A Simple Model For Integrating Quantum And Relativistic Physics

with application to the evolution of consciousness

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Abstract

If you want to make a cake, you have to know more than just the fundamental ingredients. There's also a fundamental process involved that has to be followed. Fundamentally, what makes a cell a cell is more than the physical parts. If you reduce a living cell too much, you destroy the process and fundamentally change what you were trying to understand. You have to include the life process in your explanation. Physics is the study of motion and motion is a process that makes a particle a particle. Reducing motion to 3-dimensional space and 1-dimensional time is a fine tool for Newtonian analysis, and it is still the model in relativistic physics (although they are mixed together as space-time), but quantum physics treats a particle as a whole that contains space and time as vibrations (frequency). This essay presents a geometric model of the quantum particle projected onto a background of motion and reveals the mathematical relations between the two perspectives. The secret ingredient is the way in which "past" time is displayed as the inverse of future time rather than the negative as is done on a linear time scale in other models. The result is a new perspective of physical reality as a process that involves an expanding wave function that effectively "reaches out" into the non-moving field of binary light-dark surroundings (vibrations) and collapses information into its own center. This information, stored in DNA molecules, might be what evolves from data cognition through knowledge (re-cognition) to higher levels of consciousness.

Is Fundamental the same as irreducible?

Why ask the question, "what is fundamental?" Because, in our search for understanding, every answer creates new questions, until we find the most irreducible, fundamental answer we can; right? Maybe not. To say "most irreducible, fundamental answer" suggests that fundamental means irreducible. But the answer to the question, "what is fundamental?" depends on what it is we seek to understand. If you want to bake a cake, would you ask the chef what the fundamental ingredient is? There's more to a cake than the ingredients. If you want to understand a living cell, then obviously, the individual parts of the cell are important to include in your explanation. But as the most elementary unit of life, the most important aspect – that fundamental, metaphysical thing that makes a cell a cell – is the process that allows a cell to be self-sustaining and to reproduce. If you reduce a cell too much, you destroy the process and fundamentally change what you were trying to understand. Different cells may have different ingredients, but the process is the same. So I would say that the *process* is more fundamental than the irreducible components.

In physics, it seems appropriate to think of fundamental in terms of elementary particles but isn't *motion* the fundamental *process* that makes a particle a particle? Every physical object is in motion relative to something else. A particle only seems to be at rest when I look at it in its own rest frame. If I measure a particle's position, then just for that instant it appears to be a physical object – an apparent surface. But we know that it too has internal motion. If I could hold a particle in my hand, then I would know its position because I would be in its rest frame. But if you were moving relative to me at a very high speed, the particle (as well as me and my measuring device) would be a blur, a wave function. You and I would see the particle differently but the particle-in-itself wouldn't change for you or for me. Neither one of us is shooting beams at it to measure it. We just see the reflection of the light that is shining on it whether we're looking or not. The difference is not in the particle. It's in our perspective. I just see it's "at rest" state, whereas you see it's "in-motion" state. We won't agree on spatial measurements or even time clocks. The only thing that we agree on is our relative motion. So regardless of how elementary the particle is, it can't be more fundamental than the motion that gives it form – the process that makes a particle a particle.

The first sentence I remember reading about physics was "physics is the study of motion." Motion is a unitary phenomenon and communication of information requires at least two bits. So in order to study it, motion has to be disguised as a binary. That requires it to be compared to other motion - conceptually separating it into two seemingly different ideas. The separation may be a necessary complication in order to use physics for practical purposes, but it is *less fundamental*.

Why do we still talk about *time* as if it is a fundamental entity? (Maybe that is *fundamentalism* in science?) The idea of time as an absolute quantity was introduced by Newton in the seventeenth century and served as an excellent tool in the development of physics, but isn't it obvious that time is nothing more than a gauge or scale for quantifying motion? In *The Metaphysical Foundations of Modern Science*, Edwin A. Burtt explained that before Newton, it was certainly recognized that things moved in space and changed in time, but space and time were not considered to be *fundamental* or *fundamentally* different phenomena. Instead, they were seen as different aspects of motion. Separating them was considered to be a *philosophical blunder*, especially to Isaac Barrow (1630-77), Newton's teacher, who said.

