

Zenergy : The "Phaseonium" of Dark Energy That Fuels the Natural Structures of the Universe.

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Abstract

To incorporate thermodynamic, quantum and classical dynamical laws, the Universe is treated as a quantum Carnot engine (QCE) or single heat bath in which the ensemble of elementary particles retains a small amount of quantum coherence, so as to constitute new states of matter known as "phaseonia", the first being its Zenergy, the empty ensemble of dark energy. How Zenergy fuels the natural structure of the Universe, is then in complete accord with the existence of 3+1 space-time, the known elementary particles quantizations and galactic structure. Similar QCE explanations of the natural structure of DNA, and of the human brain/mind as a conscious engine are given. Thus 'the Universe, life, consciousness and everything' may derive its entire structure from this difference between classical and quantum mechanical thermodynamic machines.

Keywords : an evolutionary cosmology, quantum coherence, quantum Carnot engine, the Creation, dark energy.

1 Introduction

A new evolutionary model of self creation of the universe using the now well defined thermodynamic concept of the Quantum Carnot Engine published in the Journal Science [1]a is presented. This takes the form of a novel synthesis of critical evidence in relation to cosmology and living systems in favour of such a quantum description of the Universe from its conception to the present day. This synthesis is proposed because, although the Second Law of Thermodynamics continues to hold since such any quantum coherent system must be quantum mechanically prepared :-

(i) quantum coherence fundamentally alters Carnot heat engine operation (ie the Carnot efficiency η for converting heat into work) from what is thermodynamically possible classically

$$\text{(from) } \eta = 1 - T_c/T_h \quad \text{to} \quad \eta_\phi = \eta - \pi \cos\phi$$

where T_c , and T_h are the temperatures of the low temperature entropy sink and the high temperature source respectively, and ϕ is the quantum coherent phase, such that

ii) by the proper choice of ϕ , work is obtained even when $T_h = T_c$ ie even when there is only one thermal bath, and

iii) in this model Universe described as a QCE, the boundary condition of the Universe's origin (its "quantum mechanical preparation") is selected so that it is empty ie has neither 3+1 space-time nor elementary particle matter, a condition which Rowlands and Cullerne (R&C) [2] have shown is describable through the mathematical concept called **nilpotence**, so as to lead to the simultaneous creation, by spontaneous symmetry breaking, of both as an all pervading field.

That is to say that no extension of physics beyond quantum mechanics is needed, other than the incorporation of thermodynamics, to explain, as is argued here, the evolution of Everything from Nothing.

This quantum mechanical evolutionary cosmological model, it is shown, not only accommodates Einstein's General Relativity, and the Second, Third and First Laws of Thermodynamics, it

i) provides a definition of what 'dark energy' might be,

ii) accounts for the creation of 3+1 space-time and complementary elementary particle matter as currently experimentally established in relation to the known properties of strong, electro-magnetic, and weak charges, including their spin.,

iii) postulates, based on the formalization of Huygens' principle of secondary sources (central to Feynman's foundation of quantum mechanics), a cosmos consisting of a Source, which is a White (W)hole, and secondary sources, which are Black Holes ie sinks, at which, respectively, 3+1 space-time and matter are in succession created (as in (ii)) and then annihilated (so as to permit the continual reconfiguration of the structural complexity of elementary particle matter in 3+1 space-time), and thus

iv) explains by means of this fundamental evolutionary mechanism outlined in (iii) operating on other non-cosmological 3+1 space-time scales, how livings systems as QCE, and in particular, DNA and human brains as QCE would come to exist and evolve, as an inevitable consequence of the operation of the quantum mechanical laws of physics (in such a self created cosmos as this).

