A Pure-Consciousness Model of the Universe

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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.

Whether there exists some reality, independent of man, that is responsible for the regularities observable in the universe, and if there is such an independent reality, what is its nature, are questions that have occupied philosophers, theologians, and scientists throughout history. In particular, whether such a reality can be found in the physical universe has seemed more and more to require a negative answer, as relativity, quantum theory, and the violation of Bell's inequalities, all verified by experiment, have made it difficult to defend any concept of an independent physical reality.

This paper and a companion paper present, respectively, the metaphysics and physics of a model of the universe based on a nonphysical independent reality. This reality can be described mathematically and the universe can be shown to be a natural consequence of it. Nonlocality, relativity, and uncertainty are inherent in this universe. And it begins with a "big bang."

The model presented in this paper is based on quantum mechanics, but it is not a new interpretation of quantum mechanics in the sense of the Copenhagen interpretation. What is presented here is a model of ultimate reality. In it, one can see the origins of the various interpretations of quantum mechanics.

Many 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 no one knows how to deal with such a concept. 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 turns out to be only part of the story. Amit Goswami, in his book *The Self-Aware Universe*,[1] shows that consciousness must be the basic stuff of the universe and that recognizing this fact makes it possible to explain nonlocality and other puzzles of quantum physics. While in my view his theory is basically correct, his approach is philosophical rather than mathematical or physical.

The model presented here is unique in that it not only connects consciousness with the rest of reality, but also provides a mathematical model of consciousness. The model reveals that ultimate reality is a universal consciousness, and my physics paper shows how the universe arises from this reality. Physically, the principal difference between the model presented here and mainstream physics is that spacetime is discrete rather than continuous, and plays an essential role in physical processes instead of just being the background for those processes.

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 mathematically, 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 real physics, of course, and you will find that not in this paper, but in my companion paper. For

the main conclusions of this paper, in the form of answers to questions that philosophers like to struggle with, go to Dick's PhAQs II.

The Nonphysical Universe

In his book, *In Search of Reality*,[2] Bernard d'Espagnat comes to the conclusion that "All knowable entities are thus mere properties, but properties of what?" Presumably, "what" means some entity that is not a property.

In the pure-consciousness model of the universe, we stop trying to answer this question and accept its premise as true. Thus, everything is a property, and the universe is the set of all properties.

What is a property? Well, first of all, we have other names for it. We can speak of the property red, the attribute red, the predicate red, or the concept red. In quantum mechanics we sometimes speak of propositions, or yes-no experiments. Is that red? Yes or no? I prefer the word *concept*, because it focuses attention on our perceptions of things. A concept is a quantum of thought. In the following pages, I will use the name concept, rather than property, attribute, predicate, or proposition. So now *the universe is the set of all concepts*.

Another way of saying this is that the universe is a thought process. It is composed of nothing but thoughts, or concepts. Some physicists have tentatively and reluctantly suggested that theory and experiments are pointing to this conclusion. We will show it to be a viable conclusion.

Definition of a Concept

We can give a mathematical definition of a concept: *a concept is the characteristic function of a set of concepts*. That is, a concept is defined as a function whose domain is a set of concepts that may or may not include the concept in question, and whose range is two-valued: the function takes the value true when applied to any concept in its domain and the value false otherwise. A

function actually has three elements: (1) a domain, (2) a range, and (3) a relation, mapping, or rule of correspondence between the domain and the range. In symbols, if A is a concept and S_A is its domain,

$A = X\{S_A\}$,

and if B is an element of S_A,

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

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.

Now this is a remarkable result. The concept existence is a member of its own domain. Thus it can exist even if no other concepts exist. If everything else were to disappear, E could be its own domain. Thus it is well-defined without any other concept.

So we have two ways to look at 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*.

This is the fundamental assertion of the model--that existence exists in itself and the universe we see is just one of many ways of experiencing it. Although it cannot be proved directly that existence exists in itself, we can suggest some

thought experiments to demonstrate the plausibility of this assumption, and we will show that this assumption leads to a model of the universe that may be susceptible to experimental verification.

