The Holomorphic Quanta

Part 4: Reintegration

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"[Physics][i] is like the god Proteus, 'the ancient one of the sea, whose speech is sooth.' The god 'will make assay, and take all manner of shapes of things that creep upon the earth, of water likewise, and of fierce fire burning.' The life voyager wishing to be taught by Proteus must 'grasp him steadfastly and press him yet the more,' and at length he will appear in his proper shape. But this wily god never discloses even to the skillful questioner the whole content of his wisdom. He will reply only to the question put to him, and what he discloses will be great or trivial, according to the question asked." (Campbell, p. 381)

The Shapeshifter
(from "The Hero With a Thousand Faces" by Joseph Campbell)

Abstract

This is final part of a 4-part presentation. In this part I focus on how the most important equations in quantum mechanics, those that are taken from statistics and encourage the Copenhagen interpretation, are really operations that reintegrate vector components of spacetime (energy in the form of motion) that had been separated and rescaled, to arrive at the desired observable in the new domain. This is presented for the purpose of supporting a better, more meaningful interpretation that leads to a demonstration of the wave structure and holomorphic nature of reality.

By redirecting attention away from the "particle" and onto the relationships that distinguish different aspects of the same unknown (like space and time as different aspects of motion), and by focusing on the meaning of various mathematical operations rather than following the rules, I conclude that the process itself is the key to understanding that the universe is a continuous transformation rather than a creation.

Introduction

This is part 4 of a 4-part presentation. In part 1, I introduced the Space-Time-Motion (STM) model and used it to illustrate how the traditional physics formulation has resulted in equations, functions and interpretations that reflect the self-fulfilling notion that space and time are fundamentally different and that space-time is some kind of mixture of the two. That interpretation has forced the impression that space is made up of particles and time extends from a beginning "point" to who-knows-what. In part 2, I began to tune the STM model to represent spacetime as a projection of the undivided form of energy, transforming it from nothingness into the expanding universe we live in by a process that has been modeled in many ways by physicists using the language of math. And since math splits, projects and transforms domains into skewed maps of each other and the *language* of math has several dialects, I used computer windows as an analogous way of focusing an image on the meaning of and relationship between the domains.

In part 3, I demonstrated how the STM model could be used to reveal some important and well-established classical, quantum and relativistic relations and how they are different ways of saying the same thing. The Correspondence Principle – looking back at and comparing new ideas to what it known or has previously been established, is a reflection with the intentional purpose of verification. At the quantum level, resonance is verification of a frequency match. So reflection is the step in the process that makes verification possible and that is done in the fourth step as reunification.

In this part, I hope to *wrap it up*, so to speak, to bring it to closure. In doing so, I feel that it is important to include certain ideas that sometimes result in rejection by scientific journals because they are better suited for journals on philosophy. But I think that science without philosophy is blind[ii]. "Smart" scientists can remember volumes of information and do math "with their eyes closed". But knowledge is just a means to an end. The real value of knowledge is in wisdom; understanding – awareness of truth – when we *see the meaning*. In Part 1 of this paper I said, "The challenge for the teacher is to give form [a model] or at least some kind of structure without creating the classical misconceptions." Although mathematicians do a great job providing the tools to work the mechanics and operations of science, it is the job of the physicist to philosophize, without being tedious or pompous, but to reflect on the meaning of the symbols and to relate new equations to our current way of thinking as well as to old ideas that are still vital or those that are ready to be revived.[iii] And that reflection must be followed by closure. Closure is the deciding step that matches the reflection with like-parts of the projection. It is a return to the first step to repeat the cycle. It separates the part that resonates from the part that doesn't (dissonance).

The interpretation that I propose is what I call The Holomorphic Quanta, which echoes Quantum Field Theory and builds upon the Wave Structure of Matter (WSM)[iv] proposed by Wolff (Wolff, 2006). WSM theory identifies a quantum particle as a spherical standing wave. It is supported by equations of particle motion modeled as the phase velocity of the standing wave (Shanahan, 2014). However, WSM lacks verification and it is missing parity and chirality.

Presenting a standing wave as part of the STM process – the holomorphic transformation of formless energy into form – introduces parity and chirality and supports the tenants of the Holographic principle (Suskind, 1995), the Holographic Universe (Talbot, 1991), the Holotropic Mind (Grof, 1993), the Holonomic Brain Theory (Pribram, 1984), David Bohm's Holomovement (Bohm, 1980) and Mark Germine's Holographic Principle of Mind and the Evolution of Consciousness (Germine, 2008). And it is supported by recent observational tests of holographic cosmology (Afshordi, Corianò, Rose, Gould, & Skenderis, 2017). By using attosecond pulses to film electron motion, they produced an image, see Figure 1, (Science Daily, 2008) that shows the crests, valleys, parity and chirality (notice how the picture resembles a pair of lips with a small bump in the upper lip) of the standing wave.