In particular, in this description of what proves to be a quantum holographic cosmos, the sum total of 3+1 space time and its matter, is always zero, so that the cosmos as a whole can be considered as empty (as in, the empty set/nothing/zero) a condition described mathematically by the concept known, as stated above, as **nilpotence**. That is to say that R&C [2] show that there exists a nilpotent formulation of quantum mechanics, in the form of the *nilpotent Dirac equation*, below

$$(\mp k\partial/\partial t \pm i\nabla + jm) (\pm ikE \pm ip + jm) \exp i(-Et + \mathbf{p}\cdot\mathbf{r}) = 0$$

where E , \mathbf{p} , m , t and \mathbf{r} are respectively energy, momentum, mass, time, space and the symbols ± 1 , $\pm i$, $\pm j$, $\pm k$, $\pm \mathbf{i}$, $\pm \mathbf{j}$, $\pm \mathbf{k}$, are used to represent the respective units required by the scalar, pseudoscalar, quaternion and multivariate vector groups, so that both amplitude and phase are uniquely and simultaneously determined by a single nilpotent state vector (in the form of a differential operator). Further this formulation combines both the Heisenberg and Schrodinger approaches and is necessarily nonlocal.

This conception of origin of a cosmos where Everything is derived from Nothing is in fact very ancient as that in the sacred text of the Hindus, the Rig Veda (x 129), below indicates,

“There was not then what is nor what is not. There was no sky and no heaven in the sky. What power was there? Where? Who was that power? Was there an abyss of fathomless waters? There was neither death nor immortality then. No signs were there of day or night,

The ONE was breathing by its own power in deep peace. Only the One was: there was nothing beyond.

Darkness was hidden in darkness. The all was fluid and formless. *Therein, in the void, by the fire of fervour arose the ONE.*

And in the ONE arose love. Love the first seed of the soul.”

2 The Universe Treated as a Quantum Thermodynamic Engine

The Quantum Carnot Engine (QCE) [1]a is a direct quantum mechanical extension of the Classical thermodynamic Carnot Engine (CCE). The postulate of the Universe as a QCE is thus in conformity with:-

(i) the existing quantum thermodynamic understanding of the Universe (defined as all that exists) as a single heat bath where black body radiation conforms to Planck's radiation law based on his quantum of action h , and

(ii) the theoretical findings of Rowlands and Cullerne (R&C)[2] that there exists, in relation to the nilpotent Dirac algebra [2]a {shown (by them) to concern a generalized form of the Dirac equation of quantum mechanics, above}, a symmetry breaking of the empty set or nothing ie ‘no thing’, from which simultaneously emerge 3+1 space-time and matter in the form (including spin) of the known experimentally validated strong, electromagnetic and weak quantizations of the elementary particles. This implies that :-

(a) these quantizations are exactly those that ensure compatibility between respectively general relativity and quantum mechanics, for as R&C show [2]a, this symmetry breaking concerns that between the 4 vector algebra (as a representation of 3+1 spacetime geodesics) and the algebra of the quaternions, (as a representation of these quantizations or elementary particles) so as to constitute

(b) an elementary particle phaseonium. Thus from the mathematical condition of nilpotence of the generalized Dirac algebra, this phaseonium can be inferred to be a direct consequence of the QCE action of the Universe on its original dark energy or “Zenergy”, which is none other than its quantum coherence at the origin of the cosmological system. [This condition of nilpotence - meaning can be derived from

nothing or the empty set – thus requires an emitter/absorber model described in terms of quantum creation and annihilation operators, the nature of which is explained in the section 3 Galactic Structure. It concerns a white (w)hole and its complementary black holes, respectively; and the retention of the small amount of quantum coherence in respect of the matter as mass also validates Mach's postulate{ which led him to his Equivalence Principle} that the mass of any body is dependent on that of all the others bodies in the Universe.]

This action, able to account for the initial creation of material structure of the universe, therefore results

(iii) in a modified globally isotropic phaseonium “almost perfectly dynamically balanced” between the 3+1 space-time field and its complementary ensemble of elementary particles [2]a, where

(iv) the initial phaseonium/Zenergy of “dark energy”, is imprinted with the 3+1 space-time field and its quantizations, such that these can be described as space-time's elementary/primitive sources and sinks, and

(v) prepares the universe for further cycles of its postulated QCE action.

