

Article

Matter, Death & Consciousness

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Abstract

An argument based on recent developments in theoretical physics is made that consciousness itself is the primordial nature of existence, and that all possible physical and mental experiences that can ever become manifest in the world are only forms of consciousness. This conclusion follows from the premise that in its ultimate undifferentiated state, consciousness exists as the nothingness of the void. Modern physics then demonstrates the only way a world can be experienced is if consciousness differentiates itself into an observer that observes all the physical and mental images of that world as projected from a holographic screen to a point of view. In this scenario, the focal point of the observer arises from the void through the differentiation of consciousness while the holographic screen arises through the void's expression of geometric mechanisms such as the expansion of space and non-commutative geometry. This scenario tells us the focal point of consciousness of the observer is the bridge that connects the ultimate being of the void to the becomings of the world. The nature of life in the world can then be understood as about becoming, while the ultimate nature of death can be understood as the final transition from becoming and the differentiation of consciousness to nondifferentiation and ultimate being. This premise also tells us that death is the end of an illusion. The illusion that ultimately comes to an end is not only the illusion of life in the world, but also the illusion of separation.

Keywords: Consciousness, nothingness, void, existence, being, becoming, life, death

1. Introduction and Overview

In a recent New York Times Op-Ed: "Consciousness isn't a Mystery, It's Matter," Galen Strawson (2016) writes: "Conscious experience is itself a form of physical stuff, and the hard problem is not what consciousness is, it's what matter is." He asks: "What is the fundamental stuff of physical reality, the stuff that is structured in the way physics reveals?" He answers: "We don't know – except insofar as this stuff takes the form of conscious experience".

We'd like to point out this argument is a strawman. Once the primordial existence of consciousness is accepted, modern physics has already shown that it's exactly the other way around: physical stuff is a form of consciousness. Ironically, this brings us back to the mystery of

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the primordial existence of consciousness. This line of reasoning is discussed in detail by Amanda Gefter (2014) as she surveys the landscape of modern physics. Based upon the recent observational discovery of dark energy and the theoretical discovery of the holographic principle she concludes that *nothing is ultimately real*.

Gefter defines ultimate reality in terms of what is invariant for all observers. Since modern physics tells us every observer's observations are observer-dependent, nothing can ultimately be real. Everything an observer can possibly observe depends on the observer's frame of reference. Only the primordial nothingness of the void is invariant for all observers and therefore can ultimately be real.

The only thing needed to complete Gefter's argument about the nature of ultimate reality is to identify the primordial nothingness of the void as undifferentiated consciousness, while the perceiving consciousness present for living organisms is differentiated consciousness. This premise tells us the individual perceiving consciousness of the observer is differentiated from the undifferentiated consciousness of the void. This essay gives the scientific reasons why her argument can be extended in this way.

The concept of ultimate reality is at the heart of all discussions of ontology, which is the study of what exists in reality. This directly leads into a discussion of being and becoming. This critical distinction between the concepts of being and becoming has a long philosophical tradition, beginning with the works of Plato. The idea of becoming has to do with the nature of the world, specifically the physical and mental world we experience through the perception of the world. All ideas of space, time, matter and energy have to do with becoming, while being has to do with something that is prior to becoming. As modern physics clearly points out, not to mention the conclusions of many modern philosophers, the only thing that is prior to the creation of the world is the nothingness of the void. In this sense, the void is the ultimate nature of being. Simply put, *being is prior to becoming*.

Relativity theory tells us that even the dynamical space-time geometry of the world has the nature of becoming. The holographic principle tells us that all the physical and mental images of the world are projected from a holographic screen to the point of view of an observer, and that these images of the world are animated through the expenditure of energy that animates the world, not unlike the animation of a movie. Everything in the world, from elementary particles to body and mind, is animated.

The animation of all things in the observer's world requires the expenditure of energy, which relativity theory refers to as an accelerated frame of reference. It is always the observer itself as a focal point of consciousness that enters into an accelerated frame of reference. The holographic principle tells us that if energy is not expended and the observer's frame of reference is not

accelerated, the observer no longer has a holographic screen, and so all images of the observer's world must disappear.

The big question is about what finally exists when the expenditure of energy comes to an end. Correctly interpreted, the holographic principle tells us that without the expenditure of energy only the nothingness of the void can exist, which is therefore the ultimate nature of reality. Only this nothingness is invariant for all observers (Gefer, 2014). Since the flow of time is directly related to the expenditure of energy, this is a timeless or an unchanging reality.

If the void is the ultimate nature of being, while all the animated images of the world projected from a holographic screen to the point of view of an observer are the nature of becoming, then what is the relation of the void to the world? The holographic principle tells us the only possible *bridge* that can connect the void to the world is the focal point of consciousness we call an observer. The perceiving consciousness of the observer must have a source, which can only originate from the void itself. In this sense, the perceiving consciousness of the observer can only be understood as differentiated.

Correctly understood, the holographic principle is telling us that the focal point of consciousness of the observer is differentiated from the all-encompassing empty space of the void whenever a holographic screen arises in that empty space and projects images of the world to the observer. Since the perceiving consciousness of the observer is differentiated, the consciousness of the void can only be understood as undifferentiated. Undifferentiated consciousness is what it means to say the void is the ultimate nature of being. As undifferentiated consciousness, the ultimate nature of being is One Being.

This nondual concept of One Being has a long metaphysical tradition, ranging from *the Tao Te Ching* to the Vedas to Zen Buddhism. It can be found in the works of Plato and the Advaita tradition of Shankara. Most modern philosophers have also come to the conclusion of the *nothingness of being* and that the ultimate nature of being or *ground of being* can only be identified as the nothingness of the void.

This is also what modern physics tells us when correctly interpreted in the context of the holographic principle. The fundamental reason this is the correct interpretation is logical consistency. This is the only possible interpretation that is not fraught with the logical inconsistency of paradoxes of self-reference.

The nature of life in the world has to do with the animation of forms. These animated forms have a tendency to hold together while animated, which modern physics calls the coherent organization of information. The holographic principle tells us that all the bits of information that become organized into forms are encoded on a holographic screen, that forms are animated with

the expenditure of energy that characterizes the world, and that images of forms are projected to the point of view of an observer.

At least superficially, the nature of death has to do with the disorganization of information in forms so that they no longer can hold together and become animated as distinctly perceived entities. At a deeper level, an argument can be made that the nature of death has to do with the transition of consciousness from the differentiated perceiving nature of an observer to its ultimate undifferentiated nature.

The holographic principle is telling us that the focal point of consciousness of the observer is the bridge that connects the ultimate being of the void to the becomings of the world. This also tells us that the nature of life in the world is about becoming, while the ultimate nature of death is about the final transition from becoming and the differentiation of consciousness to nondifferentiation and ultimate being. In this transition, the illusion of life in the world comes to an end. Ultimately, death is not only the end of the illusion of life in the world, but also the end of the illusion of separation.

The other way to say this is that consciousness is the true nature of what we are. The holographic principle tells us that the perceiving consciousness of the observer can only be identified as the focal point of consciousness at the center of its world. As we perceive the becomings of a world, the nature of our individual consciousness and being is differentiated from the void. This differentiation process can only occur as a holographic screen arises from the void and projects all the images of that world to the observer's central point of view. If the holographic screen does not arise, this principle also tells us that the ultimate nature of our consciousness and being is undifferentiated.

Correctly interpreted, the holographic principle tells us that all physical and mental experiences are manifestations of our consciousness. Whenever we have a physical or mental experience, we manifest the experience we perceive either as an external sensory perception, an internal emotional body feeling, a memory, a thought, or some other form of mental imagination. The holographic principle tells us that all these perceptions are analogous to images projected from a holographic screen to the point of view of an observer. The screen defines our physical and mental world and the observer is only a focal point of consciousness. The mystery of our existence is that we exist as a point of consciousness.

The really big mystery is that ultimately we exist as the infinity of undifferentiated consciousness, which is the void. The void expresses its potentiality through the expression of energy, fundamentally as dark energy, which is the expansion of space. The expression of this energy is an expression of desire, specifically, the desire to create and perceive a world. From that expression of desire a physical world arises and all the possible physical and mental

experiences of that world. We might even venture to say the void creates a conceptual world for itself in order to explain itself to itself within that world, and then is able to return to itself after it has gained this conceptual understanding of itself. Such a conceptual understanding of itself is not possible in the ultimate state of existence, only in a conceptual world.

What is the scientific evidence for such bold statements about the nature of reality? Relativity theory tells us the expression of dark energy is the exponential expansion of space that expands relative to the central point of view of an observer. Due to the limitation of the speed of light, a bounding surface of space called a cosmic horizon surrounds the observer at the central point of view and limits the observer's observations of things in space. If the holographic principle is applied to the cosmic horizon, all the bits of information that define everything the observer can possibly observe in this bounded region of space are encoded on the cosmic horizon.

Leonard Susskind (1995, 2008) realized the observer's cosmic horizon acts as a holographic screen that projects the images of things in space to the observer's central point of view. This is just like the projection of images from a computer screen to an observer, except the images appear 3-dimensional since their nature is holographic. Gefter (2014) has stressed that in the sense of quantum theory and a Hilbert space, the observer's holographic screen defines everything the observer can possibly observe in its world. She also realized that a consensual reality shared by many observers becomes possible if their respective holographic screens overlap in the sense of a Venn diagram and share information.

Where does the holographic principle come from? The holographic principle is automatically in effect if non-commutative geometry is applied to a bounding surface of space. Position coordinates on the surface are no longer represented by ordinary continuous numbers, but by non-commuting variables, which is a way of quantizing position coordinates. In effect, each possible quantized position coordinate defined on the surface turns into an area pixel that encodes a bit of information.

Raphael Bousso (2002) has shown the holographic principle is a general property of relativity theory called the covariant entropy bound, which is due to very general focusing theorems. The holographic principle is best understood as a geometric mechanism that allows all the bits of information that define things in a bounded region of space to become encoded on the bounding surface of that space. The bounding surface acts as a holographic screen that projects the images of things observed in that bounded space from the screen to the point of view of the observer. This geometric mechanism naturally arises with the expression of dark energy, the expansion of space, and non-commutative geometry.

How do the laws of physics that appear to govern the behavior of everything in the observer's world fit in with the holographic principle? The strange answer is that all the laws of physics are

derivative of the holographic principle, but they can only arise as thermodynamic averages. Ted Jacobson (1995) has shown that Einstein's field equations for the space-time metric, which determine the space-time geometry of the observer's world, arise from the holographic principle as thermodynamic equations of state, which are only valid as thermal averages. In other words, the law of gravity isn't really a law at all, but is only a thermal average that is a statistical consequence of the holographic principle.

