the concept existence. Existence and nothingness are just two ways of looking at the same concept. In mathematical terms, existence is true of itself, that is, it takes on the value true when applied to itself. The only other concept like it is one that each of us is familiar with: our *self*. My self is the dot of consciousness at the center of my being. It is an abstract concept that is the essence of what I am, and it is true of itself, because what I am includes a conscious self. Here, then, is a concept that is true of itself and it is conscious. In the concept model, we conclude that concepts that are true of themselves are conscious, so existence is also conscious. In the concept model, existence has a logical structure that allows it to be looked at in two ways, that is, it has two aspects. In its transcendent aspect, it is atemporal, unchanging, timeless. In its immanent aspect, it has multiple facets, most notably our selves. When we say that existence thinks itself, is true of itself, or creates itself, we mean that it is a self-referential concept. In logic, such concepts are known to result in logical paradoxes, and indeed, that is the nature of reality.

2. Is there a God? Yes. God is the name we give to the transcendent, atemporal, unchanging aspect of existence. Existence is an abstract concept, but it is a conscious being. In fact, existence and consciousness are the same concept. The transcendent aspect of existence (one of the two ways to look at existence) is outside of time and creates time and the temporal universe. We are existence observing itself inside of time. The former is God. We are not God. We do not create the universe. But God and our selves are different ways of looking at existence or consciousness. These two ways are related like particles and waves, which are two ways of looking at, say, electrons. They are views of the same thing, but they are incompatible. In physics, Bohr's principle of complementarity recognizes that this is the nature of reality. How you look at electrons determines whether you see particles or waves, and you can't have it both ways at the same time. God and our selves are like that.

3. Do we have free will? It is impossible to say either yes or no to this question. Our universe results from a single observation of itself by existence. This observation is outside of time and chooses one universe and its entire history from a population of potential universes. Is this choice random or an exercise of free will by existence (God)? The two possibilities are indistinguishable, so it is impossible to decide which is correct. Thus, it is impossible to say whether existence has free will. In our temporal universe, we

observe a multitude of quantum events in which a single alternative is selected from two or more possible outcomes, a phenomenon called *collapse of the wave function* in quantum mechanics. This takes place all the time everywhere, even at the lowest level of our brains, where it offers the only possibility for us to have free will, since everything at the higher levels of our brains is deterministic, if often chaotic. Jeffrey Satinover, in his book, *The Quantum Brain*,[7] presents evidence that the brain does amplify this quantum indeterminism at its lowest level up to the level of experience, making it possible that we might have free will. However, are the quantum choices occurring in our brains made by our selves, or are they simply the random, quantum-mechanical collapsing of wave functions? Again, these are indistinguishable. So we are free to think that we have free will or not. Science doesn't seem to be able to give us the answer.

4. What is the origin of evil? The universe obeys the quantum mechanical principle that unless something is impossible, there is a nonzero probability that it will be observed, that is, that it will exist. This results in a universe that exhibits a high degree of diversity, not only in species, but in ideas, ways of thinking, temperaments, personalities, races, social groupings, nations, and so on. This allows the universe to approach some optimal state through *natural selection*. Species, ideas, and so on often oppose each other and compete with each other, the strongest winning out. Diversity is good because it prevents stagnation. However, if you are on the losing end of some encounter, you are likely to see the winner as evil. Thus, the source of evil is diversity, which is good. So unless we want everyone to think and act in rigidly controlled ways, a condition that many see as evil, we are stuck with diversity and we are stuck with evil.

5. Can everything be explained logically? Because reality (existence) is self-referential, logic is severely limited. There are almost always different ways to look at questions, so that two people can argue a point with perfect logic and come to different conclusions. Self-reference always leads to logical paradoxes.

6. What are the theological and philosophical implications of the concept model? In the concept model, paradoxes are inherent in reality because reality is self-referential. What philosophers may call paradoxes, logicians may call contradictions, theologians may call mysteries, and physicists may call dualities. The concept model says that it is impossible to resolve all of these ambiguities. In particular, science cannot resolve them. Science may gradually shrink their sphere of influence, but it can never get rid of them. Humans are extremely uncomfortable with paradoxes. While the concept model says that there is a God, it reveals virtually nothing about God. Humans want to know how to relate to God, but the concept model can't even say whether there is free will. The search for answers to our questions about our relations with God, other people, and nature is the work of theologians and philosophers. Although theology and philosophy can't resolve all of the mysteries any better than science can, they are there to guide us. Ultimately, each of us makes personal decisions in these matters.

7. What is consciousness? Consciousness is another name for existence. Existence is an abstract concept that is true of itself. This condition is necessary and sufficient for a concept to be a conscious being, a thought thinking itself. The only such concepts are

existence and our selves, which are existence observing itself in time. Our selves are formed in our brains when we become conscious. They result from brain function, but unlike other concepts that our brains can form, these concepts are themselves conscious. This is why we feel that there is more to consciousness than just brain function.

8. Is consciousness prior to existence or vice versa? In the concept model, these two concepts are identical. They are the same concept with different names. Neither is prior to the other.

9. What happens to us when we die? The answer to this question is one of the paradoxes that come from the self-referential nature of reality. What happens depends on whether your frame of reference is temporal or atemporal, and the answers are incompatible. If you look at death from the temporal frame of reference, which is our frame of reference, everything about us that is temporal ceases to exist when we die. This includes our memories and our personalities. Our physical bodies go to sleep and never wake up. On the other hand, consciousness, which is a nonphysical human characteristic, always exists. Existence always exists, atemporal and unchanging. Thus, from the atemporal reference frame, absolutely nothing happens when we die. Existence simply exists.