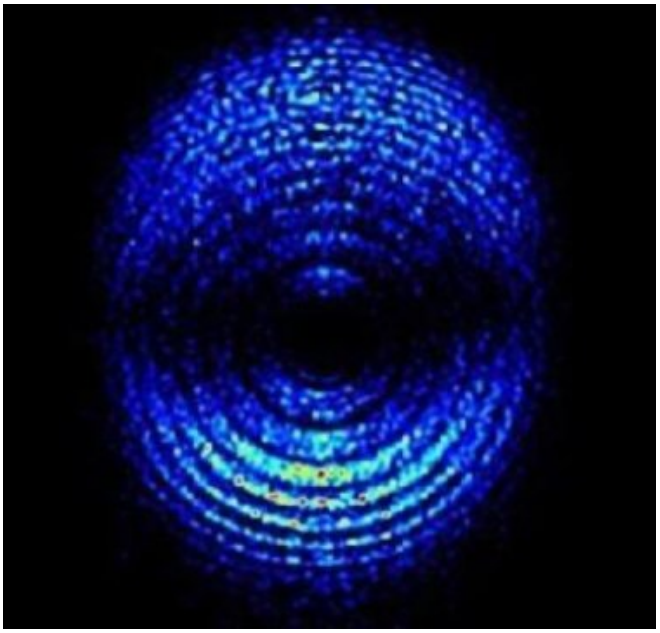

Figure 1 Image of electron "With the use of a newly developed technology for generating short pulses from intense laser light, scientists in Sweden have managed to capture the electron's motion for the first time." From https://www.sciencedaily.com/releases/2008/02/080222095358.htm

Mathematical Closure

Mathematical symbols used in abstract applications such as algebra represent operations[v]. Even the equals symbol (=) represents separation of a concept into two equivalent symbols or expressions. Addition is a projection in the same domain, but multiplication can also be considered an amplification or

projection into another domain; a product domain (e.g. 3 x 2 means 3 units of 2 so the new domain has units that are twice the size of the first). A power operation is a special kind of multiplication since the result is always symmetrical. A negative sign is can be interpreted as an operation, but also as a symbol that represents a reflection (or back-projection) in the same or a different domain. It produces a symmetric reflection that can then be added to bring closure. Similarly inverse multiplication represents reflection and it has two forms: a ratio and a root. A ratio can produce either a symmetric or asymmetric result, but a root is an inverse power operation that always produces symmetric reflections, and one of the roots may be imaginary.

Reunion or reintegration is a solution, the *result* of the sum (+) and product *operations* that *can* bring closure to separated units. In math, a set is said to have "closure" under an operation if performance of that operation on members of the set always produces a member of the same set.[vi] And a set that is not closed can be closed under operation. Closure is an important step in the process of understanding. Even the word Algebra literally means "reunion of broken parts".[vii] And the word "quantum" means the smallest unit of energy that can be considered discrete, i.e. separate from other units, and thus closed within its own boundaries. And quantum mechanics served as closure for the last phase in the evolution of physics.

Operators in Quantum Mechanics Bring Closure

Complex *transform* equations, like derivatives, integrals, Fourier and Laplace transforms, etc. are all compositions of numerous mathematical operators. Two of the most common transforms in physics and engineering are the Fourier transform and Laplace transform. It is interesting to note that the wave function itself, $e^{i(ks-\omega t)}$ is a double-transformation function – the product of the Laplace transform and Fourier transform of unit (Dirac delta) functions. A Fourier transform, defined as

$$\mathcal{F}[f(t)] = F(\omega) = \int_{-\infty}^{\infty} f(t)e^{-i\omega t}dt, \qquad (1)$$

converts a differential equation into a temporal frequency, and a Laplace transform, defined as

$$\mathcal{L}[f(t)] = F(s) = \int_{0}^{\infty} f(t)e^{-st}dt, \qquad (2)$$

converts a differential equation into a spatial frequency. The way to describe how one function *translates* another is by a convolution integral $F(s) * F(\omega)$. So motion, expressed as $e^{i(ks-\omega t)}$ may be considered a convolution of space with time.

To show how this relates to the operators in quantum mechanics, we write the phasor in space as the product of the rectangular representation $\left(\frac{1}{s}\right)$ and quantum representation $e^{i(ks-\omega t)}$. In vector mechanics, this operation is the inner product (dot product, the projection of a vector onto a basis), $S = \psi \cdot f_s = \frac{1}{s}e^{i(ks-\omega t)}$, which is the equation for a spherical wave moving outward in space.

In quantum mechanics, for lack of any physical interpretation, it is interpreted as the expectation value (the statistical approach).

$$\langle f(s)\rangle = \int \psi\psi^* f(s)ds. \tag{3}$$

But when applied to a wave function, this is simply a scaling factor because the product, $\psi\psi^*$ is just the scale times its inverse (since the inverse of $s = e^{2\pi is}$ is $\frac{1}{s} = \frac{1}{e^{2\pi is}} = e^{-2\pi is}$, which is the conjugate of s). And since the wave function maps motion as the slope of the phasor in S-T coordinates, which is the derivative of one component with respect to the other, the integral in Equation (3) gives you back the measurable scalar component. The quantum operator (which would be inserted for $f(s)$) serves the purpose of identifying the basis (an inner product, a vector projection onto the spatial axis[viii]). It inserts the appropriate variable to work in the rectangular domain ($\hat{x}$ = x in the case of position) or converts the wave function into a momentum function by substituting $k = \frac{2\pi}{h}p$ and $\omega = \frac{2\pi}{h}E$ into

$$\psi = e^{i(ks-\omega t)} \tag{4}$$

to get

$$\psi = e^{\frac{i}{\hbar}(ps-Et)} \tag{5}$$

and then projecting that onto the momentum domain by taking the first derivative with respect to s. This extracts the momentum variable, p, along with $\frac{i}{\hbar}$. So the momentum operator is

$$\hat{p} = \frac{\hbar}{i}\nabla. \tag{6}$$

This operator is considered to be the most important operator in quantum mechanics because we can write all other classical observables as functions of **r** and **p**. (Morrison, 1990, p. 146)

Not Just "To Be or Not To Be"

The term "particle-wave duality" means we don't have to choose between particle and wave. With the STM model we can visualize the transformation of an expanding spherical wave into a potential particle (a metamorphosis of perspective), by allowing our visual image to *morph* from one to the other just as you would when you see an object at rest with respect to your own body, and then visualize it as being in motion with respect to, say the sun.

