

THE PHYSICAL BASIS OF QUALIA: OVERCOMING THE 1ST PERSON 3RD PERSON BARRIER

RICHARD L. AMOROSO
Noetic Advanced Studies Institute
120 Village Square MS 49
Orinda, CA 94563-2502 USA
email: cerebrosopic@mindspring.com

Abstract. The physical cosmology of the least unit of awareness inherent in the Continuous State Conscious Universe (CSCU), is the central structural-phenomenological principle of Noetic Field Theory (NFT). The concept of the *least unit* provides the fundamental arena for describing the physical structure and function of consciousness. Physically qualia are a continuous chain of mental events filling the state and domain of awareness. In this respect mentally - qualia represent the ‘experience’ of the content of the Mind. Individual consciousness or moments of consciousness entail the meaning associated with the “feel” of such Qualia. The purpose of this paper is to develop a cosmological model of Qualia as real physical objects. NFT postulates that Qualia may be quantified and categorized, and thus may exist independently of a particular entity under certain circumstances; therefore it becomes necessary to develop a multifaceted model of qualia in order to have sufficient parameters for describing both 1st and 3rd person aspects for the apprehension of any particular quale.

Keywords: Consciousness, Qualia, Noetic Field Theory, Structural-phenomenology

1. Introduction

Postulating that Qualia are physically real, which suggests that they may also exist independently of private 1st person introspection is a challenging task; even the statement of which appears immediately misleading. For example, by definition “a sound in the forest” is not, by definition, the physical ‘ripple’ in the leaves of trees; but the conscious apprehension of that ripple in the trees by some conscious entity. So what is the ‘it’; what is the substrate or physical noumenon beyond the phenomenon of apprehension that could actually exist or be recorded *extra-entity*, that would produce or reproduce the same Qualia later, in the same individual, or another individual and thus potentially also a robotic device?

This postulate means that subjectivity is not the sole requisite for their existence and qualia thus may be shared ontologically or independently, signifying the potential for dissolution of the 1st person 3rd person barrier. As the chemical elements were classified into a periodic table in past centuries; a similar type of ordering is predicted for qualia in ensuing centuries.

1.1 Qualia: An Initial Definition

Since David Chalmers is well known in contemporary Philosophy of Mind there is some utility in beginning with his delineation of qualia. Chalmers leads in to his *working definition* of qualia with descriptive phrases like “the subjective quality of experience, there is something it feels like to be a cognitive agent” [1]. He initiates his definition with a well known line from Thomas Nagel that states [2]: ‘that a being is conscious if there is *something it is like* to be that being’:

A mental state is conscious if there is something it is like to be in that mental state...a mental state is conscious

if it has a *qualitative feel* - an associated quality of experience. These qualitative feels are also known as phenomenal qualities, or *qualia* for short. The problem of explaining these phenomenal qualities is just the problem of explaining consciousness. This is the really hard part of the mind-body problem. I use the term [qualia] in what I think is the standard way, to refer to those properties of mental states that type those states by what it is like to have them...Qualia can be properties of 'internal' mental states as well as of sensations. It is often convenient to speak as if qualia are properties instantiated directly by a subject, rather than a subject's mental states; this practice is harmless, and justified by the fact that qualia correspond to mental state-types in their own right [1].

A Basic Simplified Conventional Definition of Qualia - The '*what it's like*' character of mental states. The way it '*feels*' to have mental states such as pain, seeing red, smelling a rose, etc.

Qualia is plural for quale. "Quale" is a technical term introduced by C.I. Lewis (1929) [3-4]. A quale is an introspectible and seemingly monadic property of a sense-datum. For example, the qualia of a visual sense-datum of a rose would include the experienced red-ness, and the qualia of an olfactory sense-datum of a rose would include the sweet-ness of the scent.

Defining qualia is no simple task. One must first, as Chalmers predicts, complete the task of preparing a comprehensive theory of consciousness, and then at the leading edge of that theory clarify a plethora of terms before one can begin to convey any semblance of understanding as to how Qualia are represented phenomenologically and apprehended by the mind ontologically. Since this task is theoretically possible with NFT lets give it a try!

In terms of an overview of the noetic cosmology of a continuous state conscious universe (CSCU) introduced in proceeding chapters, there exists a structural - phenomenological domain defined as the psychosphere¹ or complete set of higher dimensional boundary conditions representing an individual conscious entity. Central to this domain is the temporally localized Heisenberg matrix of the brain holoscape [10] representing the raster resolving the entrained moments of conscious awareness. This plane of awareness is like standing wave modes on a violin string centered on the present moment which is timeless or eternal [5] and as such is a self-organized complex system which is in essence a microcosm of the entire conscious universe [6-10]. The continuously evanescent mental states of information is termed qualia or the physical embodiment of mental content that changes or evolves with changes in mentation or intention. In this general framework of the noetic formalism:

If one assumes that qualia is a tensor psychon; the leading lightcone singularity is modulated by a phase of the noeon psychon field.

We will spend the rest of this discourse explaining what the above sentence means!

2. The Physical Basis Of Subjective Experience

'What's it like to be a bat?' is the title of a well known 1974 article by Thomas Nagel [2] that discusses the difficulties associated with developing a scientific explanation for the nature of experience. Nagel states that current reductionist attempts fail by filtering out any basis for consciousness and thus become meaningless since they are logically compatible with its absence [2,16]. His main premise is that if one assumes that an organism has any conscious experience at all, "that there is something it is like to *be* that organism". This is the subjective character of experience for any conscious entity wether it be a bat or a Martian. Every experience has a specific subjective nature [17, 18, 19].

Nagel also states that "there are facts which could not ever be represented or comprehended by human beings, simply because our structure does not permit us to operate with concepts of the requisite type"; because "to even form a *conception* of what it is like to be a bat one must take up the bat's point of view". If one removed the viewpoint of

¹ The psychosphere [14] represents the sum total of an individual entities mental existence which includes the mind and consciousness. This represents a complex geometric topology which at the semi-classical limit entails a temporal domain in Minkowski space that couples to quantum processes in the brain and body; and through the mediation of the Noetic Field (noeon) also includes a timeless higher dimensional domain of an individuals eternal elemental intelligence.

the subjective observer; what would be left? Nagel suggests that the remaining properties might be those detectable by other human beings or the physical processes themselves or states intrinsic to the experience of awareness. This changes the point of view of qualia to the form that “there is something it is like to undergo certain physical processes”. “If our idea of the physical ever expands to include mental phenomena, it will have to assign them an objective character”. Nagel recognizes the fact that:

Very little work has been done on the basic question (from which mention of the brain can be entirely omitted) whether any sense can be made of experiences having an objective character at all. Does it make sense ... to ask what my experiences are *really* like, as opposed to how they appear to me?... This question also lies at the heart of the problem of other minds ... If one understood how subjective experience could have an objective nature, one would understand the existence of subjects other than oneself [2].

These are the questions we intend to answer here. The first thing this means is that contemporary definitions of qualia are inadequate. The standard definition is still somewhat suited for describing the subjective character of qualia; but since qualia in the physical sense of noetic field theory now must have a dual nature, another component to the definition must be generated to describe qualia from the objective sense - i.e. to distinguish the phenomenology of qualia from the noumenon or existence of the physical thing in itself.

Thus defining the threefold nature of qualia now includes the three forms:

Type I. The Subjective - The *what it feels like* basis of awareness. The phenomenological states of the qualia experience. (This is the standard definition of qualia)

Type II. The Objective - Physical basis of qualia independent of the subjective feel that could be stored or transferred to a 3rd party. The noumenal elements of qualia upon which the phenomenology is based.

Type III. The Universal - Living systems represent Qualia of the conscious universe. They are a substrate acting as a ‘blank slate’ carrier from within which Q-II are modulated into Q-I by superradiance.

For clarification it should be noted that all three forms of qualia are considered physically real by the noetic theory because the noetic fields of the continuous state cosmology on which the noetic model is based are all physically real.

2.1 WHAT’S IT LIKE TO BE A PRION

We will analyze the objective character of qualia by taking a much more fundamental approach than that of confining ourselves only to mammals as Nagel did. We begin with the prion [11,12] defined as the most primitive form of living system [13, 15] (see Chapt 4). Since Noetic Field Theory (NFT) assumes that self-awareness is not a requisite for qualia; a primitive form must be associated with the *cognitive domain* [13] (see chapt 4) of even the most fundamental living system. Very few activities are associated with the ‘life’ of a prion. It may be reasonable to limit prion existence to only three activities: 1. Translation, 2. Conformational change and 3. Propagation. We need not say the prion has any form of awareness at all if we use only the objective definition of qualia. More will be said on this later as we discuss the basis for life and the relation of qualia to this basis. Suffice it to say that at the most fundamental level, just being a living system ‘entitles’ any life form, even the most primitive such as the prion, to a certain fundamental action mode. These ‘actions’ are the effects of the inherent mechanical aspects of self-organization in a conscious universe.