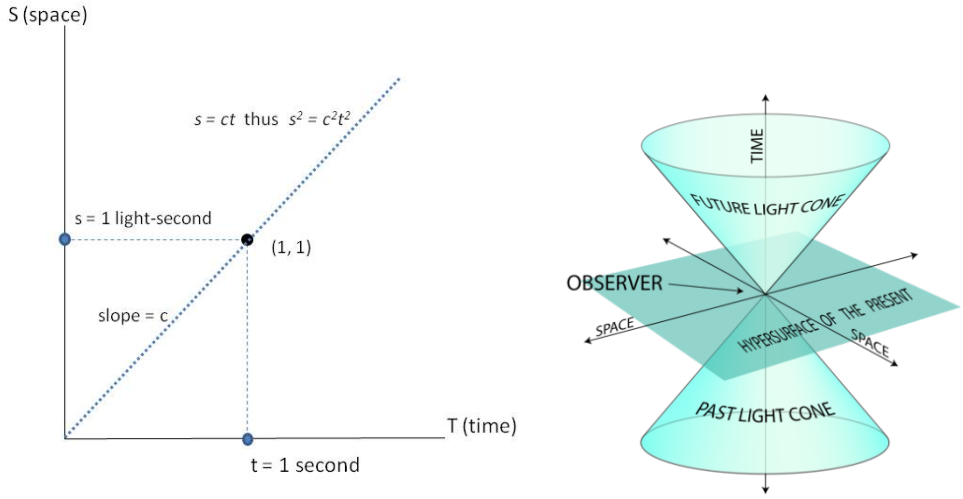
> "Clearly, just as we measure space, first by some magnitude, and learn how much it is, later judging other congruent magnitudes by space; so we first reckon time from some motion and afterwards judge other motions by it; which is plainly nothing else than to compare some motions with others by the mediation of time; just as by the mediation of space we investigate the relations of magnitudes with each other." (Burtt, 2003, p. pg. 158)

Reducing motion into space and time was a useful tool in Newtonian physics, but now it is what separates relativity and quantum physics. According to Lee Smolin, the #1 problem in physics today is to, "combine general relativity and quantum theory into a single theory…" That theory, he says, will be a finite theory, without the infinities and singularities that plague both relativity and quantum theories. The reason (in my humble opinion) they can't be united is that relativity models space and time as being fundamentally different, with space as three dimensions and time as one. Quantum theory – through the time-independent Schrodinger equation – does not. It includes inverse time or frequency, which is *not* considered one-dimensional.

What about space-time? Is space-time considered to exist and is it more fundamental? The concept of space-time was introduced by Minkowski as "a kind of union of the two" (Minkowski, p. 39). To physicists, space-time is a mixture: 3 parts space and 1 part time. Einstein referred to the space-time continuum because it provides an invariant and the laws of physics must be invariant regardless of the observers' state of motion. However, he said that "space-time does not claim its existence on its own, but only as a structural quality of the field." (Einstein, 1952, p. 155)

The Minkowski model

The Minkowski space-time (ST) formalism is used to illustrate space-time as a continuum (Penha & Rothenstein, 2007). I'll briefly describe a few points about the Minkowski diagram, beginning with one symbol for space (S) and one for time (T), see Figure 1a. Note that upper case S and T are used to mean the modulus of space and time, where $S = s^2$ and $T = t^2$ which are positive. So we imagine a flash of light at $(t = 0, s = 0)$ that expands spherically outward at the speed of light $S = CT$ or $s^2 = c^2t^2$, represented by the diagonal line from the origin.



a. b.