10. What happened before the big bang? What happens after the universe ends? These are meaningless questions because existence has an atemporal, unchanging aspect. Seen from this unchanging reference frame, there is always a big bang. Every instant of time always exists. There is always an end of the universe. It is as if there were an infinite number of universes identical to ours but displaced in time. In this picture, there are an infinite number of Dick Dolans, all infused with conscious selves. But because consciousness has no memory, each of these selves thinks that this is the first and only time that our universe has unfolded. Thus, something that is timeless and unchanging looks to us like a changing, one-shot universe with a beginning and an end. Here we have yet another paradox that has its roots in the self-referential nature of reality. By the way, the lack of memory is what makes it possible for consciousness to exist in all living humans at the same time while seeing itself as separate and unique in each case. There is only one consciousness and it is in all of us, but its temporal memory and knowledge are different in each of us. Its view of itself in time is absolutely limited in each of us by our individual brains.

11. What is time? In the concept model the concept existence has a logical nature by which new concepts can be defined in terms of others. The total number of concepts gets larger as you advance through this logical structure. There are two ways to look at this progression. Either all possible concepts exist at once, or the number of concepts expands in stages that resemble time steps. The universe obeys the quantum mechanical rule that says that both of these possibilities are likely to be observed. We are existence observing itself temporally, so we see the universe expanding in time.

12. Many physicists say you can’t apply quantum mechanics to the entire universe because 1) there’s no observer, and 2) the universe is not a repeated experiment, so

the laws of probability don't apply. Is this true? No. Existence is the observer, and one can speak of the probability that existence observes a particular universe out of the population of possible virtual universes described in the paper. These represent different results of a repeated "experiment."

13. How does existence create the physical, temporal universe? The physics of the creation of the universe by existence is the subject of my physics paper.[1] The concepts of the concept model become spacetime points in my *inflaton spacetime model*. The logical expansion in the number of concepts, seen as an expansion in time, is the big bang. The particles of which we are made are processes involving spacetime points. Thus, we are made of time and this is why we can experience time. Our universe results from a single self observation by existence that chooses one universe from an infinite population of potential universes. By a process of splitting described by Hugh Everett's "many-worlds" interpretation of quantum mechanics, which takes place outside of time, the population of potential universes is dominated by universes that support living beings with conscious selves. This process is described earlier in this paper.

14. What are some predictions of the inflaton spacetime model? In a sense, one could say that the model "predicts" all the phenomenology of the standard models of particle physics and cosmology, since everything is there in the model. A specific prediction just confirmed is the mass of the Higgs boson. The Higgs field is not a particle field, but it does fluctuate around its vacuum expectation value, and these fluctuations are seen as Higgs bosons. The model's prediction is that the Higgs mass will be around 120 GeV, actually a little higher because this value is based on an approximation that lowers the result. The LHC experiments have recently confirmed that the Higgs boson mass is approximately 125 GeV. I'm happy with this agreement within 4%.

A prediction of the model still to be confirmed (or not) is the composition of the dark matter around galaxies. In the inflaton spacetime model, dark matter is a remnant of inflation. The conversion of inflaton energy to particles at the end of inflation is not 100% efficient, and the remaining energy is dark matter.

There are other phenomena in the model that can be considered predictions because I didn't put them into the model, but instead discovered them there. Two good examples concern neutrinos. In the model's discrete spacetime, neutrinos behave very peculiarly. They oscillate between a velocity slightly above the speed of light and one slightly below it. When traveling faster than the speed of light they are righthanded and have imaginary mass. When traveling slower than c, they are lefthanded and have real mass. I was trying to think of a way to fix this peculiarity when I realized that in the tachyonic phase, a neutrino could not be turned into an electron by an SU(2) rotation. Therefore, lefthanded electrons would have neutrino partners but righthanded electrons would not. As far as anybody could tell, there would be no righthanded neutrinos. That is just what is observed! So the model predicted that nature is chiral without anyone's even looking for it! Later, when neutrino oscillations were confirmed experimentally, I went looking for a way to incorporate them into the model. To my surprise, I found that the requirements for neutrino oscillations—neutrino mass differences and different mass and flavor

eigenstates—were already there in the model. I think it is a mark of a good model when it tells you things you weren't even looking for.

The model allows you to calculate the mass of the electron very simply, something that even the standard model doesn't do. That's a prediction that's already confirmed. In principle, you can also calculate the value of the cosmological constant, but I haven't done it because it seems to require a supercomputer and a programming wizard, both of which are beyond me. However, a rough estimate can be obtained rather easily, and I have done that.

There are other interesting predictions about the structure of hadrons and the second- and third-generation leptons. Electrons are resonances of points. Hadrons are resonances of superpositions of points. Points are, after all, quantum states, so a superposition of several of them is another point, quantum mechanically. Thus, hadrons are point particles! Muons and tau particles are superpositions, too, and therefore composite particles. These predictions need to be confirmed, and I confess I'm not sure how to do that.

In short, the model makes lots of predictions and there's lots of work for the future.

Historical Note

The ideas in the first half of this paper date from 1964. There have been many revisions over the years. The first Internet version appeared in August 1999.

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