The other laws of physics that govern the interactions of the electromagnetic and nuclear forces can be understood to arise from Einstein's field equations for the space-time metric through the usual unification mechanisms, which include super-symmetry and the Kaluza-Klein mechanism (cf. Bailin & Love, 1987) of extra compactified dimensions of space. All the usual quantum fields of the standard model of particle physics then arise as extra components of the space-time metric through unification mechanisms. The final result is akin to 11-dimensional super-gravity, which is a part of M-theory. Like gravity, the electromagnetic and nuclear interactions arise from the holographic principle as thermal averages. Like the holographic principle, these unification mechanisms can all be understood as geometric mechanisms.

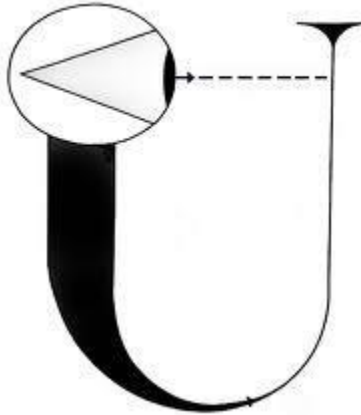
These geometric mechanisms pretty much explain the creation of the observer's world, the nature of all physical and mental stuff in that world, and why that world appears to be governed by the laws of physics. The observer's world is only created because the void has the potential to express these geometric mechanisms. The void expresses its potentiality as it creates a world through geometric mechanisms, such as the expansion of space, and observes that world from the central point of view of that world, as all the physical and mental images of that world are projected from a holographic screen to the point of view of the observer.

2. Modern Physics Tells Us Life in the World Is an Illusion

Reality is merely an illusion, albeit a very persistent one - Albert Einstein

It helps to back up and review in detail how modern physics has brought us to this critical point in the development of science. Modern physics is concerned with the nature of the physical world, which is to say matter and energy apparently existing within some kind of space-time geometry. There is a big puzzle in the connection between consciousness and modern physics in that all the matter and energy in the physical world that apparently exists within some kind of space-time geometry is composed of observable things like fundamental particles, while there is a long metaphysical tradition that equates the nature of being to consciousness itself, which is to say the observer of the observable things.

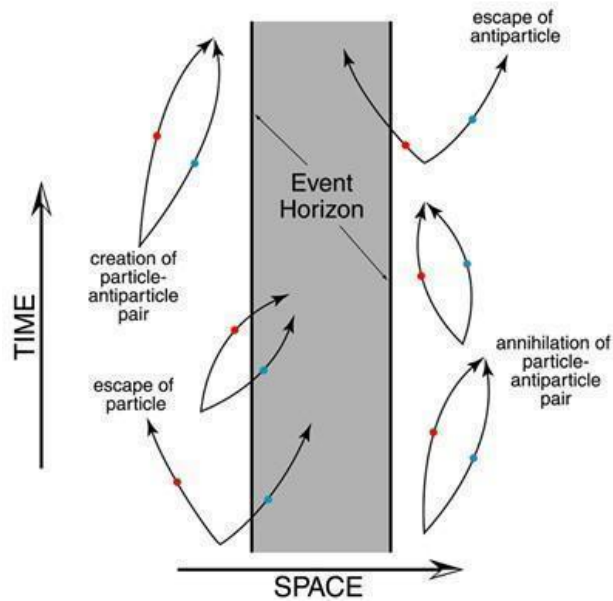
The big conundrum is about whether consciousness itself, as the observer of the observable things, can arise from some complicated configuration of the observable things like a human brain. Is it possible that consciousness arises from the things it observes? The simple answer is no. The problem with this idea is it lacks logical consistency and inevitably leads to paradoxes of self-reference. Almost all serious thinkers that have considered this puzzle have come to the conclusion that this idea is not possible, which begs the question: where does perceiving consciousness come from?



Wheeler's Universal Observer (image from Gefter, 2014)

The scientific answer to this question about the source of perceiving consciousness is really about what is ultimately real. Is the physical world the ultimate nature of reality, or is there an ultimate state of reality that is beyond the physical world? Until recent discoveries in physics, many physicists held the position that the physical world is the ultimate nature of reality, but that position is no longer tenable (Gefter, 2014).

The basic difficulty with this position goes back to the problem of the unification of quantum theory with relativity theory, which is the problem of fundamental particles existing in some kind of space-time geometry. Relativity theory tells us there is no such thing as an absolute space-time geometry, and so with unification there can be no such thing as fundamental particles. Change the space-time geometry as observed from the point of view of an accelerating observer, and the symmetries of that space-time geometry also change. Since all so-called fundamental particles reflect the symmetries of the space-time geometry as representations of a symmetry group, there really is no such thing as fundamental particles.



Hawking Radiation (image from universetoday.com)

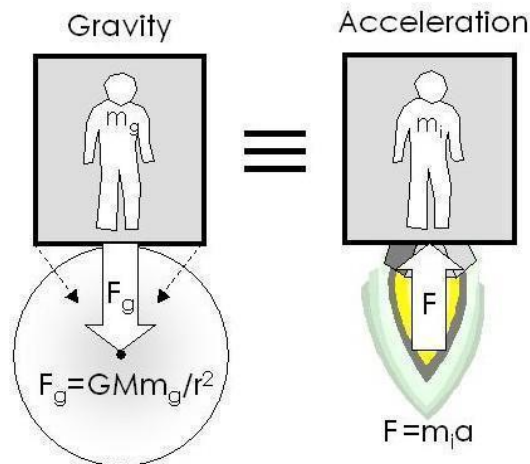
The ultimate example of this dilemma is an event horizon, which always arises from the point of view of an accelerating observer. The observer's horizon fundamentally limits the observer's ability to observe things like particles in space. As Hawking (1996) realized with the discovery of Hawking radiation from the horizon of a black hole, an accelerating observer that accelerates away from the black hole horizon in a rocket ship does not observe the same set of particles that an observer observes while free falling through the black hole horizon. The basic problem is the event horizon of the black hole breaks the symmetry of empty space, and so radically alters what these two observers call fundamental particles. For the freely falling observer, particles of Hawking radiation do not exist.

How can particles of Hawking radiation radiated away from the event horizon of a black hole exist for the accelerating observer but not for the freely falling observer? How can any particles be fundamental if the particles that appear to exist for an observer can change or appear to go in and out of existence based on whether the observer's point of view is accelerated or not? If neither space-time geometry nor particles are really fundamental, what is?

We might guess that only the consciousness of the observer is really fundamental, and that so-called fundamental particles can change based on whether the observer's frame of reference is accelerated. Although this is a good guess, it's not quite the right answer. There must be something more fundamental than the point of view of the observer that explains whether that point of view is accelerated. The basic problem is acceleration implies the expenditure of energy, and that energy has to come from someplace. There must be some kind of a mechanism inherent in the generation of the energy that gives rise to the observer's accelerated frame of reference. If

that energy is not expended or the acceleration mechanism is not put into effect, the observer's frame of reference is freely falling.

At the root of this problem is the underlying foundation of relativity theory. Relativity theory is fundamentally based on the principle of equivalence. The exertion of any force, which requires the expenditure of energy, is equivalent to an observer's accelerated frame of reference. For example, the force of gravity on the surface of a massive planet is equivalent to the acceleration of a rocket ship through empty space. An observer on the surface of the planet observes exactly the same kind of accelerated motion of objects that fall through space as an observer in the accelerating rocket ship, and so there is no possible way to distinguish between these two scenarios based only on the accelerated motion of objects. As an object accelerates through space, it gains kinetic energy. We usually think that gravitational potential energy is converted into kinetic energy as the object accelerates under the force of gravity, but where does the energy come from in the accelerating rocket ship? The answer is the energy comes from the energy expended as the thrusters of the rocket ship force it forward through space.

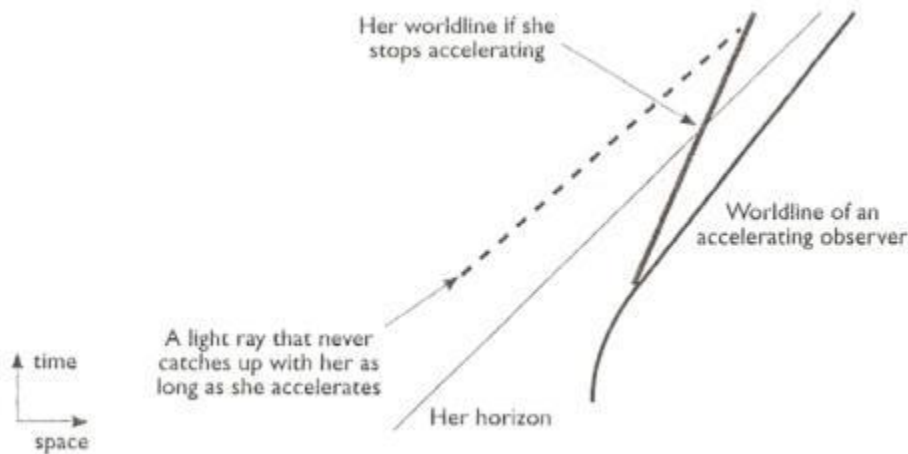


Principle of Equivalence (image from mysearch.org)

This means that before we can discuss an observer's accelerated frame of reference, we have to discuss the expenditure of energy or the mechanism that generates this accelerated motion. The consciousness of the observer cannot really be fundamental because there is the issue of whether or not the observer's point of view is accelerated and energy is expended. The observer is only in an accelerated frame of reference if energy is expended. Where does this energy come from? The strange answer is the energy comes from the same place as the observer's point of view. The irony of this answer is that this most fundamental of all places and all things can only be described as the void or nothingness.

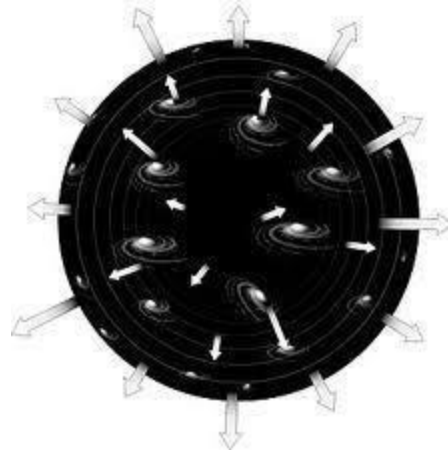
Closely related to the issue of the principle of equivalence is the issue of the generation of an event horizon. Although the horizon of a black hole seems like a special case, it turns out event

horizons arise for all accelerated observers. The observer's horizon always limits the ability of the observer to see things in space. An event horizon always arises for any observer in an accelerated frame of reference. In the most generic case, this is called a Rindler horizon (Smolin, 2001). In line with the idea that the observer's accelerated frame of reference is only an accelerated point of view, we say the observer's horizon arises as the observer follows an accelerated world-line through its space-time geometry.



