Deep Reality

The YouTube Talks

Edgar L. Owen

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To my secret muse

PREFACE

This book contains the text from my series of Deep Reality YouTube talks on the Theory of Everything for easy reference. The YouTube talks are concise and hopefully clearer versions of my books on Universal Reality available on Amazon under Edgar L. Owen. The Deep Reality talks can be found on YouTube by searching on Edgar L. Owen.

These talks have been written primarily to clarify and further develop my own understanding of the true fundamental nature of reality but hopefully they will inspire others as well. I personally believe Deep Reality presents the best and most comprehensive Theory of Everything that has so far been proposed, but reality is always the final arbiter of truth and always has the last say.

To the extent this book accurately describes the true nature of reality it's not something I have created. Rather it's the beauty and logic of the fundamental principles of reality itself revealing themselves to someone who has hopefully been able to observe and study it without projecting too much of his own personal programming onto it. Reality is continuously evolving and revealing itself to all of us in all its awesome glory, and I believe anyone willing to observe it carefully and open-mindedly will be able to personally confirm the validity and utility of the theory this book presents.

I would like to thank everyone who has helped make this book possible and encouraged me while writing it. Thanks to all of you for putting up with my unusual hermetic life style. And a special thank you to all my wild visitors, including the occasional human, and to the beauty and profundity of nature, which always inspires me with joy and meaning. Thanks to reality itself for continuously revealing itself in all its glory to those who will only look with opened eyes, and thanks most of all to my secret muse. Thank you; thank you! Thank you all!

And finally thanks to all those thinkers, scholars, scientists and visionaries throughout history without whose heroic efforts, genius and cumulative hard work this book could not have been written.

The author welcomes all comments and questions and can be contacted at Edgar@EdgarLOwen.com.

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1. THE TWO SIMPLE PRINCIPLES OF RELATIVITY

1. In this talk I'll explain in simple non-mathematical English the secrets of understanding what relativity really is and how it really works.
2. This is a revolutionary new way to understand relativity. And it also immediately explains the true underlying nature of mass and energy, and for the first time why mass and energy can be converted into each other and conserved.
3. It also gives us an entirely new understanding of the nature of space and spacetime itself and it also improves the standard curved space model of gravitation.
4. And this model in turn shows us for the first time why the presence of mass actually curves spacetime.
5. And in addition it gives us an entirely new insight into what's really going on inside black holes.
6. So as you see this isn't just another standard physics talk but an entirely new understanding of mass, energy, space, and time which all turn out to be different aspects of the same fundamental phenomenon.

7. So let's get started with the first of the two very simple fundamental principles that underlie relativity.
8. The first principle is that everything in the universe continually moves through space, or time, or a combination of space and time at c, *the speed of light in a vacuum*.
9. This means that if something is standing still in space then it's moving at velocity c through time.
10. Since the internal clocks of photons of light stand still in time that's why light moves through *space* at the speed of light because it has no intrinsic velocity through time.
11. And everything else moves at some combination of velocities in space and time and the faster it moves in space the slower it moves in time.
12. So in every case the total velocity in space and time of everything in the universe is always equal to c.
13. There are no exceptions. This is a core fundamental principle of reality itself that cannot be violated.
14. Now a quick note is in order. Since space and time are different dimensions of a 4-dimensional universe at 90° to each other it's actually the *vector velocities* of space and time that equal the

speed of light. That means the squares of the space and time velocities add up to the square of the speed of light. So keep this in mind, when we say velocity we mean vector velocity.

15. This single simple principle underlies special relativity and explains why clocks slow when they're moving through space.
16. And it also explains why time passes, because we continually travel through time at the speed of light, and this is what we experience as the passage of time.
17. Yes we all continually travel forward in time at the speed of light because of this fundamental principle of relativity except when we travel at high velocities in space in which case our velocity in time slows and we age more slowly.

18. OK, this first principle explains special relativity but we still need to understand general relativity, which is the effect of gravitation on time.
19. The key here is the second simple fundamental principle of relativity, which is that mass and all forms of energy are all forms of *spatial velocity*.
20. That's right, energy is just velocity in space and that's all it is. Every form of energy including mass is just some form of spatial velocity.
21. Now we already know that *kinetic energy* is linear spatial velocity, *heat energy* is just the aggregate kinetic energy spatial velocity of all the molecules in some material, and that *electromagnetic energy* is just spatial velocity in the form of electromagnetic waves in space.
22. Now it's only because all forms of energy are all forms of spatial velocity that energy can be conserved. For something to be conserved it must quite obviously be different forms of the same underlying thing.
23. OK, but how does mass fit in? What kind of spatial velocity could mass be?
24. Since masses can be either at rest or in motion there is only one possibility. Mass has to be ultra fine in place vibrations in space itself. Specifically a mass is a *field* of ultrafine standing vibrations *of* space itself.
25. This simple but profound insight immediately explains the gravitational effects of mass, the effect of gravitation on time in general relativity, and why mass and energy are conserved.
26. Mass and energy are conserved because they are different forms of spatial velocity. So the conversion of mass to an equivalent amount of energy is simply the conversion of an equivalent

amount of ultrafine vibrational velocity to either linear or wave form velocity in space.

27. OK, so we now have the two simple fundamental principles that explain essentially all of relativity. 1. Everything in the universe is continually moving through combined space and time at c velocity. 2. All forms of energy including mass are forms of spatial velocity and masses are fields of intrinsic ultrafine vibrations in space itself.
28. So this explains why time slows in a gravitational field. It slows because a gravitational field is a field of intrinsic spatial velocity and time must slow within the field so that the total space and time velocity of anything in the field continues to equal c.

29. Now this new model of masses as fields of ultrafine spatial vibrations also explains why gravitational fields attract.
30. The vibrations of gravitational fields get weaker further from their centers of mass. This sets up a velocity gradient in the field with more intrinsic velocity closer to the center. This creates velocity vectors pointing towards the center that the inertial motions of objects in the field tend to follow. This is why gravitational fields attract towards their centers of mass. We stand on the surface of the earth because there is a greater amount of intrinsic spatial velocity in that direction.
31. In effect this model of masses as fields of intrinsic vibrational velocity in space explains why mass curves space, something missing from traditional discussions of general relativity which just state that mass curves space without telling us *why* it does.

32. In fact this new model suggests an improvement to the usual curved spacetime model of relativity.
33. We can replace the old curved space model with a completely equivalent but much easier to understand model of *densified spacetime*.
34. In this new model spacetime is still 4-dimensional but now it's Euclidean and flat, which is the way we actually see it is.
35. Instead of gravitational curvatures there are now fields of vibrational densification due to the presence of mass. The models are completely equivalent and all the equations of relativity still work just fine.

36. We just take all the curvatures and compress them all along themselves until space becomes flat again but it's now very finely crumpled along the curvatures, and then we set these very fine crumples into vibrational motion.
37. The huge advantage of this new model is that space is now back Euclidean and flat like we always saw it was and it still does everything the old curved space model did. Space is just compressed into ultrafine vibrations where the curves used to be.
38. The result is that space is now much much easier to comprehend and it's enormously easier to understand how relativity works than before.
39. But there is more, much more. Because this new model reveals the fundamental equivalence of space and time with mass and energy. Because if mass and energy are just forms of spatial velocity and total spacetime velocity always equals c then mass plus energy plus time always equals c! Mass and energy are just forms of space, and space itself is just a giant universal field of energy.

40. Because these two fundamental principles are essentially talking about the same thing they can be combined into one single even more fundamental principle that underlies all the four fundamental aspects of the observable universe.
41. Mass and energy are forms of spatial velocity and spatial plus time velocity always equals c. So we can now say the total amount of mass, energy, and velocity in time at every point in the universe is always equal to c!
42. This amazingly simple single principle essentially tells us everything we need to know to understand how space, time, mass, energy, gravitation, and relativity work! It's truly amazing and truly profound.
43. So the entire universe itself now consists of a single fabric of intrinsic c velocity. The total spacetime velocity always equals the c at every point in the entire universe.
44. This velocity can take the form of either velocity in time or velocity in space.
45. And whenever it takes the form of velocity in space that velocity manifests as some sort of energy or mass.
46. So imagine a universe originally full of empty space. At every point in this universe time passes at c unless there's some mass or energy present.

47. Since every mass or energy consists of velocity in space the velocity in time there slows so the vector velocities in time and space still always sum to c.

48. Now, note that a velocity *in* space can only be *with respect to space*. So there must be something to move with respect to space inside space for there to be any velocity in space at all.
49. The things that can move *in* space *with respect to it* are called elementary particles and of course they compose all the structures in the universe.
50. The only way things can have spatial velocity and move with respect to space is for little pieces of space to crystallize out into what we call elementary particles. Only if particles detach from the fabric of space can they move with respect to the space from which they detached.
51. So whenever there's some form of spatial velocity it's always because of the presence of some form of particle that carries the mass or energy of that spatial velocity.
52. So we see the universe is a profoundly beautiful and simple system when reduced to its essential components.
53. Imagine a completely empty original fabric of space through which time pass at velocity c at every point.
54. Then particles crystallize out of this fabric and separate from it. Because the particles are like little pieces of the spacetime fabric they can now move with respect to it but they still obey its fundamental principles.
55. Only because particles move with respect to space itself can they have spatial velocity and this is the only way movement and velocity in space can exist.
56. And the spatial velocity that exists is always some form of mass or energy.
57. That's what particles are; they are a means the universe devises to create velocity with respect to itself. Particles are a means to create mass and energy in the universe so that structures can exist and things can happen. Without particles this wouldn't be possible.
58. The total velocity at every point in the 4-dimensional fabric must still always equal c. So whenever there's some velocity in space associated with the existence of a particle the velocity in time slows to keep the total velocity equal to c.
59. In this way the total space and time velocity of every point in space and every particle in space is always kept equal to c.

60. And if particles move through intense gravitational fields their velocity through space slows as it does for example as they fall into a black hole. In this way the total linear velocity in space plus the intrinsic velocity of the field never exceeds the c.
61. This simple fundamental principle of the c velocity of light in a vacuum applies to the entire universe and to everything in it! It's truly amazing, and truly profound and beautiful!

62. Now what we call empty space actually consists of the quantum vacuum and virtual particles are continually popping in and out of existence everywhere within the quantum vacuum throughout the entire universe.
63. As a result the so-called empty space of the quantum vacuum is actually a universal field of energy called the zero-point energy. The average spatial velocity of this field is miniscule but it is a field of energy that fills the entire universe.
64. Within this universal field of zero-point energy the fields of energy of the masses and charges of all the actualized particles add additional areas of intrinsic spatial velocity density to the field of zero-point energy.
65. So the entire universe becomes a single field of various amounts of spatial velocity and at every point in this field the amount of spatial velocity reduces the velocity of time so that the total velocity in both time and space always remains equal to c at every point in space.
66. So the entire universe consists of velocity equal to c in one form or another.
67. And all this leads to all sorts of other amazing insights that will be explored in more Deep Reality talks. Stay tuned!

2. THE COMPUTATIONAL UNIVERSE

1. In this talk I'll explain how and why the universe is a computational system and what the amazing implications of this are for its fundamental nature and how it works.
2. To begin just take a look at the world around you. You think you see a bright, colorful world full of physical objects that continually plays out the dramas of daily life.
3. However cognitive science shows us without any doubt at all that the world we experience around us actually consists entirely of neural data in our brains.
4. Sensory data is input into our brains through our eyes, ears, nose, mouth, and skin. And then our brain organizes it into data structures meaningful to our functioning and existence. The world we experience around us is entirely a *simulation* of the actual world outside running in our brains.
5. Now of course there is a real external world outside our brains but it's impossible for us to experience that directly. All we ever experience of it is the simulation our brains compute.
6. But of course every one of us assumes the world we experience is the real world as is actually is, but since every one of us and every individual of every species experiences that world very differently none can be correct.
7. Every living being lives within its own simulation of reality and every living being thinks its simulation is the real actual world but this is simply not true.
8. We experience the world as consisting of an empty space full of physical objects, but what we are really experiencing is data constructs being computed in our brains.
9. This is easy to understand by analogy to virtual reality. All the actual data in a virtual reality exists as bits and bytes in the controller memory which is non dimensional. But in the headset all this data is projected into the semblance of a moving 3-dimensional world full of objects and actors.
10. But the actual data of the virtual reality is data being computed in the controller memory. It's not actually objects in space.
11. And it's exactly the same in our brains. All the actual data of our experience of reality is just data being computed in our brains, and then our brain projects it into the semblance of a 3-dimensional space full of moving objects just as a virtual reality becomes dimensional only in the headset display.
12. OK, so there's no doubt at all that every detail and aspect of the world as we experience it actually consists of data being

computed in our brains but what of the real world outside our brains? Is that data too or is it physical objects in dimensional space as we assume?

13. All the evidence suggests it's just more data. How else could it be so convincingly simulated by data in our brains as a physical world if it didn't also consist entirely of data?
14. If the data in our brains seems like a perfectly real physical world, then why couldn't the actual world also consist entirely of data? How else could it be so accurately and convincingly simulated as data if it wasn't actually data?

15. The insight that the universe consists entirely of data has profound consequences.
16. First the only way that data can change is to be computed. Thus the universe must be computational. The universe is a computational system that continually recomputes itself in every moment. The universe is an enormous cosmic computer that continually recomputes its entire data state in every moment.
17. This means that every process in the universe is effectively a running program that computes its own data state in interaction with all the other running programs that constitute its computational environment, and together in interaction the programs of all the processes in the universe compute the current data state of the entire universe.
18. So even we are the programs of ourselves continually recomputing the data of ourselves in interaction with the other running programs around us.
19. Our program is enormously complex. It consists of all the myriad subroutines of every cell, organ, and system in our bodies down to the interaction of our elementary particles. All these subroutines working together compute our organism and being in every moment of our existence.
20. And since these computations involve quantum processes, and our control program has the ability to imagine, evaluate, and select among alternatives our computations are nondeterministic and there is room for free will. So we are the biological robots of ourselves, but we are free, autonomous robots capable of intelligent decision-making and we remain fully human.

21. Nevertheless at the most elemental level we consist entirely of data as does everything in the entire universe.
22. How this works is easy to understand because it changes nothing.

23. Throughout history science has progressively reduced everything to combinations of more and more elemental components. Materials were reduced to chemicals, chemicals to elements, elements to atoms, and finally atoms to particles.
24. During this process nothing changed in the objects themselves, they were just more deeply and completely understood. The discovery that we were made from elementary particles didn't change us in the least.
25. Now science just needs to take one final step and realize that all elementary particles reduce to data. Each elementary particle is a different set of elemental data. With this the reduction of reality to its elemental components is complete, and again nothing changes. Humans are still fully human just as we were before. The fact that our elementary particles are actually data doesn't change us in the least. It just deepens our knowledge of ourselves.

26. Now the insight that the universe is computational and consists entirely of programs computing data also solves some major philosophical and scientific problems.
27. For one thing it immediately explains Wigner's "the unreasonable effectiveness of mathematics in the natural sciences." Until now why mathematics is the best description of the universe has been a deep unsolved mystery.
28. But when we realize that the universe is computational it's quite obvious that logic and mathematics will automatically provide the best possible description of a universe that is itself logico-mathematical.
29. But even more profoundly it solves the mystery of how and from where the laws of nature could control a universe that was thought to be physical. In a physical universe there is no place for the laws of nature since they aren't physical objects so where could they exist and how could they control the universe?
30. But in a computational universe where everything is data the data of the laws of nature automatically become just as real a part of the universe as the data they compute. The laws of nature are the virtual data that computes the observable data of the observable universe, and they are both equally real components of a computational universe.
31. In addition this computational model of the universe also leads naturally to the unification of relativity and quantum theory as we will see in the next Deep Reality talk #3.

32. OK, so if the universe is a computational system what is its structure and how does it work?
33. Since the universe is computational there are basic similarities with how computers work but there are some important differences as well.
34. Any computational system must have data, a program that computes the data, and a processor that runs the program. Thus the universe must also have these three elements as well.
35. There must be a program consisting of the data that encodes the fundamental laws of nature that's not directly observable, and there must be a processor that executes this code
36. Now the cycling of this processor that runs the code that computes the universe will be the ultimate source of the passage of time.
37. So the processor runs the program code, which continually recomputes the data of the observable universe, which is the universe of science consisting of particles and particulate structures.

38. This is how the computational universe works in a nutshell but there's more.
39. The code data of the elemental program isn't directly observable. In other words it's virtual data. Now science has already discovered the realm of virtual data is the quantum vacuum. So it makes sense to assume that the quantum vacuum is the realm of all virtual data and that the program code exists within the quantum vacuum as virtual data.
40. Likewise the processor isn't directly observable and must be an intrinsic attribute of the quantum vacuum. This means that the quantum vacuum is the non-dimensional computational space in which the observable universe is computed.
41. In other words the quantum vacuum is the original formless dimensionless virtual realm in which the observable universe is computed, so the observable universe must also exist within the quantum vacuum.
42. Thus we can say that the data that constitutes the observable universe is the observable aspect of the quantum vacuum. Dimensional spacetime and all the elementary particles exist as an observable data structure we call the observable universe within the quantum vacuum.
43. The observable universe is observable because it's data structures interact, and the interactions of data structures are in fact what observations are. Otherwise its data has the same status as the unobservable virtual program data.

44. So we now have a picture of the hidden fundamental structure of all aspects of the entire universe.
45. All that exists is the quantum vacuum, which is the entire universe and all the data of the universe exists within the quantum vacuum. The observable universe of science exists within the quantum vacuum and consists of all actualized elementary particles and the structures they form.
46. But in addition the virtual data of the laws of nature also exists within the quantum vacuum. This includes what we can call the *complete fine-tuning*, which is all the fundamental constants, particle values, data types, logical operators, and whatever other virtual data is necessary to compute the entire observable universe.
47. And in addition the quantum vacuum is the processor that applies the program data to the observable data to continually recompute it.
48. And the processor is the fundamental source of time in the universe. Each set of processor cycles recomputes all the observable data of the universe and produces a tick of the universal clock.
49. The processor runs at an unimaginably rapid rate far faster than the fastest particle interactions because it's what computes them.
50. The processor is the source of all happening, change, process, life, and time in the universe. It's what brings the universe and everything in it to life.

51. And importantly the processor cycle rate is what sets the speed of light in a vacuum equal to c.
52. Recall in the first Deep Reality talk the fundamental principle that everything in the universe continually moves at velocity c either in time, space, or some combination of time and space.
53. The processor cycle rate is now seen as the source of the velocity of c that accounts for the continual velocity of everything in the universe.
54. Every process in the universe is continually recomputed equal to c.
55. Think of it this way. In every processor tick a separate application of the processor computes each coherent process. Each processor application uses the same number of processor cycles to compute its process. If there is some velocity in space some of those processor cycles are used to compute that velocity. Then any cycles left over are used to compute the internal evolution of the process.

56. Now the internal evolution of the process is how fast it changes in time as the processor ticks. It's the resulting clock time velocity of that process that depends on how much spatial velocity that process has.
57. This is how the universal processor computes the principle that everything in the universe has a total spacetime velocity equal to c. The velocity of c emerges directly from the cycle rate of the universal processor that computes the universe.
58. That's why c velocity applies to everything in the universe because everything is computed by separate applications of a single universal processor at c.
59. This is how the different clock time rates of relativity arise. The cycle rate of the universal processor is the same everywhere in the universe because c is the same everywhere in the universe, but whenever there is spatial velocity this same processor rate computes a slower local clock time rate to keep the total space plus time velocity equal to c.
60. This is how a single universal processor cycle rate computes all the different relativistic clock time rates in the universe. In essence there are two distinct kinds of time, as I'll explain in another Deep Reality talk on Time.
61. Now that we understand the basic structure of our computational universe we can proceed to explain how to accomplish the long sought unification of relativity and quantum theory in Deep Reality talk #3.

3. HOW TO UNIFY QUANTUM THEORY & RELATIVITY

1. In the previous Deep Reality talk on the Computational Universe we learned how the universe continually computes itself and everything in it including ourselves. This now enables us to understand how particle interactions create what we call spacetime. This opens the path to the long sought unification of quantum theory and relativity in a manner that's scientifically consistent with both theories.
2. The apparent incompatibility of relativity and quantum theory is the most important unsolved problem of modern physics, but there's a single simple insight that reveals how to accomplish this long sought unification.
3. And not only that, this same simple insight simultaneously resolves the apparent paradoxical nature of the quantum world.
4. The key is to understand that the apparent incompatibility between quantum theory and relativity is due to their very different models of spacetime.
5. Both theories view spacetime as a *preexisting container* within which events occur, but the spacetime of quantum theory is passive and unchanged by events whereas the spacetime of relativity is dynamic and affected by events, it curves as masses move within it.
6. In these very different views of spacetime lies the apparent incompatibility of relativity and quantum theory.
7. So the key to unifying them is a single model of spacetime compatible with both theories. And this becomes easy when we realize what spacetime really is.