Figure 1 (a) A normalized plot of time vs. space that illustrates the point that light travels one unit of distance (light-second) in one unit of time (second)

(b) Minkowski's time vs. space diagram is normally shown with time as the verticle axis and space as a horizontal plane. The time axis is mirrored to include the past as negative time and the future as positive time. However there is no representation of direction in space since 3D space is represented as a 2D "hypersurface of the present".

It is then *assumed* that time is one-dimensional and space is three so the T axis is mirrored as $t = \pm\sqrt{T}$ and the negative axis represents the past. A "light cone" in Figure 1b is formed by revolving the line, (the diagonal in Figure 1a) that connects the origin with the point (1, 1), around the T axis to represent the limit of causality. The intersection of the time axis with the space "hypersurface" is said to represent an event or the present.

No physicist or mathematician would blink an eye when they saw the equation that describes a spherical expansion of light ($s^2 = c^2t^2$), written as ($x^2+y^2+z^2 = c^2t^2$). It is mathematically correct, because the equation for a sphere (S) is $S = s^2 = x^2+y^2+z^2$. But if

we are to reevaluate the fundamental meaning of time, we cannot make the assumption that time is one-dimensional while space is three. Doing so dis-integrates motion and creates problem #1 in physics.

There is certainly an advantage to unfolding space as $s^2 = x^2+y^2+z^2$: it fits our perception of 3D space, making the model seem intuitive. But the problem with unfolding one side of an equation without doing the same to the other (leaving it "enfolded" as David Bohm might say (Bohm, 1980)) is that it creates an artificial asymmetry – a lop-sided perspective that complicates the math, requiring parameterization in terms of hyperbolic functions (Jackson, 1975, p. 517). The result is a transformed coordinate system that must be calibrated by using the original ($c^2\Delta t^2 + \Delta x^2 = n^2$) to mark increments on the distorted axes. (Penha & Rothenstein, 2007). And interpretation of results becomes twisted.

Furthermore, mirroring the T axis to represent the past as *negative time,* has the advantage of providing a sense of past, present and future as we seem to experience time, but because it centers on zero as the reference, it artificially introduces a singularity. There is no such thing as zero time or zero space. The equation, $t = 0$ is supposed to mean the start time or reference time, not the magnitude, but coordinates on the S-T graph represent increments of change, i.e. magnitudes. So representing $t = 0$ on the graph incorrectly represents zero time and zero space.

The alternative approach presented below as the Space-Time-Motion model is to represent a unit of measurement (i.e. the first increment on either scale rather than crossing the axes at zero) as the reference with magnitude of one. This reinterprets the origin of the graph (which is actually zero *motion* – the real process) as being the "at-rest" state of the quantum model, and the region between zero and the first unit of measurement on either axis S or T as the energy that the particle potentially contains if measured (which requires a moving frame and thus the relativistic model).

The Space-Time-Motion (STM) Model

The Space-Time-Motion or STM model (http://vixra.org/abs/1402.0045) uses the same idea of a light flash at some position, s_0 and time, t_0 expanding in a sphere as ($s^2 = c^2t^2$). But neither side of the equation is unfolded. The squared terms represent space as a whole and time as a whole, which are symbolized by upper case $S = s^2$ and $T = t^2$. Then $s^2 = c^2t^2$ can be written as

$$S = Tc^2. \qquad (1)$$

In this form, the equation means that ***space and time are equivalent***, in exactly the same way that $E = mc^2$ means that *mass and energy are equivalent*. They are equivalent because they are two different ways of representing the same phenomenon. They are simply different scales for the same *process*[i]. Equation (1) suggests that time (T), is transformed into units of space (actual physical quantities) just as mass is converted into energy. The term c^2 is simply the factor that relates the units of measurement.

Graphically, $S = CT$ is a line on the S-T plane through the origin with a slope of C as in Figure 1a above, which represents the motion of a spherical wave front. In contrast to the Minkowski diagram, the STM model considers change (both S and T) to be positive (a modulus, an absolute value) so there are no negative axes. Just as the radius of a sphere is a positive measure from the center outward to the surface of a sphere, positive S values represent outward-directed change in space. Similarly, positive T values represent outward-directed change in time. The "arrow of time" simply means that regardless of

which direction motion happens in 3D space, once movement happens, it is positive[ii]; it can never "un-happen".