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.

Self-generating in the case of existence also means that it is 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 pure-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.

The idea of a concept existing necessarily is quite foreign to our way of viewing the universe. 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 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; the ego is only self-aware. The self may or may not have free will, but the ego definitely cannot. The ego becomes self-aware by forming a concept of self--I--that is true of itself. This concept is conscious and thereafter creates itself. Thus, consciousness arises from brain function, yes. Evolution has endowed our complex brains with the ability to become self-aware, but when a human brain becomes self-aware, it hosts within it a conscious idea--the self. It is impossible to separate the self and the ego as long as the brain is alive. We are conscious if and only if our brain and ego are self-aware. Yet consciousness seems to us to be more than physical, and it is. We have within us a conscious *idea*--the self.

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.

To summarize, a concept that thinks itself is a consciousness. We can see this 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 domain. Yes, the domain 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*.

As noted above, a function has three elements: a domain, a range, and a relation between them. In the case of existence, let us denote these 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 ones, 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--a very rapidly expanding set.

Alternatively, instead of an expanding set of concepts, which brings in the notion of time a little prematurely, we can look at each of the stages of the expansion we have just described as an alternate domain of existence, so existence is seen as a foliation of many, many logical levels, all of which exist at once.

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?" leads to the conclusion, which Cantor proved impossible, that this set has as many elements as subsets. The resolution of this paradox is found in the concept model. 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 all cardinalities at once. Alternatively, from a different reference frame, it is 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 be.

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 $2^N - 1$. Relations among the concepts of this 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 this simple definition will give us more than enough concepts.

Orderings of Spacetime

Now let us examine this simple 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 an instant of time. But how much

time? How long an instant? 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 domain, but less can be said about its time relationship to concepts not in its domain. The relationship "later" is transitive, however, so for any concept, there is some transitive closure 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.

As it extends in time, the universe expands. This expansion is spacelike, and in my physics paper, I call the concepts that make up the universe *spacetime points*. However, there is no natural ordering, no natural geometry. Thus, as a mathematical space, the universe is partially ordered, but the ordering is very weak. 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. However, most of these possible universes are only possibilities or potentialities.

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 T. 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, 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. Wave functions are concepts and as such, the concept model considers them to have real 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. Therefore, all possible universes may be observed. The wave function of the universe assigns to each possible universe a probability of being observed. Existence is the observer here. What it sees when it looks at itself is what exists, so 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, some may be virtual, and the rest remain only unrealized potentialities. Virtual universes can actually exist, but 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.

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. Why this is so can be explained by a kind of *natural selection* process conceived by Lee Smolin. Smolin bases his theory on two postulates. The first can be generalized as the assertion that any universe spawns at least one and possibly many new universes, the number of new universes being equal to the number of replication mechanisms in the original universe (or equal to one if there are no such mechanisms). The number of such mechanisms is a function of the parameters of the universe. Smolin's second postulate says that these parameters change randomly by very small amounts from the spawning universe to the new universes that spring from it. Given these two postulates, natural selection leads to a population of universes that is dominated by universes with maximal numbers of the replication mechanism. I will not give the details of the natural selection process here. Interested readers can find the details in Smolin's book.[3]

In Smolin's theory, the replication mechanism is a black hole. This is consistent with the belief of many physicists that black holes lead to other universes. In the concept model and its physical counterpart the QST model, which is explained in my physics paper, there are no singularities and black holes do not connect to other universes. *In the concept model, the replication mechanism is our selves*. Each time a potential someone dies, that potential self becomes a pure consciousness indistinguishable from existence, and expands to form a new potential universe. We'll explore this in more detail later, but for now the important thing is that in either case, the wave function of the universe is dominated by potential universes that are supportive of life forms like ours, so it

is overwhelmingly likely that any universe that exists will look like ours. In the case of our selves, the reason is obvious. In the case of black holes, Smolin shows that the parameters that support life are the same as the parameters that result in a maximum number of stars, and ultimately in a maximum number of black holes. 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. Smolin's idea of a natural selection process provides the answer.