8. The key is to realize that spacetime *is not* a preexisting container in which events occur, but a data structure *created by events as they occur*. Specifically what we call spacetime is created by elementary particle interactions and I'll explain how this works.
9. But first note that if spacetime is created by particle interactions then it's automatically going to be consistent with quantum theory, and when spacetime is simply scaled by the presence of mass-energy as it's created it's automatically consistent with relativity as well. In this way both theories can be unified. So this clearly looks like the correct approach.
10. And in addition all the apparent quantum paradoxes disappear because all the paradoxes of quantum theory, such as non-locality,

are with respect to a preexisting spacetime that no longer exists! So when quantum events create spacetime every one of these seemingly paradoxical aspects of quantum theory disappears. So this approach is doubly promising.

11. Also note that even though we imagine we see an encompassing empty space around us we never actually observe it. All we actually observe is *objects with dimensional relationships* to each other and to ourselves. Our brains try to tell us there's an empty space between these objects but that empty space is completely unobservable so there's no way to confirm it actually exists.
12. Now in the previous Deep Reality talk we found that the quantum vacuum is a formless computational space and that particles are actually numeric data within this computational space.
13. We can understand this by understanding how virtual reality works. A virtual reality exists only as data in the controller's memory in a completely non-dimensional form. Only in the virtual reality headset is this non-dimensional data displayed dimensionally as the very convincing illusion of a 3-dimensional space.
14. In the same way actual particles and interactions in the real world are data in the computational space of the quantum vacuum and it takes a brain to act as a headset to display this data dimensionally in its simulation of reality. Only then do we get the illusion we live in a surrounding 3-dimensional physical space.

15. OK, so if particle interactions create a spacetime compatible with both relativity and quantum reality how does this work?
16. First all particle interactions exactly conserve total mass-energy. The total mass + energy of all the particles entering any particle interaction is exactly equal to the total mass-energy of all particles coming out of the interaction. This is always true whether particles change into other particles or just scatter off each other. The total mass-energy coming out always equals the total mass-energy that came in.
17. Now this conservation of mass-energy produces dimensional relationships among the numeric positions and velocities of the particles exiting an interaction because their velocities are part of the total energy conserved.
18. These dimensional relationships are an example of *entanglement*. Entanglement is a universal principle that holds at all scales and is easy to understand with a simple example.
19. For example if a raisin chocolate chip cookie is broken into two parts, the two parts will become entangled on their ingredients

because the total amount of all ingredients is conserved. If we know the number of chocolate chips and raisins in one half we automatically know the number in the other half because they must equal the number in the original cookie. So the numbers in each half are related to the numbers in the other.

20. Thus we can say that the cookie breaking interaction causes the two resulting halves to become entangled on their raisins and chocolate chips.
21. So when mass-energy is conserved in particle interactions the resulting particles become entangled on their mass-energies. The resulting masses and energy of all emitted particles will have dimensional relationships to each other because their total must equal that entering the interaction that produced them.
22. So every particle interaction generates dimensional relationships among its resulting particles. And since all particles in the universe are part of a single universal interaction network dating back to the big bang there will be dimensional relationships among all the particles in the universe.
23. And because all *the objects in the universe* are composed of particles all objects in the universe become dimensionally interrelated.

24. Now the key to understanding the true nature of spacetime is to understand that this universal network of dimensional relationships among particulate objects is what our brains simulate as an encompassing physical spacetime.
25. All the objects in the universe actually consist entirely of data including the data of their dimensional relationships. Our brain samples this data by interacting with it thereby establishing our dimensional relationships with external objects. And then our brain projects all this data into the semblance of a 3-dimensional space around us within which it arranges the objects.
26. If we have a set of numbers representing the locations of objects the easiest way to make overall sense of it is to place the data in a 3-dimensional graph. This is exactly what our brains do. They take the data of the individual dimensional relationships of objects and construct an internal 3-dimensional graph called empty space and place all the objects within this graph. That enables us to make instant sense of the dimensional interrelationships of everything around us all at once even though it’s actually an illusion.
27. All observers including ourselves are part of this universal network of dimensional relationships because every observation

boils down to particle interactions between the observer and things observed that establish dimensional relationships among them. When we observe an object we are establishing a dimensional relationship between it and us.

28. Thus our brains take the numeric data of the universe sampled in our neurons and display it in our heads as a surrounding 3-dimensional space that makes it much easier for us to make sense of the world around us. It's an enormously useful evolutionary adaptation but it's completely illusory because the actual universe consists entirely of logical relationships among numbers in the computational space of the quantum vacuum.
29. So what our brain displays as a surrounding physical space is actually its internal graph of numeric dimensional relationships among objects. Spacetime is actually a data structure in our brain's simulation of reality that our brain tells us is a physical structure in the external world.

30. OK, this is how the spacetime we think we see around us is computed by particle interactions. And it automatically incorporates relativity because the dimensional relationships among particles are scaled by the amount of mass-energy present as they're computed.
31. This scaling automatically produces the correct curvature of spacetime by masses, or in the improved Deep Reality model the resulting intrinsic spatial velocity densification.
32. But we still need to incorporate quantum spacetime into this same model to unify relativity with quantum theory. How does this work?
33. To add quantum reality we just need to show how the fuzzy dimensionality of the quantum scale is computed by particle interactions at the same time it computes relativistic spacetime.
34. Now there's a very simple way to do this based on the processor model from the previous Deep Reality talk on the Computational Universe.
35. Recall from that talk that the universal processor computes relativistic space & time velocities simply by allocating a fixed number of processor cycles to compute every separate coherent process.
36. First the velocity in space is computed and then any left over cycles are used to compute velocity in time. In this way the total space plus time velocity of everything in the universe is always computed equal to c. The source of c is the fixed number of

processor cycles used to compute every process. This is how the key fundamental principle of relativity works.

37. So to incorporate quantum indeterminacy we just have the same *universal processor randomly oscillate between space and time velocities at the quantum scale as it computes the univers*e.
38. This simple addition to the universal processor model is sufficient to account for quantum indeterminacy and have the processor compute a spacetime that's compatible with both relativity and quantum theory, which is exactly what's needed to unify them.
39. Thus we have a simple model of a universal processor that simultaneously computes a unified quantum and relativistic spacetime. We have a working model of quantum gravity.

40. All right, so how do these random particle scale processor oscillations account for quantum indeterminacy?
41. The two key examples of quantum indeterminacy are the Heisenberg Uncertainty Principle and wavefunctions. The processor oscillations automatically explain both.
42. Take the Uncertainty Principle, which states that it's impossible to exactly measure the complementary variables of either energy and time, or position and momentum at the same time.
43. This is quite clearly telling us there's an intrinsic limit to how accurately time variables and space variables can be simultaneously measured which implies a random oscillation in how they're actually computed.
44. This is exactly what we would expect if the velocities of time and space were always being randomly conflated at the quantum scale as they were being computed.
45. It's as if we are trying to measure the time and space velocities of some particle by placing it on a graph where the space and time axes of the graph are constantly oscillating at the particle scale. If the reference graph itself is constantly oscillating it becomes impossible to get an accurate reading of how the particle is behaving in both space and time simultaneously. We can get an exact value of either at a single point in time but the value of the other will be uncertain at the scale of the oscillations.
46. So just introducing random quantum scale oscillations between space and time velocity as they are computed automatically gives us the Uncertainty Principle.

47. Now the other major example of quantum indeterminacy is wavefunctions.

48. Current interpretations of quantum theory think of particles as wavefunctions *in a preexisting space* and these wavefunctions are interpreted as the particle being smeared out in this space with some probability of being anywhere within its wavefunction.
49. But since there is no longer any preexisting space this interpretation of wavefunctions can't be correct.
50. The correct model is that the movement of particles is computed in computational space as simple data values, and it's only when these movements are dimensionalized in comparison to other particles that they look like wavefunctions.
51. This is demonstrated by the fact that the entire wavefunction itself has an exact spatial velocity and time evolution that reflects the computational movement of the underlying numeric particle. It's only the dimensionality *within* the wavefunction that's indeterminate; the wavefunction itself has an exact trajectory.
52. No wavefunctions do provide very accurate mathematical descriptions of quantum particles and are still valid, but their meaning is now reversed. Instead of describing particles smeared out in a preexisting space they actually describe how space may be dimensionalized as particle interactions create it. The equations are exactly the same, but the interpretation is turned on its head. In this manner Deep Reality remains consistent with the equations of quantum theory.

53. Now each particle interaction and the dimensionalities of the particles resulting from it are computed as a *coherent process* by *a new application* of the universal processor with its own unique random oscillation pattern. A *coherent process* is one computed by a single processor application with a single oscillation pattern.
54. Because they are computed by separate random oscillation patterns the dimensionalities of each coherent process will be indeterminate with respect to all others at the quantum scale of the oscillations.
55. This means that the dimensionalities of particles look like wavefunctions from the perspective of other particulate structures such as an observer or measuring instrument because wavefunctions accurately describe the oscillation patterns of their dimensionality as it's computed.
56. So the simple fact that each set of coherent particles produced by an interaction is computed by *a separate oscillation pattern* makes their dimensionalities indeterminate with respect to those of others at the quantum scale.

57. This is the computational source of wavefunctions, which are now properly reinterpreted as the probabilities of how quantum spacetime can be dimensionalized when particles interact.

58. OK, now there's just one more piece to complete the picture. When particles interact they must have exact dimensional relationships to each other for their mass-energies to be conserved. This means that their dimensional indeterminacy must be resolved to exact values for an interaction to take place.
59. This occurs through a process called *decoherence* which randomly selects mutually exact dimensional relationships from the two particle wavefunctions as they interact. This produces the exact mutual dimensionality necessary for mass-energy to be conserved in an interaction. Only through decoherence can mass-energy be exactly conserved so that particles can interact.
60. Now decoherence occurs because a particle interaction is computed by *a new processor application* with a new oscillation pattern that now applies to both interacting particles. The whole interaction including its resulting particles is now computed as a single coherent process with a new unique random oscillation pattern.
61. So a decoherence is a handoff from separate applications computing separate particles to a single new application computing their interaction and results. Two separate oscillation patterns are replaced by a single new oscillation pattern that resolves the dimensional indeterminacy to conserve mass-energy. The dimensional indeterminacy is resolved when the new application begins computing the interacting particles as a single new coherent process with its own new oscillation pattern.
62. So the interaction of two particles randomly resolves their dimensional indeterminacy with respect to each other to exact values. This used to be called *wavefunction collapse* before decoherence was discovered.

63. So we now have an overall model of the universal network of dimensional relationships produced by particle interactions that's consistent with both quantum reality and relativity.
64. The entanglement network of all particles in the universe consists of exact interaction nodes where particles decohere to exact dimensional values with respect to each other connected by fuzzy lines representing the relatively indeterminate dimensionalities of individual particles between interactions.

65. Some particle interactions occur rapidly but many persist through time. All the *particles bound in atoms and molecules* that make up most of the universe are interactions that persist through time in the entanglement network. The dimensional relationships of bound particles are a major contributor to the overall data structure of spacetime.
66. Now the entire entanglement network of all particle interactions throughout the history of the universe extends conceptually back to the big bang, but only the current present moment slice is the actual current universe. The current data state of all the current particles in the universe is the data that makes up the entire universe. This data makes up the entire observable universe and this data *is* the observable universe.
67. The entire observable universe consists of the data of all actualized particles and that's it. There's nothing else to it. This data includes the dimensional interrelationships among all particles coded in their numeric particle values.
68. Thus the current data of all the current particles in the universe contains both the structural and dimensional data of the entire universe. It's the actual data state of the entire current observable universe that encodes both all particle structures and their dimensional interrelationships. This is what our brains sample and interpret as physical objects in a physical spacetime, but in reality it's all just particle data.

69. Now the mutual dimensionalities of particles in interaction nodes are exact. This means that the overall dimensionality of the entire node network is exact at the classical level of human observation and at the level of relativity.
70. However the fuzzy particle lines coming out of every particle interaction take the form of wavefunctions in their dimensionalities because each is being computed by a different random processor oscillation that conflates their spatial and temporal velocities differently.
71. Thus the entire entanglement network of the universe consists of exact interaction nodes connected by wavy lines in the form of particle wavefunctions.
72. As wavefunctions decohere in new interaction nodes their dimensionalities exactly align with each other because their interaction is now being computed by a single new processor application with its own new oscillation pattern.
73. So the totality of all exact node interrelationships accounts for the exact dimensionality of relativity, while the fuzzy behavior of

particles between interaction nodes explains the dimensional indeterminacy of the quantum world.

74. This is how the dimensional spacetime that's constructed by particle interactions accurately explains quantum indeterminacy at the particle scale while becoming exact at the relativistic scale. And this is exactly what we observe in the world around us.
75. Recall that the source of the apparent incompatibility of quantum theory and relativity was due to their different models of a preexisting spacetime. So by replacing both these physical preexisting spacetimes with one computed in a manner consistent with both relativity and quantum theory we automatically achieve the long sought unification of relativity and quantum theory.
76. In essence the universe consists of myriads of quasi-independent *dimensional fragments* at the quantum level that are stitched together by successive particle events to create a consistent overall spacetime at the classical relativistic level.
77. Then in turn new particle interactions create additional fuzzy dimensional fragments waiting to be stitched together by subsequent decoherence events. And so the process continues forever dynamically creating relativistic spacetime at the classical level out of fuzzy dimensional fragments at the quantum level.

78. Now as promised this model also resolves the apparent paradoxical nature of the quantum world. Take the standard spin entanglement paradox. A particle interaction creates two particles that have entangled equal and opposite spins and they fly off in different directions. The spins of the particles are created as a new dimensional fragment that's inherently indeterminate with respect to a laboratory spin detector. So a measurement of one particle's spin can find it in any random orientation. But thereafter a measurement of the spin of the other will always find it in the exact opposite orientation.
79. This is now simply explained. The particle interaction that created the equal and opposite spins was computed as a coherent process by a single processor application with a single random oscillation pattern. The spins were exactly computed as equal and opposite within this dimensional fragment so spin would be conserved.
80. Thus the two mutually opposite spins were computed as *a completely independent dimensional fragment*, one of myriads that get stitched together to form a consistent spacetime at the classical scale.
81. Thus the spins were always exactly equal and opposite within their dimensional fragment as the particles moved away from the

event. However this exact spin relationship was indeterminate with respect to a spin detector not being computed with the same oscillation pattern.

82. Now the measurement of the first spin was a decoherence that randomly aligned the entire dimensional fragment *of both spins* with the detector. Since both spins were part of the same dimensional fragment the alignment of one with the detector automatically aligned the dimensionality of both with the detector.
83. So when the second spin was measured it was automatically found to be equal and opposite because its spin dimensionality had already been aligned with that of the detector.
84. So there was never any faster than light transmission from one particle to the other telling it how to align itself. It was just a matter of a single dimensional fragment encoding the opposite spins being aligned with the detector as one of the spins was measured.
85. The measurement of one spin automatically stitched the whole dimensional spin fragment into the already existing spacetime of the laboratory and detector.
86. And as to the problem of non-locality, in a computational universe without a preexisting physical spacetime everything is automatically non-local so non-locality is no longer paradoxical, it's normal.
87. This demonstrates how particle interactions creating spacetime automatically resolves the apparent paradoxical nature of the quantum world. Other examples are given in my books.

88. Now this talk is a simplified overview of the entire theory. Refer to my books on Universal Reality, especially Universal Reality 2.0 for the complete details.
89. The unification of quantum theory and relativity is an enormously important breakthrough that emerges naturally from the Deep Reality computational universe. And in turn Deep Reality has all sorts of profound new implications for time, cosmology, and even the nature of existence and consciousness. These will all be explored in upcoming Deep Reality talks. Stay tuned and subscribe to be notified…

4. TIME – WHAT IT REALLY IS & HOW IT REALLY WORKS

THE TWO KINDS OF TIME

1. Time and what it really is and how it really works has always been the greatest of mysteries. But now from the revolutionary new computational perspective of Deep Reality the true nature of time finally becomes clear.
2. To explain time we must explain both relativistic time and our existence in a present moment through which time flows, which is the most fundamental experience of our existence.
3. In Deep Reality talks 1 and 2 we discovered that the universe is a computational system driven by a universal processor that's the ultimate source of time, happening, and change in the universe. And that the universe continually recomputes every coherent process with a separate application of this universal processor.
4. Each app computes its process using the same fixed number of processor cycles. First cycles are allocated to compute any velocity in space and then any left over cycles are used to compute the internal evolution of the process, which is its velocity in clock time.
5. This fixed number of processor cycles results in everything in the universe being computed with a total space plus time velocity equal to c, the speed of light in a vacuum. This is the first of the two fundamental principles that underlies relativity.
6. So the fixed number of processor cycles used to compute every coherent process is the source of the uniform c velocity of the entire spacetime fabric that can be expressed either as velocity in space or velocity in time.
7. Now this means there are *two completely different kinds of time*. There's the processor cycle rate and clock time, which is computed by processor time based on the local amount of spatial velocity present.
8. Processor time is universal because the processor continually recomputes the entire universe in its current present moment including all local clock time rates.
9. So processor time continually runs at the same c velocity rate everywhere in the universe but clock time runs at different rates throughout the universe depending on the amount of spatial velocity present.
10. Whenever there's any spatial velocity present clock time runs slower than c and this is called time dilation.

THE REALIZATION OF TIME

11. Now we directly experience both these kinds of time. Our experience of the present moment is our direct experience of the processor computing the universe and us, and the flow of clock time through the present moment is our experience of the processor computing our local clock time rate depending on the amount of spatial velocity we have.
12. So *our fundamental experience of the passage of time through the present moment* is our *direct experience of the most fundamental process of the universe*, the universal processor continually recomputing our own being at velocity c. We directly experience the most profound and fundamental process of the universe in every second of our existence.
13. This is an enormously profound and wonderful realization, and it has all sorts of amazing implications. Realization is just a matter of understanding what we're actually experiencing.

THE ABSOLUTE SPACETIME METRIC

14. Now as the processor continually computes the universe it computes both the structural relationships of all particles and objects, and the dimensional relationships among all particles and objects.
15. Our brain then samples this data and displays it as a simulation of a surrounding physical space full of physical objects through which clock time flows. This works the same as a virtual reality headset that displays *data* stored in memory as a moving 3-dimensional world.
16. Now the universal network of all dimensional relationships forms an *absolute spacetime metric*. It contains all the dimensional relationships among all the particles and objects in the observable universe stored in the data of the particles themselves.
17. The important thing to understand here is that all ongoing dimensional computations *are computed with respect to* this universal metric. This means that all actual relativistic effects are computed with respect to the universal metric and become integrated with it.
18. So whenever there's any spatial velocity with respect to this metric there will be an actual slowing of the velocity of time to keep total space + time velocity equal to c.

19. And it's important to remember that spatial velocity includes the *intrinsic spatial velocity* objects experience within gravitational fields, which is the 2nd fundamental principle of relativity.

OBSERVATIONAL VERSUS ACTUAL TIME DILATION

20. Now this is the view of the computational universe *from the outside*. It's a god's eye view of how time actually works inside it.
21. But we aren't gods that stand outside the universe looking in. We live within the universe. This means we view the absolute spacetime metric from within it. And we all have some internal spatial velocity with respect to the metric either as linear spatial velocity or because we're in the intrinsic spatial velocity of a gravitational field. This spatial velocity means our clock time will be running slower than the universal c velocity.
22. So how does the fact we are moving within the absolute metric with slowed clock time affect our view first of our own time, and second the clock times of objects moving relative to us?
23. First whatever spatial velocity we have inside the metric slows our own clock time rate. Our *clock time* is no longer running at the c velocity of the processor because some of the total processor cycles are being used to calculate our velocity in space.
24. Now it's extremely important to understand the difference between the *processor c velocity of light* and the *actual local speed of photons of light*.
25. Light itself doesn't always travel at c relative to the absolute metric. *Photons* actually always travel at the *velocity of local clock time*, which can vary from location to location. For example light slows to a halt trying to escape from a black hole because the enormous intrinsic spatial velocity of its gravitational field slows clock time there to a halt. So the velocity of photons within a black hole also slows to a halt as well. This is why light can't escape from black holes.
26. So light photons always have a local velocity equal to the local clock time velocity. In the intrinsic spatial velocity of a gravitational field they don't actually move at the universal speed of light relative to the metric.
27. However even in a gravitational field every observer still observes light traveling locally at the speed of light because *both the velocity of light and the velocity of his clock time are slowed by the same amount*, and the local velocity of light is measured in local clock time.