It is postulated that the holophote entry [7, 9] (see chapt. 4) of the noeon (exchange particle of the noetic field) from every point in the topology of spacetime into every atom or molecule [7], is the teleological coherent action principle that facilitates the conformational change responsible for prion propagation when certain other *in vivo* conditions are met [15]. If we assume that the *cognitive domain* of the prion is associated with the physical boundary conditions of the hypersphere of the prions physical chemistry, certain specific orientations of the molecular bonds associated with the translations involved in conformational change to the infectious form of the prion protein lead to propagation relative to the radiation pressure of noeon coherence as it enters from the complex HD domain of the noetic hypersphere into principle molecular phase planes that can be kinetically activated.

3. Developing A Metaphor For Explaining Qualia

A 'Movie Theater' (MT) model of the mind is used to illustrate the structure of Qualia Type I and II because it is synonymous with the triune or three base states [10, 14] fundamental to consciousness in NFT: 1. Elemental Intelligence, 2. The Noetic Field, 3. Classical dynamics in brain and body. Secondary metaphors of rainbow formation and stroboscopic action on a violin string are also pertinent. Qualia are only perceived within the hierarchical processes of the complex structure of living systems (Or perhaps in the future a cybernetic system that duplicates these features).

According to NFT a living system is not only comprised of spacetime connected biochemistry animated by a nonlocal teleological action principle sometimes called the '*elan vital*', but a living system also entails a Cognitive Domain [7, 9, 13] within the boundaries of the psychosphere [10, 14] that is associated with the above complex processes within which the actual conscious awareness resides and Qualia are apprehended.

Can there be a living-system with a cognitive domain devoid of mental content? In this respect we might assume that coma is a deeper or more 'empty' state than sleep. NFT postulates that the prion is the simplest form of living system. Should the lowly prion be assigned a domain of Elemental Intelligence that is co-eternal with God? Noetic Theory contains the concepts that can help us solve these dilemmas. According to NFT rock contains one of the triune elements of consciousness - the noetic field. But rock is not alive or conscious. Prions and viruses do have a cognitive Domain but no agency or self-awareness. Their activity is purely mechanistic. Plants are living systems, i.e. material 'animated' by the *elan vital*, but the 'agency' of their cognitive domain is also mechanistic. Any living system by virtue of the life process has a Cognitive Domain which in the most primitive might be synonymous with its de Broglie wave. Agency and in that sense rudimentary awareness begins with bacteria, making them smarter than trees, since they are reported to make choices beyond that dictated by mechanism alone; but self awareness probably only begins with some mammals dolphins or birds.

Logically, but somewhat arbitrarily, the assumption is made that prions and viruses are not 'aware' but have the mechanistic consciousness of plants - a step above rock. Something about the boundary conditions of a cell seems required for the rudimentary intelligence assigned to bacteria. While a virus commandeers a cell and its machinery this seems to be more what might be called a form of anti-consciousness rather than the simplest form of self intelligence; its thievery does not get it true cognition by use of the hosts body or cellular consciousness. The current state of NFT development can not make this delineation definitively only probably. A rigorous answer must wait for empirical testing.

The next challenge is what entities or 'who' should have elemental intelligence co-eternal with God? In some theologies - *The spirit in the body is the soul of man*. If we assign intentional action to the lowly bacteria as we have done here; are they entitled to this distinction? Is the fundamental domain of Elemental Intelligence some micro boundary condition so that a human being would as it were be a 'galaxy' of micro bacterial type domains of Elemental Intelligence? At present this seems to 'woo woo' sci fi or Eastern panpsychic-monistic to answer. But without some Cartesian revelation from God or future empirical development utilizing putative Dirac-Noetic Interferometry or the cerebroscopic transducer as a research platform to 'see' the HD domain of Elemental Intelligence; we are forced to leave this as an open question at present. Fortunately this bears little effect on our seminal definitions of the physical nature of Qualia because it seems that wherever we set a demarcation on the 'qualia pyramid' or hierarchy, the result is the same as far as defining Qualia is concerned.

Firstly Qualia can only be apprehended subjectively in a living system, shared by synchronicity breaking down the 1st person 3rd person barrier by a 'sufficiently simulated' artificial living system (since we don't know exactly what that means at present, we will drop it from the discussion for now). By following the predictions of NFT by definition :

Postulate 1 Any entity with sufficient awareness (Computation in the logic array of its cognitive domain) for intentional action, beginning with bacteria, have the *conscious* ability to apprehend Qualia Type I and utilize type II; for the lowest living systems this is primarily a mechanistic activity. The mechanistic effects result from the 'radiation pressure' of coherence of the unified noeton field.

A single hydrogen atom has the ability to exist as an isolated entity in space, but this does not seem to be true of a Quale (singular of Qualia) because they are comprised predominantly of 'light' confined to the hyper-holographic domain of

the psychosphere comprised of an array of 'least units' of awareness which cannot be separated from the topological fabric of reality in the same way that an image cannot be resolved by single photons. Of course bold statements like that are sometimes proven wrong in the future, it may be possible to confine a Quale in a QED cavity or atom as was recently done for photons. The main utility of the concept of Quale may be in defining some particular unit of awareness in stand alone form for illustrative purposes.

Is there a definitional distinction between apprehension and the 'feel' of Qualia? This represents a challenge that is perhaps moot; but in order to consider infinitesimal shades of difference, for the purpose of discussion we will say that Qualia is the content of the instantaneous moment of apprehension. (See Fig. 1) We want to make this distinction so fine that FAPP there is no distinction between apprehension and qualia. The rationale for this nomenclatural abyss is that by the noetic definition Qualia has the properties of an elephant: a rope (tail), pillar (leg), hose (trunk), wall (body) etc. in that Qualia can be looked at from various perspectives of both apprehension (Type I) and structural phenomenology (Type II). Specifically, Qualia exist in a hyperholographic domain that has eternal or timeless properties, spacial cavity configuration properties, noetic field informational and temporal action properties etc.

Back to the 'movie theater' metaphor. When the projector bulb is on, this represents a living system with a blank slate of Type III Qualia. If the projector bulb is on but not shining on the screen, a boundary condition proximal to the screen would represent sleep and a boundary condition distal to the screen would represent coma.

Some mention will have to be made at some point concerning distortion. Filters of personality, psychosis, drugs etc that distort apprehension, i.e. S1 'sees' lucidly and S2 is wearing 'filters'. This brings up another definitional dilemma that relates to the collective unconscious. Is there some absolute Platonic form for each Quale that is apprehended in various degrees of impurity by each entity from within species and from bacteria upwards. Or should we define everyone's perception as different which therefore becomes a different Qualia. We already know that individual differences cause varied reaction to the same stimulus.

Qualia I cannot be just the film in the projector. Just the film would be Q II objects like a DVD, video tape or the vibration of the leaves of trees as the unapprehended precursor to sound. Therefore Qualia in the 'movie theater' metaphor entail a complex self-organized system of the three types of qualia. These factors working in concert summate into Qualia I when apprehended.:

- The *film* - data impinging the quantum raster from either external or internal sensory input or mentation processed in each case by the Cognitive Domain or Brain as transducer. Q-II.
- The *light* - Noeons of the noetic field Q-III that act as
 - A) the *elan vital* and
 - B) 'light of the mind'.
- The *image* on the screen - Content of the mind filling the cognitive domain of the theater. Q-I.
- The *feel* or apprehension of qualia entails all of the above - Type I qualia
- Type II qualia is all the above physical parameters not apprehended as in Type I. Type II qualia may be stored extracellularly or shared by telepathy or synchronicity breaking down the 1st person 3rd person barrier.

Postulate 2 In the above context in general: If one assumes that Qualia can be represented as a continuous array of tensor Psychons evanescing within the brain holoscape of the cognitive domain of an entities psychosphere; the leading lightcone singularity is modulated by a phase of the noeon psychon field.

This postulate first made above in section 1.1 now begins to be more comprehensible.

3.1 APPLYING THE MOVIE THEATER METAPHOR OF QUALIA

Based on the fundamental tenets of Noetic Field Theory that consciousness has three base states: 1. Nonlocal Elemental intelligence, 2. Action of the Unified Noetic Field and 3. Semi-classical Brain Dynamics or Cognitive Domain, it is possible to make a generalized chart of living systems and qualia. The chart cannot be perfected yet without future empirical research; but the chart represents a 'best guess' based on what the Noetic Theory suggests.

HIERARCHY OF LIFE AND AWARENESS (QUALIA)

I. ROCK OR INANIMATE MATTER - Noetic Field only. One of the three component of consciousness, but not a living system. No Qualia.

II. PLANTS, AND INFECTIOUS PROTEINS LIKE THE PRION AND VIRUSES - Noetic Field. Rudimentary Cognitive Domain, but its activity is purely mechanistic by flux of Qualia type II. Rudimentary levels of Q-III.

III. BACTERIA PLUS - Noetic Field. Qualia Type I and II. Cognitive Domain has rudimentary awareness, *choice* is generally a mechanistic computation. Q-III.

IV. LOWER CLASSES OF ANIMALS - Noetic Field. Qualia Type I, II and III. Cognitive Domain/ Brain has basic awareness and ability for conscious choice, some of which is genetically encoded and instinctual.

V. MAMMALS, DOLPHINS, BIRDS - Noetic Field. Cognitive Domain/ Brain. Elemental Intelligence (Soul). Qualia Type I, II and III. Many in this class have self-awareness. Elemental Intelligence is a more theological component of consciousness; it is this parameter that allows a living system to exist beyond Earthly temporal existence.