These cycles can be thus be inferred as ones of further symmetry breaking and creation of structure, i.e. as critical phenomena [3], where these phenomena will again be imprinted on the modified Zenergy, further irreversibly modifying it. They are processes, in conformity with experimental discovery of the signature of the Big Bang imprinted on the universe's current background radiation [4]a. It provides a further experimentally testable hypothesis that there should exist an entire spectrum of “almost perfectly dynamically balanced” thermodynamic structure indicative of these symmetry breakings imprinted on the current Zenergy (sometimes referred to as the energy of the dynamic quantum vacuum) and consequently on the 3+1 space-time field, which will be imprinted with mass in the sense of Einstein's General Relativity. Yet while this thermodynamic model is essentially adiabatic, such that entropy production can be both created and destroyed so as to constitute an information metric [1]b, the QCE action shows that the Second Law of Thermodynamics continues, it is emphasized, to hold [1]a. Thus quantum mechanics is not in fact, as is generally believed, globally reversible. For the QCE model of the Universe describes what John Conway calls a unique birthing [5]a in confirmation of the mathematical fact that *any* universal model of a theory (ie quantum mechanics in this case) in a language of sets [5]b, has a unique birth-order field automorphism. Further references in support of QCE as a universal model quantum mechanical model are also given in [5], and of the postulate of Everything from Nothing in [6].

It can therefore be concluded from the above arguments:-

- A) that the Universe as a QCE is a natural extension of existing science, incorporating thermodynamics with established quantum and classical dynamical laws, and
- B) that at the Act of the Universe's Creation, there will, in retrospect by inference from R&Cs' work [2], be both the spatial and the temporal quantum coherence necessary for the Universe's quantum holographic full wave front reconstruction (which the very fact of the now known structure of 3+1 space-time must have taken place). That is to say the Universe is both quantum holographic and a quantum hologram [6]b. A postulate

further confirmed by Schempp's quantum holography [9] which describes the actual workings of magnetic resonance imaging (MRI) [10] in terms of the 3 dimensional nilpotent Heisenberg Lie group [9]c. It is such that the adaptive resonant working of MRI concerns the condition of phase conjugation, which is one of 3 dimensional spatial self reference [9]a.

3 Galactic Structure

But it is also known from observation that the structure of the Universe constitutes an ensemble of galaxies. Thus from the above postulate that the Universe as a QCE is the source of all natural structure which constitutes a relativistic almost perfectly balanced phaseonium (rapbp), it can be further inferred that each galaxy is a secondary source of this whole natural structure, the Universe, and itself a rapbp and a QCE. This deduction is in complete agreement with the "phaseonium" sum of histories approach to quantum mechanics, which Feynman conceptualized in terms of Huygens' principle of secondary sources. That is to say the numerous galaxies, many of which are visible to us all by various types of telescope, are actual secondary sources of their Source, the Universe, which accounts therefore for their existence. A formal explanation [1]c similar to but quite different from Everett's many worlds interpretation. Possible evidence for this rapbp deduction is the spiral (ie phase/phaseonium) nature of many galaxies. It is one that can be tested in relation to equation (2) of [1]a , which in the example described there, says that

$$PV = h\Omega n/2\pi$$

where P is the radiation pressure, V is the cavity volume, Ω is the cavity frequency and n is the average number of thermal photons in that frequency mode. This equation therefore asserts that such model galaxies as QCEs should exhibit a well defined quantization in relation to radiation pressure on their natural global structure. Further since the source of the Universe as a QCE is, as deduced above from R&C research [2], the "white hole" from which emerges the phaseonium ensemble of elementary particles throughout 3+1 space-time, it can be inferred that this "white (inertial/ 'dynamic') hole" as their Source, must be in almost perfectly balanced equilibrium with set of "black (gravitational) holes" of the secondary sources i.e. its ensemble of galaxies as QCEs.. That is, the black holes are to be considered now as absorbers of both matter and 3+1 space-time, complementary (in the sense of Huygens' Principle) to the emergent (R&C described) white whole.