28. This also means that every observer always experiences himself moving through clock time at the speed of light because both his light and his clock time are slowed by the same amount. This is always true no matter how much spatial velocity he has.
29. So an observer in the increased intrinsic spatial velocity of a gravitational field will have his local clock time slowed by the spatial velocity of the field but will still experience local light traveling at the speed of light, and himself continually traveling forward in time at the speed of light even though both light and his progress in time are actually slowed relative to the absolute dimensional metric.

COORDINATE CLOCK TIME

30. OK, this is how an observer within the metric views his own local clock time. But how does he view the clock time of other clocks moving relative to him?
31. Relativity calls an observer's own clock time his *proper time* and the time he observes on other clocks moving relative to him *the coordinate times* of those clocks. If another clock is moving relative to him its time velocity will appear to be slowed so that its total space plus time velocity still equals c.
32. Now the slowing an observer sees depends on the *apparent spatial velocity* of the clock *relative to him*. The moving clock will be observed running slower depending on its spatial velocity *relative to the observer*. This means different observers could observe the same clock running at different rates depending on its different amount of spatial velocity relative to them.
33. So if two clocks are moving relative to each other they each see the other clock moving with the same spatial velocity in the opposite direction, so each clock sees the other running slower! In this way both see the total space plus time velocity of the other clock equal to c.
34. Now obviously both observers can't be right because clocks can't actually run at two different rates at the same time.
35. This means that time dilation due only to *relative* spatial velocity among observers isn't an *actual relativistic effect* but only an *observational relativistic effect*. It vanishes with no trace as soon as the relative motion stops.
36. So *actual relativistic effects* are due to spatial velocity relative to the computational metric but *observational effects* are due to spatial velocity *relative to an observer*.

37. The difference is that actual relativistic effects are permanent and agreed to by all informed observers, whereas observational relativistic effects vanish as soon as the relative spatial velocity stops without any lasting effects.
38. So actual relativistic effects are with respect to the absolute dimensional metric but the often contradictory observational effects are due simply to relative spatial velocity with respect to an observer.
39. So recalling that relative spatial velocity includes both linear spatial velocity and any difference in the intrinsic spatial velocity of gravitational fields this explains all aspects of how clock time appears to observers in all cases.
40. Now the distinction between actual and observable relativistic effects is crucial because only the existence of an absolute dimensional metric enables us to accurately explain both the actual time dilation of the space-traveling twin and to solve the mystery of rotation.

SOLVING THE MYSTERY OF ROTATION

41. The existence of an absolute computational spacetime metric is a little understood aspect of relativity that not only solves the problem of why some spatial velocity produces permanent actual effects and some only temporary observational effects, but also solves the problem of what rotation is actually relative to, a problem that's been unsolved ever since Isaac Newton first posed it centuries ago.
42. Actual rotation is absolute in the sense that it self manifests by the presence of centrifugal force and the resistance to tilting of the axis of rotation, which is why gyroscopes work.
43. But the question was what is rotation actually relative to that makes it behave this way? We might think rotation is relative to the surface of the earth but this can't be true because the earth's surface curves, and a gyroscope maintains its same orientation no matter where it's moved.
44. Over 100 years ago Max Planck suggested rotation was with respect to the aggregate mass of the universe but there's no known principle of science or relativity that explains why this should be true so it's remained a mystery.
45. It turns out that Planck was correct but only Deep Reality shows why. He's correct because the dimensionality of rotation like everything in the universe is computed with respect to the absolute dimensional metric, which is the metric of all particles in

the universe and thus all the mass in the universe. So rotation turns out to be another example of an actual as opposed to an observational relativistic effect.

46. So by measuring both what specific spatial velocities result in how much actual time dilation, and exactly what orientation rotation is relative to we can discern the actual form of the absolute dimensional metric around us, which would otherwise be invisible. Rotation and actual time dilation are how the absolute dimensional metric reveals itself.

THE PRESENT MOMENT & THE ARROW OF TIME

47. Now it's important to note the little known fact that relativity itself confirms the existence of a present moment and also explains the arrow of time. So relativity itself actually requires the existence of a present moment and an arrow of time.
48. The fundamental principle of relativity is that everything in the universe is computed with a total space plus time velocity equal to c. This means that everything in the universe *continually travels through combined space and time* at c. Nothing is static.
49. And *this means* that everything must be *at one and only one position in both space and time* at any moment. And the one position anything is in time is clearly its present moment. This is how relativity itself proves the existence of a present moment.
50. Now the current present moment of every *individual thing* in the universe is the single universal current present moment of everything in the universe. It's the single current universal present moment in which the entire universe exists.
51. This is easy to understand because in every successive current present moment of *mine* everything else anywhere in the universe must always be doing something. Thus there must be a common current universal present moment in which everything exists at the same time.
52. And in addition the familiar twin example also proves a universal present moment because the twins always *part in a shared present moment* and always *meet again in another shared present moment.* This is true even though their clock times ran at different rates during their separation. This conclusively demonstrates that all observers share a common universal present moment through which their individual clock times can flow at different rates.
53. Now the arrow of time has long been a fundamental mystery. Why does time flow, and in only one direction? Deep Reality reveals the simple solution. Because the single universal processor

continually computes the entire universe with cycles running in the same direction all the local clock times it computes also flow in the same direction. This is the source of the arrow of time. We experience this as the arrow of our own local clock time flowing through the present moment.

54. Now some believe the arrow of time is due to increasing entropy but this is clearly false because entropy varies widely throughout the universe with no connection whatsoever to how local clock time varies.
55. And entropy isn't even fundamental because it depends entirely on the distribution of forces in the universe, which can change. For example in an initially static universe the ultimate entropy state would be a single universal black hole, but in a universe with an ever accelerating Hubble expansion the ultimate entropy state is a vast nearly empty universe, just the opposite.
56. So the arrow of time has nothing to do with entropy. Its source is the fundamental principle that everything in the universe is continually moving at c, the speed of light in a vacuum, through spacetime, the same fundamental principle that underlies relativity and the present moment as well.
57. Additional discussions and proofs are given in my books.

THE UNIVERSE IS A 4-DIMENSIONAL HYPERSPHERE

58. Now the computational concept of two kinds of time has many important implications. For one thing it reveals that the overall geometry of the universe is a 4-dimensional hypersphere.
59. Our 3-dimensions of space are the surface in the current present moment, and the radial dimension is processor time extending back to the big bang at the center.
60. It's important to understand that the entire universe is only the 3-dimensional *surface* of the hypersphere *in the current present moment*. The past radial dimension and spatial surfaces no longer exist. All that exists is the entire current universe in the current universal present moment. Our entire observable universe is just the 3-dimensional *surface* of a 4-dimensional hypersphere.
61. Thus the universe is 4-dimensional but it's time dimension contains only a single actual point, the point of current processor time. The continual ticking of the processor continually recomputes the entire surface in the single point of the next current present moment.
62. And as it's recomputed every point within the surface is computed with a total space plus clock time velocity equal to c. This

produces the different local clock time rates of all the different processes within the surface.

63. But all these local clock time rates exist only in the current present moment surface and have nothing to do with the continual uniform extension of the radius, which is due to the fixed processor rate of present moment time.
64. So each *set of processor cycles* creates *one tick of present moment time* as it computes the next surface of the hypersphere.
65. So the surface continually expands from one layer to the next due to the progressive passage of processor time extending the radius.
66. Now note that the radius extends uniformly in processor time but the spatial surface has expanded at different rates throughout its history, most notably during the inflationary period right after the big bang.
67. So how can a uniform lengthening of the radius produce different rates of expansion of the surface? The key is to understand that the extension of the radius is due to ticks of processor time but the *expansion rates of the surface are measured in clock time*. And since processor time can compute different clock time rates this isn't inconsistent. How this actually works will be explained in the upcoming Deep Reality talk on Cosmology.
68. And again we directly experience this fundamental recomputation and expansion of the universe in our own being in our experience of a present moment through which our local clock time flows.

VISUALLY CONFIRMING THE HYPERSPHERE

69. Now amazingly we can also directly confirm the 4-dimensional hyperspherical geometry of the universe with our own two eyes. We actually see it opened before us.
70. We actually see down the past radial dimension of the hypersphere in all directions from every point in its 3-dimensional surface. The further we look, the further back in time we see. So with powerful enough telescopes we can actually see back over 13 billion years down the past radial dimension to when our universe was still young. This is exactly what a hypersphere looks like from the inside, so when we look out in any direction the universal hypersphere is revealed before us!
71. Of course the past universe we see back then no longer exists. We see what it looked like back then because light from there is just now reaching us. What's actually going on now at those distances is unseen and unknowable.

72. In actuality all those most distant parts of the universe now exist in the same present moment we are experiencing right now. There's just no way for us to see what's actually happening there because it will take its current light billions of years to reach us.

TIME TRAVEL

73. And finally this new understanding of how time really works reveals the actual truth about time travel, and debunks supposed paradoxes like going back in time and killing your mom before you were born, and for that matter the impossibility of changing the past in any way at all or ever visiting it.
74. Since the entire universe exists entirely within the current universal present moment in which the universal processor is recomputing it there's just no past to travel back to or change. Time travel to the past is simply impossible because the past just doesn't exist. So sadly no going back to view dinosaurs or improving the present by changing the past.
75. But we are *all* time travelers. We all continually travel forward in time at the rate our local clock time is being computed, which is the local speed of light. The passage of clock time is us traveling forward in time at the local speed of light. So we all do continually travel forward in time.
76. But as we all continually travel forward at our local clock time rates we continually remain in the universal present moment as its recomputed tick by tick across the entire universe. We continually remain in the present even as we travel forward in clock time because the current present moment is all that exists and clock time's computed within it.
77. So there's no traveling to another present because no other present actually exists than the one we're currently in. The entire universe exists only within the current present moment so there's simply no other place to go. It's simply impossible to ever leave the present because it's all that exists. All that currently exists is the entire universe in the current universal present moment. Outside this there's not even nothing.
78. So it's completely impossible to travel to any *actual* past or future because there are no actual pasts or futures. They simply don't exist.
79. However we can travel through clock time at different rates *within the present moment* depending on our spatial velocity. This means we can age slower or faster as the present moment progresses

depending on our spatial velocity. So time travel is possible in this sense if it's properly understood.

80. For example a time traveler could theoretically take off from ancient Rome 2000 years ago and travel at a high velocity through space to slow his aging and return to earth today not too much older than when he left. So an ancient Roman could land his spaceship today and give us an eyewitness account of life back in ancient Rome, or from any time or place in the past for that matter. And he could show us his photos and videos from there as well.
81. Only in this sense is time travel possible. Colloquially some might say he traveled to the future but actually he just traveled *through the present* much more slowly *for 2000 years* until he landed back on earth.
82. So also with the right spaceship we could depart earth today, travel at high velocity through space and arrange to return at any time in the future we wished.
83. But again we aren't actually traveling to the future in this scenario. We are simply remaining in the present moment at a much slower clock rate for much much longer. Because time passes so slowly on our spaceship we could live long enough to return to earth many years or centuries hence.
84. So when we understand the truth about time travel we immediately see there are no possible paradoxes where someone could go back in time and kill his mom before he was born. This is simply not possible because there's no actual past to return to. Once computed the past is forever fixed and unalterable. Deep Reality makes the universe consistent again.

SPACE TRAVEL

85. Now our new understanding of time also reveals how long distance space travel is theoretically possible within a single human lifetime.
86. The faster a spaceship travels in space the slower it travels in time. So if we travel fast enough through space approaching the speed of light, our velocity in time can slow to almost nothing and we would hardly age at all.
87. For example to travel the ~25,000 light years from earth to the center of the galaxy assuming a constant 1g acceleration and deceleration, the same as earth's gravity, would take only 19+ years by clocks on the spaceship even though it would take a little over 25,000 years on clocks back here on earth. So even a round

trip to the center of our galaxy could easily be made within a single human lifetime by the clocks of the space travelers.

88. So traveling vast distances in space in very little time is certainly theoretically possible. However the necessary propulsion system and the near impossibility of avoiding collisions with interstellar objects at near light speed makes it questionable.

CONCLUSION

89. OK, so this wraps up the Deep Reality talk on time - what it really is and how it really works. We've covered the two kinds of time, present moment time, and the clock time it computes, how clock time behaves under various relativistic conditions, and revealed the implications for time and space travel, and the geometry of the universe. All this and much more is covered in much greater detail in my book Universal Reality 2.0.
90. But there are many more amazing insights to come in the next Deep Reality talk on cosmology including a completely new understanding of black holes, dark matter, dark energy, and why we may be living in a big bounce universe.
91. Stay tuned and subscribe to stay informed…

5. A NEW UNDERSTANDING OF DEEP COSMOLOGY

1. In this Deep Reality talk on Cosmology we'll explore the implications for black holes, dark matter, dark energy, the expansion of the universe, and the reasons we may be living in a big bounce universe. We'll begin with what's really inside black holes.

BLACK HOLES

2. In Deep Reality talk 1 we discovered the two fundamental principles that underlie relativity and reveal the nature of the spacetime fabric.
3. 1. All processes in the universe have a total space plus time *vector* velocity equal to c, the speed of light in a vacuum.
4. 2. Masses are fields of intrinsic spatial velocity in the form of minimal scale vibrations of space itself. Objects in gravitational fields feel the intrinsic spatial velocity of the field, which slows their velocity in clock time. So mass and energy are forms of *spatial velocity* and all forms of *spatial velocity are forms of energy*. Refer to Deep Reality 1 for the details.
5. Combining these two principles we get a single universal principle that the total mass-energy plus clock time velocity at every point in the spacetime fabric equals c.
6. This means that the fabric of spacetime is a uniform field of c valued velocity, which can take the form of either velocity in time or velocity in space, and any velocity in space is always some sort of energy. And energy always reduces the velocity in time so their vector sums equal c. This is why the presence of mass-energy slows clock time.
7. Now these principles immediately reveal what's really inside black holes. Black holes are uniform spherical volumes of spacetime with an intrinsic *spatial velocity* equal to c. They are the maximum possible density of mass & spatial velocity.
8. And because the spatial velocity within a black hole is c the velocity of clock time is zero.
9. So black holes are uniform throughout, there are no singularities at the center where the laws of physics break down. And there's no vanishing of mass out of black holes into another universe or dimension. These are errors based on the fiction of an infinitely compressible spacetime.

10. Now the atomic matter inside black holes collapses at least to neutrons just as it does in neutron stars because the intense gravitational pressure overcomes the mass deficit of protons plus electrons relative to neutrons, and all protons and electrons combine into neutrons. Thus all the atoms in a black hole collapse to the size of their nuclei and a black hole is essentially a single huge uncharged atomic nucleus.

THE UNIVERSAL HYPERSPHERE

11. Now recall in the previous Deep Reality talk on Time that the universal processor continually computes the universe as the 3-dimensional *surface* of a 4-dimensional hypersphere. The 3 dimensions of space are the surface, and processor time is the radial dimension stretching back to the big bang at the center.
12. The processor continually adds ticks that lengthen the radius and the surface gradually expands. This results in the gradual Hubble expansion of space.
13. Now it's important to understand that the radius extends tick by tick in *processor time* but the Hubble expansion of the surface is measured in *clock time*.
14. So since processor time computes different clock time rates based on the amount of spatial velocity, and the amount of spatial velocity has varied enormously over the history of the universe, the surface has expanded at very different *clock time rates*.

INFLATION & THE HUBBLE EXPANSION

15. Now Deep Reality proposes a very simple and reasonable scenario for the expansion of the hypersphere.
16. First, the big bang was an *actualization event* where the original particles of the universe actualized out of the quantum vacuum.
17. Now recall from Deep Reality 2 that *particle interactions* create the dimensional relationships among particles that our brains simulate as spacetime.
18. So as soon as particles appear they begin to interact and this automatically creates a spacetime large enough to contain them. The dimensional spacetime universe is born from the computational interaction of particles.
19. Now assume for the moment that the particles initially have enormous heat energy. We'll explain why later on. Thus their

interactions cause them to fly apart at near light speed due simply to their momentum.

20. So the initial expansion of space is enormously rapid. The entire universe expands at near light speed spatial velocity.
21. This drops the overall *clock time rate* of the universe to almost nothing. Thus the initial enormous expansion takes almost no clock time at all. This initial enormous expansion is called *cosmic inflation*.
22. Now the fact that the overall clock time rate was almost zero makes it seem that inflation occurred almost instantaneously in clock time when eons of processor time ticks were actually used to compute it.
23. So inflation actually took an enormous amount of processor time but almost no clock time. This is consistent with inflation expanding the universe from essentially nothing to cosmic dimensions in less than a second. Thus the radial processor time dimension lengthened to cosmic dimensions even as almost no clock time passed. The radial dimension of the hypersphere grew at a rate much faster than its clock time rate.
24. In this view inflation was due simply to the *momentum* of the enormously hot interactions of big bang particles and nothing more. There's no need for an unknown inflaton field to explain inflation, it's simply that the slowing of clock time to almost nothing makes it seem to have occurred almost instantaneously.
25. Now over time the expansion of the universe gradually slows and as expansion slows the average *spatial velocity* of the universe drops increasing its *overall clock time rate* to what it is today.
26. Today the Hubble expansion of the current universe is enormously slow, and only measurable over vast cosmic distances. This means the lengthening of the radial dimension is also enormously slow.
27. Now the processor runs at an unimaginably rapid rate, far faster than the fastest particle interactions because it computes them all.
28. So tick-by-tick the processor extends the radial dimension at an unimaginably rapid rate, but each extension is unimaginably minute to account for the enormously slow expansion of the surface.
29. So in this model the entire expansion of the universe is due to the original momentum of the big bang. That's it, a very simple and reasonable theory that seems to explain the facts.
30. Now the initial enormous lengthening of the radial dimension of the hypersphere during inflation means the age of the universe in processor time ticks is enormously older than its 14 billion *clock time years.*

31. This means the entire universe is enormously larger than the *observable universe* within the particle horizon.
32. And this means the *curvature* of the 3-dimensional surface is extremely small. And this is consistent with current measurements of the curvature of space that indicate it's very nearly flat.
33. So this aspect of Deep Reality leads to the testable prediction that space has a very slight positive curvature, and that the actual size of the entire universe is vast and is measurable from its curvature including the size of the unobservable part beyond our particle horizon.
34. Now there's also an apparent very slowly *accelerating Hubble expansion* attributed to *dark energy*. But first we need to understand *dark matter* and how that works.

DARK MATTER

35. Dark matter is necessary to explain the apparent missing mass of the universe revealed by the unexpected rapid rotation of the outer arms of spiral galaxies, and the strength of gravitational lensing. The amount of dark matter necessary to explain this is around 5x the amount of ordinary matter in the universe, a very large amount indeed.
36. Current theories of dark matter all propose new types of particles beyond those of the standard model but Deep Reality suggests a much simpler and more reasonable explanation that seems to fit the facts quite well.
37. In their standard treatise on Gravitation, Misner, Thorne, and Wheeler explain on p. 719 that the Hubble expansion of the universe is uneven. Only the empty space *between galaxies* is expanding, but the space *within galaxies* is gravitationally bound and doesn't expand.
38. This obviously means there's an uneven expansion of the fabric of space around galaxies – which is precisely where dark matter is required to explain their rotation! Now an uneven expansion produces warps in the fabric of space, and warps in space are precisely what gravitational fields are. So the uneven expansion of space produces additional gravitational fields around galaxies that explain the dark matter effect.
39. This very simple and obvious explanation of dark matter I proposed in 2013 has additional advantages as well. First there are no particles involved so it's automatically dark and unobservable except for its gravitational effects just as dark matter is. Second it

doesn't require any new particles outside the standard model so no new physics is required.

40. And once dark matter masses are produced they can move under gravitational forces just as galactic masses can, which explains why dark matter is found in other areas near galaxies as well.
41. This new dark matter theory is testable by simulating the movements of galaxies and dark matter fields. Dark matter should be observed being initially created around galaxies and then moving around under gravitational forces.
42. Now note the very interesting fact that if this model is correct the amount of dark matter in the universe *continually grows at a slow exponential rate* because as dark matter is created its additional gravitation leads to ever more warping of space as the universe continues to expand.
43. And this is in fact consistent with recent evidence from the European Southern Observatory suggesting that the amount of dark matter in the universe has greatly increased over time. (http://www.eso.org/public/usa/news/eso1709/).
44. Now this theory may or may not account for the entire dark matter effect but given the enormous expansion of the universe since the big bang the uneven expansion of space should be producing a huge gravitational effect. So if it's not the dark matter effect what else could it be?