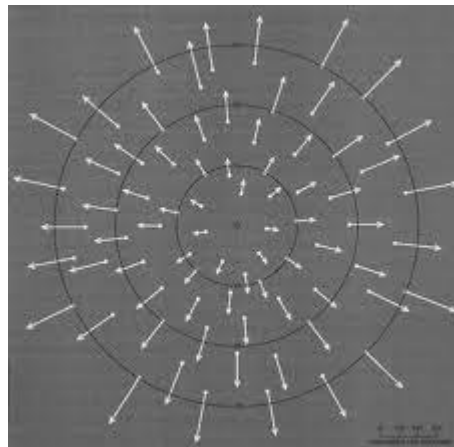
Accelerating Observer's Horizon (image from Smolin, 2001)

This brings us back to the question of where does the energy come from that gives rise to the observer's accelerated frame of reference? Although the answer seems exceedingly strange, it can be summarized with only a few concepts. This answer is at the heart of all theories of the big bang creation event. The energy must come from the same place that the observer comes from, which is the void. The nature of this energy is called dark energy, which is understood in relativity theory as the exponential expansion of space, which always expands relative to the central point of view of an observer. Dark energy is the creative energy that puts the “bang” in the big bang event (Gefter, 2014). If space does not expand and dark energy is not expended, only the void exists, which is like an empty space of potentiality. If space does expand and dark energy is expended, an observer's world is created, and the observer of that world is always present to observe that world at the central point of view of that world.



Exponential Expansion of Space (image from scienceblogs.com)

In relativity theory the force of dark energy is called a cosmological constant Λ , which gives rise to the exponential expansion of space that always expands relative to the central point of view of an observer. With the exponential expansion of space and the expression of dark energy, the farther out in space the observer looks, the faster space appears to expand away from the observer. Due to the limitation that nothing can travel faster than the speed of light, the observer is always surrounded by a cosmic horizon that limits the observer's ability to see things in space. This limitation of the speed of light is really not that mysterious, since it is like the maximal rate of information transfer in a computer network. At the observer's cosmic horizon, space appears to expand away from the observer at the speed of light, and so this is as far out in space as the observer can see things in space.



Accelerated Expansion of Space (image from Susskind, 2008)

How can space appear to expand? The answer is the curvature of space-time geometry as formulated by Einstein's field equations for the space-time metric. The space-time metric is the

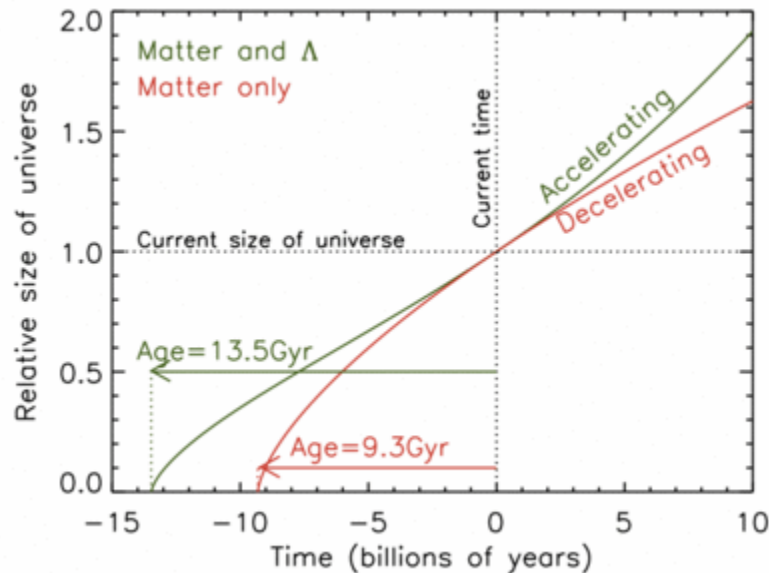
field that measures the curvature of space-time geometry. Einstein's field equations relate a change in the metric in a region of space to changes in the energy content of that region of space.

$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} = 8\pi GT_{\mu\nu} - \Lambda g_{\mu\nu}$$

Einstein's Field Equations for the Space-time Metric

With the attractive force of gravity, space appears to contract. This gravitational contraction of space is like the kind of length contraction and time dilation that occurs with uniform motion in special relativity, but with gravity generalizes to accelerated motion. Relativity theory tells us the gravitational contraction of space always occurs relative to point of view of an observer, like the observations of a distant observer limited by the event horizon of a black hole. At the horizon of a black hole the contraction of space or the attractive force of gravity is so strong that even light cannot escape away from the black hole, cross out of the boundary of the horizon, and reach the point of view of a distant observer.

In a very similar way, the repulsive force of dark energy gives rise to a cosmic horizon that limits the observations of the observer at the central point of view. With the repulsive force of dark energy, space appears to exponentially expand relative to the central point of view of the observer, and due to the limitation of the speed of light, this limits the observer's ability to see things in space. At the observer's cosmic horizon the expansion of space or the repulsive force of dark energy is so strong that even light cannot cross into the boundary of the horizon and reach the central point of view of the observer.



Accelerated Expansion of the Universe (image from scholarpedia.org)

Although a lot of dark energy was used up in the big bang event, astronomical observations indicate there is still a lot of dark energy left in the universe. These are observations of the rate with which distant galaxies accelerate away from us. If the only kind of force operative over galactic distance scales was the force of gravity, the expansion of the universe should be slowing down, since gravity is an attractive force, but that is not what is observed. The expansion of the universe is speeding up, as though all the galaxies were repelling each other. This repulsive force, like a force of anti-gravity, is called the force of dark energy. Its current observed value in terms of the cosmological constant is $\Lambda=10^{-123}$.

If the only recent discovery of modern physics was dark energy, physics would only have another puzzle, but about the same time dark energy was discovered, the holographic principle was discovered ('t Hooft, 1993, Susskind, 1995). The holographic principle is about where all the bits of information that define all the observable things in any bounded region of space are encoded ('t Hooft, 2000).

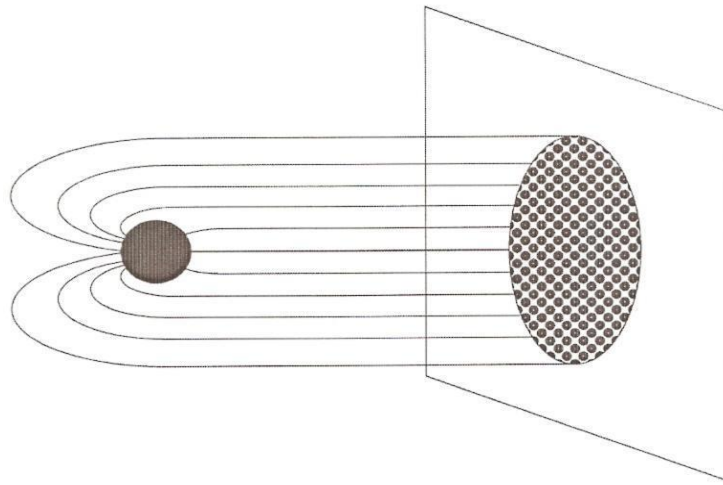
The strange answer is that these bits of information are not encoded in space itself, but on the bounding surface of that space. The bounding surface of space acts as a holographic screen that projects the images of things into space, just like a conventional piece of holographic film projects holographic images into space. The other analogy is a computer screen. Bits of information encoded on the screen project images into space to the point of view of an observer.

This kind of holographic projection from a screen into space is really no different than the kind of animated space-time geometry projected from a computer screen to the point of view of an observer, except the images appear three dimensional since their nature is holographic. Just like the animated frames of a movie, the projected images are animated over a sequence of screen outputs. With each screen output, which corresponds to an instant of time, the images are projected into space. Since the projected images can become distorted as they change in size and shape, the projection of images from a screen to an observer over a sequence of screen outputs can give the appearance of the curving or warping of space-time geometry.

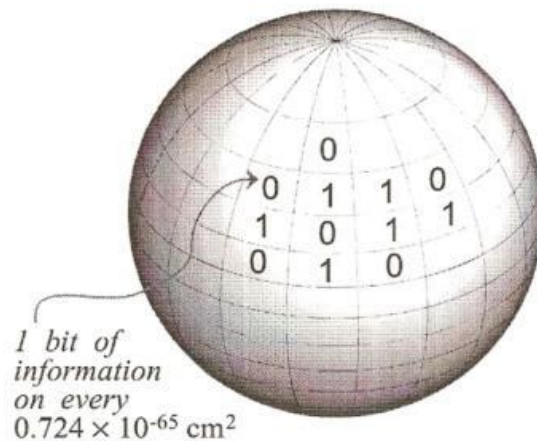
Just like a computer screen, each pixel defined on the screen encodes a bit of information in a binary code of 1's and 0's. In a conventional computer, this encoding of information in a binary code is performed by switches that are either in the on or the off position, but on a holographic screen, the encoding is generically performed by spin variables that are either in the spin up or the spin down position. Since spin variables are mathematically represented by SU(2) matrices, this encoding of information has a purely mathematical representation.

The holographic principle is fundamentally about how the space-time geometry of any bounded region of space is defined, specifically where all the bits of information defining the space-time

geometry of that bounded region of space are encoded. The strange answer is that all the bits of information are not encoded in space itself, but on the bounding surface of that region of space.



Holographic Projection (image from Susskind, 1995)



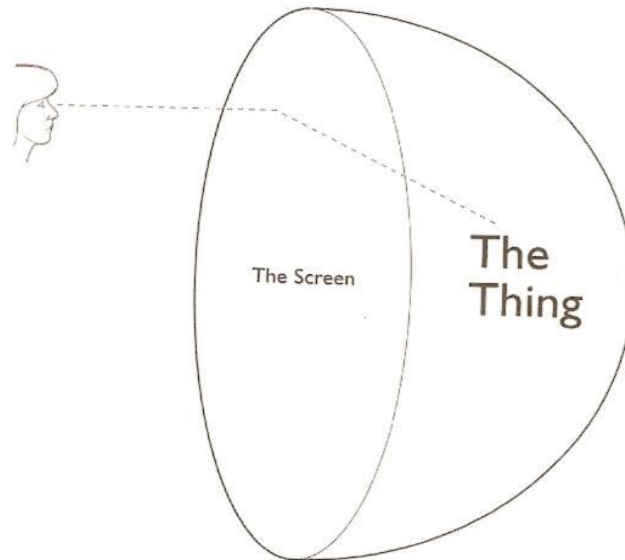
The Holographic Principle (image from 't Hooft, 2000)

Bits of information are encoded in a pixelated way, with each pixel on the screen encoding a single bit of information. The holographic principle tells us the pixel size is about a Planck area $\ell^2 = \hbar G/c^3$, given in terms of Planck's constant, the gravitational constant and the speed of light. For a bounding surface of space of surface area A , the total number of bits of information encoded is given by $n = A/4\ell^2$.

What is a bounding surface of space? The answer is for any region of space, the bounding surface is an event horizon that limits the ability of the observer of that region to see things in that region of space. With the expression of dark energy and the expansion of space, the observer

at the central point of view has limited ability to see things in space due to its cosmic horizon, and so the bounding surface is the observer's cosmic horizon.