This explanation not only therefore :-

- (i) re-asserts Mach's principle in relation to the equivalence of inertial and gravitational mass, as already asserted above, and
- (ii) shows that the QCE phaseonium model would account for the need in the corresponding classical model to introduce some unknown parameter such as the so-called cosmological constant into Einstein's equations of general relativity in order to explain the universe's actual behaviour which is in fact quantum mechanical,
- (iii) says that the initial Zenergy phaseonium can almost certainly be described as a universal topological pre-space, which would explain how the evolving Universe as a

QCE composed of many galaxies, is connected quantum mechanically non-locally together. It is also to assert that the equivalence of the well known Schrodinger and Heisenberg representations of quantum mechanics must concern this set of topological equivalence classes. It can no longer be assumed therefore that the use of one of these representation or the other is simply a matter of convenience or choice, for as the above arguments show the Universe may derive its entire structure including 3+1 spacetime itself, as a consequence of these topological equivalence relations. It says that the SETI search for intelligent life should be undertaken using pre-spatial quantum mechanical communication via quantum teleportation, and confirms the nature of QCE as a quantum universal computer constructor model.

Further it is a model, which, it appears, remarkably combines both those of Hawking in relation to galactic black holes, with that of Hoyle in respect of the "continuous creation" of matter. That is to say structure (matter and 3+1 space time) absorbed in a black hole has the potentiality to re-emerge from the R&C white (w)hole of 3+1 space-time, as Hoyle postulated. This could, for example, provide an explanation for the unexplained phenomenon of very high energy cosmic rays. It constitutes quantum tunneling 'on the grand scale' as the explanation of the creation of 3+1 space-time and the nature of matter in accordance with the R&C model, its eventual destruction in black holes, and its topologically regulated adaptive re-emergence. Thus the Universe as an rappb would allow a finite fixed quantity of matter to be continually recycled in 3+1 space-time to produce structures of greater and greater complexity. Huygens' principle also implies, in order to correctly describe such a model of Zenergy without any or only a vestige of 3+1 space-time, that, the galaxies as secondary sources must be sited on a closed surface S with the property of 3+1 space-time, in agreement with the well known conceptual illustration of the Universe as an expanding 'matter bubble'.

Similarly from observation it is known that such galaxies are an ensemble of stars. These are therefore themselves quantum mechanical ensembles since they produce their energy as a result of nuclear fusion. Thus the stars can also confirmed to be QCE which are in almost perfectly balanced equilibrium throughout the majority of their lifetimes, etc, etc.

The overall conclusion that can be drawn therefore is, that if the Universe is itself a QCE, it is also a hierarchy of QCE, concerning galaxies, stars, solar systems, and eventually biospheres like our planet Earth, all of which are almost perfectly balanced systems, i.e. rappbs in the sense given above. For example, in the case of the solar system like our own, it too constitutes a 'phaseonium' of orbiting planets, as Kepler demonstrated in relation to the deduction of his laws from the astronomical observations of Tycho Brahe, or as indeed did Newton since in relation to his law of gravitation, he was forced to assume instantaneous action at a distance. And from neuron or neural science, it is known from the very early work of Ramon y Cajal on the brain that neurons constitute essentially dynamically "independent structures". The hypothesis therefore that the brain is a QCE consisting of a phaseonium in which the ensemble of neurons retain a small amount of quantum coherence, fits very well therefore with both Cajal's early finding and the later work of Eccles, Pribram, Hameroff and Penrose, to name but a few [14], that the brain works quantum mechanically. And since each

neuron is a type of living cell, it can be further inferred, that any organism is a QCE ensemble of living cells, which again would be themselves QCEs.