But what is the distinction between a massless photon and a particle that has rest-mass? The difference is that light is the outgoing wave with the *potential* to express material form and according to WSM theory; matter is the *actual* form that results from the interaction of the outgoing wave with outside interference i.e. incoming waves.

Consider again the light sphere. It was produced in darkness (*devoid* of any contrast that contains information) by the pulse of light. The sphere is therefore just a thin shell. What's inside that shell? If there are no other sources of light, it must be darkness. As the light shell moves outward, *the void fills with darkness*. By the same reasoning, we could say that the darkness outside the shell recedes. So rather than saying that light travels at speed *c*, we could say that light is the constant – the only thing that doesn't move – and *darkness recedes-outward* and *fills-inward* at that speed. It's a subtle difference, but it makes more sense of how light can have the same velocity regardless of the velocity of its source. Rather than picturing a particle of light being emitted by a moving filament, which would add velocity to a particle, we imagine that a disturbance made by the light bulb transforms the darkness (call it space, field, ocean, either, universe, information-less energy, or maybe it's dark energy) into light (radiation, information). The disturbance propagates outward, *uncovering* a ring of light (not moving, but being revealed and then re-covered).

The Standing Wave

Now consider if the light bulb at the center of the sphere stays on continuously. This disturbance will have a certain frequency, so effectively it is radiating in equal cycles, pulses or events, modeled as waves. Each wave has the same frequency and wavelength. And then imagine that there are billions of other light bulbs completely surrounding the first one. According to the Huygens-Fresnel principle (along with the Fresnel-Kirchhoff diffraction theory (Cantrell, 1997)) *there are*[ix]. Every point on a wave front can be considered a point source of a spherical wave. So we don't even need a flashbulb and we don't need any dedicated outside sources; they are everywhere, and we need them all[x]. And there will be a component of their disturbance moving directly inward, toward the center of the first. Any component that is in tune (the same frequency) and coherent (in phase) will contribute to the equation for an incoming spherical wave

$$S_{in} = \psi_{in} \cdot f_s = \frac{1}{s} e^{i(ks+\omega t)} \tag{7}$$

The sum of the incoming and outgoing waves is a spherical standing wave,

$$S_{out} + S_{in} = \frac{1}{s}\left[e^{i(ks-\omega t)} - e^{i(ks+\omega t)}\right]. \tag{8}$$

This is what Daniel Shanahan used as a model particle whose relative motion is its phase velocity[xi] (Shanahan, 2014). The WSM theory makes good sense, but there are details that need to be worked out in order for it to be acceptable to the mainstream.

A standing wave pattern would be in space-time balance and resist a change in that balance but any shift in phase would appear as acceleration, resulting in particle motion. But then the positive acceleration would be countered by an inverse

acceleration that would act against it to rebalance and attain space-time equilibrium and then maintain that constant velocity. This gives the particle inertia.

With the STM model, we can see in Figure 2 that the outgoing phasor is aligned with the spatial axis and the incoming phasor is aligned with the temporal axis. This is because $(ks - \omega t) = 0$ for the outgoing phasor and the incoming phasor is 90° out of phase as $(ks + \omega t)$. The resulting standing wave phasor, the vector sum of the incoming phasor and the outgoing phasor, is a tangential vector, in line with the projection of the potential acceleration vector discussed in Part 2.

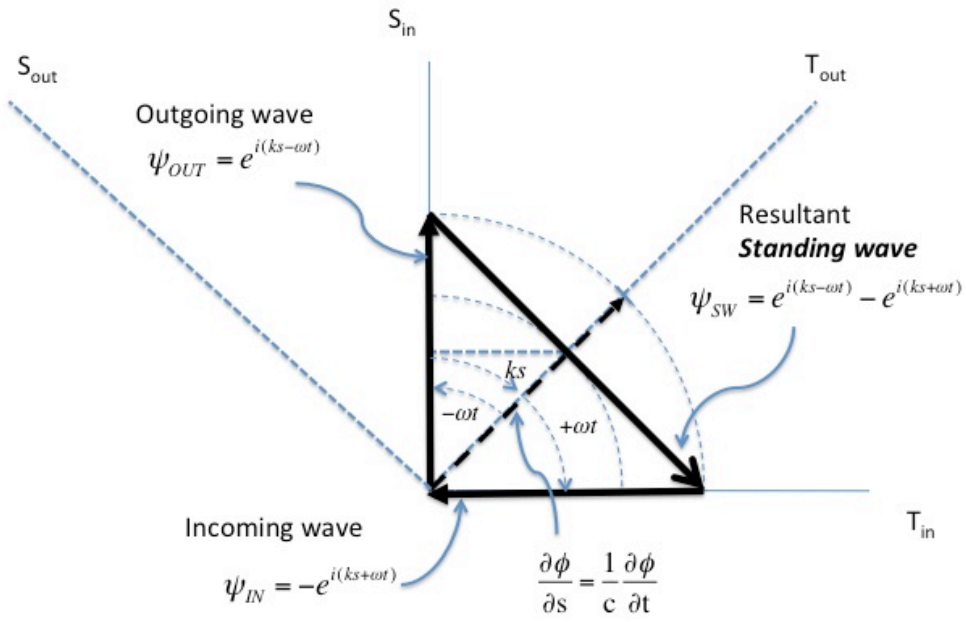

Figure 2 Resultant standing wave vector is the sum of the outgoing wave and incoming wave

So the resultant vector looks suspiciously like the acceleration vector except that the tip of this vector is at the time axis. We could interpret this as meaning that it is a *potential future state*, meaning that in the next time increment the time axis would be shifted so that the tip of the vector is at the origin, as shown in Figure 3. Then it would be exactly the same as the Klein-Gordon vector in Figure 8 of part 3.