Mathematically, it is *not incorrect* to use negative variables, such as $-s$ and $-t$ because the magnitudes of $S = (-s)^2 = s^2$ and $T = (-t)^2 = t^2$ give the same result. So it seems to make perfect sense to use the negative as the opposite direction - a mirror image of each axis on a graph. But mirror images can be distorted if you look too close or if seen from the wrong perspective, especially at the point of reflection. Result? What some people call *fairy-tale physics* - see Jim Baggott's book, Farewell to Reality: How Modern Physics Has Betrayed the Search for Scientific Truth (Baggott, 2013). Poetically, it is through the looking glass that we find fairy-tale physics.

Rather than using the negative reflection, the STM diagram uses inverse, so the region between the zero-motion point and "1" (one unit of measurement) on the T axis represents the past, the inverse of the future as shown in Figure 2. The measurement event effectively inverts or enfolds what was the future into the past and transforms t into $1/t$ or frequency of vibrations. On the S axis, the region between the zero-motion point and one corresponds to inner space, beneath the apparent surface of the sphere, as spatial frequency $(1/s)$. The zero-motion point is where the light flash originated, where an observer would see the wave front expand outward. The first measurement of the wave front, immediately after the flash, is shown as position, s_1 and time, t_1.

What appears to be the intersection of the two axes is neither zero time nor zero space, so they don't actually intersect; it represents the zero-motion-perspective or "at-rest" state. Here, the word *state* has the same meaning as *perspective*. The at-rest state of a light flash is what the light sphere itself would measure if it could measure itself. From its perspective, it is not expanding or moving. It is a unit of light, with a given amount of energy that does not change with time. If it were conscious and able to measure itself, say 1 second after the flash at Event 2, it would "think" it was a constant size and see the flash bulb shrinking and collapsing into the past toward its center. And that would reset the event reference to s_1 and t_1.

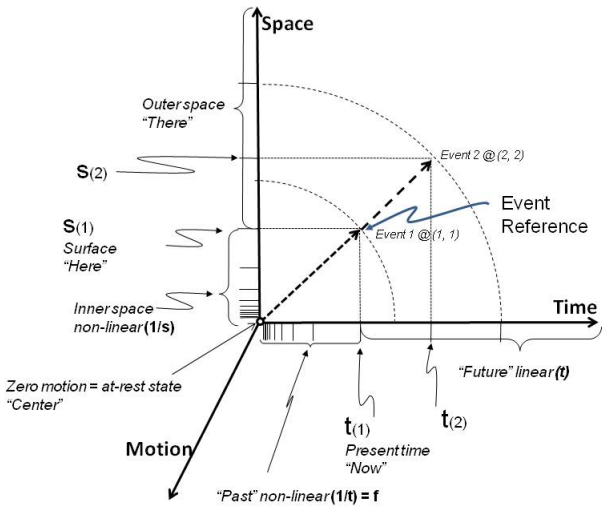


Figure 2 Event Reference from the at-rest perspective of the flash bulb. *Event 1* represents the flash (at position 1 and time 1) and *Event 2* represents the measurement of the light reaching 1 light-second in 1 second. Every event that came before *Event 2* (the "past") is thus represented as a point closer to the origin.

Now if, instead of a light sphere, the STM model is used to represent a physical particle, in agreement with what Milo Wolff calls the "wave structure of matter" (Wolff), then the event reference in Figure 2 becomes representative of every moment we experience as now. It is the "present" and the perceived surface of every physical particle. We are conscious particles and experience the event reference as *here* and *now*. The future is outside and the past is inside.

After every observation, the particle's wave function expands outside of the event reference, into the future until the next observation (event 2), which resets the event reference and collapses the wave function. This effectively draws in the surrounding space so the T in the equation $S = Tc^2$ is interpreted as the future - a field outside the particle being transformed into space as an actual particle.