DARK ENERGY

45. Now if the amount of dark matter is increasing with time this has some very interesting implications because it means the total gravitation of the universe is increasing which should eventually slow its expansion.
46. And it also suggests that the apparent current accelerating expansion of the universe could be an observational illusion, and if this is true then dark energy may not even exist!
47. This boils down to how the rate of expansion is measured. Type 1a supernovae all explode with the same brightness. Thus their apparent brightness's can be used as standard candles to measure their distances.
48. Next their redshifts are used to measure the rate at which they're receding from us which is used as an indicator of how fast space at that distance at that time in the past was expanding.
49. Then by comparing the apparent recession rates at various times and distances we get a picture of how fast space has expanded over time, and the picture that emerges seems to indicate that the

expansion of space has been very gradually accelerating over the past 5 billion years.

50. But if the amount of dark matter and thus the amount of gravitation is increasing over time this creates a problem with the measurements because the space we see closer to us has existed longer and will have denser dark matter gravitational fields on average.
51. Now light takes longer to traverse stronger gravitational fields because it has to traverse their curvature (in the Deep Reality model their intrinsic vibrational peaks and valleys).
52. This means that light from standard candles travels farther than their nominal distances closer to us. So there'll be a slightly greater gravitational redshift as the standard candle light traverses the space closer to us that will be mistaken for a very slightly increased more recent Hubble expansion.
53. As a result more recent Hubble expansion rates will seem to be greater than they actually are compared to earlier ones. And this effect in itself could be sufficient to make it seem like an extremely small acceleration is occurring when it actually isn't. In other words dark energy may not actually exist because it could be an observational effect produced by the ongoing increase in the amount of dark matter increasing the average gravitation closer to us in time.
54. Whether this is enough to eliminate the extremely small dark energy effect is unclear but it should at least reduce it. The jury's still out and further study is needed.

THE HYPERSPHERE IS EMERGENT

55. Now while the hypersphere is a very useful concept up to a point it's extremely important to understand that the observable universe is not a *physical hypersphere*, nor is the hypersphere *even actual* in the sense that it's an independently stored data structure.
56. The hypersphere is actually just the *emergent structure* of the entire network of dimensional relationships among particles when viewed at cosmic scales.
57. All the actual data of the universe is stored as individual particle values including their dimensional values. There is no stored hypersphere that exists anywhere.
58. However when all the dimensional relationships among all individual particles are viewed in aggregate they assume the *emergent form* of a hypersphere since the gravitational attraction

of all masses in the universe curves its overall geometry into a closed hyperspherical surface.

59. Emergence is easy to understand by analogy to a TV screen where the actual data is only the individual pixel colors, and the show *emerges* from the relationship of all the individual pixels in aggregate.
60. In the same way the entire observable universe is an emergent structure that emerges from the *data interactions* of all individual particles. Just like the TV show it's actually only the individual values of its elemental data and the whole picture *emerges* only to an observer able to see it in aggregate.
61. So all the particle interactions in the universe create the entire emergent structure of the universe bottom up following the elemental rules of the complete fine-tuning operating over evolutionary time scales.
62. So the observable universe consists entirely of individual particle data and the hypersphere is a structure that *emerges* from the relationships of particle data in aggregate.
63. Specifically this means the hypersphere is not an independent *causal structure* in which the continual extension of the processor time radius *causes* the 3-dimensional surface to expand. This is just a convenient fiction that makes some things easier to visualize.
64. There actually is no processor time *radius* at all. The 3-dimensional surface is a valid emergent structure but the form of its cosmic geometry derives from the overall scaling of particle interactions by the presence of mass-energy. It isn't directly expanded by the passage of processor time. The emergent spacetime surface is just created large enough and in the correct closed hyperspherical geometry to contain all the particle interactions that create it.
65. So the passage of processor time continually recomputes the surface but doesn't physically create a radius that expands it.
66. This enables us to understand how the continual passage of processor time can compute an observable universe that eventually begins to *contract* in a possible big bounce universe.

A POSSIBLE BIG BOUNCE UNIVERSE

67. Now if dark energy is an artifact of the increasing amount of dark matter and doesn't actually exist, or even if it does exist but is weaker than the exponential increase in dark matter, this leads to a very interesting conclusion.

68. Basically from the beginning the universe has expanded simply as a result of the original momentum of the big bang, which means its rate of expansion has gradually slowed from inflation to the current enormously slow rate of the Hubble expansion.
69. However the continuing expansion gradually increases the amount of dark matter formed by the uneven expansion of space around both galaxies and previous dark matter. So the total amount of gravitation in the universe continues to grow at a slow exponential rate.
70. Eventually the increase in gravitation overcomes the expansion. The expansion stops and the universe begins to contract. And as the contraction proceeds gravitation becomes more and more concentrated and the universe begins an increasingly rapid collapse towards a single universal black hole.
71. So at some point in the future the universe collapses into a single universal black hole that swallows all the atoms in the universe converting them to neutrons. And since all the spacetime in the universe is maintained by particle interactions the entire dimensional universe outside the universal black hole collapses into it and vanishes.
72. The universal black hole is a volume of uniform c valued intrinsic spatial velocity in which clock time comes to a stop. As a result all particle interactions cease and since particle interactions hold compound particles together all the neutrons in the black hole dissolve into their quark-gluon plasma.
73. Now interestingly this instantly converts 99% of the gravitational mass of the universe into pure heat energy. This is because the total mass of the quark and gluon components of neutrons is only 1% of the neutron's mass. The rest of neutron mass is due to the incredible spatial velocities of their quarks and gluons.
74. So the net effect is that at least 99% of the mass of the universe is instantaneously converted into heat energy in the most enormous possible nuclear explosion.
75. This conversion of 99% of the gravitation of the universal black hole into heat energy instantly creates a new white hole big bang. Clock time restarts and a new universe begins expanding through a new cosmic inflation and Hubble expansion until it too creates enough dark matter to reverse its expansion and collapse back into another universal black hole – white hole transition.
76. In this way the universe continually undergoes big bounce cycles that presumably continue forever.
77. This is a wonderfully imaginative and potentially testable theory based on two perfectly reasonable mechanisms that automatically

create big bangs and gravitational collapses in a never-ending cycle.

78. Note that only a *universal black hole* produces a new white hole big bang because spacetime is maintained outside *individual black holes* by myriads of particle interactions.
79. So spacetime only collapses into a universal black hole when all the particles of the universe fall into it. And since clock time has stopped within the black hole, this allows its internal spacetime metric to collapse as well including the dimensional structures of compound particles. Only at this point can neutrons dissolve into their elemental quark-gluon plasma.
80. And this is what converts the *gravitation* of the universal black hole to an equivalent amount of *pure heat energy* that provides the momentum for the expansion of the next universe.
81. The gravitation to heat transition also resets the *maximum* entropy state of the universal black hole to the *minimum entropy state of the ultra hot big bang*, which solves the problem of how the initially minimal entropy state of the big bang could possibly have originated, a problem that's troubled Penrose and others.

CONCLUSION

82. This concludes the Deep Reality talk on Cosmology. Much additional detail can be found in my book Universal Reality 2.0.
83. In the next Deep Reality talk we'll discuss the amazing consequences of emergence and information cosmology.
84. So stay tuned, and subscribe to stay informed!

ADDED AS A COMMENT ON THE TALK

85. Note that the big bounce theory also neatly solves the problem of why the universe is composed of regular matter rather than antimatter. It's simply because the matter of each successive big bounce is created from the quark gluon plasma of the previous bounce which is ordinary matter that doesn't contain anti particles. This is important evidence in support of the big bounce theory.

6. EMERGENCE & INFORMATION COSMOLOGY

EMERGENCE

1. The classical scale universe of our daily lives is *emergent*. It emerges from the continual interactions of countless myriads of individual elementary particles.
2. This means the actual elemental data of the computational universe is just the data of elementary particles that's continually updated by their interactions, and the enormous richness and variety of all the *complex particle structures* we see around us are *relationships* among groups of particle data viewed *in aggregate*.
3. All compound structures in the universe are emergent. *We* are the emergent structures of *our* elementary particles, and everything else is the emergent structure of its elementary particles. So everything above the elementary particle level is emergent. In particular dimensional spacetime is an emergent structure created by particle interactions as explained in Deep Reality talks 2 and 3.
4. In a computational universe emergence means that the data of emergent structures isn't independently stored. The only data that's actually stored is the data of elementary particles and their particle components.
5. Emergent structures are the *data relationships* that emerge from groups of particle data viewed in aggregate. They can't even be recognized except by other emergent structures including human observers.
6. Emergence can be easily understood by an example. Assume the universe is a vast 3D TV screen and the colored pixels are the actual stored data of the elementary particles. And assume these pixels continually interact according to the laws of the complete fine-tuning that govern the universe.
7. Over time the continual interaction of all the pixels on the screen will gradually produce the entire universe of stars, planets, inanimate objects and eventually life. Humans will evolve and begin to live out their lives on the screen.
8. But all the while the only actual data was always just the individual pixels on the screen. All the compound structures existed only as forms produced by the pixels. And these emergent forms are visible only to observers able to view groups of pixels in a meaningful way.
9. The information is all there but it's only stored in the individual particle data. Thus the combined data of all individual particles is

the data of the entire observable universe including its emergent structures.

10. So our TV shows the entire history of the universe but only an observer able to see the relationships among the pixels will be able to make sense of it.
11. All the individual pixels are just blindly interacting with their neighbors according to the rules of the complete fine-tuning and have no idea at all what countless myriads of them are computing in aggregate.
12. This is how emergence works. The universe continually recomputes its complete data structure but only at the individual particle level. Out of these computations emerges the complexity of the entire universe based on the extremely simply but incredibly profound rules of the complete fine-tuning. The universe consists only of the individual data of elementary particles but over evolutionary time scales this computes the entire emergent complexity of the observable universe.

REALITY MATH VERSUS HUMAN MATH

13. Now the great beauty of this model is that it enormously simplifies the design of the universe, because now only a single elemental program that computes individual particle interactions is sufficient to create the entire universe.
14. So all the enormously complex equations of science are just *descriptions* of the universe at the emergent scale, but don't actually compute it. Thus the computational logic and math of the universe becomes enormously simpler than the human math and science that describes it at the emergent scale. The elemental program that computes the entire universe is relatively quite simple.
15. This means there are major differences between *human math* and *reality math*. Reality math is just the relatively simple logic and math needed to compute particle interactions. Human math discovers and generalizes the basics and then explores their nearly inexhaustible implications but these have no necessary connection to the actual logic and math of the computational universe.
16. In particular infinities and infinitesimals aren't necessary to compute particle interactions in a finite universe with a minimum granular scale. Other differences are explored in my book Universal Reality 2.0.
17. Thus the actual computational universe becomes much simpler, and the great complexity of the universe of science is mainly

descriptions of its emergent structures rather than the computations that compute it. Much of this complexity arises in the manner in which particle interactions create spacetime.

CONSISTENCY & COMPLETENESS

18. Another important implication of the design of the computational universe is it must be logically consistent and logically complete. If a computational universe produced logical inconsistencies it would tear itself apart, and if it were logically incomplete it would pause in its computations and cease to exist.
19. But the computations of the universe are like those of a typical computer program in this respect. They always produce a consistent subsequent state from the previous state and all states throughout the entire history of the universe are always logically and mathematically consistent because the axioms of the complete fine-tuning are consistent. So unlike human mathematical systems Gödel's Incompleteness Theorem doesn't apply to reality math or the computational universe. The computational universe is completely consistent and logically complete.
20. And this has important implications for the nature of the complete fine-tuning that underlies it.

THE COMPLETE FINE-TUNING

21. Computational systems must be based in a set of consistent logical rules. We can call the complete rules necessary to compute the entire observable universe *the complete fine-tuning*.
22. The complete fine-tuning is all the virtual data necessary to compute the entire universe. This includes the elemental structures such as what particle components exist, and which combinations form valid particles, the elemental constants like c, the speed of light in a vacuum, and the charge strengths, and the logic and data manipulation operators used by the elemental program.
23. The *elemental program* uses the operators, constants and structures to encode the logico-mathematical rules used to compute all particle interactions.
24. The rules that compute the entire universe must exist somewhere as virtual data. The realm of virtual data is the quantum vacuum. So all the virtual data of the complete fine-tuning exists within the quantum vacuum, which is the realm of all virtual data.

25. Now the entire observable universe of actualized particles emerges from the quantum vacuum and depends upon the virtual data of the quantum vacuum to maintain its existence. So it makes sense to think that the entire observable universe also exists within the quantum vacuum as its actualized data.
26. In this view the quantum vacuum is all that exists. It contains two realms, the realm of the virtual data of the complete fine-tuning and the realm of the actualized data of the observable universe that the virtual data computes.
27. The observable universe consists of the actualized data of the elementary particles and particle components and the implicit interrelationships produced by their computational interactions that are the emergent structures of the universe. This is the design of the entire universe of the quantum vacuum in a nutshell.
28. Now the virtual data of the complete fine-tuning is observable only through its effects on the observable data, and the observable data of the observable universe is observable in the sense that its processes can interact. This is because all observations are interactions, and all interactions can be considered generic observations.
29. So to properly understand the emergent universe and how it works we need to understand what the elemental data is, how it's computed, and the nature of the emergent universe that emerges from its interactions.

THE ELEMENTALS

30. First *the particle components that form particles* are the elemental data of the universe rather than the particles themselves.
31. The reason is that particles often transform into other particles when they interact, but the amounts of their *particle components* are always conserved with only a couple of rare exceptions.
32. The particle components that make up elementary particles are identity (for example baryon and lepton numbers), mass and the other force charges, spin, spatial & temporal parity, and a few others.
33. Putting these particle components together in the right combinations forms all known particles, and in every particle interaction these particle components are conserved rather than the particles themselves. Thus they are clearly more elemental than the particles they form.

34. So the particle components are the elemental data types from which the entire universe is constructed. They are the little data bits of reality.
35. We must also add the *numeric* positions and velocity of particles in computational space to the elemental particle data as these are necessary to conserve total mass-energy in all particle interactions, and distinguish among particles of the same type. It's these relative positions and velocities of particles that in aggregate our brains simulate as dimensional spacetime.

STRUCTURAL RULES

36. Now the main determinant of how particles interact is the conservation of their particle components including mass-energy and the balance of the 4 fundamental forces that determine their binding energies. These are set in the complete fine-tuning and determine the emergent structure of the universe.
37. The best example is how the balance of electromagnetic force strength and the conservation of energy determine how atoms and molecules are formed.
38. Electrons and protons are attracted to each other due to their equal and opposite charges. They want to combine to form neutrons, but they usually can't because energy must be conserved in all particle interactions and the combined mass of a proton plus electron is less than that of a neutron. So a large amount of additional energy is necessary to form neutrons and this is usually only available in the extreme gravitational forces of neutron stars or black holes.
39. So without additional energy electrons fall towards protons but they can't combine and they can't escape either. As a result electrons are trapped in specific harmonic standing waves around protons called orbitals depending on their energy.
40. Electron orbitals are all the possible harmonic standing waves electrons can form around protons. It's very simple, and how these orbitals are filled produces all the different possible atoms and molecules that determine the entire structure of the universe.
41. Each different harmonic wave has a different energy and this is why electrons have quantized energies in atoms, which led to quantum theory and is also the source of their spectral lines.
42. So only the very finely tuned *relative masses* of protons, electrons, and neutrons permit all the matter in the universe to exist. Only slight differences in these masses would make atomic

matter and the entire universe impossible. This is only one example of the exquisite tuning of the complete fine-tuning.

43. Now a fairly small set of similar rules determines the packing of protons in nuclei by the strong force and the other fundamental rules of particle interactions that create all the emergent structures in the universe.
44. And these rules are all encoded in the elemental program that computes all particle interactions.

EMERGENT STRUCTURE

45. So emergent structures include all the compound data structures above the elementary particle level.
46. Elementary particles emerge from particle components; compound particles from elementary particles, atoms from compound particles, molecules from atoms, chemicals from molecules, and materials from chemicals. So all the incredibly complex structures of geology, planets, stars, galaxies and the entire observable universe including the biological structures of life and ourselves emerges from the simple rules of the complete fine-tuning.
47. But this entire universal structure is actually computed in the form of a single highly connected universal entanglement network which is the emergent structure containing all implicit relationships among all the particles in the universe.

DOMAINS & THINGS

48. When examined more closely this entanglement network takes the form of *computational domains*. Domains are fuzzy, hierarchical, overlapping areas within the entanglement network distinguished by computational similarity, density, or relative action and motion. So domains are distinguishable emergent areas within the entanglement network but aren't completely discrete independent entities since the entire entanglement network is strongly connected through particle interactions.
49. Now humans and other species base the discrete *things* we think in terms of on these naturally occurring domains in an *ad hoc* manner depending on the task at hand.
50. For example an ocean is a single body of water characterized by myriads of overlapping domains of currents, tides, waves and ripples. However surfers see the ocean in terms of individual

waves, oceanographers in terms of currents, and smelt in terms of tides. This is how living programs base the *discrete things* in their simulations on naturally occurring computational domains in the entanglement network.

51. Another example is the domain of a forest which consists of myriads of overlapping domains of trees, species, branches, twigs, leaves, etc. any of which could be considered a discrete individual thing by humans depending on current interests.
52. How humans use things and the *logic of things* to compute their simulations of reality is described in more detail in my books.

HIGH LEVEL EMERGENCE

53. Now domains and things can be categorized as inanimate or animate. Humans and all other living beings are examples of animate emergent processes.
54. But emergence holds at all levels. So the great sweeps of cosmology, evolution, and human history are all emergent processes. And no doubt there are many emergent processes far beyond the limited comprehension of our human brains.
55. So there's an immense overlapping hierarchy of processes continually recomputing their domains from the subdomains that compose them. Human history is the aggregate computational effect of the actions of all individual humans over time. And the evolution of the earth is the aggregate computational effect of the continual interactions of all its individual particles over 4.5 billion years.

EMERGENT PROGRAMS

56. Now each emergent process can be considered an *emergent program* that continually recomputes its data state in interaction with the other programs that make up its computational environment. And in interaction all the programs in the universe compute the entire evolution of the universe.
57. This is a valid way to consider the emergent universe so long as we remember that programs are based on overlapping hierarchies of intrinsically fuzzy domains and always somewhat arbitrary.
58. Emergent programs are programs in the same sense as computer programs. Like computer programs the only actual computations are those of the elemental operations. The high level program is

the *emergent effect* of the organized sequences of all the elemental computations in aggregate.

59. So the important takeaway is that emergent programs and data structures are just ways of viewing a single universal entanglement network in terms of individual things and processes. So it's important to understand the structure and implications of the entanglement network from the point of view of *information cosmology*.

INFORMATION COSMOLOGY

60. It's useful to define *forms* as *meaningful units* of data or in-*form*-ation. The word *form* emphasizes structure whereas *information* emphasizes content but structure and content are identical when it comes to information.
61. So basically *data* is the raw data of the universe whereas *forms* connote units of data meaningful to some observer or process.
62. In this view the universe consists entirely of forms. Individual forms continually emerge, trans-form, split, combine, and dissolve into other forms depending on their computational interactions with the other forms that constitute their computational environments.
63. Now forms continually interact with other forms, and these interactions *alter* the interacting forms. An interaction is always an alteration of some sort. The alteration of a form by an interaction is the form's 'experience' of that interaction. So all interactions of forms can be considered *generic experiences*.
64. *In particular all forms carry information about other forms they've interacted with in the alterations produced by those interactions*.
65. Living programs have evolved to augment generic experience by developing *specialized data structures* that alter in response to interactions with other forms in a manner that represents *knowledge* of those other forms.
66. These specialized data structures are the *simulations* by which living programs model themselves within their environments to facilitate their functioning. Living programs are characterized by having internal simulation models of their environments. The human mind is a simulation. The Simulation will be explored in Deep Reality talk 7.
67. The alteration of forms in the simulation is the essence of *knowledge* because it encodes information about the forms that

produced the alterations. And in this universe the transmission of information by forms about other forms is incredibly rich.

68. The *Sherlock Holmes Principle* is the communication of information about non-present forms by proximate forms. The Sherlock Holmes Principle is the basis of all knowledge, including scientific and forensic knowledge.
69. A great example of this incredible richness is the spectra that enable us to deduce the chemical composition of both near and distant objects simply from the forms of light they emit or absorb.
70. The manner in which individual forms evolve is governed by the General Principle of Evolution. Forms that are *computationally adaptive* in interactions with other forms tend to resist change and persist.
71. So the *Darwinian principle of evolution* is simply a special case of this general principle that applies to individuals of species that tend to propagate their kind.
72. Another important point of information cosmology is since all forms experience each other in their interactions, the universe can be said to consist entirely of generic observers continually observing each other. And in this sense the universe observes or experiences itself into existence and becomes aware of itself through the continual interaction of its forms. And it becomes *consciously aware of itself* through the experiences of the living programs it creates.
73. In this way Deep Reality incorporates the concept of observer into its fundamental structure.