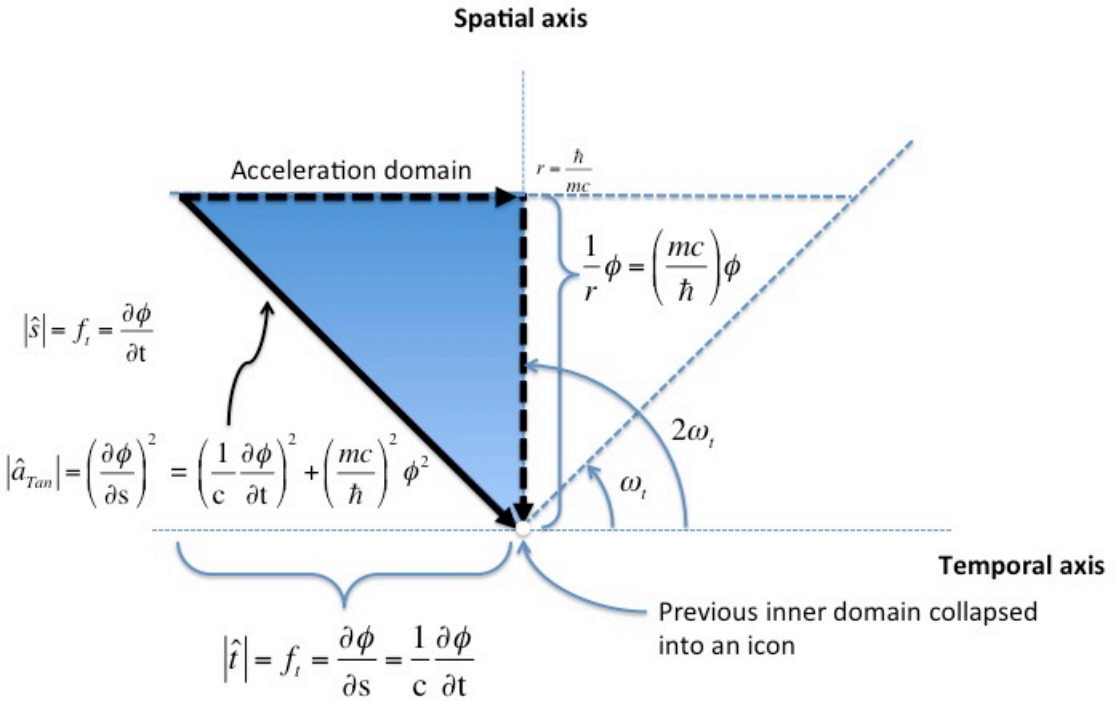

Figure 3 The spherical standing wave phasor diagram shows that the vector sum of the outgoing and incoming waves results in a vector that is described by the Klein-Gordon equation.

According to Equation (21) of Part 2 $\left\{\left(\frac{mc}{\hbar}\right)^2 = \left(\frac{2m}{\hbar}\right)\frac{E_{FP}}{\hbar}\right\}$ the outgoing wave could have been interpreted as the energy of two potential particles. In other words, with just the outgoing wave, there was no change in the gradient to cause a change in frequency, so there was no acceleration vector. Only the potential for the vector if something made the frequency change. The incoming wave provides that interference as a constant change in the gradient, so it makes the vector actualize. Once it does, it becomes its own unit of energy, comprised of two particles.

We could double click to collapse it to an icon at the origin and click that icon to translate it back out to $\frac{1}{r}$, the reverse of what we did in Part 2, and expand it at the event reference on the spatial axis, to get Figure 4.