This is where things start to get weird. The holographic principle tells us the observer's cosmic horizon acts as a holographic screen that encodes all the bits of information that define everything the observer can possibly observe in that region of space. Every observation of something is like the projection of an image of that thing from the observer's holographic screen to the observer's central point of view.



The Observer, the Screen and the Thing (image from Smolin, 2001)

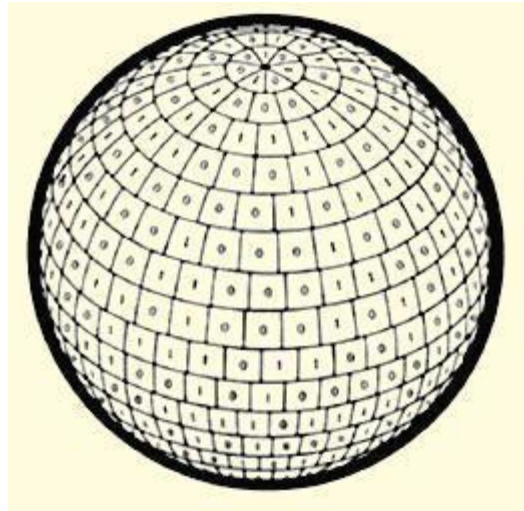
Before delving into all the weird implications of the holographic principle, it is worth an examination of how the holographic principle arises in the first place, and secondly, how the holographic principle gives rise to a world that appears from the point of view of the observer of that world to be composed of matter and energy, all of which appears to reduce down to some kind of fundamental particles existing in some kind of space-time geometry.

The first question is: how does the holographic principle arise in the first place? The answer is it can only arise if there is a bounding surface of space that acts as a holographic screen that projects all the images of things in that bounded region of space to the central point of view of an observer. This is the critical role that dark energy and the exponential expansion of space play, as the expenditure of dark energy gives rise to a cosmic horizon that acts as the observer's holographic screen. All the bits of information encoded on the observer's holographic screen in effect define everything in the observer's world in the sense of a Hilbert space. The observer's cosmic horizon is the bounding surface of space that defines the observer's world as it limits the observer's observations of things in space.

How does the observer's cosmic horizon encode all the bits of information that define everything the observer can possibly observe in its world? The answer has to do with the quantization of space-time geometry. This is what the unification of quantum theory with relativity theory is all about. The most generic way to understand unification is with non-commutative geometry. Although the holographic principle was first discovered in string theory, which has been generalized to M-theory (see Witten, 1995), string theory is a special case of non-commutative geometry. All examples of the holographic principle occur in some kind of non-commutative geometry. Even fractal geometry can be understood as non-commutative. If non-commutative geometry is applied to a bounding surface of space, the holographic principle is automatically in effect. Non-commutative geometry is manifestly holographic. This basically says the space-time geometry of any bounded region of space is a direct consequence of how bits of information are encoded on the bounding surface of that region of space.

How does this happen? The basic problem is that position coordinates on the bounding surface of space can always be parameterized in terms of some (x, y) coordinate system, like latitude and longitude on the surface of a sphere. In a commutative geometry, there are an infinite number of (x, y) position coordinates, since the geometry of the surface is a two dimensional continuum and is infinitely divisible. The quantization of space-time geometry turns this infinitely divisible continuum into a finite number of quantized position coordinates on the surface.

The way non-commutative geometry performs this trick in the most generic case is to require an uncertainty relation between the x and y position coordinates where the product of uncertainty is at least as large as the Planck area. This is analogous to the uncertainty relation between the position, x , and the momentum, p , of a particle in ordinary quantum theory where the product of uncertainty is at least as large as Planck's constant, except in non-commutative geometry the uncertainty relation is between the position coordinates of space itself, not the dynamical variables of particles defined in a space-time geometry. Non-commutative geometry is fundamentally about how space-time geometry is quantized, not how the dynamical variables of particles are quantized. This turns the (x, y) position coordinates defined on the bounding surface into non-commuting variables.



Horizon Information (image from Gefter, 2014)

Whenever non-commutative geometry is applied to a bounding surface of space like a cosmic horizon, there are no longer an infinite number of position coordinates defined on the surface, but rather a finite number of non-commuting variables, which give rise to pixels. In effect, each quantized position coordinate is smeared out into an area element of size $4\ell^2$. The total number of pixels defined on the bounding surface of area A is given as $n=A/4\ell^2$, which corresponds to the number of non-commuting variables that define the non-commutative geometry.

In the most generic case of non-commutative geometry, these n non-commuting variables give rise to n bits of information defined by the n eigenvalues of an $SU(n)$ matrix, and so the n pixels defined on the bounding surface encode n bits of information. Since an $SU(n)$ matrix can always be decomposed into $SU(2)$ matrices, and since $SU(2)$ matrices encode bits of information in a binary code like spin variables that are either spin up or spin down, the $SU(n)$ matrix thus encodes n bits of information in a binary code, which is the nature of horizon entropy.

$$S_{\text{BH}} = \frac{kA}{4\ell_{\text{P}}^2}$$

Horizon Entropy

The second question was about how the holographic principle gives rise to a world that appears from the point of view of the observer of that world to be composed of matter and energy, all of which appears to reduce down to some kind of fundamental particles, and appears to exist in some kind of space-time geometry. Although this sounds like a broken record, the answer is geometric mechanisms.

The first step in solving this puzzle is to understand how bits of information encoded on a bounding surface of space give rise to the appearance of a curved space-time geometry in a

bounded region of space. This is the problem of how the holographic principle explains the nature of gravity, which is understood as the curvature of space-time geometry.

Although there are many ways to approach this problem, the most generic way is the second law of thermodynamics. The second law is a very general statistical relationship that relates how a change in the number of bits of information or entropy that define the configuration state of everything in a region of space are related to the thermal flow of energy or heat through that region of space. This relation is usually written as $\Delta Q = T\Delta S$, where ΔQ is the flow of heat through the region of space, T is the absolute temperature of that region of space, and ΔS is the change in the entropy or number of bits of information that define the configuration state of everything in that region of space.

The flow of heat through that region of space is understood as the random thermal motion of those things through space, while the holographic principle tells us all the bits of information defining everything in that region of space are encoded on the bounding surface of that region of space as $S = kn$, where the total number of bits of information encoded is given in terms of the surface area A of the bounding surface as $n = A/4\ell^2$. The constant k is called Boltzmann's constant, which converts thermal kinetic energy into conventional units of absolute temperature.

Remarkably, this simple statistical relation between the flow of heat through a region of space and the entropy of that region of space implies Einstein's field equations for the space-time metric in that region of space as a thermal average as long as things are near thermal equilibrium, which is called a thermodynamic equation of state. The reason is fairly simple. The holographic principle tells us all the bits of information that define everything in a region of space are defined on the bounding surface of that region of space as $S = kn$. As heat flows through that region of space and the heat content of that region changes as $\Delta Q = T\Delta S$, the second law tells us the entropy of that region must also change as $\Delta S = k\Delta n$.

Since entropy is given in terms of the surface area of the bounding surface, $n = A/4\ell^2$, as heat flows across the bounding surface, the surface area of the bounding surface must change. As the bounding surface of space changes, the geometry of the region of space bounded by the bounding surface also changes. This change in the geometry of the bounded region of space is mathematically specified by Einstein's field equations for the space-time metric, which relates a change in the curvature of the space-time geometry of that bounded region to a change in the energy content of that region of space.

Before the discovery of the holographic principle, the vast majority of theoretical physicists thought Einstein's field equations for the space-time metric were about as fundamental as physics can ever get. Thanks to the holographic principle, we now know that Einstein's field equations are not really fundamental, but only arise as a thermal average in any bounded region of space,

or a thermodynamic equation of state that is only valid near thermal equilibrium. Einstein's field equations arise from the holographic way bits of information are encoded on the bounding surface of that space.

Remarkably, the holographic principle is more fundamental than Einstein's field equations for the space-time metric. Einstein's field equations are derivative of the holographic principle as a statistical or thermal average that is only valid near thermal equilibrium. The force of gravity and the curvature of space-time geometry only arise in a bounded region of space from the holographic way bits of information are encoded on the bounding surface of that region of space.

The holographic principle in turn is only a geometric mechanism that allows bits of information to become encoded on a bounding surface of space whenever a bounding surface like a cosmic horizon arises with the expression of dark energy and the exponential expansion of space.

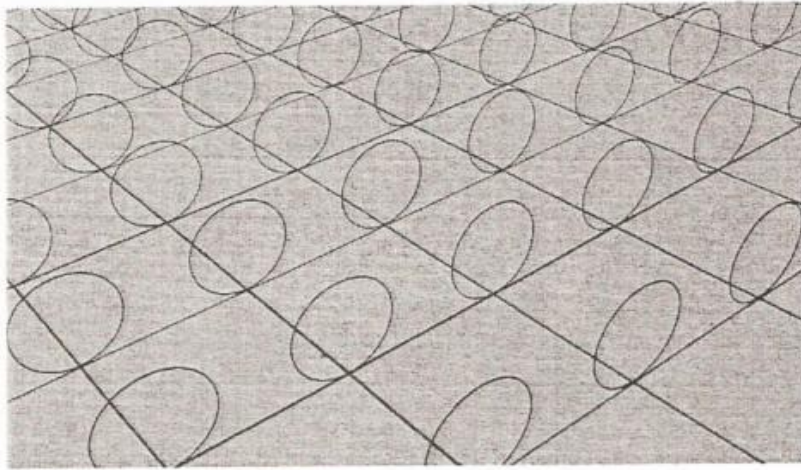
If Einstein's field equations are only derivative of the holographic principle, which in turn is only a geometric mechanism, what is really fundamental? The weird answer is nothing is really fundamental. Only the potentiality of the void to express itself with the expenditure of dark energy and encode bits of information on a bounding surface of space is really fundamental. This is the potentiality of the void to create a world for itself and observe that world from the central point of view of that world.

The second law of thermodynamics in the context of the holographic principle also explains the temperature of an event horizon as observed by a distant observer. This becomes an important issue when we discuss the temperature of a cosmic horizon as observed by the observer at the central point of view, since this horizon temperature sets the stage for the thermal evolution of the observer's world.

The observer will observe thermal photons radiated away from the horizon as a consequence of the horizon temperature. These thermal photons have an energy given in terms of their momentum as $E=pc$, where quantum theory tells us this momentum is related to wavelength as $p=h/\lambda$. The wavelength of a thermal photon that is just barely bound within the horizon as observed by the distant observer is given approximately in terms of the horizon radius R as the maximal circumference of the horizon, $\lambda=2\pi R$. For example, for a black hole horizon, a thermal photon that is barely gravitationally bound within the black hole as observed by a distant observer has a wavelength that is about equal to this maximal horizon circumference. This tells us the energy of a thermal photon that is barely bound within the horizon and is just barely able to escape away from the horizon and become radiated to the distant observer is given as about $E=hc/2\pi R$. The energy of this radiated thermal photon is the flow of heat, $\Delta Q=hc/2\pi R$. The second law tells us this flow of heat is related to the change in entropy as $\Delta Q=T\Delta S$, where $\Delta S=k\Delta n$. The lowest energy thermal photon radiated away from the horizon corresponds to the

smallest possible change in entropy, $\Delta n=1$, which gives the observed horizon temperature as about $kT=hc/2\pi R$.