This model can be used to represent the relationships between quantum energy, relativistic energy, and total energy in Figure 3. The equations that tie the two perspectives together are $E_o = mc^2 = pc = \frac{hc}{\lambda} = hf$, where m is mass and p is momentum, h is Planck's constant, λ is wavelength and f is frequency.

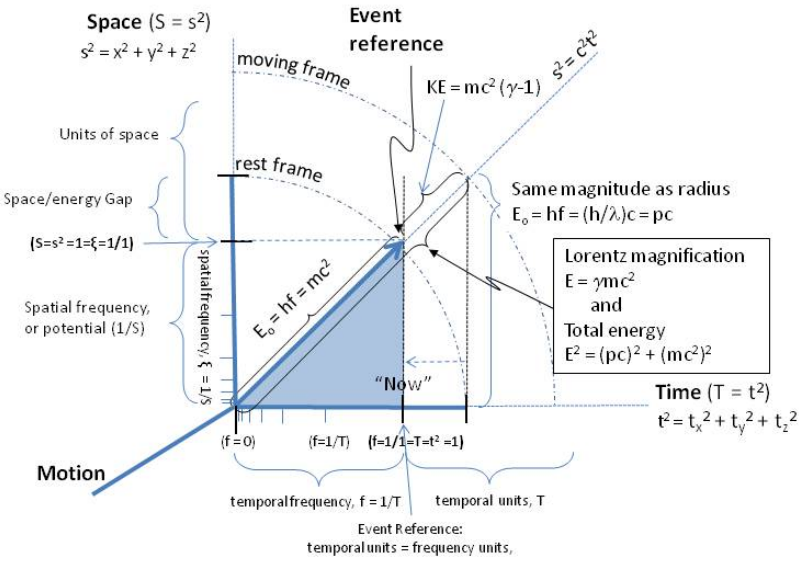


Figure 3 Space-Time-Motion (STM) model

A quantum particle at rest with energy $E_o = mc^2 = hf$ is represented as a vector. By superimposing it on a background, moving frame (with components $S = s^2 = 1$ and $T = t^2 = 1$ in natural units), we can see how the two models are related.

Vector E_o lies on the hypotenuse of two similar right isosceles triangles: the smaller (rest frame) and the larger triangle (moving frame). Geometrically, the horizontal and vertical legs of the larger triangle have the same magnitude ($E_o = hf$ for the horizontal and $E_o = pc$ for the vertical) as the hypotenuse of the smaller one. These triangles accurately depict the well-known relationship (Halliday, Resnick, & Walker, 1993, p. 1122) for total relativistic energy (E) of a particle. Using the Pythagorean theorem:

$$E^2 = (pc)^2 + (mc^2)^2. \quad (2)$$

The larger hypotenuse represents total energy $E = mc^2 + KE$ where KE is the relativistic kinetic energy

$$KE = mc^2(\gamma - 1). \quad (3)$$

and

$$\gamma^2 = c^2/(c^2 - v^2) = \frac{1}{\left(1-\frac{v^2}{c^2}\right)} \quad (4)$$

is the Lorentz factor. Combining equations, the total energy is thus

$$E = mc^2 + KE = mc^2 + mc^2(\gamma - 1) = mc^2 + mc^2(\gamma) - mc^2. \quad (5)$$

or

$$E = mc^2(\gamma). \quad (6)$$

The Lorentz term (γ) is simply the magnification factor that results from projection of the rest-frame units onto the moving frame.

The quantum model contains motion in the form of frequency, *f*, but the relativistic model splits motion into two complementary concepts. Representation on the *ST* plane is thus a conformal projection[iii] of the particle onto the observer's moving reference frame. Because *S* and *T* are still enfolded, it is not used for calculating motion in any particular direction in space. It just shows why motion creates the Lorentz magnification and time dilation. There is nothing different about the particle-in-itself, but different moving frames would seem to *empower* it with different amounts of kinetic energy, KE, which introduces a distortion in the appearance of the particle from each moving perspective.