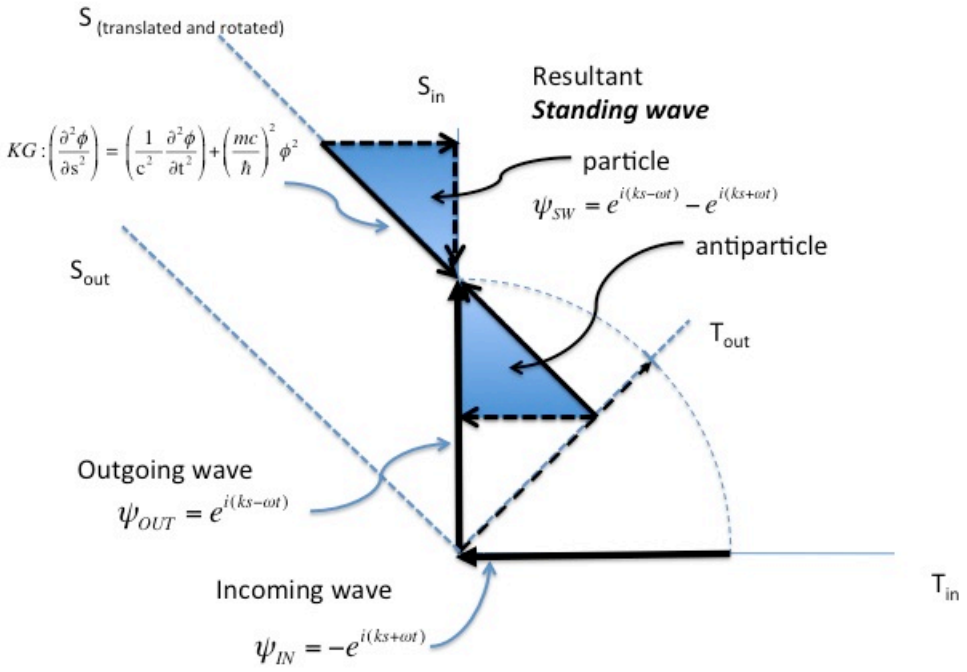

Figure 4 The spherical standing wave phasor diagram shows that the vector sum of the outgoing and incoming waves results in a pair of potential particles. One represents the real particle and the other an antiparticle. The rotated and translated coordinate system produces a phase shift, giving the particles their own inertial system, separate and distinct from the background.

So we could deduce that the incoming wave provided the necessary interference to resonate with them and transform them into *potential form*. My interpretation is that one of them, in outer space, represents a particle and its mirror image, in inner space, represents an antiparticle, with equal mass and opposite charge (180 degrees out of phase). I said *potential form* because neither one will have *actual form* unless there is an interaction that changes the frequency argument of the velocity vector, which would make one of the acceleration phasors larger than the other so that they don't cancel each other. Until that happens, the outer phasor represents the potential particle and the inner phasor represents the binding energy that must be overcome in order to give the outer particle form, which separates it from the original center (photoelectric effect).[xii]

This line of reasoning could be followed repeatedly to attempt finding correspondence with all of the particles in the Standard Model of particle physics, lending further support to the particulate nature of reality. But the physical part is only one aspect of reality. Unlocking the mysteries of the universe means that there is a mystery, a lock and a key. Energy is the mystery, physical form (differentiated into separate units) is the lock, and recognizing the equivalence of space and time is the key. The second mystery is how to use that key. The answer to that is found in the harmony of nature.

Quantum Harmony Forms the Natural Scale

Rather than choosing the physical aspect as the cornerstone of reality, with time as imaginary, let's focus on the energy – the units of area on the STM diagram. So instead of treating an area as a particle, I will treat it as a ray of monochromatic light (a laser) like a hologram.

So let's go back to square one. The outgoing wave (at t_0) has a specific energy that we represent as the area of the square, $s_0 \times t_0$. The incoming wave has the same energy (at t_1), so the combined energy should be shown as double the area. If we use the vector symbol, as in Figure 2, the resultant vector shows the phase relation, but cuts the quadrant in half. So even if the scale is halved, as discussed in part 2, the area of the triangle below the resultant vector is not enough to include both waves. To account for this, and to show the phase relation, I reflected the triangle as shown in Figure 5.

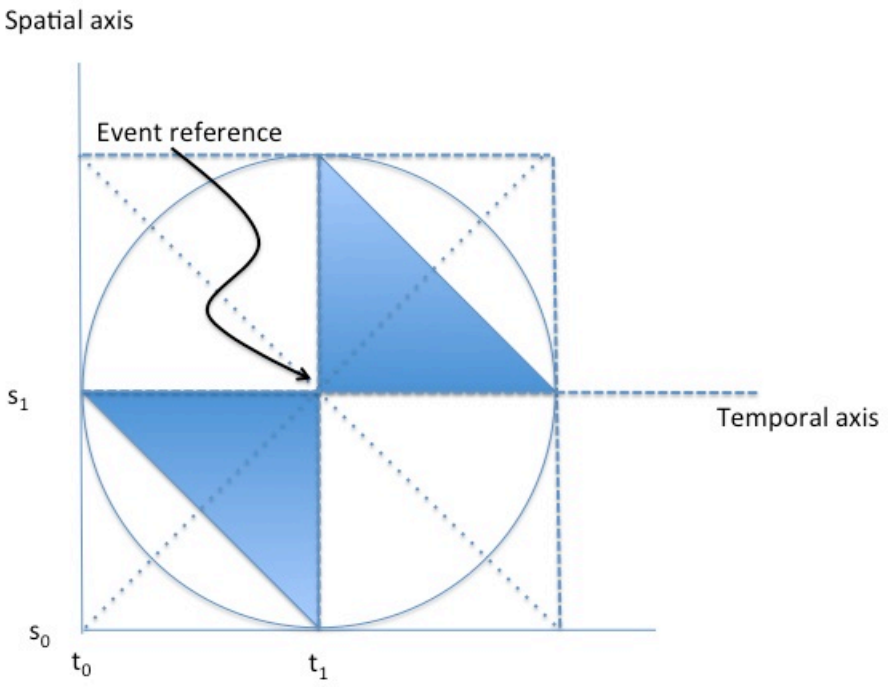

Figure 5 Resultant wave as a combination of two areas on the STM diagram

This is the energy diagram at t_1 showing the outgoing wave in the lower left and the incoming wave in the upper right quadrant. Notice that the point of symmetry (what was previously the origin) is projected up along the diagonal line – translated from s_0 , t_0 to s_1, t_1 so it is offset from the source point of the outgoing wave. This is exactly the same geometry as before, in Figure 1 of Part 3, with the velocity vector split in half and leaving a spacetime gap at the center of the quantum domain. Now if we double click on this translated center, the shaded area in the lower left quadrant would collapse to an icon to represent energy "captured" inside the event reference, transforming what was a divergent field into a curled field. This

forms a completely closed spherical boundary in space that would appear from the outside to be a particle.