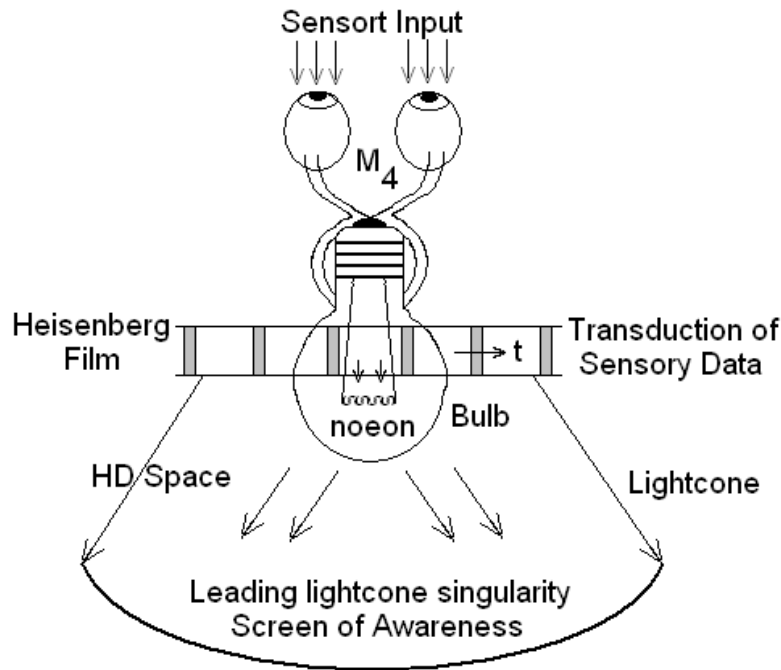


Figure 1. The Movie Theater metaphor of Qualia displayed as a two dimensional representation of the twelve dimensions of the psychosphere. In the description of the scale invariant least unit of awareness [Chapt 4] the Wheeler geon or de Broglie wave ball of light covering HD space is the *light* comprising Qualia which would be represented at the movie screen. The bulb when on represents the spark of life or *elan vital* inherent in every point of spacetime and every atom of a living systems biochemistry. The film represents the informational basis arising from quantum activity in sensory processing and mentation by the brain or cognitive domain acting as a transducer. The lightcone is oscillating at the speed of light. Only one Casimir element of the screen is depicted. In actuality hundreds of millions of these screen components are utilized in the hyperhologram to represent qualia and awareness.

3.2 LIMITS OF QUALE

Does our putative extracellular or extra-sentient containment of Qualia have to be immediate to another living system? If we utilized the true definition of a sound², yes. But that is a superficial definition like defining consciousness as wakefulness. Our intention here is to develop a definition of Qualia that is not just descriptive of its phenomenological character but descriptive of its complete structural-phenomenological noumenon which gives the character and the context of Qualia within the continuous state conscious universe (CSCU). With the proper configuration which would entail some sort of control mechanism, theoretically one could put the proper 'configuration' of a Qualia within a 'rock' but it would not be apprehended unless placed in superposition with a living-system. Since Qualia by the generally accepted definition listed in section 1 is in essence the 'feel of awareness' or the what it's like to be aware, we now begin to split hairs if we are going to be able to define Qualia in a manner in which it can be transferred or shared and stored extracellularly.

Assume a particular conscious entity perceives a simplest form of experience, not temperature because it habituates dramatically over a short duration. All continuous experience habituates to a degree. Lets arbitrarily choose a simple visual experience because vision is the dominant sense with the largest data field. Assume the subject is in a completely darkened room with only a pinpoint of monochromatic light emitted in millisecond pencils. If the subject is highly skilled at attention by for example extensive training in meditation; awareness for illustrative purposes is maximized. But there will still be infinitesimal differences in the chain of Qualia from individual limitations and instantaneous variation.

Qualia generally occur in a smooth or continuous perceptual stream of discrete events - discrete frames of film in the projector appear as a smooth continuum on the screen in the same manner that raindrops summate by the Huygens principle of wave train addition into a coherently perceived rainbow. Because of quantum changes or differences from moment to moment the same Qualia varies because:

1. Attention to nodes x_1 to x_2 to x_n is never perfect.
2. Quantum uncertainty or fuzziness exists in the oscillation of all biochemical species.
3. Other extra-quantum oscillations from macroscopic motions or distractions.
4. Loss by habituation

If we claim the infinitesimal variances are minimal and can be ignored for all practical purposes (FAPP) in the case of individual awareness, these variances could be said to be maximized in a different subject sharing the exact same state of awareness by some method of dissolution of the 1st person 3rd person barrier. What is the point of that spectral variance? The answer is that a particular qualia is never precisely the ideal state of a particular qualia. Since even intra-subjectively there is some averaging over the interval of an instantaneous qualia. To clarify - when is a qualia not the Qualia? Is there a Platonic type form for a particular qualia? Lets assume an object in some arbitrary setting. For the sake of precision we must realize that each 1,000 units of a particular qualia are all different according to the above four parameters, but FAPP with some averaging we can claim that the 1,000 vary only with infinitesimal differences such that the 1,000 are in essence the same qualia in this particular case. It is this 'average' that we would like to quantify as the 'point of white light' (in a dark room) with 'full' attention and neglecting loss by habituation. So the infinitesimal averaging would be multidimensional across all properties. Even though all qualia are considered unique, we will not be concerned with the infinitesimal differences within a category for a unique qualia. At some level an 'impure qualia' breaks the barrier of infinitesimal differences and does become a different qualia. By putting the infinitesimal variations aside we are ready to begin the next problem in our discussion; that of the 'periodic table' of conscious elements and holographic properties of the 'collective unconscious'.

Awareness has been defined as the fundamental principle of a conscious universe. As illustrated in Fig. 2 below it is in the seat of this awareness that qualia is experienced. After a further note on the philosophical basis for qualia, its physical cosmology will be addressed.

² Sound is defined not as the vibration of the medium but as the apprehension of that vibration through the sensory apparatus from an ear to a mind.

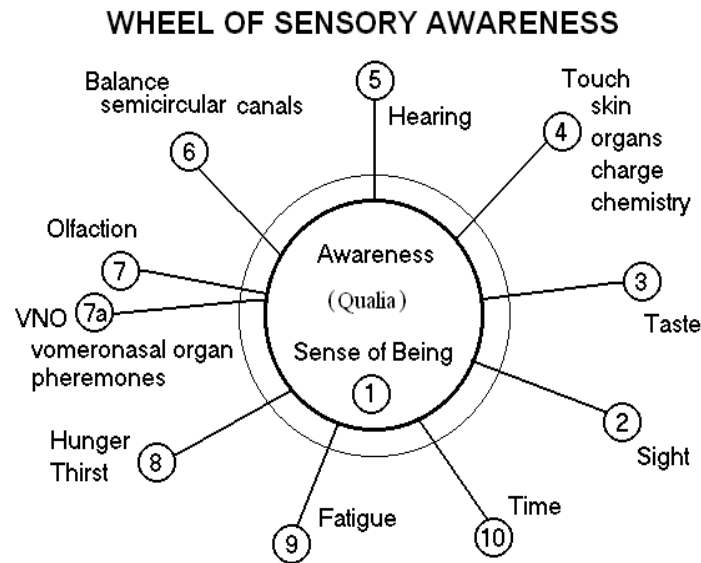


Figure 2. The *wheel of awareness*. All sensory input is transduced by the brain into the mind which is the seat of awareness. It is in this primary core that the ‘feel’ or qualia occurs. The deepest aspect of mind is the sense of being.

4. Philosophical Basis For The Universal Nature Of Qualia

The following remarks support the philosophical suggestion that qualia are the same for all living systems in the same way that DNA is universal to all cellular organisms. Hemoglobin and chlorophyll have similar molecular structures. Likewise Noetic Theory predicts that qualia have a universal structural-phenomenological form in a conscious universe that can be categorized in a manner paralleling that of the periodic table of chemical elements. It is generally believed by psychologists that archetypes of Jung’s collective unconscious represent some form of real basis for historical human memory, a basis for personality and the evolution of human consciousness. The best circumstantial evidence for the existence of a Jungian type collective unconscious is the ability of *idiot savants*, who are typically handicapped and isolated with little formal education, to recite daily weather data for example perfectly for hundreds of years. Cats are able to watch videos of birds with interest and several commercial products are available. These ruminations lend a degree of philosophical support to the assumption of Noetic Cosmology predicting local, nonlocal and unitary aspects of qualia universal for all living systems.

4.1 THE MICROSCOPIC COGNITIVE DOMAIN - BASE OF THE QUALIA PHYAMID

Barbara Shipman [20] discovered a relationship between the topology of the quarkonium manifold and the waggle dance of honey bees. By mapping a six-dimensional quantum geometrical figure onto two-dimensions she recognized the pattern as that of the honeybee's ritual dance. To her, this implied that the bees mind is coupled to the quantum world, since it is in the quantum realm that the six-dimensional geometry of phase space has real meaning. The bees use the waggle dance to communicate to other bees in the hive the location and distance of a food source. The form of the dance changes according to the location of the flowers constituting the source. The surprising thing is that there may be a deep mathematical explanation for how the dance changes form. Shipman’s reasoning related the geometry of the bee’s waggle dance to a space in symplectic geometry known as a “flag manifold.” Although Shipman isn’t suggesting that honey bees understand flag manifolds, she believes it is possible that the instincts which control their behavior are wired in such a way that the quantum principles related to this kind of geometry apply.