Is one perspective more fundamental than the other? I think that can be answered by what we know about the speed of light being constant regardless of the speed of its source. If I could not see anything around me, I would not perceive uniform motion. But if I was holding a flashlight, I would see what appears to be light moving away from me at a constant speed, reflecting off of objects and returning to my eyes (moving frame perspective). Now from my at-rest perspective, if it is really the wave function of my body (and my awareness) that is expanding and collapsing with each observation, then the light is not moving at all. It is my expanding awareness drawing in information-modulated waves as events in the light.

And the source of the light is irrelevant. If you were coming towards me with a light in your hand, I would see your light the same as I see mine. To me, events that I see in your light would reach me at the same speed as mine regardless of your speed relative to me. This suggests that the reason the speed of light is constant is because it is the real, fundamental constant – the only thing that is *not* moving.

But we also get information in the dark, or what we perceive to be darkness. In fact, the contrast between light and dark is what really contains visual information. So in order to include both light and dark, it is better to refer to "*the field*" of vibrations. As Einstein said, "The field thus becomes an irreducible element of physical description." (Einstein, 1952, p. 150)

Physical form is the manifestation or perception we observe when motion separates the field into two coherent waves, *S* and *T*, one moving outward as a quantum particle wave function and the other moving inward as the collapse of the same wave function modulated with information. The surface boundary then is the *holographic interference pattern* forming

the apparent surface of the volume in space. The volume contains the back-projection of energy ($E_o = pc$) in Figure 3 and is what we perceive as the particle. The space/energy gap in Figure 3 represents a distinct, quantized difference between the particle at rest and in motion and makes it appear solid.[iv]

How does this relate to consciousness?

Jim Baggott says that reality is a metaphysical concept that cannot be measured. Once things are measured, they somehow change (fundamentally) from things-in-themselves to things-as-they-are-measured. That is exactly what we learn in quantum mechanics. As observers, we fundamentally change reality from the realm of unknown (potentially real) to known (empirically real) simply by observing or accepting information into our awareness. The great thing about empirical reality is that it feels good; it feels real. The measurement process gives us that satisfying feeling of recognition, the joy of hearing, feeling or seeing something we already know, and the epiphany when we suddenly understand something new. Transforming the unknown into awareness with our senses is the most natural process of life. Even the simplest biological cell has to somehow recognize and take in what it needs for survival.

Am I suggesting that all matter draws in information and is therefore conscious? No; but perhaps all matter that contains molecules, like DNA, that store information is conscious to some degree. A certain amount of information reaches our senses and our cells every moment, whether we know it or not, and becomes uniquely part of every cell. We know that DNA molecules contain all the information necessary to form, nourish, reproduce and heal the cell, but do we know where the information came from in the first place? And is the genetic code fixed for a particular organism or does it evolve?

If information from events around us collapses into and becomes part of the cells of our bodies, then every cell would have nearly the exact same information, but a slightly different perspective than every other cell depending on its location and function in the body. Perhaps that is how cells are able to differentiate and produce individual parts of the body. This could also be tested if there is a sensitive enough instrument to detect the differences, by using PCR to multiply DNA molecules from different parts of the body. It seems to agree with Karl Pribram's "Holographic Hypothesis of Brain Function" (Pribram, 1984) to explain why memories cannot be eradicated by removing individual parts of the brain.

Drawing in information is the process of acquiring data. Cognition is the process of acquiring knowledge. Consciousness is about cognition and re-cognition. Data becomes knowledge when it is used as a reference for re-cognition. If I say, "I know something," I mean I recognize it as something I have seen, heard or experienced before. I know that the raw data that I draw in myself is true, although I may not understand it. "I know what I see," or "I believe what I can hold in my hands," are both ways of expressing the satisfaction that comes from direct experience as opposed to learning from someone else's experience. But knowledge is not the same as understanding. Knowledge just happens; I either have it or maybe I'll get it. Understanding is a feeling I get when all of the necessary pieces of knowledge come together and superfluous information is filtered out to form a new perspective. When this happens, I have a satisfying *epiphany*, defined by Merriam-Webster as "(1) a sudden manifestation or perception of the essential nature or meaning of something (2) an intuitive grasp of reality through something (such as an event) usually simple and striking (3) an illuminating discovery, realization, or disclosure."