BEYOND THE ANTHROPIC PRINCIPLE

74. Another important consequence of information cosmology is that once the past has been computed it's completely fixed and can never be changed, not even in the slightest detail. The precise actual results of every quantum process were completely fixed as they were computed. So the entire logical structure of the *past history* of the universe is now completely exact and determined down to the minutest detail. It can't be changed in any way whatsoever.
75. By contrast the future hasn't yet been computed so its possibilities are probabilistic. And the present is the current moment in which the current actual observable universe is being computed from its previous exactly fixed data state.
76. This means the universe isn't a *causal structure*. Causality applies to a physical universe not to a computational universe. Adding 2 +

2 doesn't *cause* 4, it *computes* it. So the entire past universe is an exact and consistent computational structure, not a causal structure.

77. In particular this applies to the exact structure of the *complete fine-tuning* that's the original data structure of the universe. This means there's simply no possibility whatsoever of any other complete fine-tuning than the one that's existed since the big bang. The current actual state of the entire history of the computational universe that was computed from the complete fine-tuning completely *falsifies* even the possibility of any other complete fine-tuning.
78. In addition the complete fine-tuning exists because it, and perhaps only it, can produce a logically consistent and complete computational universe, which is absolutely required for the universe to exist. For a computational system to be consistent its axioms must be consistent. Certainly many of the details of the complete fine-tuning are necessary for consistency such as its precise logico-mathematical structure.
79. So this is the solution to the supposed *Anthropic Problem*. Why do we live in a universe with a complete fine-tuning that makes it just right for intelligent life?
80. The answer is that any other complete fine-tuning is simply impossible. That's all there is to it…
81. The fact we can *imagine* other possible complete fine-tunings in no way implies they must exist or have actually formed complete other universes! This is an incredible fallacy and the height of irrationality. And it's the ultimate in non-parsimony to imagine that because we can't yet explain a small set of values that myriads of entire other universes pop up to include all other values!
82. And since this is the reason for most of the speculation about multiple universes there just isn't any valid reason to think multiple, pocket, bubble, or multiverses actually exist.
83. Faced with the problem of why something is the way it is, the rational approach is to solve the problem, not to imagine googles of other possible universes suddenly appear!

OVERVIEW

84. Now if there are big bounces as proposed in Deep Reality 5, each stochastically evolves a new emergent universe that's a new variation on a fundamental plan implicit in the complete fine-tuning since the beginning.

85. While the basic principles remain the same the details will vary widely depending on the quantum randomness that continually tweaks the progress of evolution. So emergence can play out in many different random ways within the overall plan.
86. However in each universe emergence tends to converge towards basic end states hidden implicitly within the complete fine-tuning, such as the evolution of life, and eventually some form of intelligent life. This is the principle of *convergent emergence* though the particulars depend on myriads of random quantum events.
87. These are the greatest questions. Does the universe somehow evolve towards a state of increasing self-awareness by creating more and more sentient beings as organs to become aware and conscious of itself or does it evolve in some other unforeseen direction?
88. One might like to think it ultimately evolves towards a design of increasing universal sentience and compassion, but the evidence for that remains unknown.
89. One last consideration is the possibility that the particular data evolution of each successive big bounce somehow feeds back to tweak the complete fine-tuning of the next one, and in this way could successive big bounce universes gradually evolve towards some ultimate unknown end?

CONCLUSION

90. This concludes our Deep Reality talk on Emergence and Information Cosmology. Much more is to be found in my book Universal Reality 2.0.
91. Stay tuned for the next Deep Reality talk on *The Real Simulation*. And subscribe to stay informed….

7. WE ARE THE ROBOTS OF OURSELVES

INTRODUCTION

1. We are the robots of ourselves. We are autonomous, free willed, sentient, purposeful, intelligent, biological robots living our lives in a simulation programmed by our brains.
2. And when we understand how our robots work we can operate them more effectively to improve our lives and achieve our goals. We become able to formulate more reasonable and positive goals, and correctly valuate the cost benefits of achieving them.
3. So in this Deep Reality talk we'll explain how our robots work, and the secret to operate them effectively.
4. We are robots in the sense we are complex *computational systems* designed to operate according to the instinctual imperatives transmitted in our DNA from our parents.
5. So we are the *running programs of ourselves*. We share the basic functional design of all robots including the *electronic robots* we create. However we are *biological robots* designed by eons of evolution based in the fundamental rules of the complete fine-tuning that govern the universe.
6. Our programs are incredibly complex. We consist of billions of simultaneous computations from those of all our individual elementary particles, cells, tissues, organs, and homeostatic systems up through our brains and nervous systems. We *are* this wonderfully designed computational system in its entirety continually computing our existence. We are the living robots of ourselves and we remain fully human.
7. Fundamentally we are the *emergent structures* of the continual interactions of all our elementary particles. And it's only because our elementary particles have the organization they do that we emerge as ourselves rather than a stone, a baboon, another person or anything else.
8. Our computational design is the cumulative result of eons of evolution of living beings. Simply because certain designs were better able to function and survive within their environments they were the ones that passed on their designs to successive generations.
9. Thus the design of our robot has been honed by evolution to function effectively within its environment and here we are, the living biological robots of ourselves operating autonomously within our environments, and even improving our environments to improve our lives.

DESIGN

10. Now the basic *systems design* of electronic and biological robots is quite similar. Even though the *hardware* is very different they must have the same basic *functional design* to operate effectively in the same real world governed by the same laws of nature. Even details like self-awareness and consciousness are ultimately just a matter of the number and organization of feedback circuits.
11. Thus the design of our robots is the same basic systems design for any successful autonomous organism and it's used to design electronic robots as well.
12. In order for a program to act purposefully it must encode the elements of its environment, its purpose within its environment, and how to effect that purpose within its environment.
13. Thus living organisms are characterized by *purposeful control systems* that sit atop the computational system of their biological body to control its behavior. These control systems are encoded in the brains and minds of biological organisms.

FUNCTIONAL STRUCTURE OF CONTROL SYSTEM

14. The functional components that enable an organism to operate autonomously and purposefully include the following systems.
15. **The boot up system** is the basic firmware encoded and passed in DNA to new organisms as they're created. It contains the code used to construct and maintain the body and operational system of the new organism, which are effectively its hardware and software.
16. **The instinctual imperatives** are also encoded and passed in DNA. These are the fundamental rules that encode the purpose of an organism and guide its actions.
17. All organisms are born with the instincts necessary for them to survive. The only way this is possible is for those instincts to be encoded and passed in DNA from generation to generation. This is an obvious insight from the computational perspective of Deep Reality that appears to have been totally overlooked by evolutionary biology.
18. The basic instinctual imperative is to generate actions that result in feedback the organism valuates as positive and avoid feedback it valuates as negative. Operationally this translates into a hierarchy of instincts, primarily those of survival and procreation.

Under survival are the instincts of eating, drinking, and avoidance of predators and personal injury. Species specifics include suckling and bonding with mothers in baby mammals, quickly learning to walk and run in newborn herbivores, nest building in birds, and seeking the sea in newly hatched sea turtles.

19. There's also a vast range of species specific instinctual mating behaviors that produce feelings valuated as highly positive in the organisms that have them.
20. Some instinctual imperatives like suckling and mate seeking are age dependent and together define an organism's purpose at all stages of its life.
21. Conflicting instincts may lead to one overriding another when valuated higher as in male-male fights over mating privileges when avoidance of injury overrides the desire to mate. Instinctual imperatives are largely fixed but putting them into action generally involves complex intelligent behaviors.
22. **The data input system** is the sensory and perceptual systems of an organism that receive data from external sources and from internal feelings. The data input system functions as tuned antennae and perceptual filters to extract information of potential value to the organism from the huge mass of raw data in its environment. These systems are especially tuned to detect motion, predators, prey and other food sources, and family or group members from the background. They involve extensive pattern recognition to organize sensory input into things, processes and dimensional relationships. It includes recognizing the meanings in animal cries, behaviors, odors, food tastes, and in humans it also includes the pattern recognition of written words and symbols. This information is then presented to the control system for processing.
23. **The control system** is the central operating system that coordinates and runs all the other systems. It continually updates data storage memory with new data input, and translates plans to actions on the basis of valuations in furtherance of the instinctual imperatives. The control system is massively parallel and mainly operates at the unconscious level.
24. **The simulation** is the organism's internal data model of itself within its environment and is continually updated on a microsecond scale to reflect ever-changing conditions. This is the stored data memory of an organism. It consists of short-term memory the data of the conceptual present moment; working memory, the data being used in current computational processes; and long-term memory, the archive of historical data.
25. Data is generally stored as organized information structures in the

form of things, characteristics, relationships, processes, actors, actions, and events. It includes the information of the internal concept of self within an external world. The underlying organizational principles of this data are stored in the form of the underlying rules by which the world and its actors and processes are perceived to function. These rules constitute *the logic of things* by which organisms understand how they and the world operate at the classical scale. It also includes the belief systems and worldviews that organisms view the world in terms of, often at the expense of accurate knowledge.

26. *Knowledge* is the internal consistency of a simulation over the broadest possible scope. We have no direct knowledge of external reality but we can test the accuracy of our simulation of reality through its internal consistency over the widest possible scope. A computational universe must be logically consistent, so an accurate simulation of it must also be logically consistent. And if actions computed on the basis of a consistent simulation also produce expected real world results, that confirms the accuracy of knowledge in the simulation.
27. **The learning system** continually reorganizes the data input and storage systems and attempts to improve the richness and logical consistency of relationships by extracting, analyzing, and updating their organizational principles. The learning system is especially important during childhood as it constructs the simulation from the ground up from experience. It also enables the organism to continually learn and improve its understanding of the underlying logic of things by which the simulation appears to operate. However there are limits to how much the simulation can be improved by the learning system, since beliefs formed during childhood are often resistant to facts.
28. **The emotive system** generates excited emotional states of various tonalities in response to circumstances valuated as important. Adaptively this system is designed to energize appropriate responses to important situations. However if negative situations can’t be resolved the emotive system may become maladaptive leading to anxiety and depression.
29. **The valuation and meaning system** continually assigns meanings to data relative to the organism and valuates them against instinctual imperatives and possible actions. This prioritizes situations and possible responses.
30. **The planning system** imagines and projects future states and different possible actions within them. It plans actions based on prioritized meanings and valuations among imagined possible situations and actions and their probable effects. This involves

intelligent analysis and decision making based on the logic of things.

31. An organism's *functional intelligence* is its ability to accurately deduce the consequences of logical situations in its simulation to improve its decision-making. As my father used to tell me, 'Life's an intelligence test'. Functional intelligence is a major determinate of evolutionary success and most successful species have high functional intelligence. Human functional intelligence is revealed by overall life style. IQ on the other hand is a measure of how well one does on IQ tests and humans with very poor life styles can have high IQ's.
32. *Wisdom* is high functional intelligence combined with the ability to extract information relevant to a particular situation from the broadest possible simulation of experience.
33. *Free will* is the generation of actions in response to but not completely determined by external events. Our control system exhibits *free will* in two ways. First all computations in the universe are subject to quantum randomness including those of our own program. This means the actions of our program aren't completely determined by external events. Our robot responds to situations in the external world but isn't determined by them.
34. We have the feeling we have complete free will because thoughts and plans just pop into consciousness as if our consciousness *had* those thoughts. But thoughts have to come from where they are computed. And almost all are actually being computed by our planning system at the unconscious level. And then our focus of attention system pops them into consciousness, and our consciousness thinks it had those thoughts.
35. Our degree of free will is the number of possible viable choices we can imagine and select among. Our freedom lies in the richness of our possible choices. Only to the degree we have rich viable choices are we truly free.
36. Second, our free will is enhanced by a planning system that predicts possible alternate futures and then selects among alternate actions in response. The random quantum basis of this planning and decision-making endows it with free will. Our conscious decision-making system can also slightly override our unconscious decisions, though almost all decisions are actually made at the unconscious level and consciousness acts mainly in a minor quality control and guidance function.
37. **The action system** translates plans made by the planning system into actions from the simplest bodily movements to complex plans involving multiple action sequences. Actions in progress are also actively monitored and corrected by perceptual and motor

feedback through the planning and control systems.

38. **The focus of attention routine** is a specialized subsystem that monitors unconscious processes in the simulation and informs the organism that it's *experiencing* those processes. It generates the information that threads of representational information in the simulation are being experienced. The focus of attention routine scans the simulation like an adjustable spotlight with a central focus and an area of peripheral illumination. This routine is the basis of consciousness as explained in an upcoming Deep Reality talk on *Existence, immanence and Consciousness*.
39. We tend to identify with our focus of attention routine and conscious mind, but we aren't just our consciousness in a physical body but our entire computational systems down though every particle interaction of every one of our biological structures. And we run automatically and almost entirely at the unconscious level.
40. *Intuition* is the emergence into consciousness of computations being made at the unconscious level. Almost all mental computations are made at the unconscious level in a massively parallel process. The focus of attention routine is a largely linear process that continually pops individual unconscious thoughts into conscious awareness. This happens all the time, but if it has some particular unexpected relevance we call it an *intuition*.
41. **The biological processor** drives and coordinates all the computational processes of the organism and is the source of its biological clock rate. It produces the experience of everything taking place within a flow of clock time at a perceived rate unique to the organism. This is a *massively parallel processor*. There's too much information being computed within our robots for it to be otherwise. In turn it's driven by the universal processor that simultaneously computes all the data states of the entire universe.
42. All parts of the control system are overlaid on top of and integrated with the computational processes of the somatic body. The computations of the somatic body are all the actual particle interactions that emergently produce the functions of cells, organs, muscles, and hormonal, circulatory, digestive, pulmonary, reproductive, and repair systems. The operational control system is based in the nerves and brain and becomes an integral part of the processes of the total organism. All these systems work together in computational harmony to operate the entire organism. Together they *are* the total program of the organism. This entire resulting program is the biological robot of our self. It's who we actually are.
43. Though all living computational systems are based on a functional prototype, there are innumerable variations across species and

individuals from single celled organisms through advanced beings such as humans and everything in between.

44. But even single cell organisms are programs and information structures that include some information of themselves within their environments, and have computational systems that enable them to function more effectively than random chemistry, and this greatly improves their survival. This ability to function purposefully rather than randomly is the essence of life, and is the key to the success of life.

OPERATING YOUR ROBOT

45. Our consciousness is here to guide and exercise quality control over the otherwise automatic operations of our robot.
46. When we understand how our robot works we realize we have much greater control over it than we thought, and that it's much more intelligent and capable than we imagined.
47. Our robot's been designed by eons of evolution to optimize our lives within our environments and we just need to give it a chance to fulfill its purpose. This is done by giving it the best possible care and guiding but not hindering its own highly intelligent and capable operations. Just by lovingly directing it towards what needs to be done and letting it do its job unimpeded it will usually come up with optimal solutions and actions.
48. Just point it at the problem and let the unconscious work freely to solve it; see what pops into consciousness and encourage this process without criticizing or suppressing it
49. Give it strong, intelligent, and enlightened guidance and let it do its work. Pose the problems to the unconscious and let it operate and return suggestions to consciousness.
50. Realize your robot's purpose is to serve you and optimize your existence and that it's enormously intelligent and capable of doing so.
51. We can exercise much greater control if we just actively guide our robot rather than just letting it run on automatic in habitual patterns or forcing into actions it resists.
52. The key is to break out and try new things and explore new ideas and situations to find what you and your robot really like best. In this way we use our robot to gain greater control and improve our lives.
53. Give your robot's planning system free rein to think outside the box and formulate entirely new and better goals and viable options to achieve them. Take the time to analyze how your own

robot works and how you can help it work more effectively to improve your life.

54. When we're born the universe gives us our own robot to operate and carry us around. It gives us the most exquisitely wonderful and highly capable living robot imaginable and it's up to us to learn to operate it to its full capacity to achieve what we want from our lives.
55. Yet most of us just let our robots run more or less on automatic and sink into a routine life of perpetual drudgery rather than taking full advantage of the wonderful robot we've been given.
56. The universe gives us just one single robot to live out our lives within. But we often don't take proper care of it. We don't treat it right, let it rest and repair itself, or do the things that really make it happy and healthy. We don't give it the love and care it deserves.
57. We are riding in our robots. They are our loyal beasts of burden. They faithfully carry us around throughout our lives with complete loyalty never leaving our sides. They deserve our greatest appreciation and the best possible care. We should love them and take the best possible care of them and continually reward them for their loyalty and service
58. We are the robots of ourselves and together we can live happy productive lives that have a lasting positive influence on the world. In an ultimate sense we and our robots are an organ of consciousness and action the universe has created to better know and improve itself. This is our ultimate purpose and this is the end towards which we should operate our robots.

CONCLUSION

59. This concludes the Deep Reality talk on The Robots of Ourselves. Our entire being is an enormously complex computational system acting autonomously, freely, and purposefully as a running program in a computational universe full of running programs. We are our programs continually computing our existence the best we can in accordance with our instinctual imperatives within the real constraints of our environments.
60. We are the biological robots of ourselves. We are free, sentient, intelligent, emotive computational systems programmed by eons of evolution to live our lives according to our programs. We are fully human, and this is what our humanness is.
61. Stay tuned for the next Deep Reality talk on The Real Simulation and subscribe to stay informed.

8. WE LIVE IN A REAL SIMULATION

THE WORLD IS NOT AS IT APPEARS

1. We live in a simulation, a real simulation. The world we experience our entire lives within isn't the real actual world, and even we aren't our actual selves.
2. The bright colorful world of physical objects in 3-dimensional space we see around us simply doesn't exist. It's a complete illusion that's being computed by a program. We're a virtual being living in a virtual reality.
3. But this simulation isn't being programed by an alien programmer in a movie but by our own brains. Our own brain *is* the alien programmer that programs our simulation. It constructs both ourselves and the entire world we see around us and places us inside that world to live out our lives.
4. Our brain constructs its simulation of reality from the raw abstract data of actual reality, reorganizes it into simple logical structures, and then paints those structures with meanings and appearances to create the illusion of the bright physical world we see around us.
5. So the bright physical world is actually a virtual world playing out in our brains, and our brains project it into the virtual reality we think we see around us.
6. So the world we experience is a huge illusion. It's a virtual reality being computed by our brains. Our brains tell us it's real but this is an enormous trick.
7. However all is not lost. There is a real world beyond our simulation and our simulation is a part of that world and embedded within it. This real world consists entirely of programs continually computing their data, and our simulation is just one of those programs continually computing the data of ourselves.
8. And because our simulation is embedded in the actual world we can discover the true nature of the actual world by discovering how our simulation obscures it.
9. Our simulation must obviously have sufficient logical correspondence with the real world for us to function and survive within it.
10. So our brain samples the *logic* of the real world and builds its simulation on this logical framework.
11. But then it extensively *colors* these logical structures with *meanings and appearances* to make them seem more interesting and useful.

12. So our brain's simulation of reality isn't arbitrary but a finely tuned *evolutionary adaptation* designed to help us function more effectively in actual reality by making it easier to compute.
13. But in doing so it completely misrepresents the true nature of reality and hides it within multiple veils of illusion. And only when we understand these veils of illusion and how they work are we able to lift them and discover the deep reality revealed within.
14. So all the *appearances* of the world are illusions created by our brains. And we can confirm this by removing them one by one to discover the true nature of the actual world that underlies them all. There we find the actual world is computational and everything is the data of what it is and nothing more. All else is appearance and exists only in our simulations of reality rather than reality itself.

OUR PERSONAL PROGRAMMING

15. The first of our simulation's veils of illusion is our personal programming.
16. Our programs are learning systems that learn from our experiences beginning in infancy. Thus our simulations are highly programmed by our parents, peers, and the media and culture of our society.
17. As a result our simulations are heavily programmed with the beliefs that compose our personal worldviews.
18. These include the full spectrum of often misinformed and even delusional belief systems, prejudices and ideologies based on ethnic and gender identities, religious beliefs, interpersonal relationships, and political and interest affiliations. All these beliefs become incorporated into our simulations and are projected back onto reality as if they were actually real.
19. This also includes the notion of an objective morality, an objective good and evil. Morality and ethics are social constructs that evolved to help stabilize societies. These aspects of human culture are highly adaptive because they tend to suppress interpersonal conflicts that destabilize social order. But as aspects of personal programming morality and good and evil aren't objective attributes of reality.
20. All this extensive personal programming makes it increasingly difficult for people to recognize the true nature of reality within their overly cluttered simulations. And because people think their simulations are reality they tend to act in accordance with their personal programming even at the expense of common sense and well-being.