What about other forces of nature besides gravity, like the electromagnetic and nuclear forces? What about other quantum fields besides the space-time metric that comprise the standard model of particle physics? The unification of quantum theory with relativity theory solves this problem in a straightforward way based on geometric mechanisms. The only known mechanisms of unification are supersymmetry (Dine, 2016) and the Kaluza-Klein mechanism of extra compactified dimensions of space.



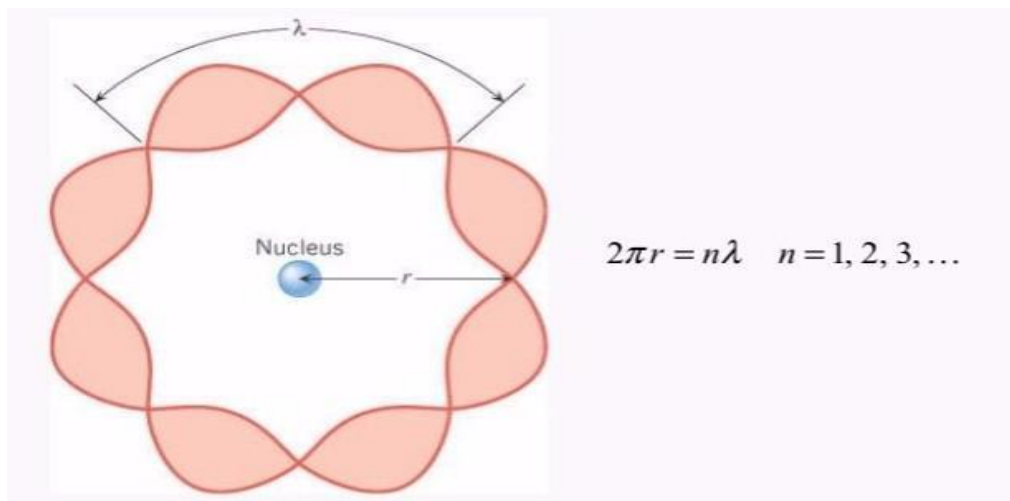
Extra Compactified Dimensions of Space (image from Greene, 2001)

If there are six extra compactified dimensions of space, then Einstein's field equations for the space-time metric give rise to the electromagnetic, strong and weak nuclear forces. The quantum fields that describe these forces are extra components of the space-time metric that arise in extra compactified dimensions of space. The quantum fields for these extra forces represent the curvature of space-time geometry in extra compactified dimensions of space, just like the ordinary components of the space-time metric for the usual four extended dimensions of space-time represent the force of gravity.

If super-symmetry, which is the idea of spatial coordinates with both commuting and anti-commuting aspects, is applied to Einstein's field equations for the space-time metric with six extra compactified dimensions of space, not only are the boson force particle quantum fields generated, but also the fermion matter particle quantum fields. If the extra compactified dimensions of space are formulated in terms of non-commutative geometry, not only are the force particle fields and the matter particle fields generated, but also the Higgs symmetry breaking fields. By breaking the symmetry of space, the Higgs mechanism gives rise to the mass energy carried by all the matter particle fields.

In the Kaluza-Klein mechanism, the electron is understood in terms of an extra compactified dimension of space. At each point of ordinary 3+1 dimensional space-time there is an extra circular dimension of space. Momentum can flow in the extra circular dimension just as it can flow in an extended dimension. Quantization of momentum in the circular dimension explains the quantization of electric charge, which is quantized in units of the electron. This is the usual Bohr argument for quantization of momentum in terms of an integral number of wavelengths fitting into the circumference of the circular orbit, $n\lambda=2\pi r$, where r is the radius of the circular orbit, n is the number of wavelengths, and in the sense of a Fourier transform momentum and wavelength are inversely proportional to each other, $p=h/\lambda$, except momentum in the extra circular dimension is the nature of electric charge. Momentum can flow in either the positive or the negative direction, explaining both the positron and the electron.

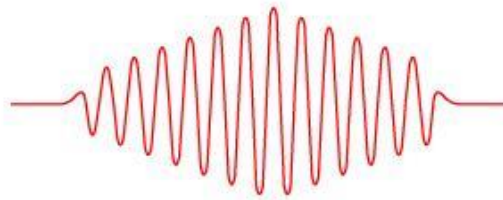
What we call an elementary or point particle is really only angular momentum quantized in an extra compactified dimension of space. As a geometrical mechanism, the quantization of electric charge is really no different than the quantization of energy in a hydrogen atom.



Quantization of Momentum in a Circular Orbit (image from slideshare.net)

The idea of a gauge theory naturally arises from this idea of extra compactified dimensions of space. With multiple extra compactified dimensions of space the idea of an Abelian gauge theory generalizes to non-Abelian gauge theories, which explains nuclear charges in addition to electric charge. In both cases, the nuclear and electrical forces are understood in terms of extra components of the space-time metric that arise with extra compactified dimensions of space, which allows the gravitational force to become unified with the nuclear and electromagnetic forces in a natural way.

The final result of unification is called 11-dimensional super-gravity, which includes all the standard quantum fields of the standard model of particles physics, including the electromagnetic and nuclear forces in addition to gravity. Since 11-dimensional super-gravity can only arise as a thermal average valid near thermal equilibrium, it is only valid as a low energy limit. All so-called fundamental particles are thus understood to be nothing more than localized excitations of field energy, which are called wave-packets. The wave-packet is localized in space and time, which gives rise to the particle quantization of energy and momentum.



Wave-packet

The wavelength of the wave-packet is extended in an extended dimension of space, which allows for the particle quantization of energy and momentum, while the quantization of wavelength in an extra compactified dimension of space gives rise to the internal structure of the particle like electric charge. Internal structure is related to external structure since the space-time metric relates the curvature of extended dimensions of space to compactified dimensions of space.

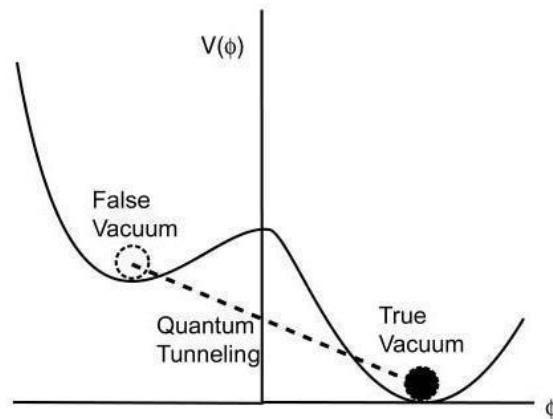
A so-called fundamental particle is thus nothing more than a localized excitation of field energy. These quantum fields all arise from the space-time metric through the usual unification mechanisms of super-symmetry, extra-compactified dimensions of space, and non-commutative geometry. All the quantum fields of the standard model of particle physics are really only extra components of the space-time metric that arise through these geometric mechanisms. Even the space-time metric only arises as a thermal average through the geometric mechanisms of the expression of dark energy, the expansion of space, and non-commutative geometry. In reality, there are no such things as fundamental particles or fundamental forces, only the potentiality of the void to express these geometric mechanisms.

Simply put, there is no Theory of Everything because there is No Theory of Nothing. The potentiality of the void cannot be reduced to a theory or conceptualized in any other possible way. That is the nature of infinite potentiality. Scientific reductionism simply does not apply to infinite potentiality. Anything is possible as long as it can be expressed in terms of a geometric mechanism. The expression of this potentiality always requires the expenditure of energy. In

emotional terms, the expression of this energy is the expression of desire, which directly leads to the manifestation of desires. The manifested world is only a *manifestation of desires*.

This important point cannot be stressed enough. Correctly interpreted, the holographic principle is telling us *the physical world is only an expression of the potentiality of the void*. This expression of potentiality always requires the expression of energy, which in emotional terms is the expression of desire. Through its geometric mechanisms, the void has the potential to create a world for itself and to observe that world from the central point of view of that world. The void is the source of everything in that world, including all the matter, energy, information and even the space-time geometry of that world, but it doesn't end there. The void is also the source of the perceiving consciousness that observes that world. When we use the word *source*, we really mean potentiality. Just as the source of the world is an empty space of potentiality called the void, the source of the perceiving consciousness that observes the world is the potentiality of the undifferentiated consciousness of the void.

If we take the big bang creation theory seriously, as formulated with inflationary cosmology, we understand that at the moment of creation of the observer's world a great deal of dark energy is expended. That world is initially only about a Planck length in size, but then inflates in size due to an instability in the amount of dark energy. This instability in dark energy is like a process that burns away the dark energy. Inflationary cosmology hypothesizes that at the moment of creation the cosmological constant takes on a value of about $\Lambda=1$, but due to an instability in the amount of dark energy, the cosmological constant transitions to a lower value. This transition is like a phase transition from a metastable false vacuum state to a more stable vacuum state of lower energy. The most stable state, the true vacuum with $\Lambda=0$, is a state with zero dark energy.



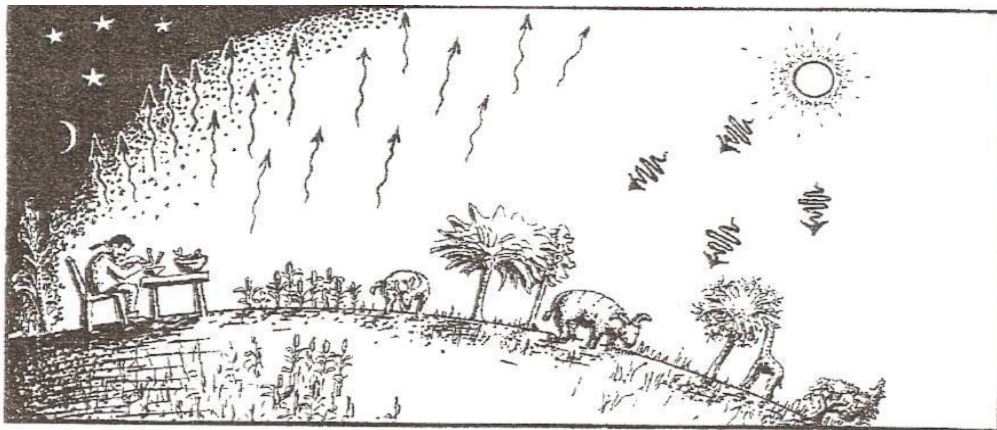
Metastable State (image from ned.ipac.caltech.edu)

The expenditure of dark energy breaks the symmetry of empty space by constructing an observation limiting cosmic horizon that surrounds the observer at the central point of view. The instability in dark energy is like a consumptive process of burning that burns away dark energy

and undoes this broken symmetry. As dark energy burns away to zero, the cosmic horizon inflates in size to infinity, and the symmetry is restored. We understand this undoing of symmetry breaking is like a phase transition from a false vacuum state to a true vacuum state. Dark energy burns away as the phase transition occurs. This idea is also consistent with the current measured value of the cosmological constant, $\Lambda=10^{-123}$, based on the rate with which distant galaxies are observed to accelerate away from us, which also corresponds to the size of the observable universe of about 15 billion light years.