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. 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 life is nearly zero. However, there are millions of selves in a universe like ours, and each one will eventually add another potential universe to the population. According to Smolin's second postulate, each of these new potential universes will have parameters very close to ours, and so it will support potential conscious beings having selves, which will give birth to new potential universes, and so on and on. 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. As Smolin shows, 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, beginning with the big bang. Time is created along with our universe and is an essential part of 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 (in the concept model, in contrast to Smolin's model, these universes spawn no additional universes). However, 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.

To ensure mathematical rigor, one more assumption is necessary for this model. We need to assume that when the squared magnitude of the wave function of the universe is integrated over the whole parameter space, the result is a finite number. This requires, for example, that if a parameter can vary between plus and minus infinity, the wave function goes to zero at these extremes such that the integral of its squared magnitude over this range is finite. Otherwise, we could not speak of the probability of observing a particular kind of universe.

A useful concept is that of a network or *tree* of potential selves and universes. The root of the tree is in the pure concept existence in the "magic" region of parameter space that represents universes that support life. A universe with such parameters contains many conscious beings with selves. At death, each self creates a potential universe that has parameters not too different from its parent universe and so contains many selves, which create universes, and so on. The

infinite branched network consisting of all such universes and selves is the tree I speak of.

There is a difference between the selves and universes that exist potentially, which contribute to the form of the wave function of the universe, and our real, observed universe and the selves within it, which result from the choice of one universe from the potential population. Until existence observes itself, existence has a potential beginning in time whenever any potential self becomes self-aware, and it potentially becomes free to expand and create a universe any time a self dies (and also at the root of the infinite tree of selves and universes). There are an infinite number of these points in the tree of selves and universes. The observation of itself by existence involves the selection of one point where a self dies (or the root of the tree). None of these possibilities is more likely than any other. No instant of time is more important than any other. When existence observes itself, it sees the universe created by itself when the chosen self dies. This universe becomes real. The selves in the chosen universe, our universe, are real because our universe is real. They are our selves. However, when we die, the universes potentially created are not created because a universe already exists. Existence has a beginning in time when the chosen self becomes self-aware, but since no universe has yet been created, this self is only virtual. When this self dies, existence expands, creating the universe that we see. The selves in this universe--our selves-- are real, and are existence observing itself within time.

Any of the possible paths through the infinite tree of potential selves and universes is a possible way in which the observation of itself by existence can take place. The wave function of the universe is the sum of the probability amplitudes for all of these potential histories, just as the wave function for a particle interaction is the sum of the amplitudes for all of the ways in which the interaction can occur. Recall that there is a Feynman diagram for each of the ways in which particle interactions can occur, and most of them involve virtual

particles. It is the same here. What happens is that existence observes itself and creates a universe, but the wave function for this process is shaped by the quantum interferences among all of the different ways in which this can happen, which involve potential universes and selves. This is really just another way to look at Lee Smolin's natural selection process, which we talked about earlier. Still another way is to compare the tree of selves and universes to a multiple-slit experiment, like the famous two-slit experiment in which electrons are fired at a target through a plate containing two slits. With one slit open, the electrons hitting the target are bunched behind the slit, but with both slits open the target shows an interference pattern. It is impossible to say which slit any given electron went through. Each electron seems to have gone through both slits. In the case of the universe, each self-death point is like a slit. It is impossible to tell which self will be chosen. The probability amplitudes for all add up to give the wave function of the universe, which is sharply peaked, unlike the featureless one that would result if there were only one potential universe for each choice of parameters.

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, all of these choices are really only one choice. This makes the existence of free will a moot point. Existence simply exists and observes itself. It does not change, so any question of choice is meaningless. Free will is a meaningless idea.

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.

As we have seen, all possible universes potentially exist, but only one is ever observed. 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. As we will see, our own universe and our selves are histories. It is meaningless to think of us or our universe without time.

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. From this comes spacetime, and as my physics paper shows, 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.*

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 are capable of supporting a conscious concept. This makes it 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 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 domain 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 domain of the self includes itself, just as the domain of existence includes existence. The domain of the self is part of the domain 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, at least as long as we are alive.