Shipman says that it is not the standard model of quantum theory that explains the wagging dance but the ontological non-collapse versions of de Broglie and Bohm. The Bohm & Hiley model [21] suggests that a ‘quantum

force' directs an electrons motion by a field that it is always in contact with. This quantum potential is compatible with the 'energy covering' of the least unit of awareness described by noetic cosmology [6, 7, 9].

Korall and his collaborators [22] have found that bursts of 250 Hz magnetic fields applied to dancing bees cause a misdirection of up to 10 degrees in the honeybees flight direction. Their analysis of the data suggests that this action is the result of a quantum mechanical nuclear spin resonance. This work on the language of bees seems to give evidence of the involvement of a nonlocal collective unconscious that can enable a superposition of states among the cognitive domains of individual bees. Shipman [20] concludes that the geometry of the collective activity [31] relates to vacuum topology [30] in the same manner as elementary quarks and anti quarks confined to the spacetime manifold correspond to the vertices of a hexagon. The motion of the quark manifold can be shown to correspond to the 'holophote' entry of the noetic field of consciousness into all living systems [6, 7, 9].

Additional theoretical evidence that mental activity is associated with the noetic field is suggested by a behavior observed in some birds called the vestibular-ocular response. A bird's body oscillates stochastically in the wind while perched on a tree branch; but the bird's head remains fixed perfectly still. This process is considered non-computable and beyond the capabilities of a bird brain to process. Indeed it is believed a super computer could not compute it. The more sophisticated the super computer only the better the approximation. If this is true it suggests sophisticated non-computable information exchange occurs in the 'collective unconscious' of vacuum topology.

5. The Foundations of Qualia in Physical Cosmology

Even the simplest living systems given intentionality are comprised of hundreds of billions of atoms. Each atom is known to have an associated de Broglie wave suggesting that a rich nonlocal structural-phenomenological cavity QED computational informational array configures qualia. Therefore explaining qualia should entail a discussion of the HD topological properties of the polarized Dirac vacuum in association with the cosmology of the Noetic least unit [6]. The Noetic Model of mind is a structural-phenomenological microcosm with boundary conditions defined as the limits of the entities psychosphere. The domain of this multi-level complex system operates under a complementarity of classical, quantum and unitary mechanics. Following this Noetic definition, a living-system is a triune system; which signifies the brain as a classical / semi-classical I/O array and the mind as a unitary coherent system with the long range correspondence between the two mediated by the Noetic Field.

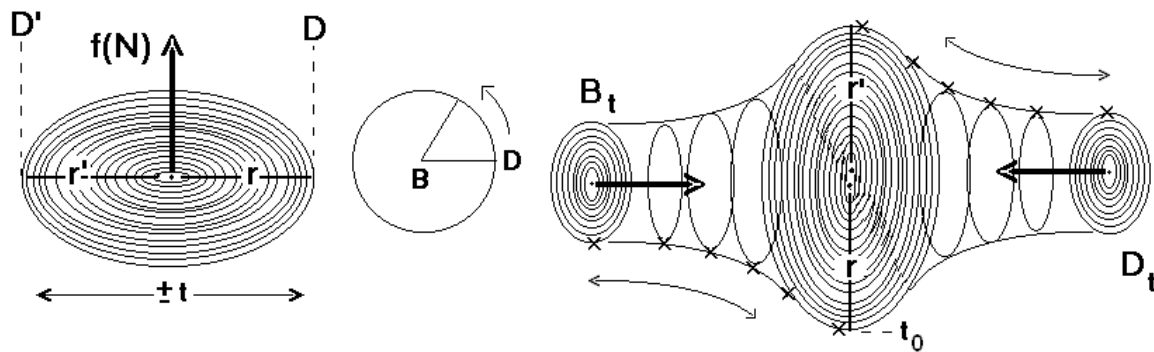


Figure 3. Temporal / Atemporal duality of the wavefunction of a living system. 3a represents a 2D model of the cognitive domain where the noetic force $f(n)$ that couples the mind to 3D reality focuses the noetic field on the 'eternal present' at t_0 which then spreads out along its coherence length r in spacetime by influence of the future / past. Inside the circle is life and outside is death D . The reference circle 3b illustrates how the coherence length evolves with the increase of intelligence and content from birth B to death D . Although the radial velocity signified by the arrow remains the same along the radius from B to D , the maturer entity maps out more area in the same time segment. This seems to explain why time perception seems longer for a youth and accelerates with age. 3c is a 2D drawing conceptualizing a 4D slice of the psychosphere showing the present and future / past boundaries of its wavefunction. The central sphere is the cognitive domain where qualia of the moment emerges; but total life energy and memory fills the whole eternal cavity like in an optical computer where both programming and data are stored holographically in light beams without need for static storage devices [8].

Hawking has discussed a wave function of the entire universe where the ground state corresponds to de Sitter space in the classical limit [23]. Noetic Cosmology includes everything within the bounds of the 4D Hubble sphere H_R . Every lesser system within H_R would be a component of the H_R wave function having its own component wave function of the total universe.

$$\Psi_{U_{HR}} = \sum_i^{\infty} |\psi_i\rangle \quad (1)$$

According to the de Broglie / Bohm model of quantum theory all matter has an associated pilot wave guiding its evolution. This quantum potential as it is also called engulfs all ‘particles’ including living systems. In the noetic cosmology developed here this is synonymous with the HD energy covering of each least unit, which has also been described as a Wheeler Geon or ‘ball’ of light with sufficient self-energy to cohere. This energy is what noetic cosmology considers to be contained in the psychosphere or ‘soul’ that can exist eternally independent of temporal 3(4)D Euclidian / Minkowski reality.

Like the wave function of all matter for the entire universe in Hawking’s Bigbang quantum cosmology; ‘consciousness’ holds a similar status in Noetic Cosmology. As stated in section 2, a living-systems is defined as a Qualia of the conscious universe (Q-III). In terms of the ‘least unit’ of noetic cosmology [7] and the associated triune nature forming the basis of living-systems, this consciousness provides [9]:

- The unitary field filling all space, governing all matter
- The *elan vital* or life principle
- Light of the Mind - Qualia I, II & III

Qualia are a high level component of conscious life with more complexity than described by the usual type I definition as the ‘what it feels like’ aspect of awareness centered on the eternal ‘now’ of a living system [5]. Any ‘thought’ occurs in a web of multiple states: mood, health, energy, degree of wakefulness, biases toward object of apprehension. Can Noetic Theory definitively categorize these aspects of Qualia?? Some aspects of qualia description could be considered extraneous under certain specific conditions, for example, orientation could be discounted when contemplating a sphere. Probably the distance factor would cancel in apprehending a pencil of light in a dark chamber. The point of this discussion is that within certain limits there is a particular fundamental ‘form’ that manifests any particular qualia. Meaning that there exists a universal fundamental periodic array of conscious elements utilized by all conscious systems - high level language like German or Greek are different but the language of Qualia is the same for all conscious systems. This principle of course is required for dissolution of the 1st person 3rd person barrier.

The best “current theory” for a preliminary description of the interrelationship between the two domains is that of Cavity Quantum Electrodynamics (CQED). QED couples the Psychon [10] to the Dendron on the classical side and QED long range coherence couples the Psychon to its qualia on the mind side. We will use the work of Preparata [24-27] as the model of QED for the discussion here.

General principles of CQED laser physics [24-27] state by Anderson’s dictum that the production of coherent modes requires two special conditions:

- An external power source called the “pump” and
- Finely tuned mirrors or the “cavity”.

Without these conditions, there is no lasing.

The continuous state CQED of the Noetic Least Unit [6, 7] satisfies these conditions [10]. The Action or “pump” is inherent to the dynamics of the continuous dimensional-reduction-spin exchange-compactification process of the of the 12D topology creating and recreating the standing-wave present [6, 7, 9]. The same hyperstructures of the least unit provide the “QED cavity”. The present acts as the neutral ground state and the energy mode covering [7] at the ‘top’ of the cycle is the excited state. The wave train of qualia is the ‘lasing’ action.

Classical information undergoes a type of “superradiant phase transition” during the continuous noetic

transformation, a form of ‘quasi-particle’ transition [10] through the intervening ‘Fermi-measurement’ barrier of quantum chaos. In the noetic cosmology [6, 8] the unitary domain is ‘always’ coherent. Planck scale chaos is the temporal barrier between the 4D Minkowski subspace and the HD eternal realm. Our perception of Euclidian reality is also a form of coherence, although a more limited form; this is why it appears smooth. Chaos is required for the barrier so that the higher and lower domains can both interface and be isolated (a form of complementarity) with enough degrees of freedom for the complexities of matter, living-systems, and intelligent intentionality.