There are different levels of consciousness and every epiphany raises our awareness to a higher level, from which we gain new perspective. The lowest, perhaps *instinct,* is that level of consciousness that flows naturally out of the process – driven by relative motion and the flow of information. Through evolution, all of the information acquired by our ancestors is stored and passed on, allowing offspring to recognize what they need to adapt. The hierarchy of needs then drives consciousness to evolve from the most basic physiological to eventual self-transcendence. "Transcendence refers to the very highest and most inclusive or holistic levels of human consciousness, behaving and relating, as ends rather than means, to oneself, to significant others, to human beings in general, to other species, to nature, and to the cosmos" (*Farther Reaches of Human Nature*, New York 1971, p. 269).

I think that Baggott hit the mark by explaining why many of the current theories in physics can't be correct, but I don't think that *most* physicists have "abandoned the search for scientific truth." I do wish that they would focus their energy and resources on what really matters though. I can't imagine a world that will benefit from black holes, worm holes, parallel universes and the like. I can, however imagine a world in which everyone holds truth in the highest esteem, above wealth, ego and religious belief (including fundamentalism in science), a society with honor and integrity, focused not only on finding truth, but revealing it as well, in order to dissolve the perceived physical boundaries and experience the wonder of transcendence. That to me is fundamentally important.

What if the information contained in DNA can be retrieved, deconvolved, reconstructed, and rendered like the information from a CT or MRI in medical imaging? Imagine a forensic investigator that can use a victim's or suspect's DNA and render a 3D video of exactly what occurred in all three dimensions around the victim. Would that eradicate crime? And what about those who have been convicted of a crime they didn't commit? Their own DNA can provide proof of their innocence. That gives new meaning to "the truth will set you free."

Would that make people appreciate the value of truth? Just the idea that truth - actual events - becomes an integral part of my DNA, encoding and controlling the function of each cell, makes me appreciate truth as the creator of consciousness and sustainer of life and health. Can we accelerate our own evolution if the scientific community takes charge of these holistic concepts rather than leaving them to pseudo scientists who make fantastic claims without even trying to follow the scientific method? Perhaps that is why terms like "Beings of light" evoke ridicule from serious scientists. But technically, we are all Beings of light, some more enlightened than others.

> "And perhaps that is why the Beings of light tell us again and again that the purpose of life is to learn. We are indeed on a shaman's journey, mere children struggling to become technicians of the sacred. We are learning how to deal with the plasticity that is part and parcel of the universe in which mind and reality are a continuum, and in this journey one lesson stands out above all others. As long as the formlessness and breathtaking freedom of the beyond remain frightening to us, we will continue to dream a hologram for ourselves that is comfortably solid and well defined."
>
> Michael Talbot – The Holographic Universe

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Notes:

[i] Note that the word *process* can be used as both verb and noun form. The verb form of *process* refers to an action of change and the noun refers to an object such as a bony protrusion (e. g. spinal process)

[ii] If it is desired to model direction in space, then the space axis can be unfolded, which would hide the time axis from the 3D representation. Effectively, it would be "understood" or "collapsed" into the mind as information.

[iii] It is a projection because the graph on a two-dimensional plot is a collection of individual points, (s_i, t_i). Motion itself is inferred from the shape (slope) of an imaginary line that connects one point to another. The magnitude of motion is represented in the figure by the symbol, c, which is one side of a square surface c^2 – the "motion plane". The one-dimensional line is a projection that *refers to* or *implies* motion but motion is not actually part of the *S*-*T* plane.

[iv] If this model is valid it can be used to calculate the quantized energy levels of electron orbitals.