This burning away of dark energy also explains the normal flow of energy in the observer's world in terms of the second law of thermodynamics. Relativity theory tells us the radius R of the observer's cosmic horizon is inversely related to the cosmological constant as $R^2/\ell^2=3/\Lambda$, while the holographic principle tells us the absolute temperature of the observer's horizon is inversely related to its radius as $kT=\hbar c/2\pi R$. At the moment of creation, R is about ℓ , Λ is about 1, and the absolute temperature is about 10^{32} degrees Kelvin. As Λ decreases to zero, R inflates in size to infinity, and the temperature cools to absolute zero.

The second law of thermodynamics simply says that heat tends to flow from hotter to colder objects because hotter objects radiate away more heat, which is thermal radiation. The instability in dark energy explains the second law as dark energy burns away, the observer's world inflates in size and cools in temperature, and heat tends to flow from hotter states to colder states of the observer's world.



Second Law of Thermodynamics (image from Penrose, 2005)

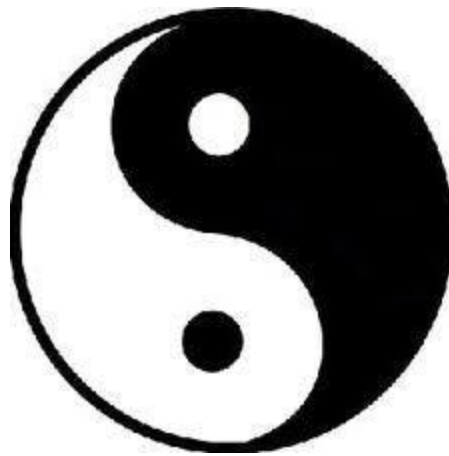
The normal flow of energy through the observer's world reflects this normal flow of heat as dark energy burns away and the observer's world inflates in size and cools. This normal flow of energy naturally arises in a thermal gradient. This also explains the mystery of *time's arrow*, as the normal course of time is related to the normal flow of energy through the observer's world. As far as the holographic principle goes, a thermal gradient is also a temporal gradient.

What are we to make of other forms of energy besides dark energy? Modern physics gives an answer in terms of symmetry breaking. All forms of positive energy arise from dark energy through symmetry breaking. This allows an observer's world to emerge from the void along the lines of the inflationary scenario, but only if the total energy of that world adds up to zero.

The remarkable discovery of modern cosmology is cosmic observations indicate the total energy of the observable universe is exactly zero (Gefter, 2014). This is possible in relativity theory as the negative potential energy of gravitational attraction can exactly cancel out the total amount of dark energy and all other forms of positive energy that arise from dark energy.

How do other forms of energy, like mass energy, arise from dark energy? The answer is symmetry breaking. As dark energy burns away, high energy photons are created, and these photons can create particle-antiparticle pairs, like proton-antiproton pairs. One of the mysteries of cosmology is why there are so many protons in the universe and so few antiprotons. Symmetry breaking gives the answer. At high energies, antiprotons can decay into electrons and protons into positrons, but there is a difference in the decay rates due to a broken symmetry, and so more antiprotons decay than protons. As the universe cools, protons become relatively stable, and so that's what's left over. Even the mass of the proton arises through a process of symmetry breaking called the Higgs mechanism. The expenditure of energy that characterizes all the gauge forces, like electromagnetic energy in a living organism or nuclear energy in a star, all arise from dark energy through a process of symmetry breaking, but all of this positive energy is exactly cancelled out by the negative potential energy of gravitational attraction.

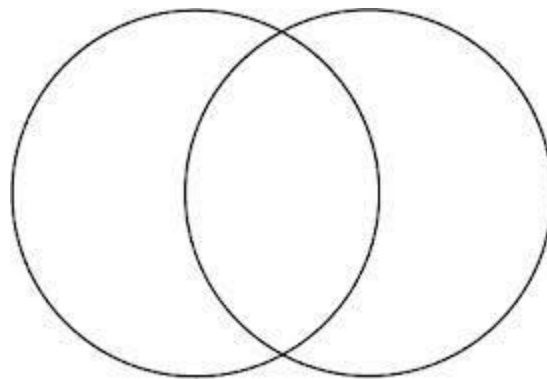
The observational fact that the total energy of the observable universe exactly adds up to zero tells us something important. Since everything in the world is composed of energy and all energy ultimately adds up to zero, this tells us that everything is ultimately nothing.



Ying-Yang Balance

If the void is the ultimate nature of reality, the physical world is a lower form of reality, like a virtual reality of images projected from a screen to the central point of view of an observer. This lower form of reality, with its projection of images from a screen to an observer, only exists when the void expresses its potentiality through geometric mechanisms, which is the nature of becoming. When the void expresses its potentiality through these geometric mechanisms it creates a world for itself, which it always observes from the central point of view of that world as the perceiving consciousness of the observer is differentiated from itself. If this potentiality is not expressed, only the void exists. Simply put, *being is prior to becoming*. As undifferentiated consciousness, the void exists as One Being.

What about a consensual reality apparently shared by many observers? The answer is many observers can share a consensual reality to the degree their respective holographic screens overlap in the sense of a Venn diagram and share information. This is just like the kind of information sharing that occurs in an interactive computer network. Each observer only observes its own holographic screen, but to the degree different screens overlap, different observers can apparently interact and share information. The network of interacting holographic screens can share information to the degree the screens overlap.

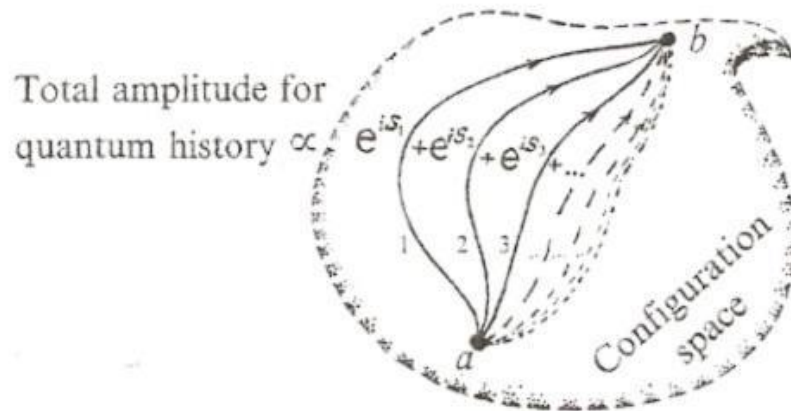


Overlapping Bounded Spaces

Each holographic screen encodes bits of information in a binary code. This is due to defining n quantized position coordinates on a bounding surface of space, which is due to defining n non-commuting variables on the bounding surface. The n bits of information, one per pixel, arise from this holographic mechanism as the n eigenvalues of an $SU(n)$ matrix.

It's worth pointing out that the holographic principle is completely consistent with quantum theory. In effect, each observer has its own Hilbert space of observable values, with all the bits of information for observables encoded on the observer's holographic screen. In this sense, each observation of something by the observer is like a screen output that projects an image of the thing from the screen to the central point of view of the observer.

The well-known fact that the observer has the innate ability to focus its attention on things in its world raises the issue of choice. How is this choice expressed? Quantum theory gives a natural answer in terms of a quantum state of potentiality. The quantum state can always be expressed in terms of a sum over all possible paths in some configuration space.



Sum Over all Paths (image from Penrose, 2005)

The configuration space relevant for the holographic principle are n non-commuting variables defined on the observer's screen that give rise to the $SU(n)$ matrix that defines the n bits of information encoded on the screen. That is the nature of the observer's Hilbert space.

Since the observer's holographic screen projects all images of the observer's world, each path specified in the sum over all paths is a possible world-line through the observer's projected space-time geometry. The observer's space-time geometry is not only projected from its holographic screen, but is also animated over a sequence of screen outputs. It is the observer itself that follows this world-line through its projected and animated space-time geometry. As a focal point of consciousness, an accelerating observer always follows a world-line.

Just as the observer observes its own world, the observer follows a world-line through its own world. Each observer's world-line is defined by the observations made on its world-line. In computer terms, each observation is like a screen output. A sequence of screen outputs occurring over a sequence of decision points on the world-line allow for the animation of observations. Until an observation is made, the quantum state of potentiality branches into all possible paths, but as the observer chooses to observe a particular state of information at a decision point, a particular path is followed.

Each screen output on the observer's world-line is a decision point where the observer chooses to follow some particular path rather than some other possible path. Each possible path of the

observer through its projected and animated space-time geometry is a possible world-line. At every decision point or screen output the observer has a choice to make about what to observe and which path to follow in its world. This choice arises with the observer's focus of attention on images of its world.

Quantum theory tells us each observer has its own Hilbert space of observable values for its own world defined by quantization of non-commuting variables on the observer's holographic screen. This defines everything the observer can observe in its own world, but due to information sharing in the network of overlapping screens, its observations can become correlated with the observations of other observers.

What is meant by other observers? Each observer is only a point of view that arises in relation to its own holographic screen. This point of view can be called a differentiated focal point of consciousness, or individual consciousness. The holographic principle tells us this focal point of consciousness is a point of singularity that arises at the center of the observer's horizon, which is to say the observer is the singularity at the center of its own world. Many apparently distinct observers can share a consensual reality, but ultimately when these geometric mechanisms are no longer expressed, only the undifferentiated consciousness of the void exists.

What role does the observer play in the creation of its world? The nature of quantum potentiality tells us every observation is a choice or a decision point on the observer's world-line as the observer's path or world-line branches into all possible paths. In computer terms, every observation is like a screen output. In the language of quantum theory, every observation is a decision point on the observer's path about what to observe and which path to follow. The observer expresses its choices through its focus of attention on images of its world.

Even the laws of physics are not fundamental but are all chosen. Everything is a choice and nothing is determined. All the laws of physics that appear to govern that world can only arise with random choice as statistical or thermal averages, which is what the second law of thermodynamics tells us in the framework of the holographic principle. As long as things are near thermal equilibrium, the laws of physics only appear fixed and stable due to symmetry breaking, and in some sense have frozen out of the quantum state of potentiality like a phase transition that turns water into ice, although the better analogy is probably the spontaneous magnetization of a magnet. The laws of physics only appear stable because they all arise through symmetry breaking within a metastable or false vacuum state.