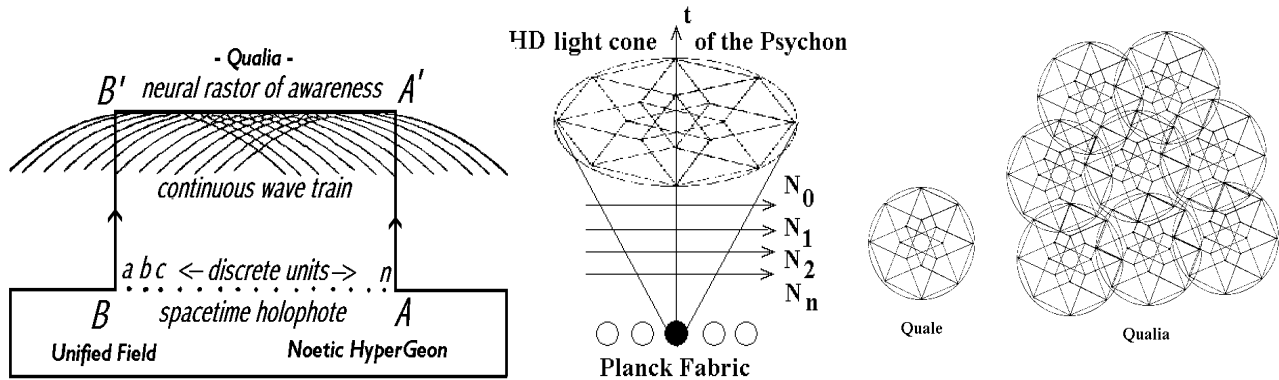


Figure 4. Conceptual extension of Fig. 1. Each discrete unit (dots *a* to *n*) in 4a represents a fundamental least unit of awareness tiling the spacetime backcloth; the holophote action of which emits by superradiance, the unified field into every atom of a living system. The neural raster coincides with the leading lightcone singularity of awareness in Fig.1; only one wave front of which is shown in either figure. Multiple wave fronts summate by Huygens’ principle of wave train addition (as microscopic drops of water create a macroscopic rainbow) to form the structural-phenomenology of qualia. 4a and 4b are side views and 4c is more of a top view of the wave surface.

This process can be described by Gauss’ Theorem for the flux of a vector field *C* through the surface of a cube:

$$\int_S C \cdot nda = \int_V \nabla \cdot CdV, \tag{2}$$

where *S* is any closed surface, *V* is the volume inside it, and *n* is the outward unit vector normal to the of the surface area element *da*; and by Stokes’ Theorem for the circulation *C* around a square:

$$\oint_{\Gamma} C \cdot ds = \int_S (\nabla \times C)_n da, \tag{3}$$

where *S* is any surface bounded by Γ . ∇ is the vector operator

$$\nabla = \left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z} \right) \tag{4}$$

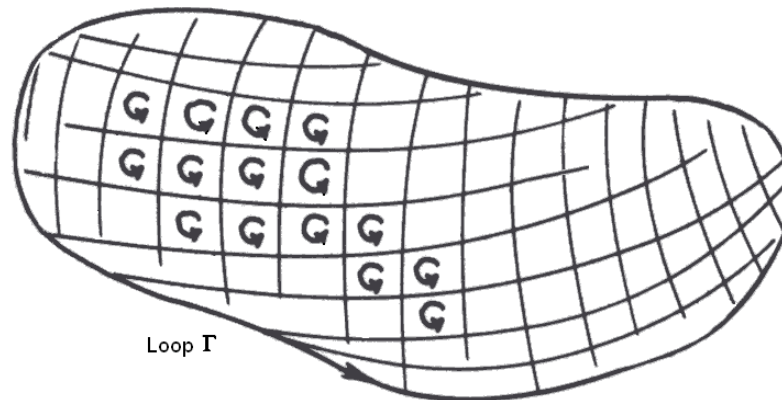


Figure 5. 2D view of the circulation C (Continuous state dimensional reduction compactification process of noetic cosmology) around the loop Γ surrounding the closed (12D Superspace backcloth) noetic surface of the Psychosphere that leads to superradiance (The continuous state of the least unit is a damped harmonic transformation which produces superradiance by CQED) of the *elan vital* from every point in space into the biochemistry of living systems generating life at the 1st level of the hierarchy and qualia at the 2nd level through self referential hyperholographic feedback.

5.2 THE PHYSICAL BASIS OF QUALIA

The '*psychosphere*' has been defined as the complete boundary conditions for a conscious living system encompassing all three types of qualia. The hyperholographic-like topology is a structural-phenomenological cosmological process comprised of *dynamic* and *static* Casimir modes [10]. These counter propagating future-past Casimir boundary conditions simplistically can be said to be governed by Gauss' and Stokes' theorem and generate an evanescent wave of Q-I awareness (on the Q-III carrier base) that is focused physically on the 'leading light-cone singularity of a Minkowski space *standing wave*' domain of each *present instant*. This tier of the complex system operates by absolute parallelism [32] and deficit angle hysteresis of the continuous state noetic transformation of the dynamic / static Casimir boundary conditions of Q-II elements where Q-I appear as a superradiant effect. This domain could be said to couple to the dendritic microprocess of Pribram's holoscape or dendron by way of the Eccles psychon [10]. The experimental design for empirically testing this noetic model is based on a new class of interferometer called the Dirac-Noetic Interferometer (DNI) that utilizes spin states of Dirac spherical rotation in contrast with the symmetry conditions of the continuous state transformation of the least unit of noetic superspace to manipulate superradiant effects of the new noetic action principle to be applied in initial experimentation to the *cognitive domain* of the prion [15] defined by noetic theory as the simplest mode of a complex living system.

Our earlier definition of a living system as a complex hierarchical structural-phenomenology can now be seen to coincide with the model of qualia we have developed in this discourse. The following postulate, which will probably be found challenging for most cognitive psychologists to accept, is made directly by noetic theory as a result of noetic theory being a form of Cartesian dualism where mind is able to exist independent of the temporal reality.

Postulate 3: The Type II Qualia for a *pencil of light*, is the pencil of light.

The contrast between qualia and quale of the light pencil relates to the nature of light waves and quanta, which at present is still not completely understood. The photon concept is incomplete. In addition to the current understanding of the photon as a wave-particle duality; there is also a duality between time and eternity or the unified field [7, 9]. As stated in earlier chapters the Planck barrier exists only for fermions. So the 'hidden' unitary aspects of the photon (in this case our light pencil) allow it to be shuttled into the timeless domain of the mind through quasiparticle transitions [10].

Once postulate 3 is made however noetic theory does clearly predict that Qualia Type I occurs when the Qualia Type II energizes the appropriate cavity of the cognitive domain of the psychosphere. The delineation above leads to one more complexity in our definition of Qualia. Noetic Theory by definition claims that the noumenon of Q-I is it's unapprehended Q-II form which is a structural-phenomenology in its own right physically and therefore has its own noumenal elements. We avoid discussion here of the noumenon of Q-III as a path not relevant to human awareness. In this sense though the noumenon of Q-III is the whole cosmology of the CSCU discussed in chapters one through five.

Returning to the additional complexity of defining Q-II as a photonic pencil..The light pencil is a dynamic element. Perhaps static elements should be included. Possible digital or analog forms of storage that could be fed into the holographic matrix of a cerebroscopic transducer.

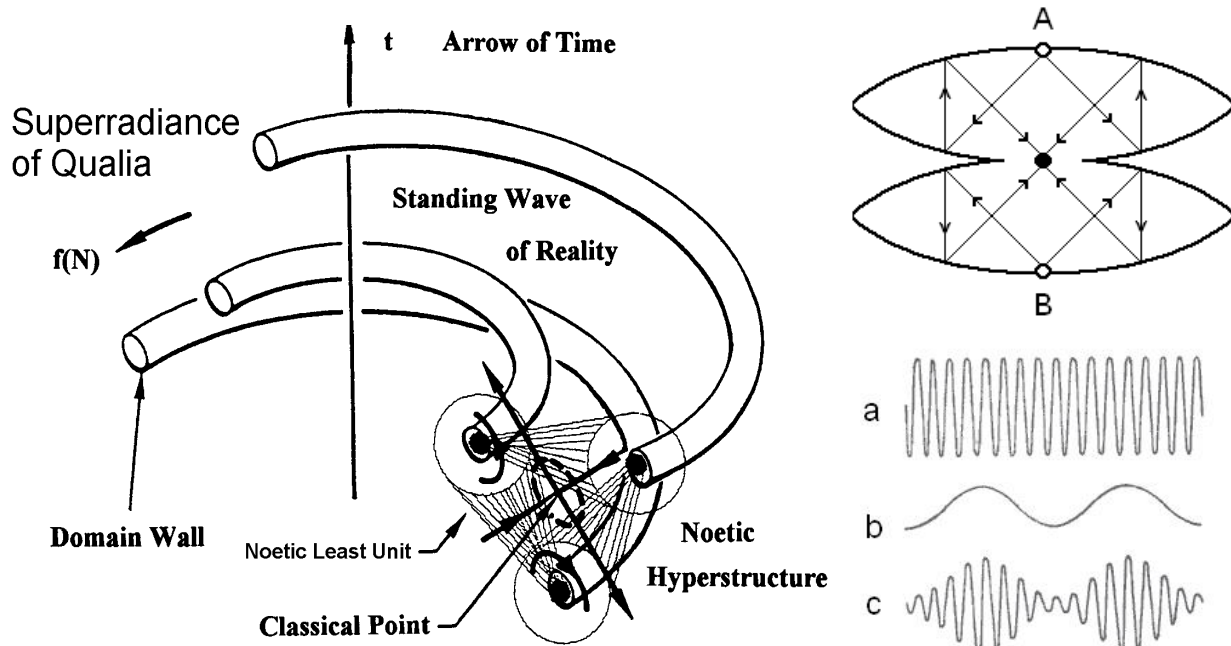


Figure 6. Continuing to build a metaphor for the emergence of qualia from the continuous action of the noetic least unit, recall that the least unit structure (6a) is a microcosm of the whole conscious universe and as such the past oriented reduction process produces periodically a classical spacetime point. The domain walls represent the lightcone singularities of Q-III propagation, the surfaces of which act structurally as Casimir-like plates, and phenomenologically as a carrier wave base for Q-I qualia production by Q-II modulation. 6b represents four pairs of parabolic mirrors (the Q-III Casimir domain walls) whose foci overlap; this is the high frequency wave in 6c denoted as a. The longer wave b represents a Q-II qualia which is modulated by the Q-III wave into the usual Q-I qualia. Thus a, b, and c in 6c represents the three forms of qualia and how they work together to form Q-I by superradiance of the noetic field.