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 is merely an illusion. 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. Paradoxes like this are typical of self-referential concepts like existence. It is all right to have it both ways. We simply have here an example of Bohr's principle of complementarity, like wave-particle duality. From one frame of reference the universe is timeless. From another, it expands in time, and our universe is made of time. Barbour won't be able to get rid of time altogether. Time is real to us. It is not an illusion. Interestingly, we get a chance every night to experience what it's like to be outside of time. In dreamless sleep, our brains are no longer self-aware, so the self cannot exist in time. But the self creates itself and exists forever, so the self continues to exist when we are asleep, but it exists outside of time. We are never conscious of being asleep, only of being awake at night and then being awake in the morning. There is no time outside of time.

From what we have deduced so far, existence has certain characteristics: (1) It has a beginning in time. It creates itself. (2) It expands with time. It expands forever. (3) In free expansion, it creates a universe. (4) It self-organizes. (5) It can exist in many places and always has these characteristics. The modes of existence that are our selves share these characteristics. They begin when we first become conscious, whenever that is. They become free when we die. Between these events, they are coherent histories, observable only to themselves (ourselves). We live long enough to reproduce so that we spawn other modes of existence. Ultimately, all these modes of existence become free, through death, to create new potential universes. This is how our selves serve as the replication mechanism for new universes that we spoke of earlier. Quantum mechanics requires that the wave function of the universe reflect this possibility, which makes Lee Smolin's natural selection process possible and makes it overwhelmingly likely that the universe will look like the one we see.

At death, the self is stripped of all of its domain except itself. All of the time-based concepts of which it was true are gone, and the self is left a pure, conscious concept outside of time. As such, it is indistinguishable from existence. Since existence already exists and is creating our universe, no change occurs outside of time when we die. No new universe is created when a real self experiences death.

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 the same person, all 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. Some day, when everyone realizes that our selves are all the same consciousness, we will collectively survive death, because everyone's memory will contain the knowledge that their consciousness was Caesar's, and Cleopatra's, and everyone else's. Then consciousness will "remember" that it survives death. Until then, 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 choice 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.

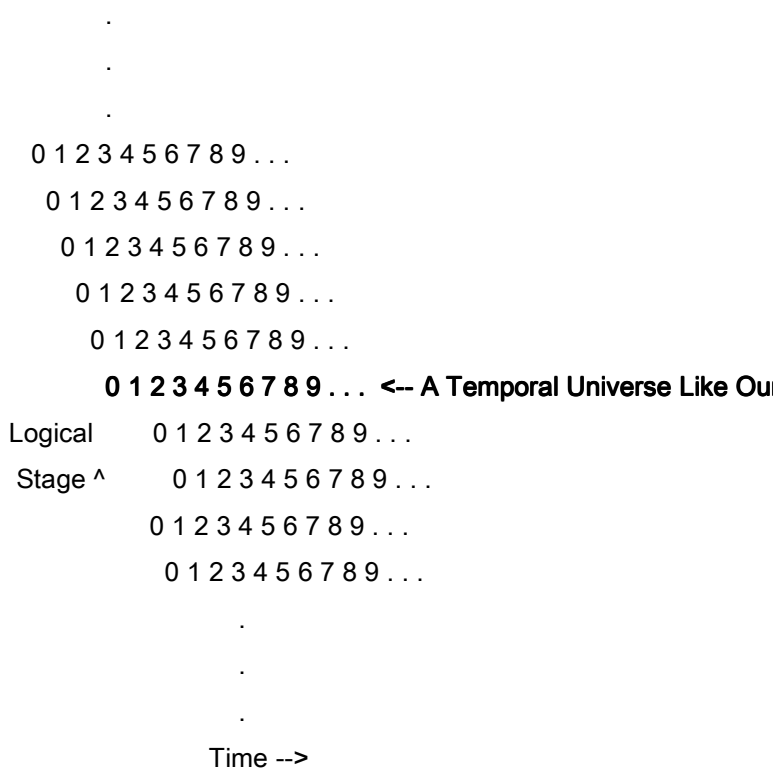
Atemporal Existence and the Temporal Universe

In this section I'm going to attempt to clarify how existence can be atemporal, eternal, and unchanging and still be compatible with 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. From our point of view in this universe, we think it makes sense to ask questions like, "What happened before the big bang?" and "What happens after the universe collapses to a singularity (as my physics paper predicts it will)?" 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. However, this doesn't really answer the questions. In this section I expand the concept model to shed some light on the confusing dichotomy between temporal and atemporal.