21. In essence there are two kinds of people, those who realize they've been programmed and try to transcend their programming, and those *who think they are their programming*. Unfortunately most people fall into the second category. Such people have little chance of realizing the true nature of reality even though it lies clear before them.
22. In particular our personal programming includes the *desires and attachments* that Buddhism rightly identifies as the source of emotional suffering.
23. Because personal programming is learned behavior it can be reprogrammed and brought closer to objective truth. There are two basic methods that help do this. The first is to make conscious circular negative thought chains and break them by replacing weak links with links that connect to positive thought chains.
24. The other method is simply to ignore them and let them gradually fade away. By become mindful of the presence of a dysfunctional chain one can just let it pass on its own without attaching attention or importance to it. As humans we all have desires and attachments, but the key is *not to be attached to our attachments*.
25. When we realize we are our running program we find we have considerable ability to reprogram it and make it happier, healthier, and more successful. We can potentially change our personal programming as much as we like, within the constraints of reality of course.

SPECIES-SPECIFIC ILLUSIONS

26. All species view the world through their sensory and perceptual systems, and conceive of the world in terms of their own conceptual structures and these vary widely among species. Thus every species views the world differently, and every species thinks its simulation is actual reality. But since every simulation of every species and individual is different none can be true representations of reality including our own.
27. The sense organs of different species are tuned to enormous ranges of sensory information. Different species pick up widely different ranges of light and sound waves, chemical odors and tastes, and they pick them up with greatly different resolutions. And many species have sensory organs humans completely lack.
28. But in all cases species base their simulations of reality on the particular range of sensory information they're tuned to receive.
29. And then their very different conceptual structures use this sensory input to construct very different simulations of reality.

30. In this way the simulations of bees, jellyfish, eagles, sharks, and humans are all very different. But in all cases each species is completely convinced that the world its simulation creates is the actual reality they all share when this is clearly impossible.
31. Thus each species experiences its simulation as reality and none, including humans, experience it as it actually is. Even if we know better intellectually we can't help looking out at the world *of our sensations* and thinking that's the way the world actually is, but nothing could be further from the truth.

SINGULARITY ILLUSIONS

32. As individuals we're only at one place and time at once, in only one orientation, scale, motion, and perceived clock time rate at once. But reality itself has no intrinsic position, orientation, scale, motion, or clock time rate. This makes it impossible to experience the true actual nature of reality.
33. As individual observers we experience the world entirely from the perspective of our *own singularity* and relative to ourselves. As a result we think reality exists in terms of a perspective relative to us but this isn't true.
34. In reality the universe exists from no perspective at all and from all possible perspectives at once. It's perspective independent but able to accommodate all possible perspectives. It's what's called a *frame independent structure*.
35. Now the only frame independent structures are logico-mathematical. In fact the great beauty of the equations of relativity is they're frame independent. This means everything is expressed in terms of relationships with other things rather than with respect to any absolute reference frame. This allows any observer to overlay his own reference frame, and all frames produce equally valid views.
36. Thus the positions, scales, orientation, motions and perceived clock time rates of objects within the universe are all characteristics seen by individual observers and vary widely among observers.
37. This means the universe *itself* has no position, scale, orientation, motion, or perceived clock time rate.
38. So the universe is very different when viewed by an ant, an elephant, or a human. Sizes aren't actual aspects of reality.
39. And the universe has no orientation since orientation depends mainly on the gravitational orientation of the observer, which will be upside down to observers on opposite sides of the planet. Thus

things have no intrinsic orientation though we always imagine them having one relative to our bodies.

40. Every organism has its own biological clock rate and perceives the clock time rate of all events relative to its internal rate. Thus fast reacting organisms like flies and chipmunks perceive events happening at a slower rate than we do, and elephants and great whales perceive them happening at a faster rate. The perceived internal clock rate is roughly related to the size of organisms and the time it takes for nerve impulses to move across the body.
41. So all these dimensional aspects of the universe we think are intrinsic are actually observer dependent and exist only in the presence of an observer. Thus the universe itself simply has no locations, scales, orientations, or perceptual clock time rates. These aspects of dimensionality are all aspects of observer simulations that simply don't exist in reality.
42. And the only way this can be true is if the universe is a frame independent computational structure consisting entirely of data.

THE ILLUSION OF APPEARANCES

43. The world we see around us is a world of appearances painted over a colorless logical structure. The logical structure is sampled from the actual world but every last appearance is produced by our brains.
44. Cognitive scientists are well aware of the fact that all appearances are products of our brains. They call them *qualia* and recognize they are private experiences that exist only in our own minds.
45. However they never seem to understand what this implies about reality. Reality itself simply has no appearances, and this can be true only if the universe is computational and consists entirely of data.
46. Reality itself simply has no colors, odors, sounds, tastes or touches. These are all created by our simulations and painted over the logical structures we sample from reality to make it more interesting and meaningful and easier to compute.
47. We think of the world around us as a colorful world full of sounds, shapes, textures, odors, and tastes but every one of these is created in our simulation and doesn't exist in reality itself. Of course photons of various frequencies exist, particle structures transmit sound waves, and molecules carry the information we interpret as odors and tastes but it's our simulation that interprets these as colors, sounds, odors and tastes.

48. Our simulation creates appearances from our *interactions* with the raw data of reality, paints them over the data structures, and then projects them back out into a virtual world it itself constructs.
49. And our simulation tells us the simulated things out there in its virtual reality are real actual things that have colors and textures, and produce sounds and smells when the entire world of appearance is actually produced in our brains, and produced very differently in the brains of other species.
50. Thus all the appearances of everything in the world without exception are illusions produced by our simulation. Actual reality and everything within it simply has no colors, textures, odors, or tastes. The world of appearances is a complete illusion.
51. And when we subtract all the appearances from reality we're left only with running programs computing data confirming what all the evidence suggests. When we remove all colors, smells, tastes, sounds, feelings, and other appearances from reality all that's left is their data.
52. So appearances are information about how our program *interacts* with external reality and the entire world of appearances is an illusion.

THE ILLUSION OF THINGS

53. In the previous Deep Reality talk on Emergence we discovered how the *discrete things* in our simulation are actually based on fuzzy, overlapping, hierarchical *domains* in the entanglement network, and how they are seen differently by different species and individuals.
54. This means the way we tend to think of reality in terms of individual things, characteristics, processes, actors, actions and events is an illusion constructed by our simulation.
55. Actual reality consists of myriads of raw overlapping patterns and one of the main tasks of the simulation is to extract discrete meaningful things from these patterns.
56. This is called *pattern recognition* and it's been studied for years to enable robot vision to extract meaningful things from fluid visual backgrounds.
57. Simulations use pattern recognition algorithms to construct individual things from raw sensory input. This is highly adaptive as it enables living organisms to use the relatively simple *logic of things* to compute their actions within their environments.
58. Thus the world full of discrete physical things we seem to see around us is just another illusion created by our simulation.

What's really out there is myriads of raw data patterns, and every species makes sense of it in very different ways. The things and relationships that fleas, birds, humans and roundworms see the world in terms of are all very different.

59. Even the visual appearances of things are illusions based on the structures of our eyes. Light in the external world isn't focused into images of things. Images are only constructed by eyes with lenses. There are no images of things in actual reality. Actual reality is raw data devoid of things.

THE ILLUSION OF SELF

60. One of the most interesting *things* the simulation constructs is the objective self. The fact that our objective selves are illusions has important implications for the nature of the true self, as we'll see in the Deep Reality talk on *Realization*.
61. The objective self, like most other *things* is constructed in infancy through a process of pattern recognition and updated throughout our lives.
62. In other species this process doesn't develop to the extent it does in humans but nevertheless they manage to function quite well in their own simulations of reality. So the objective self isn't a necessary aspect of the simulation. However it's quite clear that all organisms must compute their actions in term of a self that's distinct from the world to survive. Fulfilling their instinctual imperatives depends on this distinction.
63. The objective self includes the concept of our physical body. This only developed to its current level with the advent of mirrors, and later photography and video, which allowed people to see themselves freely as objects. These technologies created a much stronger identification of self with the mental construct of the physical body.
64. Prior to the modern obsession with objective self we thought of ourselves much more as animals do in terms of the subjective self of our direct experiences, perceptions, feelings, actions and thoughts as *experienced from the inside*. This is much closer to our true identity, which is the *totality of direct experience*.
65. So our concept of ourselves as an objective thing with a physical body is as much an illusion as the other things in our simulation. These are concepts that are useful in computing our functioning but they're fundamentally misleading illusions that obscure the true deeper nature of reality.

THE ILLUSION OF A PHYSICAL WORLD

66. The illusion of a physical world consisting of physical objects in a physical spacetime is one even science is unable to shake. This is atavistic considering what physical actually means in science.
67. Physical is ultimately just a label for something having mass, energy or dimensionality. But as we've seen in previous Deep Reality talks dimensionality is simply the consistency among dimensional data generated by particle interactions. And mass-energy is simply numeric spatial velocity within that consistency. Even atoms are known to be almost entirely empty, so even these last bastions of physicality reduce to the information of what they are.
68. But our minds still tell us the world is a physical world so how can this be? The answer is that the apparent physicality of things just depends on their information structure. And with a little practice we can look at things and actually see they are just the information of what they are.

EVERYTHING IS THE INFORMATION OF WHAT IT IS

69. All we need to do is carefully analyze anything physical into all its separate information components such as its color, shape, texture, heft, etc. And then just mentally remove those information components one by one to see what's left without them.
70. We quickly discover that after all the information content of anything is removed there's simply nothing left of it. It's completely gone! So the apparent physicality of things is simply a *combination* of the kinds of information our mind tells us makes a physical thing. In this way we can directly see that every physical thing is actually just a combination of specific types of information. Everything is just the information of what it is and only that.
71. One could argue this just proves our *experience of things* is information and that there are real physical things out there producing our experiences but there's absolutely no evidence to suggest that and certainly no way to prove it. There are clearly actual computational processes outside our experiences but thinking they're physical is just projecting how we experience them in our simulation. How else could our simulations so convincingly encode the real actual world as *neural data* if it wasn't actually data?

72. When we think this through it's intuitive and easy to understand. The only thing that can ever be experienced is information. We experience only information and our simulation just calls some kinds of information such as heavy, hard opaque shapes physical things. But in reality every last thing we can experience is just some form of information because our experience consists entirely of information and ultimately the experience of information is all that can be confirmed to exist.
73. Thus all the apparent physical and material things in the universe are actually just *the information of what they are*. They are simply the associations of their different information components. Everything that exists in the entire observable universe is the complete information of what it is and that's all it is. This is *the fundamental principle of things*.
74. After all our entire experience of anything exists only as its information in our brains. Thus the apparent physicality of the entire observable universe is clearly just data labels slapped on certain types of data associations.
75. And even if the world was physical nothing would change since it can be experienced only in terms of its information. So physicality couldn't even be experienced even if it did exist. Thus all the evidence suggests reality is simply the data of what it is and our simulation of reality clearly confirms this.

EVERYTHING IS ITS INFORMATION HISTORY

76. So everything is the information of what it is, but the information of what it is *is the current result* of its entire *computational history* stretching all the way back to the big bang and the complete fine-tuning. Thus everything that exists is the *information of its computational history* and that's all it is.
77. But it gets even better. A form's computational history is its interactions with other forms, and all interactions are exchanges of information among forms.
78. Thus the information that forms are is loaded with information about the other forms it interacted with. The information a thing is now is a *recording* of the information of its past interactions, and that's all it is.
79. So all the past information of the universe is simply redistributed among its current information forms, to become the information that things are now. Everything *is* the information of its past interactions with other things, and that's all anything is.

80. So the information of an autumn leaf lying on the lawn isn't just its shape and color and position but the complete computational history of all the forces that gave that leaf its shape, color, and position. It's all the exact temperatures, sunlight, and breezes that brought it to its exact current condition and position. The information that the leaf is now includes the information of everything in the entire history of the universe that in any way affected its current state from the effects of the seasonal rotation of the earth to the evolution of the DNA of its species. All this information is hidden within the current information of the leaf lying on the lawn. And all this information *actually is* the leaf lying on the lawn at this exact moment of time, and that's all the leaf actually is.
81. Thus everything that exists is packed with information about other things. Everything is the combined information of all its interactions with the other things that computed the exact information of what it currently is, and everything is its entire computational history with other things.
82. Thus everything that exists is a *recording* of the past information of the universe from the perspective of its past computational interactions. And all these recordings in combination encode an enormous body of data about the past. All the information of the entire history of the universe is redistributed among all its current information forms, and these current information forms are what things actually are right now.
83. The universe consists entirely of information forms and all information forms are empty of anything other than information. The entire universe consists only of information and this information is the information of its entire past computational history and that's all it is.
84. Only because everything contains information about other things is the universe knowable. This is the *Sherlock Holmes Principle* that underlies all knowledge. By deeply understanding the information of things we gain knowledge of other things. Thanks to the complete fine-tuning, forms in our universe are packed with information about other forms and our universe is richly knowable.
85. And we exist only because our universe is knowable.

ILLUSIONS OF TIME

86. Our experience of time is full of illusions. First our simulation encodes memories of past events, which gives us a sense of

sequential time, which is completely lacking in actual reality since everything actually exists only in the current present moment. It's only organisms with memories that have any sense of sequential time and only this enables them to plan meaningful actions.

87. And our simulation also places our consciousness in an *illusory present moment* of several seconds duration called our short-term memory. By contrast the actual present moment is far shorter than the fastest particle interaction because it computes them all. Only our open present moment gives us time to compare and make sense of events as they occur. Only this enables us to understand processes as *sequences of events*. Without this the world would be totally meaningless, and all events would occur without context. Processes like music and language that depend on running comparisons of events would be completely meaningless.
88. Since our short-term memory is a product of our simulation it's quite likely its duration and character vary significantly among species. Though this insight is apparently original with me (Owen, 2009) it's really quite obvious.
89. Second the human brain continually constructs its own internal narrative, which is usually aligned with reality by incoming data, streams except in dreams when sensory input is reduced, and to a lesser extent in daydreams. An important aspect of this narrative is the simulation continually plays a stream of slightly future expected events as if they were actually happening (medicalxpress.com/news /2017-05-human-brain-pre-plays-events-fast.html). Thus we seem to live in a stream of events we expect to happen as if they were already happening. This gives us an important adaptive edge in quickly reacting to actual events. In most cases this prediction stream is reasonably accurate on a second by second timeframe but as a result we seem to live slightly in the future.

THE RETINAL SKY

90. So we live in a simulation programmed by our own brains. The bright world we see around us is actually only data in our brains, and all its appearances are illusions.
91. So when we look out into the world we're actually looking into our own minds. Absolutely everything we see and experience in the world *out there* is actually happening *in here*. The only contribution actual reality makes is a little logical structure and even that's completely reworked.
92. Our mind receives colorless data points, arranges them into color-

by-number images of things, and then paints them with appearances to construct the bright colorful world. It then reifies this world and projects it around us populating it with things it itself creates. Even our own concept of self is just one of the things our simulation places in this virtual world. And to compound the illusion our mind insists this virtual world is the real actual world but nothing could be further from the truth.

93. The world we see around us is a virtual reality running in our brains. So when we look out into the world we are actually looking into the workings of our own brain. The logic of the real world is back there somewhere directing the show, but all the costumes, actors, sets, and significance are produced and staged in our simulation.
94. Thus we look directly and deeply into our own being when we look out into the world. And if we only look deeply enough at what's really going on *out there* we begin to see what's really going on *in here*. We begin to seen the reality of ourselves within the illusion.
95. So beneath all the veils of illusion we are inevitably lead to a single conclusion, that the world and everything in it, including us, consists only of the information of what it is being continually recomputed by the running program of the universe.

CONCLUSION

96. This concludes our Deep Reality talk on the Real Simulation.
97. Stay tuned for the next Deep Reality talk on Existence, Immanence, and Consciousness where we finally discover reality's most profound and deepest secrets. And subscribe to stay informed.

9. EXISTENCE, IMMANENCE & CONSCIOUSNESS

INTRODUCTION

1. Some things exist and some don't. What's the difference? If something exists it has to have something called existence so by far the simplest and most explanatory solution is that all things that exist are forms of something called existence.
2. In this view existence is the single fundamental substance and all the individual things that exist are different forms of this single fundamental substance. So all that exists is existence and the forms of existence that exist within it. Thus everything that exists does so because it's a form of existence itself.
3. Now because individual forms of existence can be distinguished from one another they contain information thus everything that exists is an information form.
4. So existence is the originally formless fundamental substance of being and all the individual things that exist are forms of existence that exist within it and are just the information of what they are. So existence is the universal medium in which information forms are expressed.
5. This is an enormously simple and powerful model of reality that easily accounts for the entire observable universe.
6. By analogy think of a boundless formless ocean of water. Within it myriads of individual waves, ripples, and currents exist. All these are forms of water that exist within the water of the ocean. And the different forms water can take are determined by the nature of water.
7. Likewise the ocean of existence was originally formless until the data forms of the elementary particles and their particle components arose within it at the big bang. And the forms of the particles that can arise within existence are determined by the nature of existence, which we call the complete fine-tuning.
8. Now as particles arose they began to interact and the interaction of particles forms relationships among them. And these relationships among particles in aggregate are all the *emergent information structures* of the universe including *ourselves*.
9. So the universal sea of existence is the source of all the particles that exist and science calls this the quantum vacuum and the complete fine-tuning is the virtual nature of the quantum vacuum.
10. So the quantum vacuum *is* the sea of existence within which the observable universe is born and in which it exists. Its virtual data

is the complete fine-tuning and its observable data is all the elementary particles of the observable universe.

11. So all that exists is the quantum vacuum of existence, the virtual data of the complete fine-tuning that encodes its nature, and the data of all the elementary particles and particle components that exist within it.
12. So all the individual things that exist are data forms that exist within the universal sea of existence of the quantum vacuum, and all data forms are empty of anything other than existence itself.
13. This is the full nature of the entire universe in a nutshell.
14. Now the quantum vacuum of existence also has six fundamental attributes that account for the fundamental aspects of reality. These are self-necessitation, presence, happening, logicality, absoluteness, and immanence.

SELF-NECESSITATION

15. The first intrinsic attribute of existence is *self-necessitation*.
16. 'Existence exists' is the fundamental self-necessitating circular axiom of reality upon which the logical structure of the entire universe rests. It's the bottom turtle in the proverbial stack of turtles.
17. Nonexistence cannot exist so existence must exist and has always existed.
18. The first *philosophical question of existence* has always been why is there something rather than nothing, and how did something arise from nothing? The answer is simply that nonexistence cannot exist; therefore there never was a nothingness out of which something arose. Why should there be? It's nonsense to think there had to originally be a nothingness from which everything arose.
19. Therefore there's no need for a creator or creation event. We simply must accept that existence has always existed.
20. So the big bang was an *actualization event* from the preexisting quantum vacuum of existence that has always existed. The big bang was the actualization of all the data forms of the elementary particles within an originally formless quantum vacuum.
21. Thus the quantum vacuum of existence is all that exists and all that has ever existed or will ever exist. There is no beyond, before or after existence. Beyond existence there is not even nothingness; there is no beyond.

22. The second intrinsic attribute of existence is *presence*. Since existence exists it must have presence and be present. The presence of existence manifests as the *universal present moment* in which the entire universe exists.
23. Thus the presence of existence manifests as a universal present moment in which the entire universe and everything in it exists.

24. The third intrinsic attribute is *happening*. For existence to observably exist it must continually happen. Happening is the *universal processor* that drives the computations of all the particle interactions in the universe and is the ultimate source of time, change, and process.
25. Happening continually computes the evolution of the universe according to the rules of the complete fine-tuning.
26. Happening brings the universe to life. Because the universe continually evolves from within with no external source or cause the universe can be considered a *living computational organism*.

LOGICALITY

27. The fourth intrinsic attribute of existence is *logicality*. For a computational universe to exist it must be logically consistent and logically complete. If it wasn't it would tear itself apart at the inconsistencies and come to a halt at the incompletenesses and cease to exist.
28. Logicality means that every information state in the universe is logically consistent with every other information state, and all the rules by which any data state is computed are consistent. Only logicality ensures the continued existence of the universe as it's computed.
29. This means the complete fine-tuning must also be consistent, which limits the number of possible complete fine-tunings. As we've seen in previous Deep Reality talks a single elemental program computes the entire observable universe in terms of its individual particle interactions. So this elemental program and its logical operations, data types, and constants that make up the complete fine-tuning must all be internally consistent, and based on the fundamental axiom that existence exists.
30. Why what exists is what exists, is the second fundamental question of reality. The answer is what exists is determined by the complete fine-tuning and there's only one possible complete fine-tuning because the existence of the actual universe as it actually is falsifies all other possibilities.