A standard image requires a screen or other reflective surface to be resolved; but if the foci of two parabolic mirrors (Casimir plates in our model) are made to coincide the two images superpose into a real 3D image that does not need a screen. See Figure 6 above. There is a science toy called the ‘magic mirage’ that is used to demonstrate this effect of parabolic mirrors. Objects placed in the bottom appear like solid objects at the top of the device.

The holophote action of *elan vital* energetics arises from the harmonic oscillation of least unit boundary conditions tiling the spacetime backcloth. The beat frequency of this continuous action is the carrier wave of Q-III that modulates cognitive data of Q-II into Q-I awareness states which is a superposition of the two (Q-III and Q-II). This modulation of qualia occurs in the HD QED cavities of the cognitive domain. The QED cavities are a close-packed tiling of least unit hyperspheres; the Casimir surfaces of which are able to reflect quaneme elements. While the best

reflectors of EM waves are polished metal mirrors, charged boundary conditions also reflect EM waves in the same way radio signals bounce off the ionized gases of the Kennelly-Heaviside layers of the ionosphere. This reflective 'sheath' Figs. 3, 4, 5 & 6 enclosing the cognitive domain is charged by the Noeon radiation of the elan vital, the phases of which are 'regulated' in the complex HD space of the least unit cosmology.

How does noetic theory arrive at describing other more complex qualia from the simple qualia of a light pencil? Light quanta are microscopic in contrast to the macroscopic sphere of awareness. It would thus seem reasonable to assume that scale invariant properties of the CSCU least unit of awareness would apply. Like phonemes as the fundamental sound elements for language there are qualia-nemes or *quanemes* for awareness all based on the modulation of Q-II states by the geometric structural-phenomenology of Q-III.

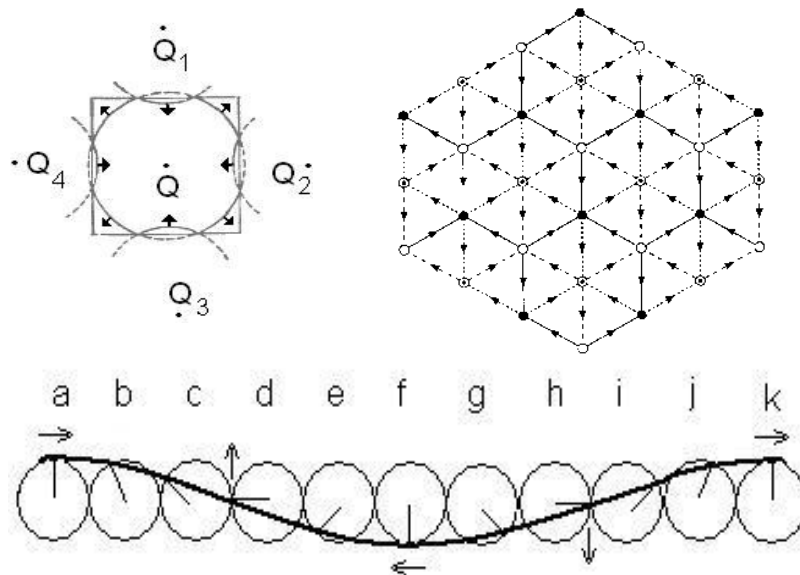


Figure 7. Each least unit (a to k in 7c for one cycle above) coupled into harmonic motion results in a standing or stationary wave when the incident and reflected transverse and longitudinal component waves are in superposition. The disturbed least unit elements move in circular orbits; where on the crest the movement is forward, backward in the hollow and both vertically and horizontally in intermediate positions. This is a Q-III wavefront built on the action of noetic superspace. In 7a as part of the close packing of fundamental spacetime least units reflection and refraction occurs. Reflected waves which are images of the source at the center Q have centers at Q1 through Q4. The higher level associated spacetime modeled in 7b [34] through topological switching and infinite topological form is able to evanesce any type I qualia by the summation and modulation of the type II quaneme sub-elements.

Propagation and reflection of the quanemes of Type-II qualia is the key to the simplicity of the physical basis of qualia as described in noetic cosmology because according to postulate 3 although these Type-II quanemes are noumenal sub-elements of qualia they represent more usual physical aspects of QED interactions. At the level of quanemes the contemporary physics that might best apply to their description is that of the several forms of superstring theory or loop quantum gravity [35]. Strings and loops are considered fundamental objects of nature in these models. Recent arguments concerning the small scale topology of space challenge the customary assumption that the dimensionality of space must be an integer [28]. This recent conjecture of noninteger dimensionalities seems to be compatible with the continuous dimensional reduction compactification process as it would occur at the level of quaneme modulation in the noetic theory of qualia. The beauty of noninteger spacetime dimension is that it provides a way to eliminate the troubling divergencies plaguing quantum electrodynamics. Another boon of this idea for the noetic cosmology is that the Hausdorff classical measure-theoretical definition of dimension can be used to define noninteger dimensionalities in a way that implies a limiting process that entails a convergence of real numbers toward zero [29]. Which is the

situation for the least unit in noetic cosmologies continuous dimensional reduction process from 12D to 0D; and although physicists consider this model incompatible with quantum theory because of its precision, it is compatible with the extension of quantum theory in noetic cosmology which does allow such precision in some circumstances [36]!

In Fig. 7c the spacetime network [34] represents a three-phase computation cycle of the propagation of noetic least units where the present is a standing wave of the future-past. During phase I quaneme data travels on the solid arcs and comes together as an event at the solid nodes, interacts and departs on the dotted arcs; for phase II interaction is on the dotted nodes and departure on the dashed arcs; finally during phase III interaction is at the hollow nodes and departure on the solid arcs, where a new cycle begins again. This is the continuous state of absolute parallelism of the noetic cosmology that provides an inherent backcloth for the computation of conscious processing and the summation of qualia II and III into the qualia I of awareness. This noetic subspace network has infinite degrees of freedom.

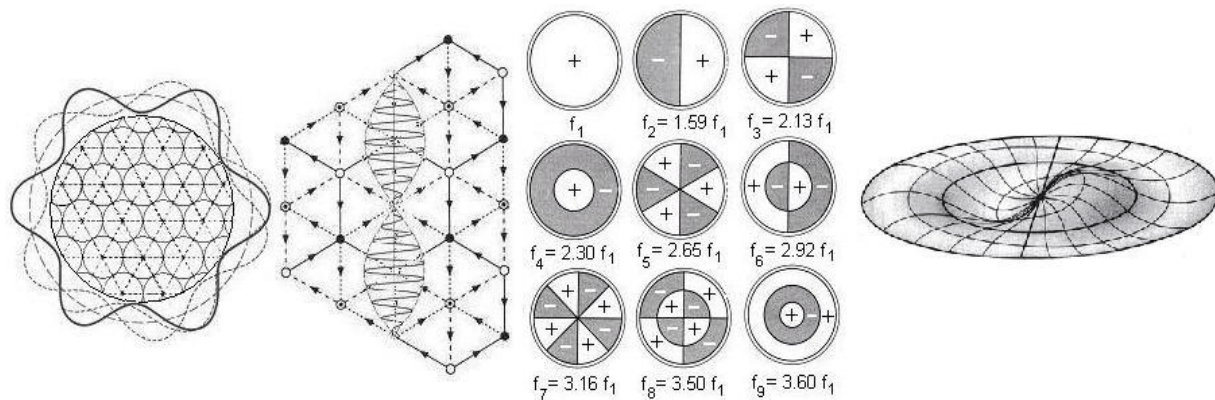


Figure 8. Conceptual summary of the cosmology of Qualia formation. In part (a) the unitary noetic field (illustrated as wavy lines surrounding a sphere of least unit tiling) acts on the structure of least units to produce the Casimir boundary plates of Q-III. One segment of which is represented conceptually in (b) as a wave coupled to the CQED continuous state of spacetime. Parabolic future-past pairs (as in Fig. 6b) are modulated by Q-II quaneme modes, nine of which are conceptually represented in (c). Each line and circumference representing a node; with the + and - signs denoting opposite displacements at an instant when the + regions are raised and the - areas depressions. Because of string tension in the asymmetry of the future-past at this early stage of qualia theory formation we might assume that the structural-phenomenology of the Casimir plates (Casimirrors) is like that of a stretched flexible membrane. In this case the frequency of each quaneme mode shown is not an integral multiple of the fundamental f_1 . In (d) the figure represents a quale vibrating in mode f_6 exaggerated for clarity. This figure is grossly oversimplified and differs in respect to a 1D wire where the nodes are points instead of the 2D surface here where the nodes are lines.