So what happens when the clock ticks t_2? We have already accounted for the energy of both waves, so we don't get another triangle to work with. Instead, we get another separation, projection and reflection (scale transformations) that continue to morph the energy we have. This is where the Golden Ratio comes into play.

Golden Closure

We have known for centuries that nature somehow uses the Golden Ratio to shape spatial features and produce harmony throughout the Universe (Stakhov, 2014). And we know that there are many physical, as well as musical and optical patterns that involve the Golden Ratio (Willard, 1993). We even know that it is somehow linked to inter-neural synchronization during spatial-frequency coding in the brain and thus related to perception (Elliott, Kelly, Friedel, Brodsky, & Mulcahy, 2015). We know it happens, and we know how to use it in art and architecture, but we don't know how it happens in nature. With the STM we can solve that.

In Part 3 Figures 9 and 10, I showed how the Golden Ratio played a role in splitting the speed vector. In this section, I will apply the same reasoning to the STM diagram to show how the incoming and outgoing waves split into multiple coherent non-divergent waves that constructively interfere with each other to form a holomorphic image that presents as a closed group of quantum particles.

The Golden Ratio is a special number, just like 1 (the Event Reference) and 2 (the scale splitting) are special, but it is a bit more mysterious[xiii] because it is a ratio, which is a solution – the result of operations: division, which is the result of separation into inverse reflections, and reunion by multiplication. The Golden Ratio is golden because it is the only number that represents the condition in which the transformed domain is equivalent to the original system. To see this, I'll continue with discussion of Figure 5.

The energy that is collapsed between t_0 and t_1 creates a "germ" for a holomorphic image. This germ is centered at the zero-frequency point (ZFP) just like that used in ray-tracing analysis of holography where ZPF means "the zero spatial frequency locus of a hologram" (Stephen Benton and V. Michael Bove, 2008, p. 78). Now in order for there to be a t_2 there must be relative motion, since time is motion. And if there is motion, there is a relativistic reference frame within which this energy must be fit. Even with its spatial dimension squashed to one half to account for stretching the time scale back into the inverse quantum region, there is still a component of the speed vector that doesn't fit, as shown in Figure 6.

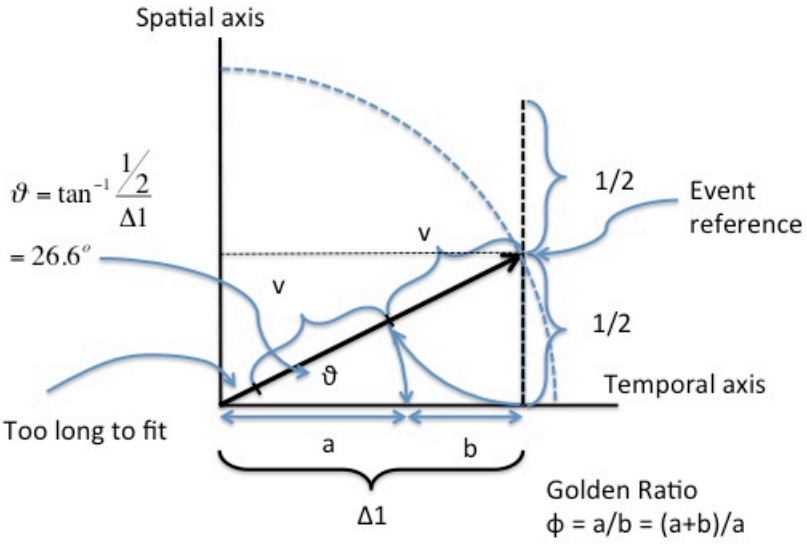

Figure 6 Scaling the temporal axis to fit the inverse temporal region into the relativistic scale is not enough to account for the speed scale

But if the reference frame is rotated slightly about the event reference, so that the speed scale fits $2v = v^2$ into the spatial scale, the center point (ZFP) would be shifted in space and time, giving it (the tiny zero-point vector) natural *quantum motion* and the apparent progression of time. The amount of shift required to make the new speed scale (Φ^2) as shown in Figure 7, fit the temporal scale (1 unit) to include the inverse domain ($\Phi + 1$) will place it at the Golden Angle of 36°.

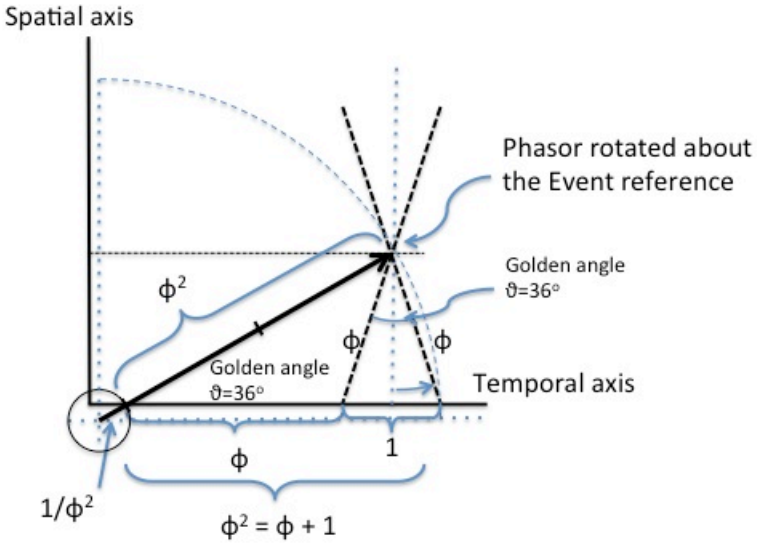

Figure 7 The Golden Angle is the phase angle that results from squeezing the extra energy of the standing wave into the quantum particle.