31. The third and final fundamental question of reality is what does actually exist? Deep Reality explains the fundamentals and science is the continuing quest to fill in all the details.

32. The fifth intrinsic attribute of existence is *absoluteness*. For something to exist it must be exactly what it is and nothing else. Thus everything that exists is exactly what it is and nothing else. Absoluteness is the source of identity that differentiates all the individual forms of existence that exist.
33. Absoluteness is the source of the individual identities of all the distinct information forms of the universe that enables them to be distinguished from each other. It's what makes different things different.
34. Absoluteness is what makes the universe exactly what it is and not anything else. It makes the universe and all its information forms meaningful.
35. Absoluteness is what makes all things the things they are the complete information of and nothing else. It's what makes the complete information of a mouse a mouse, the information of a video of a mouse a video of a mouse, and the information of a description of a mouse a description of a mouse. All these are different information forms and each is the information of what it is, and each of these things is only the complete information of what it is, and that's all it is.
36. So the kind of existence a form has depends on what that form is the information of.

IMMANENCE

37. The sixth and last intrinsic attribute of existence is *immanence*.
38. Immanence is the self-manifesting observable presence of things. It's the self-manifesting presence of existence in all the forms of existence. Immanence is what makes the information things are, real actual things in the world. It's the 'thereness' that makes them real observable things.
39. The immanence of their existence is the manifestation of their real actual being and presence in reality. Only because all things internally shine with the immanence of their existence are they actually real, present, and observable in the universe. Without the self-manifesting immanence of its existence nothing would actually appear in reality and there would be no observable universe.

40. So everything that exists shines with the immanence of its existence, which is the manifestation of its observable realness and actual presence in reality. The observability of all things in the universe is their immanence. And the observable presence of the entire observable universe is the immanence of the universe.
41. So when we experience something what we are experiencing is the immanence of its existence. Without the existence of things self-manifesting as their immanence nothing would be actually observable. The universe would be a featureless blank.
42. So all things are the complete information of what they are and the immanence of that information, and that's all anything is. The observable presence of everything that exists is the immanence of the information of what it is.
43. Only because forms shine with the immanence of their existence are forms observable by other forms.
44. All the profound beauty and meaning of the universe exists because once particle data forms arise they begin to interact, and their interactions create relationships among particles, and the *immanence* of these relationships manifests as all the emergent programs and things of the observable universe including ourselves and all the objects around us. We experience ourselves in the immanence of our own existence.
45. In our universe emergent forms are incredibly rich and filled with information about each other due to the wonderful exquisitely precise design of the complete fine-tuning, and the immanence of their existence.

XPERIENCE

46. Now the computational interactions of forms are effectively mutual generic observations in which each form xperiences the other form in the alterations the interaction makes to its own form.
47. In this way all forms experience the information of the other forms they interact with in the immanence of their own information. And the universe can be thought of as consisting entirely of all the xperiences of immanence of its data forms. In this sense the universe continually xperiences itself into existence through the mutual generic observations of all its forms.
48. Thus every form the universe creates is a means by which the universe xperiences itself and the immanence of its existence. And we are organs the universe creates that allows it to *consciously* experience itself and ideally to improve itself as well.

49. So xperience is the flip side of immanence in the continual interaction of forms that evolves the observable universe.

CONSCIOUSNESS

50. The perennial problem of how consciousness can arise in a physical universe is insoluble because consciousness isn't physical and just can't arise in a purely physical universe. But when we understand the immanence of existence in a computational universe the true nature of consciousness becomes simple and clear.
51. Consciousness is simply the *immanence of experience*. It's the immanence of the focus of attention routine as it scans our simulation of reality.
52. Our simulation is a dynamic information model of our self within our environment that's continually being updated to reflect what's happening.
53. Our focus of attention is a specialized routine that watches processes being computed in our simulation. By watching something being computed it *experiences it happening*.
54. So the focus of attention routine generates *experiences* of processes in our simulation. And the *immanence* of these experiences is what we call *our consciousness* of them.
55. All forms manifest the immanence of their existence. The immanence of any form is the actual observable reality of what it's the information of. So the actual observable reality of the information of an experience is the consciousness of that experience.
56. So conscious experience is simply the immanence of experiences.
57. Consciousness is the immanence shining within the data of experiences. The internal shining of immanence is not something visible to the eyes, but it is visible to mind as consciousness.
58. Consciousness is simply the immanence of experiences. It's the actual observable self-manifesting presence of experiences taking place in the focus of attention routine as it watches and experiences processes in our simulation.
59. So the mystery of consciousness becomes simple and clear when we understand how immanence works.
60. Our simulation computes multitudes of simultaneous processes at *the unconscious level*. But the focus of attention routine brings specific threads of the simulation to conscious attention because it creates the information they're being experienced. It does this as it experiences unconscious processes occurring in our simulation.

This generates the information that an unconscious process is being experienced, and the immanence of that experience manifests as the consciousness of that experience.

61. The focus of attention routine is also able to experience *formless immanence* devoid of individual experiences. The consciousness of formless immanence is the key to realization, as we'll see in the next Deep Reality talk.

OVERVIEW OF THE ENTIRE THEORY

62. With this talk we've now covered all the fundamental insights of the Deep Reality Theory of Everything.
63. All that exists is the universal sea of existence and the forms of existence that exist within it. This is what science calls the quantum vacuum and all the observable forms of existence that exist within it are the observable universe.
64. All the forms of existence are forms of information and that's all they are. The elemental data forms are the data of elementary particles and their particle components.
65. Once actualized all the data forms begin to interact and this forms relationships among them. These relationships in aggregate are all the emergent forms of the observable universe including ourselves.
66. The intrinsic attributes of the quantum vacuum of existence are the fundamental aspects of reality. They make the observable universe real and actual and present and drive the continual happening that results in the passage of time and the evolution of the observable universe.
67. The immanence of existence of data forms is their self-manifestation as the real actual things of the universe they're the data of. Without the immanence of their existence they wouldn't be present in the universe as actual observable things.
68. And in particular the immanence of existence of the information that experiences are taking place in our simulations of reality is what we call the consciousness of those experiences.
69. This is the entire Deep Reality Theory of Everything in a nutshell and all the essential details of how the theory explains relativity, quantum theory, cosmology, time, emergence, our selves, and our simulations of reality have been covered in previous Deep Reality talks, and much more can be found in my books on Universal Reality.

CONCLUSION

70. This concludes the Deep Reality talk on Existence, Immanence, and Consciousness.
71. We're now ready to examine the personal implications of Deep Reality in the final talk on Realization. It explains how we can directly experience the true nature of the reality we've discovered including the true nature of our own being.
72. Thanks for watching and subscribe to stay informed.

10. REALIZATION – EXPERIENCING REALITY

THE PATH TO REALIZATION

1. There are thousands of teachers and teachings, but few seem grounded in actual reality. But in Deep Reality realization is a natural part of reality and is simply experiencing reality as it actually is.
2. So there's nothing esoteric or supernatural about realization here. But experiencing reality as it actually is is the most awesome and transformative experience imaginable.
3. Now we've seen in previous Deep Reality talks that all that exists is information forms and the immanence of their existence. So realization is simply the realization of the true nature of forms and the realization of their immanence.
4. The realization of forms is the realization of the true information of forms including the forms of ourselves.
5. And the realization of immanence is simply the realization of the absolute observable presence and realness of existence shining in all forms including the forms of ourselves.
6. And in addition there's the realization of the *formless* immanence of existence in pure bright consciousness devoid of forms.
7. So realization is just realizing the true information of forms and experiencing the immanence of their existence. That's all there is to it. Realization is simply the direct experience of the true nature of reality.

THE FUNDAMENTAL REALIZATION

8. The fundamental experience of our existence is our consciousness in a present moment through which clock time flows at the speed of light. This is our direct experience of the fundamental process of the universe computing our existence.
9. The most fundamental process of the universe is happening right here inside of us in every moment of our existence, and it rockets us through time at the speed of light.
10. So we experience the most fundamental process of the universe in the most fundamental process of our existence in every instant of our lives. This is the realization of the fundamental process of reality.

THE REALIZATION OF SCIENCE

11. Realization also includes seeing the true nature of the forms revealed by science. No longer do we see the sun rise; now we see the earth we stand on slowly turning towards our blazing fusion reaction star. And we see the curvature of the earth as the sky curves down over the horizon. And deep in the sky at night we see billions of light years down the past radial dimension of our cosmic hypersphere.
12. And we feel the earth's velocity gradient field pulling us into our chairs as it slings the great mass of the moon around us, and us around our star.
13. And we see the geological forms of the earth as the information of all the past forces that computed them. Every last grain of sand on the beach, every last stone on the path is the complete information of what and where it is and this is the complete information of all the past forces that formed it and placed it precisely in its current location. Everything that exists is the hidden data of its entire history back to the big bang when its particles actualized and began interacting and evolving through generations upon generations of emergent forms to the information that little stone is right here and now on the path.
14. The entire world can be seen as its science. It's a wonderful realization exercise to practice seeing everything in terms of its deepest science. When we really understand the information of forms we begin to experience reality as it actually is.

REALIZATION OF LIFE

15. All living beings bathe in the warmth of the great fusion reaction in the sky that fills us all with life.
16. And all beings are the biological robots of themselves living out their lives according to the instinctual imperatives of their programs. And we humans are our hairless apes decked out in the latest fashions strutting the status, personas, and sexualities of our programs. And almost all play out their roles unable to escape or even recognize their programming.
17. We are our robots walking down the road, reading our emails and living our lives according to our programming. We are the autonomous, purposeful, partially free willed, wishfully intelligent, biological robots of ourselves, and our consciousness just goes along for the ride.

18. We, like all forms, are the emergent information structures of our elementary particles. We are the particular organization of all our particles that make us us rather than a stone, another person, or anything else.
19. We are our biological robots living our lives in accordance with instinctual imperatives passed down from our ancestors in our DNA. We're little blobs in a single living web of protoplasm spanning billions upon billions of generations.
20. All life is bound by a common existence. We are 8 billion forms in the planetary pool of living nutrients. We live, we die, and our nutrients are recycled through countless new lives down through the future. The biosphere is a single nutrient reservoir continually recycled through uncountable individual beings. We are all forms of existence within the universal ocean of existence, and our biological purpose is to consume our predecessors and be consumed by our successors.

THE REALIZATION OF INFORMATION

21. All things are their forms but forms are never as they appear. We experience only the illusory forms of our simulations of reality rather than the actual forms of reality itself. So we must progressively strip away the illusions of our simulations to reveal the true information hidden within the forms of experience.
22. And beyond this there's the realization that all forms are only their information; that all the forms of experience exist only as information in our brains.
23. The physical spacetime world around us is a virtual reality created by our brains. It's a simplified color by number picture sampled from reality and colored with appearances and meanings we mistake for reality.
24. But our simulation creates this world and projects it into the virtual reality around us and whispers the lie that it's real.
25. But the true nature of reality is computational. The actual universe consists of running programs continually computing their data in interaction with each other. And we can see through this illusion if we dare to discover the true information nature of reality.
26. By deconstructing all physical objects into their information structures and removing the information piece by piece we realize that without its information there's nothing left of anything at all. This is the profound and amazing realization that everything is entirely the information of what it is.

27. Everything is now realized as the information of what it is given reality by the immanence of its existence within the universal sea of existence.
28. And as the ancient philosophers discovered all information forms are empty of anything other than existence itself. Nothing has any unique self-substance other than the universal common existence all forms share that gives them their individual existences.
29. And this is true of ourselves as well. We are entirely the information of what we are shining with the immanence of our existence.
30. We are our programs running in the quantum vacuum of existence computing the data of our forms. Existence is everywhere, in and around us, and is the single universal substance of reality. We rest in the quantum vacuum of existence that gives us our existence and computes our forms.
31. Nothing changes with the realization that everything is its information. We simply realize that all the bright colors, shapes, textures, sounds, odors and tastes of the world are all just information forms, and without their information there's nothing left of anything whatsoever. Thus it becomes clear that everything is the existence of its information and that's all anything is.
32. This is the realization of the information nature of reality and the emptiness of forms.

REALIZATION OF EXPERIENCE AS SELF

33. The entire world of experiences exists entirely as information in our brains. Thus everything we seem to experience out there is actually experienced in here.
34. Thus our true self is *all* experience without exception, because all experience occurs in our simulation and beyond experience nothing is observably real.
35. Even our conception of an external world full of other beings with their own experiences exists observably only as 'our' experiences of that conception.
36. Our simulation separates experiences into experiences of self and not self but experience is all that observably exists and all experience is part of our own being.
37. Thus experience is all that exists and prior to the distinction of self and not self, so experience itself is the true nature of self. But since experience is of both us and not us, experience isn't *our* experience and true nature isn't *our* true nature. All that

observably exists is experience, and experience is true nature prior even to ourselves.

38. So true nature is the totality of all experience including experiences of both self and not self. Experience is all that observably exists and experience is true self prior to all distinctions.
39. This is the realization of true self as experience.

THE REALIZATION OF IMMANENCE

40. Experience is the experience of the information of forms but experience is also the experience of the immanence of forms. The forms of experience wouldn't be observably there except that they're filled with the immanence of their existence.
41. So the deeper realization is the realization of the *immanence* of forms. Because the immanence of forms is simply their observable presence, we normally take immanence for granted without realizing its absolutely profound true nature. But only when forms reveal the true nature of their immanence do we realize the true nature of forms and our own true nature as well.
42. Immanence is the most obvious thing in the world because it's simply the observable real presence of forms but the actual here now realness of forms is the most profound and extraordinary experience of all.
43. The fact that anything actually exists and is observably present right here in reality is absolutely incredible because it's the direct self-manifestation of existence itself through the forms of existence. It's the direct self-manifestation of the single fundamental universal substance of reality right in front of our eyes.
44. In the immanence of forms the living substance of the entire universe is revealed before us as the consciousness of experience. Immanence fills all forms and reveals the real absolute presence of existence in every form of existence.
45. Immanence is what makes all forms the real things they're the information of, including ourselves. Immanence is the profound thereness and reality of things. Without immanence the universe would be a blank and nothing would observably exist.
46. We live in a universe of immanence and immanence is the substance of consciousness. Consciousness is simply the immanence of forms of experience in our simulations of reality.
47. Forms carry information and immanence makes information real. The forms of experience carry information that things are being

experienced, and the immanence of experience is what we call consciousness.

48. All things shine with the internal light of their immanence and the internal light of experience is consciousness. So immanence is the most obvious and common thing in the world but also the most profound and amazing because it reveals the true fundamental nature of things by manifesting their existence. When the true nature of immanence is realized the true nature of everything that exists is revealed.
49. Because immanence is absolute the intensity of the experience of immanence is limited only by the capacity of the experiencer. Realizations of immanence can occur suddenly without warning as the veils of illusion drop from our eyes and the true nature of reality shines clear and bright before us.
50. The traditional definition of immanence is the hidden presence of the divine within forms but in Deep Reality immanence has no religious connotations, and immanence can be realized in all forms because immanence is simply the self-manifesting presence of existence in every form that exists.

CHI, ENERGY BODY & BUDDHA NATURE

51. Like all things we are the forms of ourselves, and the immanence of our form is the absolutely real presence of existence self-manifesting us into reality right here and now. And the realization of the immanence of our existence is our own true self.
52. We continually experience the immanence of existence in all the observable forms of our being. If we focus we feel the feelings of all parts of our body from the inside. This is our experience of our chi. Chi isn't anything unscientific or mysterious, it's simply the internal energy of our biological being and we always feel it inside us whether we pay attention or not.
53. And we experience the chi of our entire body as our energy body. Again our energy body isn't anything esoteric or New Age. It's simply all the internal feelings of our body experienced together as a single body of energy.
54. Our energy body is the immanence of our being. It's our true self because it's the total direct experience of all our internal feelings.
55. And when we include all the internal experiences of thoughts, emotions, and even sensations of external objects we finally experience the immanence of our whole energy body, and this total body of experience is who we actually are.

56. Chi can be controlled to some extent by movement, breath and thought, but everything has its own chi and chi is expressed only through its forms, so there are natural limits to chi. There are no chi superheroes here. Chi is entirely natural and entirely limited by the forms it appears within.
57. However the realization of chi helps inform our being. By feeling how chi flows through our energy body, we learn to let it flow more freely and harmoniously through the chakras, Kundalini, and other natural pathways.
58. And we can also purify chi's tone and experience it as the pure glowing energy of love, health and well-being. We can experience our energy body glowing with the intense pure love of existence purifying and healing our bodies and minds.
59. The experience of chi and energy body is the experience of the immanence of existence within us.
60. And our energy body as love has objective reality as our continual manifestation into existence by the universe is certainly the ultimate act of love.
61. In Oriental philosophy immanence is called Tao, śūnyatā, Mu or Buddha Nature. By thinking of chi as Buddha Nature we can ease the path to realization if we're careful to keep it real.
62. From this perspective we awaken our Buddhas and walk down the road as our Buddhas. We go through the day as our Buddhas, and we meet everyone as our Buddhas.
63. The awakened Buddha within is our ultimate ever-present companion, always available to guide us towards realization and right action.
64. And we recognize the Buddha in everyone we meet no matter his circumstance or behavior. Everyone is their Buddha waiting to be awakened. And we realize the Buddha Nature of all beings of all species living their lives bound in their forms. And we realize the Buddha Nature of even inanimate forms in the immanence of their existence.
65. So we become our Buddha in a world of Buddhas. We need only to acknowledge the existence of Buddha Nature as the immanence of forms to experience all forms as their Buddhas.

DEFINING GOD AS THE UNIVERSE

66. In Deep Reality the universe functions perfectly well without a god but by defining god as the universe we may experience a more personal and intimate relationship with reality. The only reasonable definition of god is the universe itself. Then there's no

doubt that god the universe exists, and god's true nature is simply a matter of scientific discovery. But we must strictly abandon every last delusional aspect of religion and realize god as the living presence of existence revealing its immanence through all its forms.

67. If anything is divine, omnipresent, omnipotent, and worthy of awe and worship it's the universe itself. The intelligence of its design is far beyond our comprehension. And god the universe continually creates itself as it computes its forms into reality. If we want a god then the universe is clearly that god.
68. From this perspective god creates and manifests all forms. God reveals itself in every form in the immanence of that form. God thinks in every mind, sees through every eye, and hears through every ear. And god looks at us from every eye looking back from our eyes. We are god hearing itself in every sound and knowing itself in every experience. God is the conscious immanence of every form, and god is the conscious immanence within our form.
69. God is the universe, and we are forms of god that god creates to know itself. All is god and all is the divinity of immanence. And all forms of god continually interact according to god's laws of nature evolving the universe towards its ultimate purpose.

PURPOSE & ETHICS

70. With the realization that all beings share a common nature as forms of existence comes compassion and understanding. With realization we're filled with a natural compassion towards all living beings no matter how evil they seem in their ignorance.
71. We are all sentient beings stuck in the forms of our species. We're mortal forms condemned to live and die that other forms may follow. And realizing the endless beauty and suffering of our extraordinarily amazing planet we're filled with love and compassion towards all our fellow beings.
72. So our natural purpose becomes realization, reducing suffering, and healing and beautifying our planet. Working towards a planetary garden of paradise tended by enlightened souls who live sustainably in harmony within it.
73. This vision of Heaven on Earth is attainable if men transcend their ruthless competitive instincts and realize the necessity and beauty of this ultimate goal.
74. So our natural purpose is to become agents of the universe to establish realization, truth, compassion, peace and harmony in a

global Heavenly Garden of Paradise on Earth. There is no higher purpose.

75. We live in an extraordinarily amazing and beautiful universe and we are amazing and beautiful beings. We're given our body to ride through the world. So love it and treat it well and enjoy it. And we are given our simulation of reality to optimize our existence so purify and enhance and enjoy it.
76. Experience the wonderful blessed immanence of your energy body and fill it with peace, love, and happiness and live in realization in your bliss.
77. Many layers of truth lie hidden within the veils of illusion. Realization is discovering the ultimate truth within the simulation but it's also using it to live more effectively in the actual world. By understanding our simulation and the logic of things and using it wisely we function more effectively within actual reality.
78. How wonderful and beautiful and awesome and profound to be alive in this amazing universe and experience it as it actually is. To be given the extraordinarily improbable gift of life among countless billions upon billions of billions of unused ancestor sperm is the greatest imaginable blessing.
79. By accepting reality as it is even as we work to improve it we abandon unreasonable desires and attachments, and by living healthy enlightened lives we purify our energy body and optimize our health. All we ever need even in the depths of the most negative forms is ultimately the immanence of existence.
80. All is the beauty, mystery, and awesome profundity of reality, and the enormous intelligence of its design is revealed in every last detail. Let's awaken and rewrite the roles we play towards happier more enlightened ends.