The Noetic Theory assumes at this early stage that the actual HD modes produce some sort of holographic-like ‘image’ that is the qualia of awareness. Figure 8 is a summary of qualia-I production form the Q-III carrier basis of life modulated by modes Q-II quanemes. Just as in the 1D case of a string standing waves are set up in the 2D membrane illustrated. In reality qualia production is much more complex and arises form the modal interactions of the Casimir boundaries of 12D spacetime cavities. Each standing wave has a characteristic frequency related to the geometry of the cavity with the lowest called the fundamental. In general all elastic bodies vibrate with a set of frequencies related to the boundary conditions and all have standing waves [33]. The next step is construction of the Dirac-Noetic Interferometer to test these hypotheses...

In Fig. 9 tension of the advanced and retarded waves of continuous *elan vital* propagation produces Casimir mirror (Casimirror) boundaries (Q-III) that modulate Q-II quanemes into nodes of awareness which by the nature of noetic cosmology are physically real and empirically accessible which will lead to the breakdown of the 1st person 3rd person barrier when noetic technology becomes available. Q-II action, such as a pencil of light on spacetime Cavity-QED, is the signal to be modulated in the Q-III Casimirrors, modes of which are the quaneme elements.

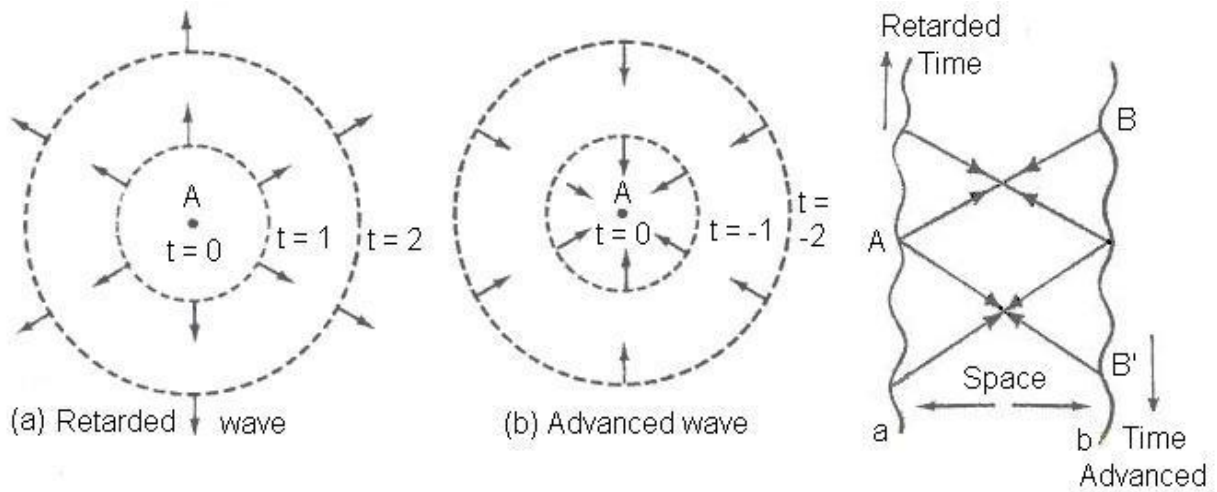


Figure 9. It is the periodic tension in the future-past oscillation of the *elan vital* that produces the Casimir mirrors of Q-III. (a) is retarded noeton wave and (b) is advanced noeton wave. These two elements combine into two parallel Casimir mirrors shown in 9(c) one of future-retarded orientation and the second past-advanced orientation. Quoneme elements of Q-II are modulated into a holographic-type real image, two microscopic nodes of which are shown between the Casimir mirrors. By Huygens principle of wave train addition these discrete elements become the macroscopic continuous qualia of perception.

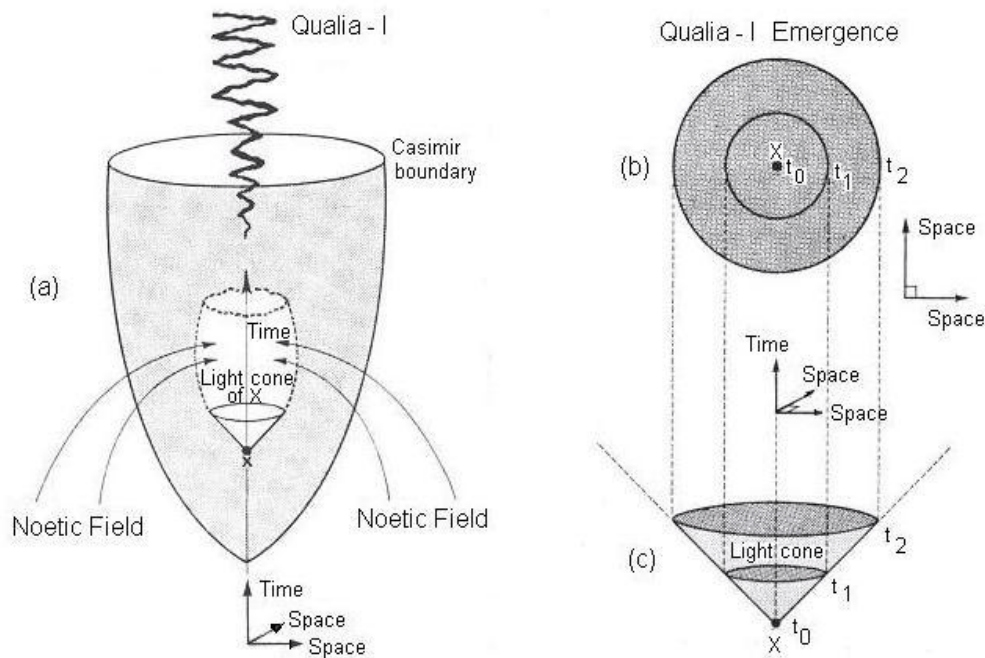


Figure 10. Another conceptual view of the three types qualia generating awareness. In 10(a) the area outside the cone represents noetic absolute space from which the HD noetic field enters the 3(4)D spacetime of our perceived reality. 10(b) is an exploded view of the central light-cone (A 3(4)D Wheeler-Feynman subspace of the 12D noetic superspace) where the three types of qualia interact to form the qualia-I of awareness by modulation and geometric summation.

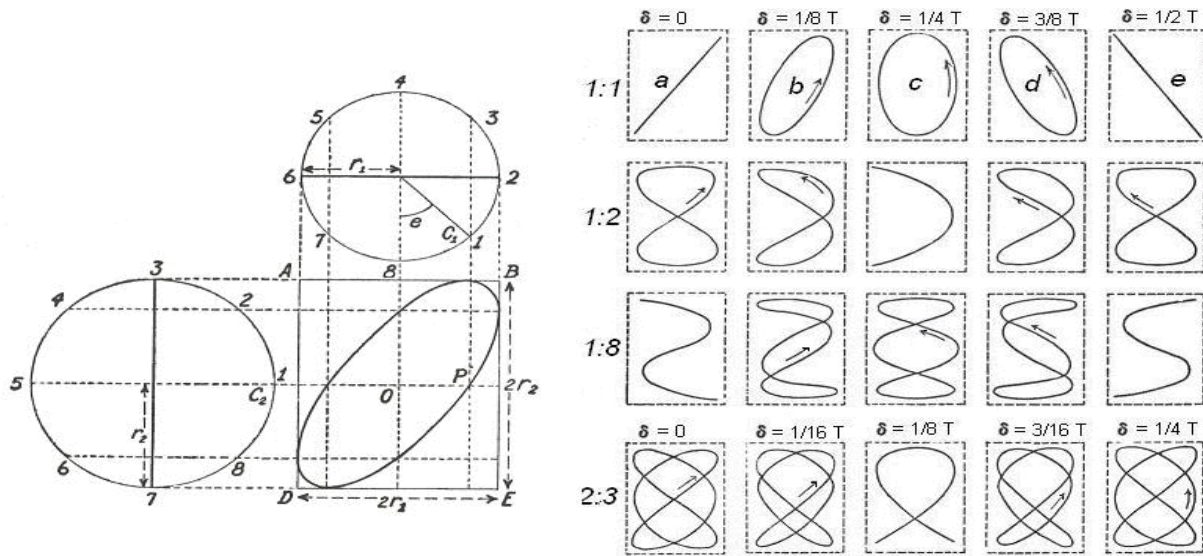


Figure 11. In 11(a) the result of the vibrating amplitudes of two simple harmonic motions r_1 and r_2 of the same period is shown as the ellipse around O that could be generated by the motion of a particle or element of Q-II. The map of the resultant quaneme motion depends on the phase difference between the advanced and retarded motions of the two Casimir mirror modulations to be compounded. The ellipse around O represents a phase difference of 1/8th period; if the phase difference were zero the path would be a straight line. If the periods differ slightly as in fig. 11(b), one vibration will gain on the other and the motion of the quaneme elements will run through the complete cycle of forms shown. The ratios on the left of (b) are the frequency ratios and across the columns are the phase.