The slightly shifted speed vector (Φ^2) can then be separated into a linear term (Φ) and inverse term $\left(\frac{1}{\Phi}\right)$ just like we did with space and time[xiv]. And the spatial component, collapsed inside the holomorphic germ is phase-shifted from the ZFP, resulting in a spatial frequency grating necessary to form a holographic image. It also provides a vector to compare with the ground state quantum numbers, $n = 1$, $l = 0$ and $s = \pm\frac{1}{2}$ since there is both a spatial and temporal component. The region outside the germ can still be compared to a particle with angular momentum for $n = 2$ and $l > 0$ since translating and rotating coordinate systems has no effect on the frequency of energy. I would suspect that there is a golden relationship here too since $\Phi^2 = \Phi + 1$, so multiplying the speed vector, Φ^2, by its scaling component (an inner product) gives $\Phi(\Phi + 1)$, which is strikingly similar to $L^2 = l(l + 1)$.

There is a lot more work to do in order to verify the use of the STM model and find correspondence between it and the current model to give us real closure[xv]. But it will require physicists to accept *process philosophy* as opposed *substance philosophy*. Otherwise, they will continue to think of space and time as fundamentally different with spacetime as an asymmetric mixture. Changing this perspective may be difficult because the prevailing cosmological model for the universe, the Big Bang Theory must be abandoned. With process philosophy there is no beginning to a process, no $t = 0$, only reference times. So there is no "past" in the sense of negative time, only the integrated reflection of here and now, which lends itself beautifully to Information Theory and the study of consciousness.

Space and time must be thought of as projections of motion and reflections of each other, as mathematical dimensions of energy and not as an independent clock and a dependent displacement. Space and time are integrated together as equals. For the next step in analysis, you might be tempted to ask what happens at $t = 3$, but the number 3 introduces a numerical distortion that doesn't work. Instead you should think in terms of shifting the coordinate reference to a new event reference, t_1 with t_0 and t_2 to serve as scale-boundary conditions. And rather than thinking of electron orbitals as being located at greater distances from the center, they should be though of as holomorphic quanta inside the event reference with different frequencies and phases, like golden triangles of different sizes and pointing in different directions.

So the next step might be to start back at square one again and rather than separating energy into two dimensions of space and time at 90°, use three dimensions at 60° apart, giving them names like E_1, E_2, E_3 rather than space, time, and something else. In fact, we may find that the principle quantum number corresponds to the number of dimensions used (2 for space and time) so it might be a good idea to go back and rename space and time to something that mimics the electron configuration system, $2s^1$, $2s^2$ since 1s would represent the holomorphic germ. That would help crystalize the understanding of space-time equivalence. However, I intend to use conformal mapping techniques (mapping $s = \frac{1}{t}$) in which the vectors represent rays that map to circles and circles that map to lines.

Conclusion

In the Introduction section of part 1 of this paper, I said that rather than trying to visualize the quantum, or memorize matrices, we often settle for visualizing a series of mysterious boxes that have inputs and outputs, temporarily ignoring what happens inside the boxes. The STM model reveals the pattern that I submit is the important process that we seek.

The steps in the process were used as section headings throughout this paper to illustrate the process used to analyze the unknown. They are 1) *Separation*, 2) *Projection,* 3) *Reflection*, and 4) *Reintegration*. It is a fundamental metamorphic process that transforms the unknowable essence into knowable quantities – from the simplest possible idea of the atom to the highly complex standard model. The steps in this process provide a template for future research and for integrating the results of previous research. They are echoed in Biology as the life process involving DNA replication by *Initiation, Elongation and Termination*. And they provide a means of bridging science with other disciplines.

The same pattern is found throughout human culture in other symbolic expressions. Mythologist Joseph Campbell identifies the process common in myths of all cultures, followed by the stories' heroes, as "a magnification of the formula represented in the rites of passage: *separation–initiation–return*, which might be named the nuclear unit of the monomyth." (Campbell, p. 30). The same process is the nexus between all religions, the belief that the soul separates from God, is sent into the world for a life of trials and tribulations, reflecting on his plight and hoping to return after death. In some religions, the cycle must be repeated many times before reaching the ultimate goal of transcendence. In all cases, there is strong emphasis on the utter worthlessness of material objects and how the lure of the physical eventually leads to failure.

And though the steps are not identified, it is the central theme of Process Philosophy in which Alfred North Whitehead introduced Event Metaphysics.[xvi] "The core proposition of event metaphysics is that the basic unit of reality is not a thing at all but rather an event – an occurrence or happening." (Various, 2004)

A Projection of Global Impact

There is no end to the process, but there must be an end to this paper. And since every answer creates more questions, it is fitting to end with the question about how this model can affect society as a whole. Most of the problems in our world stem either from the belief that there is real value in material substance or from the belief in a particular religion that separates its followers from "non-believers". These beliefs are not based on truth, but opinions or best evidence. But scientific revolutions demonstrate that (to put a spin on the old adage that the absence of evidence is not evidence of absence), *truth of evidence is not always evidence of truth*.