MOUNTAINS ARE MOUNTAINS AGAIN

81. We live our entire lives within the illusions of our simulation. Realize them as we will they remain. But the deeper realization is that our simulation is also part of reality and is the only part of reality we actually experience exactly as it is.
82. Everything that exists is part of reality and this includes our simulation of it. So we actually experience the true nature of reality we've sought in our simulation of it. We sought realization beyond our simulation but we actually experience the true nature of reality in our simulation of it.
83. This is the meaning of the Zen proverb that *Mountains are mountains again*. Originally we naively thought that mountains

were the physical mountains they appeared to be. But with study we realized mountains were the information forms of mountains, but now we finally realize that mountains are exactly what they appear to be! Mountains are the information of mountains as our simulation portrays them.

84. This is the realization of the reality of illusion. Illusion taken for reality is illusion, but illusion recognized as illusion is reality. So we've always been directly experiencing the true nature of reality exactly as it is and thus we are all already enlightened and have always been, it's just a matter of realizing it.
85. We live our entire lives in the bright clear presence of ultimate reality and all we have to do is open our eyes and look around and realize it for what it actually is.
86. So there's no path to realization, no gate to pass through. We're already in the presence of the true nature of reality and always have been. Everything that exists is the exact true nature of what it actually is.
87. Masters and teachings may help point the way, but realization requires no teaching, no master, and no temple because reality itself is the only master, and reality itself is the universal temple, and reality is the one true teaching. Reality itself is the ultimate kōan and we see reality exactly as it actually is in our simulation of it.
88. This is the meaning of *Mumon*, Zen's gateless gate of emptiness.

THE REALIZATION OF FORMLESSNESS

89. As Buddha said, *all compound forms must cease*. But the immanence of existence is the single thing that always persists. And we experience existence directly in the immanence of its forms.
90. But finally there's the deeper realization and experience of the pure *formless* immanence of existence that underlies all things as the single universal substance of reality. The realization of formless immanence manifests as the experience of bright clear empty consciousness of the absolute eternally shining presence of immanence itself emptied of all forms.
91. This is experienced through the mental exercise of meditation in which one empties consciousness of all its contents to experience the pure bright formless essence of consciousness. The rational mind fights back as its purpose is to continually generate a narrative within consciousness but when one finally learns the simple trick of letting the focus of attention rest at the center of

consciousness and dissolve, the realization of formless immanence becomes clear, and only bright formless consciousness exists.

CONCLUSION

92. This concludes our Deep Reality talk on Realization. Thanks for watching and may we all experience realization!

11. THE EXISTENCE SUTRA

1. All that exists is existence itself.
2. All that exists are forms of existence in a universe of existence.
3. All forms of existence are forms of information filled with existence.
4. The forms of existence that exist are the forms of the elementary particles and the program that computes their interactions.
5. Particle interactions create relationships among particles and relationships among particles create the emergent forms of the universe.
6. We are the emergent forms of our particles and everything in the universe is the emergent form of its particles.
7. All the forms that exist are the information of what they are filled with existence, and that's all they are.

8. The life of existence is velocity.
9. Everything that exists has a velocity of c, the speed of light in a vacuum.
10. Its c velocity is the vector sum of its velocity in space and velocity in time.
11. This is why velocity in space slows velocity in time.
12. Now all forms of velocity in space are forms of energy, and all forms of energy are forms of spatial velocity.
13. Mass is a form of energy, and masses are fields of hyperfine spatial vibrations whose intrinsic spatial velocity slows velocity in time.
14. So both linear spatial velocity and the intrinsic spatial velocity of gravitational fields slow time so total velocity everywhere in the universe equals c.
15. So the universe is a single field of c valued velocity, which is the combined spatial velocity of mass-energy and velocity in time.
16. This is the very simple secret of relativity and spacetime.

17. All that observably exists is the immanence of existence.
18. Immanence is the actual here-now observable presence of existence in all the forms of existence.
19. Experiences are forms of existence.
20. Consciousness is the actual here-now observable presence of experience.
21. Consciousness is the immanence of experience.

22. Realization is the realization of the information nature of forms and the immanence of their existence.

23. Realization is the realization of the formless immanence of existence shining in the forms of existence.
24. Realization is clear bright empty consciousness shining with the immanence of existence.
25. Immanence makes the information of the forms of existence the real observable things they're the information of.
26. All forms are their information only, and all that exists is forms of existence shining with their immanence.
27. I am the information of my forms and I am the immanence of existence shining me into existence.
28. This is the true nature of self and the true nature of being.

29. All that exists is the shining immanence of existence.
30. Consciousness is the immanence of existence.
31. This is the realization of existence.

12. THE AMAZING THEORY OF EVERYTHING

INTRODUCTION

1. Suppose you were God and wanted to create a universe just like ours, how would you do it? It turns out it's a lot easier than you might think. That's because the fundamental design of the universe is really quite simple.
2. In this talk we'll explain that fundamental design, which is also called the Theory of Everything.

FUNDAMENTAL STRUCTURE

3. So if you were God how would you start? First you'd write the universe as a program that would run on its own so you wouldn't have to make everything happen yourself.
4. Second you'd need a special computer to run the program that would compute a real universe instead of a simulated universe. So you'd need to invent a universal computer called the quantum vacuum that would make everything the program computed real and actual.
5. The quantum vacuum also needs a processor to run the program and this processor will be the ultimate source of time that makes everything happen.
6. And because the quantum vacuum exists it must have presence and its presence will manifest as a universal present moment in which the entire universe exists.

THE VIRTUAL UNIVERSE

7. OK, we have a computer so now we just need a program that computes a universe like ours to run in the computer. We need a program that creates a virtual reality that looks exactly like our universe and run it in our quantum vacuum computer. This will make the virtual reality into a real actual universe.
8. Now a virtual reality is just a program computing data in computer memory. A computer memory is a dimensionless computational space. It's apparent 3-dimensional physical reality only appears when we view the data in a virtual reality headset that displays it as colored pixels in 3-dimensional form.

9. So we'd design our universe in the exact same way. The universe will consist of particle data in memory, there will be a program that continually computes this data, and it will be our minds acting as headsets that view the results as a 3-dimensional world.
10. The observable universe is just the data of all elementary particles and their relationships. So a relatively simple program that computes individual particle interactions is all that's needed to compute the entire universe.
11. This works fine because everything above the particle level is an *emergent structure* that's actually just relationships among particles viewed in aggregate. Emergent structures include dimensional spacetime and all objects made of particles including ourselves.
12. Think of particles as the colored pixels in a virtual reality headset. A viewer doesn't see individual pixels, but he sees the relationships among pixels as moving objects in a 3-dimensional world. The virtual reality emerges from the relationships among pixels in aggregate.
13. So all that's needed to create an entire universe like ours is just the data of individual particles and a relatively simple program that computes their interactions. This is what makes the universe so easy to create.

THE COMPLETE FINE-TUNING

14. Now the data of the elementary particles is mainly the data of their particle components.
15. The particle components include identity (for example quark and lepton numbers), the various force charges including mass, which is the charge of gravitation, spin, and temporal and spatial parity. Numeric particle positions and velocities in memory are also stored so that particles of the same type can be distinguished and total energy and momentum can be conserved.
16. Now all the elementary particles are just valid sets of these few particle components, and the precise values of the particle components are part of the complete fine-tuning.
17. The complete fine-tuning is all the fundamental values, data types, data structures, data manipulation operators, and everything else used by the elemental program to compute the universe. The complete fine-tuning is all part of the program that computes particle interactions.

18. We have to be sure to set the complete fine-tuning to the precise values it has in our universe because this small set of values is what determines the entire emergent structure of the universe.
19. These are the basics, so to start the universe running we just actualize a bunch of elementary particles to make a big bang and the processor automatically begins computing the entire universe from their interactions.

COMPUTING THE UNIVERSE

20. Now how do we design our program to compute particle interactions that create a universe like ours?
21. Basically whenever particles have the same x, y, z and t locations in computer memory our program computes an interaction which can be either the particles scattering off one other, combining or splitting to form new particles, or forming bound relationships to create atoms and molecules.
22. What happens depends mainly on energies and whether particle components can be conserved among resulting particles. There can't be any unused particle components left over outside of particles.
23. In all interactions the main thing the elemental program does is conserve all particle components including energy and momentum. The total of each particle component exiting any interaction always equals the total entering the interaction with only a couple of rare exceptions.
24. Interactions often change particles into new particles but total particle components are almost always conserved. This is why the particle components are the fundamental components of the universe rather than particles.
25. Total energy and momentum are also conserved in every particle interaction which is why nominal positions and velocities must be stored in memory just as they are in a virtual reality.
26. Now because particle components are conserved the particles exiting an interaction are *entangled*. Entanglement just means that particle components have related values. All the particles exiting an interaction will be entangled on their particle components.
27. Entanglement is easy to understand because it also works with cookies. If we break a raisin chocolate chip cookie into two pieces the two pieces become entangled on their raisins and chocolate chips because the total in the two pieces equals the total in the original cookie. So entanglement and conservation are simple fundamental principles that hold at all levels.

28. Now all the particles in the universe are part of a single network of interactions dating back to the big bang. This means there are some relationships among all the particle components of all the particles in the universe. These relationships form a universal *entanglement network* of all the relationships of all the particles in the universe.
29. We humans see these relationships among particles as all the emergent forms of the universe including dimensional spacetime. The physical universe we seem to see around us is our mind's simulation of the relationships of the entanglement network at an aggregate level.
30. However we are actually viewing a reality that consists entirely of particle data in quantum vacuum memory. Our minds have just evolved to see it as an encompassing physical world, which makes it a lot easier to relate to.

ADDING RELATIVITY

31. Now we've already created a perfectly good Newtonian universe but we're missing relativity. Luckily there's a simple way to add it.
32. We just have *separate applications* of the elemental program simultaneously compute every separate coherent process using a fixed number of processor cycles, so the total spacetime velocity of every process is equal to c, the speed of light in a vacuum.
33. First processor cycles are used to compute any spatial velocity and then all remaining cycles are used to compute the internal evolution of the process, which produces its velocity in clock time.
34. In this way the total space plus time velocity of every process in the universe is computed to equal c. This is the fundamental principle of relativity.
35. So the source of c, the speed of light in a vacuum, is simply the fixed number of processor cycles used to compute processes in every tick of processor time.
36. As a result there are *two separate kinds of time*, processor time, which manifests a new universal current present moment at each tick, and the local clock time rates processor time computes which all depend on the local amount of spatial velocity.
37. And we actually experience this fundamental process of the universe as our consciousness of a present moment through which clock time flows.

ADDING GENERAL RELATIVITY

38. Now to include general relativity all we have to do is make mass and the other force charges be fields of *intrinsic spatial velocity* so they slow the clock time of processes in their fields.
39. Each of the four forces is a different form of intrinsic spatial velocity. In particular *masses are fields of hyperfine vibrations*, and *positive and negative electromagnetic charges* are fields of hyperfine *clockwise and counterclockwise helical rotations* that either reinforce or cancel each other out. So the charges of the four forces are all different forms of intrinsic spatial velocity.
40. This means that energy itself is simply spatial velocity. Masses and all types of energy are just different forms of spatial velocity, and all forms of spatial velocity are types of mass-energy. Spatial velocity is mass-energy and mass-energy is simply spatial velocity. They're the exact same thing.
41. Only this simple equivalence explains why mass-energy can be conserved. Different forms of energy can only be converted into one another and conserved if they are different forms of a single thing, spatial velocity.
42. With this simple addition both special and general relativity automatically become part of our universe.
43. The universe itself is now a single universal field of c valued velocity, which can be either velocity in time, or some form of velocity in space, which is always some type of mass-energy.
44. So the entire universe is a single field of c valued velocity produced by the cycle rate of the processor that computes it. This is an enormously profound and important fundamental realization completely missing from current science.

ADDING QUANTUM NATURE

45. OK we've now created a universe that naturally incorporates relativity but we still need to give it quantum nature. This is also easy. We just have the program randomly mix up or *conflate* a small percent of spatial and temporal velocities as it computes each coherent process.
46. A coherent process is a particle interaction and all the particles produced by that interaction prior to any subsequent interactions.
47. All coherent processes are simultaneously recomputed in every tick of processor time, and each coherent process is computed by a separate application of the elemental program. So there's a

separate app computing each coherent process, and each app computes its process with a different unique random conflation pattern. This simple addition is all that's needed to give the universe quantum nature.

48. Each app computes the total spacetime velocity of its process with the same fixed number of processor cycles. This gives every process in the universe a total spacetime velocity equal to c.
49. However as each app computes its process it randomly conflates a small fixed percent of the space and time cycles, and each app does this with a different unique conflation pattern. Cycles that should be used to compute spatial velocity are used to compute velocity in time and vice versa.
50. This simple addition immediately gives us the dimensional indeterminacy of the quantum world. It gives us a universe in which it's impossible to simultaneously measure spatial and temporal variables with greater than Planck constant accuracy; it gives us the Heisenberg Uncertainty Principle.
51. And it also makes particles act like wavefunctions because their dimensionalities become inherently indeterminate at the quantum scale, which is the simply the scale of conflation.
52. So just having the elemental program compute everything with a fixed number of space plus time velocity cycles at the relativistic scale while it randomly conflates them at the quantum scale adds both relativity and quantum theory to our universe with a single simple mechanism!
53. And this simple mechanism also unifies relativity and quantum theory because particles act like wavefunctions at the quantum scale but are scaled by the presence of mass-energy as they're computed and this results in the curvature of space at the relativistic scale.
54. So quantum equations still work as before but they now have a minute additional term that scales them by the presence of mass-energy, which is negligible at the particle scale and only becomes apparent at the relativistic scale.
55. Wavefunctions have indeterminate dimensionalities but for interactions to take place particles must have exact mutual dimensionalities. In particular they must have exact energies with respect to each other so mass-energy can be exactly conserved.
56. This occurs through *decoherence.* When particles from separate coherent processes interact they leave their previous apps and a single new app fires up to compute their interaction. This new app begins by randomly selecting exact mutual dimensionalities from the wavefunctions of the particles so mass-energy can be

conserved. This selection of exact dimensionalities from wavefunctions is what's called decoherence.

57. Only by making the particles exact with respect to each other can mass-energy be conserved and their interaction be computed as a new coherent process. This new coherent process will then be computed with a new conflation pattern by the new app.
58. Now each coherent process is effectively a *dimensional fragment* consisting of the coherent dimensional relationships among the particles produced by an interaction.
59. So the universe consists of myriads of dimensional fragments that are indeterminate with respect to each other at the quantum scale but whose dimensionalities are exactly aligned by decoherences whenever particles interact.
60. This creates an emergent spacetime that's dimensionally indeterminate at the particle scale but exact at the relativistic scale.
61. So spacetime is an aggregate view of the dimensional relationships formed by the conservation of mass-energy in particle interactions. Particle interactions create dimensional fragments, which are stitched together by subsequent particle interactions to create new dimensional fragments and so on to include all the particles in the universe including those in the bound interactions of atoms and molecules.
62. These particle relations are what we and other species see as a physical universe in a physical spacetime. But it's really all just the relationships among the data of individual particles. Only beings able to see particle data relationships in aggregate are able to see the emergent universe. In this respect the universe works exactly like a virtual reality.
63. This model effectively reproduces quantum reality at the particle scale and relativity at the classical scale when the dimensional relationships among particles are scaled by the presence of mass-energy as they're created.
64. The great beauty of this model is that it not only unifies relativity and quantum theory but also resolves all quantum paradoxes because quantum phenomena are paradoxical only with respect to a preexisting physical spacetime that doesn't actually exist.
65. For example the standard spin orientation paradox is no longer paradoxical. The equal and opposite spin orientations of two particles are created by a particle interaction and exist as part of their single dimensional fragment. When the spin of one is measured it automatically aligns that entire dimensional fragment with the dimensionality of the measuring device. Thus a

measurement of the other spin will always find it with the opposite orientation.

66. So quantum reality isn't paradoxical at all when we understand that spacetime is emergent and created by particle interactions. It only seems paradoxical with respect to a preexisting spacetime that doesn't actually exist.
67. So there's no faster than light communication between particles, and since there's no preexisting spacetime everything is automatically non-local, so non-locality is natural not paradoxical.
68. So what we see as a physical spacetime world is just our view of the implicit dimensional relationships among particulate objects at an aggregate scale. The physical universe emerges from the relationships among particle data; it's not an actual physical structure.

CONCLUSION

69. All right, we just created a universe like ours, and it only took us 20 minutes instead of 6 days! I think God deserves a good long rest from his labors!
70. And once we start the processor and fill this universe with particles all the rest of our universe emerges automatically as particles interact over billions of years to create all the emergent structures we see in the universe today.
71. All these emergent structures are described in my books and other Deep Reality talks and don't need to be repeated here.
72. However the universe that emerges won't be exactly the same as our current universe because all particle interactions are computed with random quantum conflation patterns, but it will be a stochastic variation on the same general plan implicit in the complete fine-tuning of our current universe.
73. So only particle data and the precisely tuned little program that computes their interactions are needed to create our entire universe. All the rest, the entire physical universe in physical spacetime is emergent and visible only to observers able to recognize the relationships among particles in aggregate.
74. Ultimately the entire universe consists only of the data of particles in a universal sea of existence called the quantum vacuum that brings the universe to life by computing their interactions.
75. So creating a universe like ours is really quite simple, and we also discover an amazing new Theory of Everything in the process!
76. Thanks for watching and if you found this talk interesting please let others know…

Edgar L. Owen was born April 1st, 1941 and quickly realized that reality is not as it appears. A child prodigy, he entered the University of Tulsa aged 15 and received a B.S. with honors in science and mathematics with a minor in philosophy at 18 before completing several more years of graduate study in physics and philosophy.

In the early 60's he moved to the Haight-Ashbury in San Francisco where he hung out with notables from the Beat Generation, and conducted an intense personal study of the nature of mind and consciousness. From there he traveled to Japan where he lived for three years studying Zen and Buddhist philosophy while subsisting as a ronin English teacher.

Upon returning to the US he began a career in computer science writing numerous programs in artificial intelligence, simulations, graphics, and cellular automata while designing and managing advanced computer systems for the New York Federal Reserve Bank and AT&T. He then left the corporate world to start his own software business marketing his own CAD programs, which he ran for a number of years. Currently he owns a premier Internet gallery of fine Ancient Art and Classical Numismatics at EdgarLOwen.com.

Deeply immersed in nature since childhood, and always considering it the ultimate source of his inspiration and knowledge of reality, he has served as Chairman of his local Environmental Commission and organized several campaigns to protect the local environment and its wildlife.

Over the last several years he has worked to combine and organize the results of a lifetime of study of the various aspects of reality into a single coherent Theory of Everything. He now spends most of his time exploring the wonderful awesome mystery of reality and how it can be experienced more fully and deeply and enjoying his existence within it.

Edgar currently lives in Northern NJ in a big brick house on top of a hill where he communes with nature and enjoys the company of his wild visitors including the occasional human. Edgar is currently single and can be reached at Edgar@EdgarLOwen.com.

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Deep Reality is an amazing new Theory of Everything that unifies the latest advances in physics and cosmology with cognitive science and the reality of direct experience. It's entirely consistent with modern science with a few improvements but reveals a number of hidden principles that underlie relativity, quantum theory and cosmology and make them very easy to understand.

And in turn these fundamental principles unify all the other aspects of reality including existence, the present moment, mind's simulation of reality, consciousness, and even realization; all essential aspects of reality about which science itself has had nothing meaningful to say.

As such Deep Reality is a truly groundbreaking and revolutionary new unified understanding of all aspects of reality that will transform our understanding of the universe and ourselves. And it's all very easy to understand because the fundamental principles that underlie reality turn out to be really quite simple.

Deep Reality reveals that the universe is a computational system, a running program than continually recomputes itself into existence. And we are an integral part of this system. We are partially free willed, hopefully intelligent, purposeful, sentient, and conscious biological robots and this is what makes us human.

And our programs have evolved to construct simulations of ourselves within our environments that make it easier for us to function. Our simulation is loosely based on the underlying logic of the world of things but completely misrepresents the actual true nature of both ourselves and reality. And only by understanding the illusions of the world of appearances our simulation creates are we able to break through to the true nature of both ourselves and reality itself.

Deep Reality is the latest version of my previous books on Universal Reality. Deep Reality unifies all aspects of reality in a truly amazing revolutionary new understanding of everything that can't be found anywhere else.