Although Figure 11 is a speculative conceptualization of how the quanemes may be modulated by the Casimir mirror carrier wave; a mechanism for the rich structure and computational power required to support the model at this stage of development is readily illustrated. These Lissajous figures, as they are commonly known in wave mechanics, are generally described as displacement patterns traced within a plane (like the screen of an oscilloscope or ball of a pendulum) by the influence of the superposition of two independent harmonic oscillations. This is illustrated in Fig. 11(b) for various frequency ratios and phase differences of the two harmonic oscillations.

6. Possible Applications Resulting From The Physical Understanding Of Qualia

This knowledge can be utilized to make psychology a hard science and develop a fundamental basis for creating a 'Moral Psychology'. Simple dissonance or harmony with the physical field of qualia is not sufficient. If this was the basic requirement a 'real' moral psychology would not be possible because states of harmony could be generated for both 'evil' systems and 'good' systems. (Setting aside for now any definition of evil and good) These systems would be dissonant with each other; but we could only say they were structurally different. The inherent teleology of the CSCU overcomes this limitation.

The approach must be theological. Postulating that life is a higher order coherent system produced by the hierarchical functioning of the noetic field acting in conjunction with elemental intelligence and 'least unit' structural phenomenology. Theological implications suggest that the noetic field acts as an *elan vital* emanating from the *Throne of God*. This is the basis for developing a moral psychology.

The implications for medicine are enormous both in terms of diagnosis and treatment. A new class of diseases of consciousness will be defined; diseases like colitis or Alzheimer's disease for which cause and cure are currently little understood. Since the noetic model of mind is a temporal/eternal complementarity; injecting timeless phase elements

would allow development of a 'Star Trek' tricorder for instantaneous healing of wounds normally taking several months.

Conscious technologies will be developed which would include telepathic machines, intelligent androids and the possibility of locating criminals by clairvoyance enhancing technologies like those portrayed in the recent Hollywood film *The Minority Report*.

7. End Note

The application of the quantum hypothesis to blackbody radiation by Planck in 1900 and to the photoelectric effect by Einstein in 1905 was met with disbelief by most and scorn by some. In a letter to a friend Einstein wrote: '*I have just published a fundamental paper about light, but I am sure that nobody will understand it.*' Einstein was correct! Scientists were so sure that energy followed a continuous spectrum that it took about fifteen years before his theory was experimentally verified.

Today most scientists believe strongly in biological mechanism and vigorously deny any need for teleology or any form of *life force* beyond the tenets of Darwinian Naturalism. Others proclaim that 'it is impossible that the bigbang is wrong.' Cartesian dualism is considered to be so archaic and foolish that scientists will openly mock any colleague who professes it. Christopher Columbus did not sail off the edge of a flat Earth or confront a plethora of phantasmagoric sea monsters on his way to a new world. This cloud of myopic 'see' monsters shall not block the horizon to wonders of the mind much longer...

References

- [1] Chalmers, D. 1996, *The Conscious Mind*, Oxford: Oxford University Press.
- [2] Nagel, T. 1974, What's it like to be a bat?, *Philosophical Review*, 83, pp. 435-450.
- [3] Lewis, C.I. (1929) *Mind and the world order*. New York: C. Scribner's Sons.
- [4] Lewis, D. 1995. "Should a materialist believe in qualia?" *Australasian Journal of Philosophy* 73:140-44.
- [5] Franck, G. 2000, Time and presence, in *Science and The Primacy of Consciousness*, R.L. Amoroso et al, (eds.) Orinda: Noetic Press.
- [6] Amoroso, R.L., 2002, Developing the cosmology of a continuous state universe, in R.L. Amoroso, G. Hunter, M. Kafatos & J-P Vigier (eds.), *Gravitation and Cosmology: From the Hubble Radius to the Planck Scale*, Dordrecht: Kluwer Academic Publishers.
- [7] Amoroso R.L., 2003, Awareness: physical cosmology of the fundamental least unit, *Noetic Journal* 4:1, 1-15.
- [8] Amoroso, R.L. 2000, The parameters of temporal correspondence in a continuous state conscious universe, in R. Buccheri & M. Saniga (eds.) *Studies in the Structure of Time: From Physics to Psycho(patho)logy*, Dordrecht Kluwer Academic.
- [9] Amoroso, R.L. 2003, The Fundamental Limit and Origin of Biological Systems, *Noetic Journal* 4:1; 24-32.
- [10] Amoroso, R.L., and Martin, B. Modeling the Heisenberg matrix: Quantum coherence and thought at the holoscape manifold and deeper complementarity. In J. King & K.H. Pribram, Eds. *Scale in Conscious Experience: Is the Brain too Important to be Left to Biologists to Study?* (1995) Lawrence Earlbaum, Mahwah.
- [11] Prusiner, S.B. 1982, *Science*, 216,p. 136-144.
- [12] Prusiner, S.B. 1998, *Proc Nat. Acad. Sci, USA*, 95, p. 13363-13383.
- [13] Varela, F.G., Maturana, H.R. & Uribe, R., 1974, Autopoiesis: The organization of living systems, its characterization and a model, *BioSystems*, 5, 187-196.
- [14] Amoroso, R.L., Consciousness, a radical definition: Substance dualism solves the hard problem, In Amoroso, R.L., Antunes, R., Coelho, C., Farias, M., Leite, A., & Soares, P. (eds.) *Science and the Primacy of Consciousness*, 2000, Orinda: The Noetic Press; Amoroso, R.L., An introduction to noetic field theory: The quantization of mind, *The Noetic Journal* 2:1, pp. 28-37 (1999).
- [15] Amoroso, R.L. & Amoroso, P.J., 2002, The Primary mechanism initiating protein conformation in infectious prion propagation, preprint.
- [16] Nagel, T., 1985, A physicalist theory of qualia, *The Monist*, 68:4, pp. 491-506.
- [17] Dennett, D.C. 1988, Quining qualia. In A. Marcel & E. Bisiach, eds, *Consciousness in Contemporary Science.*, Oxford: Oxford University Press.
- [18] Horgan, T. 1987. "Supervenient qualia." *Philosophical Review* 96:491-520.
- [19] Kitcher, P.S. 1979. "Phenomenal qualities." *American Philosophical Quarterly* 16:123-9.
- [20] Shipman, B. A., 1996, Investigating bee behavior from the standpoint of fundamental physical principles, *Am Bee J*, 136, 5:339-40; 2000, A mathematical foundation for the dance language of the honeybee, preprint.
- [21] Bohm, D. & Hiley, B., 1993, *The Undivided Universe: An Ontological Interpretation of Quantum Theory*, London:

Routledge.

- [22] Korall, H., Leucht, T., Martin, H., 1988, Bursts of magnetic fields induce jumps of misdirection in bees by a mechanism of magnetic resonance, *J Comp Physiol A*, 162: 279-284.
- [23] Hartle, J.B., & Hawking, S.W., 1983, Wave function of the universe, *Physical Rev D*, 28:12, pp. 2960-2975.
- [24] Preparata, G., 1986, *Il Nuovo Cimento*, 96A, p. 366.
- [25] Preparata, G., 1990, *Il Nuovo Cimento*, 103A, 1073.
- [26] Preparata, G., 1988, *Phys. Rev.*, A38, 233.
- [27] Preparata, G., 1995, *QED Coherence In Matter*, Singapore: World Scientific.
- [28] Isham, C., Kubyshin, Y. & Renteln, P., 1990, Quantum norm theory and the quantization of metric topology, *Classical & Quant. Grav* 7, pp. 1053-1074; Zeilinger, A. & Svozil, K., 1985, Measuring the dimensions of spacetime, *Phys Rev Let* 54, pp. 2553-2555; Jarlskog, C. & Yndurain, F.J., 1986, Is the number of spatial dimensions an integer?, *Europhysics Let*, 1, pp. 51-53.
- [29] Jammer, M., 1993, *Concepts of Space*, 3rd edition, New York: Dover.
- [30] Milonni, PW, 1994, *The Quantum Vacuum: An Introduction to Quantum Electrodynamics*, Boston: Academic Press.
- [31] Del Giudice, E., Doglia, S., Milani, M., & Vitiello, G., 1985, A quantum field theoretical approach to the collective behavior of biological systems, *Nuclear Physics B*, 251: 375-400.
- [32] Misner, C.W., Thorne K. S. & Wheeler, J.A., 1973, *Gravitation*, San Francisco: Freeman.
- [33] Halliday, D. & Resnick, R., 1962, *Physics*, New York: Wiley & Sons.
- [34] Kotiuga, P.R. & Toffoli, T., 1998, Potential for computation in micromagnetics via topological conversion laws, *Physics D*, 120, 1-2:139-161.
- [35] Smolin, L. , 2001, *Three Roads to Quantum Gravity*, New York: Basic Books.
- [36] Amoroso, R.L. & Hunter, G. 2004, The extension of quantum theory, preprint.