The nature of symmetry breaking tells us that bits of information spontaneously become organized into complex forms as energy flows in a thermal gradient, like the spontaneous magnetization of a magnet. The holographic principle and the expression of dark energy explain how bits of information become encoded on a holographic screen in relation to the point of view

of an observer, and the instability in dark energy explains the origin of the thermal gradient. The expression of complexity arises through these geometric mechanisms because the organization of information occurs at a metastable state. Even the transition from one metastable state to another metastable state is a kind of symmetry breaking. This is epitomized by a cosmological constant that is only *constant* within a metastable state, while the transition from one value of the cosmological constant to another value is akin to a phase transition.

The birth and development of the observer's body can be understood in terms of the coherent organization of information, just as the physical death of the observer's body can be understood in terms of the disorganization of information. Modern physics tells us the development of coherent organization arises through a process of symmetry breaking. This is as much the case for biological organisms as it is for physical objects. The only significant difference is the organization of physical objects through phase transitions is dependent on the transfer of heat, while biological organisms can also engage in a process of eating, which adds organizing potential energy to the organism.

There is always a balance between the flow of thermal kinetic energy that tends to disorganize objects and organizing potential energy that tends to organize objects. When the balance shifts in favor of organizing potential energy, symmetry breaking occurs and coherent organization develops. When the balance shifts in favor of too much heat, disorganization occurs. As organizing potential energy is added to a body through a process of eating, the development of coherent organization naturally occurs through a process of symmetry breaking. Although symmetry breaking may be sufficient to drive the development of coherent organization in the observer's body, the observer also plays a role in the organizing process through choice, especially when those choices become emotionally biased.

3. The End of an Illusion

Sometimes people don't want to hear the truth because they don't want their illusions destroyed - Friedrich Nietzsche

The nature of consciousness only appears to be mysterious if we do not know the true nature of what we really are. Plato describes an observer that mistakenly identifies itself with the central character of an animation of images it perceives on a screen as a prisoner. The only possible freedom is an observer that no longer identifies itself, but for that we have to know the true nature of what we are.

The age-old problem of identity often expresses itself as an identity crisis. This identity crisis is about the true nature of *who I am*. Is it possible that I am only the observer and not the person I

am observing? If I am not a person in the world, then who am I? Can the true nature of identity be purely spiritual? Can the problem of identity be answered with a statement like “*I am nothing but consciousness*”, or “*Ultimately, I am the undifferentiated consciousness of the void?*”

Ultimately, this identity crisis is about the mystery of the ultimate nature of existence. The ultimate nature of existence is a mystery that can never be explained, just as infinite potentiality can never be reduced to scientific concepts. The most that it is ever possible to say about the ultimate nature of existence is that *It Exists*, which is to say *It Is* or *I Am*.

The ultimate nature of existence can never be personified. The holographic principle tells us that the nature of a person in the world can only be understood as a limited expression of the ultimate nature of existence as the image of a person is projected from a holographic screen. This limited expression of a person in the world is very much like the animation of an avatar in a virtual reality world, which is no more real than the images of a character animated on a screen and projected to the point of view of an observer. As Plato tells us, the observer becomes a prisoner when it identifies itself with its character.



Plato's Cave (image from faculty.washington.edu)

“If man will strike, strike through the mask!
How can the prisoner reach outside except by thrusting through the wall?”
Herman Melville, *Moby-Dick*

The void expresses its potentiality as it creates a world through geometric mechanisms and observes that world from the central point of view of that world. The expression of this potentiality requires the expenditure of energy, specifically dark energy and the expansion of space. Without this expenditure of energy, neither an observer nor its world can exist.

How are these geometric mechanisms expressed? The only logically consistent answer is the void has the potentiality to express these mechanisms. The void is what exists prior to the

creation of the world. Being is prior to becoming. In the sense of One Being, the void can be understood as undifferentiated consciousness. This argument is consistent with all the nondual traditions, including Advaita Hinduism, Zen Buddhism, Taoism, Sufism, Kabbalah Judaism and Gnostic Christianity.

“Truly, truly, I say to you, before Abraham was, I Am.”
(Gospel of John 8:58)

The book of Genesis 1:4 tells us that in the beginning, *God divided the light from the darkness*. The light that Genesis refers to is not physical light, but the light of consciousness, which is divided from the darkness of the void. The light of consciousness is inherent to the observer itself and can be understood as the observer's focus of attention, which allows for the observer's expression of choice in the sense of quantum potentiality. Each decision point on the observer's world-line is another choice.

Just as the observer is understood as a focal point of consciousness to which images of the observer's world are projected from its holographic screen, the observer's focus of attention allows for the projection of those images. To use a physical analogy, the observer's own light of consciousness illuminates the images of its world like the light of a laser projects images from a physical hologram. In this sense, with the creation of the observer's world, the differentiated consciousness of the observer is divided from the undifferentiated consciousness of the void.

Genesis 1:2 also tells us the creation of the world occurs as *the Spirit of God moved over the face of the deep*. The Spirit of God is the observer, the motion appears to occur as the observer follows an accelerated world-line through its projected and animated space-time geometry, the face of the deep is the observer's holographic screen, and the deep is the void.

The *Rig-Veda* tells us *darkness was hidden by darkness in the beginning. All that existed then was void and formless*. The undifferentiated consciousness of the void is referred to in the sense of One Being as that *One thing, breathless, breathed by its own nature. Apart from it there was nothing*. The creation of the world is described in a thermodynamic sense as *that which becomes was born through the power of heat. Upon that desire arose in the beginning the first discharge of thought*. The observer is described as *whose eye controls this world in highest heaven*.

The *Tao Te Ching* describes the observer's world is only created through the expression of desire, and without that expression of energy only the mystery of the void exists: *Ever desireless one can see the mystery; ever desiring one can see the manifestations*. The Tao describes the void as *darkness, darkness within darkness. the gate to all mystery*. The gateless gate paradox describes that when *One passes through this gateless gate, one walks the universe alone*.

What is the nature of passing through the gateless gate? When the holographic mechanism that creates the observer's world is no longer expressed, the observer's world comes to an end and disappears from existence. What happens to the observer? The observer's individual consciousness must return to the undifferentiated consciousness of the void. This reunion is described as a dissolution, like a drop of water that dissolves back into the ocean (Osho, 1974).

In both Hinduism and Buddhism the final dissolution of individual consciousness into undifferentiated consciousness is referred to as the experience of nothingness or Nirvana (Nisargadatta Maharaj, 1973, 1996). The experience of Nirvana is understood as the final dissolution into nothingness in which individual consciousness reunites itself with undifferentiated consciousness. In the sense of spiritual reunion, the individual spirit of the observer reunites itself with the Supreme Spirit of the void, or to use the language of Advaita Hinduism, Atman reunites itself with Brahman (McKenna, 2013).

“Brahman is the only truth, the world is an illusion, and there is ultimately
no difference between Atman and Brahman”

“That which permeates all, which nothing transcends, and which,
like the universal space around us, fills everything completely from within and without,
that Supreme nondual Brahman-that thou art”

(Shankara)

The literal translation of Nirvana is to *blow out* the flame of life or extinguish the light of consciousness. When the light of consciousness is extinguished, only the darkness of the void remains. This reunion with undifferentiated consciousness or final dissolution into nothingness is the ultimate nature of death, which is the *end of an illusion*. The illusion that comes to an end is not only the illusion of life in the world, but also the illusion of separation. Ultimately, death is a transition from the differentiation of consciousness and the becomings of a world to nondifferentiation and ultimate being (McKenna, 2002, 2004, 2007).

Both the Rig-Veda and the gateless gate paradox refer to the ascension of consciousness. Plato also refers to the ascension of consciousness in the Allegory of the Cave. It is as though an ascended observer looks down on its world from a higher vantage point as it observes all the images of its world on a two-dimensional screen from a point of view outside the screen, and sees that all those images are only projected by its own light of consciousness (Nisargadatta Maharaj, 1973; McKenna, 2002). An ascended observer that clearly sees this state of affairs can no longer identify itself with the image of its own character animated on the screen, but can only know itself as the focal point of consciousness or singularity at the center of its own world (Gefter, 2014). Only this singularity of consciousness can act as a *bridge* that connects the ultimate being of the void to the images of the observer's world.

The birth and development of the observer's character can be understood in terms of the coherent organization of information, just as the physical death of the observer's character can be understood in terms of the disorganization of information. Although symmetry breaking may be sufficient to drive the development of coherent organization in the observer's character, the observer also plays a role in the organizing process through choice, especially when those choices become emotionally biased.

The animation of the observer's character naturally arises in the flow of energy, which in part is directed by the observer's focus of attention. An investment of emotional energy arises whenever the observer focuses its attention on its character, but this investment of energy can be withdrawn when the focus of attention is withdrawn. The part of the animation the observer can direct arises in the sense of choice with the observer's emotionally biased focus of attention, but this always plays out against the backdrop of the normal unbiased flow of thermal energy through the observer's world. Emotional bias in the focus of attention gives rise to emotional feedback as it leads to the expression of biased emotions.

In some sense, every emotionally biased expression of emotional energy that arises with the observer's emotionally biased focus of attention is an interference with the normal flow of things through its world. This interference is analogous to a quantum interference pattern in the sense of a non-stationary path. This kind of interference leads to feelings of disconnection, while coming into alignment with the normal flow of energy and following the path of least action gives rise to feelings of connection.

“Before I sink into the Big Sleep
I want to hear, I want to hear
The scream of the Butterfly.”
(Jim Morrison, “When the Music’s Over”)

Coming into alignment with the normal flow of things is the meaning of the Grail legend, while interfering with things in an emotionally biased way is the meaning of the Wasteland. The transition to this state of energetic alignment is described as a metamorphosis, like the transformation of a caterpillar into a butterfly. In this transformation, the caterpillar dies and the butterfly is born. This is the archetypal metaphor of spiritual rebirth. One dies to one's false self-identification with one's body and is reborn to one's true spiritual identity (McKenna, 2002).

How is it even possible for the observer to identify itself with the form of its body? Neuroscience has demonstrated the emotional nature of meaning. Meaning is given in an emotional context, and this is also the case for self-identification (Damasio, 1999). Emotional context has to do with the flow of emotional energy that relates one distinct perceivable thing to another distinct

perceivable thing. The observer is only able to emotionally identify itself with the form of its body due to the expression of emotions that relate the observer's body to other distinct perceivable things in its world and that make the observer feel like it is really self-limited to the form of its body. This feeling of being embodied is perpetuated by the expression of biased emotions and the observer's biased focus of attention that play an essential role in the mental construction of the observer's body-based self-concept (McKenna, 2002).