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 to even imagine, because we are made of time. Not to perceive time, for us, is not to exist. On the other hand, if there could be time without change, it would be indistinguishable from no time at all. As always, when there are indistinguishable ways for something to happen, quantum mechanics says that both are possible, so it is not meaningless to examine the consequences of having time without change.

The concept existence is atemporal and unchanging. It contains within itself a logical expansion, but all stages of the expansion exist at once. Yet the expansion looks timelike. Earlier in this paper and in my physics paper, it is shown that if the stages of the expansion are observed in a reference frame in which they are separated by some finite time interval, it is possible to create a temporal universe containing conscious beings that, because they are made of time, can experience time as something real.

Now assume that the entire logical expansion of existence is present at every instant of time. In other words, *every logical stage is present at every instant of time*. We have created a two-dimensional array: the time we see increases along the horizontal axis, while the entire expansion of existence, from the big bang to infinity, lies on a vertical line through every point on the horizontal axis. Here is what the array looks like. The numbers are time instants or logical stages.



Now, in the atemporal reference frame, nothing changes as time advances. The pure concept existence experiences only an unchanging, timeless, logical

expansion, but no time or change. Every logical stage is present at every instant of time.

This is only half of the picture. In creating this two-dimensional array, we have also created ghost universes! Every horizontal line through the array defines a temporal universe identical to our own, but displaced in time. These universes are identical to our own because existence creates only one universe by observing itself, as described above in "Wave Function of the Universe." If these ghost universes really exist, there is a big bang (0) at every instant. After I die, a Dick Dolan--not me, but someone indistinguishable from me--still exists in another universe. Thus, before the big bang there were a lot of other big bangs. When the universe ends, there are still many copies of it ticking away. Do all of these universes really exist? There is no way to know, but quantum mechanics says they might, because to any observer, this two-dimensional picture is indistinguishable from our original picture.

In this expanded picture, consciousness observes itself in time not only as my self, your self, and all the other conscious selves in our universe, but in countless other selves in universes identical to ours but displaced in time. A new, identical universe begins at every instant of time. This is possible because existence or consciousness, the pure concept, has no memory. Memory exists only in time. There is no memory outside of time; indeed, there is no time. Thus, consciousness can repeat my lifetime, your lifetime, and the entire universe over and over again and each time it will seem like the first and only time, because the memories involved at each step of the way will be identical, and will not include the fact that consciousness has done this before. In other words, *what is really an eternal, timeless, atemporal process will seem like a one-time thing*.

What this expanded picture shows is that, to atemporal existence, there is *never* a time when the temporal universe does not exist, so it is meaningless to ask what happens before the big bang or after the end of the universe. It's still a paradox, but at least we can pretend to understand it a little more. In any event,

when you have a self-referential reality, it is inevitable that you will have paradoxes.

The Universe Is a Consciousness

In this paper, we have tracked down independent reality. It is the nonphysical, abstract, self-generating, self-referential, necessarily existing, conscious concept existence in all its states. In its transcendent aspect, existence is the closest thing to a God that there is in this model of the universe. The universe is simply this thought thinking itself.

There is an ancient controversy over whether existence or consciousness is primary. In the model presented here, these are indistinguishable concepts. They are identical.

The physics of this model of reality is developed and related to current theoretical and experimental results in my other paper, *A Discrete Quantum Spacetime Model Underlying the Standard Model of Particle Physics*. In that paper, concepts are called *spacetime points*.

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