The STM model may help to change the perspectives about what really matters. If a person believes that he or she is truly a holomorphic projection, an ethereal Being of light, intimately connected to all of their surrounding energy, then the implications are that they are entirely composed of truth. By that I mean the

information energy that modulates the incoming wave (i.e. what really happened in ones surroundings) is collapsed via the holomorphic process into every fiber of our being. It forms the "golden crystals" of our DNA. If you know that, then you will know where to look for insight. You will know that there is a reflection of yourself within yourself that is absolutely true. Not only does it make life possible, it makes the life process work correctly. I submit that distortions of truth make it unhealthy and truth can restore it to health.

It is the responsibility of science to search for truth, and to never do the math with your eyes closed. If science will refocus on truth and teach society that truth is the only thing that is real, and the only thing of value, there is no doubt in my mind that we will solve the important problems.

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[i] Campbell actually said "Mythology" but I inserted the word "Physics" to hint at a point that I will make in the conclusion.

[ii] Einstein said, "Science without religion is lame, religion without science is blind." In the same spirit, I submit that science without philosophy is blind, and philosophy without science is lame.

[iii] Geometric algebra, for example, is regaining popularity, provides a space-time algebra (STA) and may provide a better tool for working the mechanics of the STM model. (Lasenby, 2017) (Hestenes, 2003) (Hestenes, 2017) Other than a few endnotes, I decided to step through the process using the computer window analogy in order to avoid the need to learn another mathematical language.

[iv] WSM has received some mixed reviews (see https://www.quora.com/search?q=milo+wolff and https://forum.philosophynow.org/viewtopic.php?t=13262), yet Daniel Shanahan strongly supported the idea in his paper, where he showed that the motion of particles is equal to the phase velocity of these standing wave patterns. (Shanahan, 2014) Recently, newly developed techniques very similar to those used in holography were used to demonstrate the wave structure, also called "Space Resonance Theory," by producing quantum coherence in the lab. (Science Daily, 2008) (Carlström, Mauritsson, Schafer, L'Huillier, & Gisselbrecht, 2018)

[v] Many of the terms used here are used in Abstract algebra, which is the tool of choice for dealing with sets of vectors symbolized by matrices.

[vi] https://en.wikipedia.org/wiki/Closure_(mathematics)

[vii] Algebra (from Arabic "al-jabr", literally meaning "reunion of broken parts") is abstract in that it uses abstractions, such as letters to stand for numbers that are either unknown or allowed to take on many values and scales. See https://en.wikipedia.org/wiki/Algebra

[viii] The same function could be projected onto the time axis. Can you visualize a spherical wave in time? Of course; it is exactly the same sphere because motion in time is just another way of representing motion in space. As long as you keep the variables symmetrical, in natural units, there is no need for further scale correction. The problem comes when you change the scales to match our senses so that one unit of space is defined as, say one meter, in which case a light unit is $3x10^8$ space units compared to one second (tick of an arbitrary clock). Then $c^2 \neq c \neq \frac{1}{c}$. *Breaking the symmetry* like this makes a light unit seem enormous – way out there in the cosmos, and a unit of time small – something we can measure with a wristwatch. On the other hand, thinking of time as something the stretches from the theoretical beginning of the universe makes a unit of space seem unimaginably small – a quantum particle. It also necessitates the use of all sorts of other scales and units to distinguish forms.

[ix] In fact, the STM model is very similar to the model used to derive the Fresnell-Kirchhoff diffraction theory in (Cantrell, 1997)

[x] That is why the title of this paper is the Holomorphic Quanta rather than Quantum. There is no quantum without the other sources, each of which can be quantized as well. And even the one of interest does not exist without its mirror image – the hidden variable in the words of David Bohm.

[xi] More outside sources at a given frequency would mean more power (flow of energy per unit time) in the standing wave. Compare this directional energy flux to the Poynting vector in electromagnetic theory, $\boldsymbol{P} = \boldsymbol{E}\times\boldsymbol{H}$, where $\boldsymbol{P}$ is the Poynting vector (energy flux or energy per unit area per unit time), $\boldsymbol{E}$ is the electric field and $\boldsymbol{H}$ is the magnetic field. The cross product is called a curl because the direction of the phasor is perpendicular to the two fields, i.e. it "curls around" $\boldsymbol{E}$ and $\boldsymbol{H}$. In our case we have the field of space and the field of time, and the curl or spin is the form of the quantum particle.

A hologram is another important comparison to make. It is a complex 3-dimensional pattern that forms by the interference patterns produced by two coherent laser beams. Any change in the relative phases of the interference pattern causes the holographic image to move across the field of view. One wavelength makes the image drift one whole "fringe".

[xii] I speculate that this would leave the antiparticle phasor to act as a force particle.

[xiii] The Golden Ration has held "special fascination" for millennia. According to https://en.wikipedia.org/wiki/Golden_ratio "Some of the greatest mathematical minds of all ages, from Pythagoras and Euclid in ancient Greece, through the medieval Italian mathematician Leonardo of Pisa and the Renaissance astronomer Johannes Kepler, to present-day scientific figures such as Oxford physicist Roger Penrose, have spent endless hours over this simple ratio and its properties. But the fascination with the Golden Ratio is not confined just to mathematicians. Biologists,

artists, musicians, historians, architects, psychologists, and even mystics have pondered and debated the basis of its ubiquity and appeal. In fact, it is probably fair to say that the Golden Ratio has inspired thinkers of all disciplines like no other number in the history of mathematics"

[xiv] Since this is the same vector previously labeled *c*, the speed of light, then the inverse scalar component is $\alpha = \frac{1}{c}$, which is the fine-structure constant in natural units.

[xv] But as authors of all physics texts must do, I will leave this to the student as an exercise.

[xvi] See https://en.wikipedia.org/wiki/Process_philosophy