The observer's body-based self-concept is emotionally energized by the expression of biased emotional energy that relates the observer's self-concept to other things in the observer's world in emotionally biased ways. This self-identification process is also an emotional attachment process. As the observer identifies itself with its character, the observer also becomes attached to things in its world, including its own body. This emotional attachment process can only occur when the observer's focus of attention is emotionally biased in favor of its character's survival and is focused on its character and other things in its world in emotionally biased ways, which directly leads to the expression of biased emotions.

Emotional bias in the observer's focus of attention and the expression of biased emotions are two sides of the same coin. As long as biased emotions are expressed by the observer's character, the observer's focus of attention is emotionally biased. As long as there is emotional bias in the observer's focus of attention, its character will express biased emotions. This kind of emotional feedback is a vicious cycle. The only way this vicious cycle can be broken is if biased emotions are no longer expressed by the observer's character and the observer stops directing its focus of attention in emotionally biased ways.

Breaking the vicious cycle is always a detachment process, or a process of *letting go*, as the observer detaches itself from its world and de-identifies itself from its character in that world. This letting go process is a kind of death as the observer stops being emotionally invested in or expressing bias in the outcome of any situations relevant to its character's survival, and in effect stops caring about whether its character lives or dies. This is a *giving up* process both in the sense of letting go and a surrender.

The impartiality of this kind of emotional detachment is the only way the expression of emotional bias can come to an end. In this detachment process, things are accepted the way they normally occur as an expression of the normal flow of energy through the observer's world, just like the acceptance of death that finally occurs through a process of grieving. In this detached state, the observer only watches as things play out in the normal way, and stops interfering with or trying to control things in an emotionally biased way so that things come out in favor of its character's survival. This state of non-interference only occurs with willingness to relinquish the emotionally biased desire to control things (McKenna, 2002).

For the purpose of the observer's awakening, only the de-animation of the observer's character and disappearance of the observer's world are required. This de-animation of the observer's world is a direct result of withdrawing its focus of attention and emotional energy away from its world. Without the observer's focus of attention on its world and this expression of energy, there can be no animation of the observer's world. This always requires a shift in the observer's focus of attention away from its world.

This shift in the observer's focus of attention away from its world is what is meant by *turning around*, which is the original meaning of the word repent. In a spiritual or metaphysical sense, the observer turns the focus of its attention away from its world and onto its own sense of being present (Nisargadatta Maharaj, 1973). The observer shifts the focus of its attention onto itself. In some sense, only the observer's focus of attention on its character and the expression of biased emotional energy can keep the observer emotionally attached to its world and self-identified with its character. The only way the observer can detach itself is if this expression of biased emotions comes to an end, which naturally occurs when the observer focuses its attention on its own sense of being present (McKenna, 2002).

An ascended observer can only know itself as the focal point of consciousness at the center of its world, or dissolve back into the undifferentiated consciousness of the void. In a very real sense, an ascended observer exists right at the edge of the abyss that separates the existence of its world and the animation of its character in that world from the void and the non-existence of its world (McKenna, 2002).

There is no scientific way to prove the existence of the undifferentiated consciousness of the void, but anyone can confirm this ultimate state of being for oneself. It is possible to do an experiment of One. That is what it means to become a Buddha and awaken from the dream of separation. All nondual traditions describe the process of awakening. When one awakens from the dream of the world, one's world disappears and only one's true underlying reality remains. The experience of one's underlying reality is the experience of undifferentiated consciousness, which is the experience of nothingness. There is no other way to describe it. With dissolution, there is a sense of falling into the void, like entering into a state of ultimate free-fall (Osho, 1974). After awakening one observes one's world again, but from an ascended point of view and self-identification with one's character in one's world is no longer possible.

What happens to the observer's differentiated consciousness with the death of its body? One possibility is the observer's consciousness remains differentiated as a focal point of consciousness at the central point of view of its world after body death. Like a phase transition, body death is only the irreversible disorganization of information in the way the observer's body is coherently organized on the observer's holographic screen. Even with body death the focal

point of consciousness can remain differentiated. Maybe a new body coherently forms for the observer, which would explain the nature of reincarnation.

It's important to point out the observer's mind is greater than just the information organized within the physical limits of the observer's body or brain. Quantum entanglement tells us the information for mental events involves entangled bits of information that are encoded both within the limits of the observer's body and outside those limits. Quantum entanglement is a natural consequence of the holographic principle since the observer's Hilbert space for observables as defined by its holographic screen arises as the eigenvalues of an $SU(n)$ matrix, and all those bits of information are entangled with each other.

Entanglement tells us that with any mental event it is possible to know about events that occur outside the limits of the body even if those events are not physically connected to the body. Even after body death, quantum entanglement remains in effect, and so the observer still has a form of mind after body death. It may be that these mental experiences after body death lead to the reincarnation of a new body.

A critical point is only the holographic principle can resolve the paradoxes of quantum entanglement, like the Schrodinger cat paradox and Wigner's friend paradox. All these paradoxes require an *outside* observer to collapse the entangled state of a quantum system, but as Amanda Gefter (2014) points out, the universe has no *outside* observer. The only possible point of view is from inside the universe. Gefter also points out that these entanglement paradoxes are really paradoxes of self-reference. All the bits of information encoded on the observer's holographic screen are entangled, but the observer cannot arise from entangled bits of information. The observer can only identify itself with a form of information it observes, which brings us back to the question: where does the observer come from? The answer is the observer arises from the void at the central point of view of its world as its world is created.

The way the holographic principle resolves this problem is that all possible images of the universe are projected from a holographic screen to the central point of view of an observer, which is only a focal point of consciousness. Dark energy tells us the observer's holographic screen is a cosmic horizon that only arises with the expansion of space. Only the cosmic horizon by breaking the symmetry of empty space allows for encoding of bits of information and projection of images from the screen along the lines of *it from bit*. Only the undifferentiated consciousness of the void as an empty space of potentiality can give rise to the point of view of the observer and the observer's holographic screen. In the sense of ascension and dissolution, the observer is right at the edge of being *outside* the universe. The only way to be *outside* the world is to go beyond the images of a world projected from a holographic screen. The dissolution of consciousness into nothingness is all about what is beyond the images of a world.

How is it possible for the observer to return to its original state of being and for its differentiated point of consciousness to dissolve into undifferentiated consciousness? The answer is the holographic mechanism that creates the observer's world must come to an end, which means the end of all expressions of energy, including the emotional energy we call the expression of desire. In all nondual traditions, this end of the expression of desire is understood not as body death, but as ego death. When the expression of all desires to live a life in the world come to an end, the observer's ego, which is the observer's mentally constructed and emotionally energized self-concept of who it is in its world, also comes to an end.

“No One Here Gets Out Alive”
(Jim Morrison, “Five to One”)

The only possible breakthrough occurs with ego death, but ego is in resistance to the very end. Ego fights for its survival until it comes to an end, since that is the nature of how ego is coherently organized as a self-replicating form of information. This fight for survival is the nature of self-defensiveness.

Self-defensive expressions can occur in the moment as an expression of the normal flow of things, but with the expression of biased emotional energy and the mental construction of ego, these self-defensive expressions become emotionally reinforced, distorted and amplified like a positive feedback loop. The ultimate expression of self-defensiveness is the fear of death, which is ultimately the fear of nothingness. Paradoxically, the fear of nothingness is the fear of the ultimate nature of being. In a twisted way, *being* becomes afraid of itself. This fear of nothingness can only arise through the paradoxes of self-reference and self-identification that give rise to the mental construction of ego.

Only ego death, or the disorganization of this complex, mentally constructed, emotionally energized, self-replicating form of information allows for the breakthrough, which is really a *break-out* as the differentiated consciousness of the observer leaves its world behind, dissolves back into the undifferentiated consciousness of the void, and returns to its primordial state of undivided being. Like any process in which a coherently organized self-replicating form of information becomes disorganized, this breakthrough is really a *breakdown*, like a phase transition that melts ice back into water or a process of burning in which the ego *burns away*. Those who go through this disorganization process describe it as a mental, emotional or psychic breakdown, or a *break with reality* (McKenna, 2002).

“Burning, burning, burning, burning
Oh Lord, Thou pluckest me out.”
(The Buddha's Fire Sermon)

As is often stated, the antidote is in the poison. The breakthrough can only occur with ego death, which is a complete and total surrender in which the fight for survival comes to an end. The fight for survival naturally comes to an end when all desires to live a life in the world come to an end. In this breakdown process, the self-identification of the observer with its character in its world also comes to an end, which is the only way the observer can *break out* of its embodied state of imprisonment. In a very real sense, only this *break with reality* can lead to the ascension and dissolution of consciousness.

Dissolution of the observer's consciousness into undifferentiated consciousness requires de-animation of the observer's world, which is a natural result of the observer withdrawing its focus of attention away from its world and its investment of emotional energy in its world. Ascension of the observer's consciousness requires enough disorganization of the observer's ego to allow for a state of emotional detachment in which the observer no longer identifies itself with its ego. This naturally happens when the expression of emotional bias comes to an end. Biased emotional energy is withdrawn away from its ego as the observer stops focusing its attention on its ego in emotionally biased ways.

As Plato tells us, even an ascended observer can still have an ego, but this mentally constructed self-concept no longer has enough emotional energy animating it for the observer to identify itself with it, and so the observer is no longer a prisoner. Plato calls this non-identified state of the observer freedom from bondage. The observer can only know itself as the light of consciousness emanating from its own focal point of consciousness and see its ego as another image projected from the screen like the self-referential narration of a movie by the central character (Nisargadatta Maharaj, 1973). With dissolution, the expenditure of all energy comes to an end, the observer's world disappears, and the observer reunites itself with the undifferentiated consciousness of the void. Ultimately, the observer can only know itself to be the undifferentiated consciousness of the void (McKenna, 2002).

In a metaphysical sense, each observer's differentiated light of consciousness, as it emanates from its own focal point of consciousness or singularity, is the nature of spiritual being, while the undifferentiated consciousness of the void is the ultimate nature of all being. Ultimately, only One Being exists.

Each observer's consciousness has an apparent individual existence, but at the end of the day when the holographic mechanism is no longer expressed and the observer's world disappears, every observer must return to its ultimate state of being as undifferentiated consciousness. The holographic mechanism must come to an end when energy is no longer expended and desires are no longer expressed. As the *Tao Te Ching* states: "*Ever desireless one can see the mystery*" (Lao Tsu, 1997).

Ultimately, there is only One Being. The void expresses its potentiality as it creates many worlds, each observed by its own observer at the central point of view and sharing information to the degree each observer's holographic screen overlaps with the screens of other observers, but at the end of the day when these holographic mechanisms are no longer expressed, only the undifferentiated consciousness of the void exists. Every observer must eventually return to this ultimate state of being. Individual consciousness must ultimately reunite itself with undifferentiated consciousness. The divided light of consciousness of the observer must ultimately return to the undivided darkness of the void.

“When the Music’s Over, Turn Out the Lights.”
(Jim Morrison, “When the Music’s Over”)

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