The descriptive vehicle of the QCE thus not only explains exactly how and in what sense any physical system can be more than the sum of its classical parts, as set out for example above in relation to the Universe itself as a QCE. That is, the Universe as a system functions additionally as a white (w)hole, and that it is this contribution of the white (w)hole that ensures the presence of both matter and 3+1 space-time (ie the corresponding classical universe would be fluid and formless, i.e. empty). But it also establishes the fundamental importance of the recycling of matter and energy to all QCE if they are to remain rapbbs, i.e. relativistic almost perfectly balanced phaseonia within the Universe as a QCE. This is to say that mankind's survival as a QCE is constrained by this universal QCE imperative, from which ultimately there is no escape, for mankind is, of course in this Universe an inseparable part of it and subject to its immutable laws, and the boundary condition that lead to its initial Creation.

4. DNA and Living Systems as QCEs in this postulated QCE Hierarchy

A further example that therefore comes immediately to mind of such a "perfectly dynamically balanced" [7] phaseonium, is the double helix structure of DNA with its base pairings of nucleotides known in their symbolic form as the genetic code [8]. It is then a natural extension of this hypothesis of DNA as a QCE, the cycles of which enable it to replicate itself, to that of living systems as similar self replicating QCEs, where the cycles of self-replication are controlled by their DNA such that :-

- i) in the case of prokaryote non-nucleated primitive cells [8]b, this is a simple replication of the cell itself including its DNA as a QCE, while
- ii) in the case of the eukaryote nucleated multi-celled organism, this replication while still corresponding to the control cycles of its DNA, concerns now the organism's eukaryote celled structure itself as a QCE, where it maybe inferred that each of the nuclei of such cells with its chromatin is there to protect and maintain the perfect dynamic balance of its DNA during the now significantly longer and more complex process of development of the embryo of its organism. That is, this protection is there to ensure what is the actual gauge invariance of its DNA throughout the process of replicating of the organism.

That is to say, that these DNA imprinted/encoded phaseonia would indeed fuel the structures of life from the residual Zenergy (in an analogous manner to the way 3+1 space-time and the quantizations of the elementary particles are fueled from the Zenergy in the case of the Universe).

This prediction is in excellent agreement with similar research [8,7], which shows DNA to be imprinted with the quantum holographic phase information necessary to reconstruct the 3+1 space-time molecular/matter structure of the particular dynamic organism for which its genetic code describes the necessary control cycles. These models provide detailed phaseonium explanations of the structure of DNA such that the quantum phase encoding of the holographic images of its organism is sufficient to fuel the 3+1 space-time construction of its embryo, where in such quantum holographic

models [9] it is the 3 dimensional Heisenberg nilpotent Lie group description, which specifies the 3 dimensional spatial gauge invariance referred to above. This follows Schempp's discovery [9]b that it is the gauge invariance of this Heisenberg group, which introduces holographic signal theory into quantum physics. [Furthermore as already briefly pointed out, Schempp's quantum holography[9]a describes the working of magnetic resonance imaging (MRI) machines [10] in widespread use throughout the world for medical diagnosis. This process of extracting the desired medical images results in diffraction patterns easily demonstrated to be holographic in nature. It should be comparatively easy therefore to demonstrate experimentally that these machines are therefore indeed themselves QCEs. That is to say that these holographic diffraction patterns are the result of a quantum mechanical thermodynamic measurement process.]

Thus, living systems would be hierarchies of QCEs, which maintain various degrees of quantum coherence (as does the Universe as a QCE), and so are in fact macroscopic quantum rather than classical machines, where it is these degrees of quantum coherence that constitute the vital difference between living and non living matter as already postulated by many authors. That is, crudely they can be thought of as pumped laser-like systems.

An example of such system where it should be comparatively easy to demonstrate that it is a QCE, as there is extensive experimental data and technological diagnosis equipment already available, is the heart-lung system (H-LS). This system fuels the body with oxygen, nutrients, and is, most significantly, part of its immune system for the maintenance of its wholeness/health. This new model would therefore explain those unexplained features of the H-LS in respect of which it differs from that of conventional mechanical fluid pumps or CCE, such as for example why it has 4 chambers. Another example in view of the work of Berry in relation to the geometric phase and quantum chaos [11]a (as is evidenced for example, in relation to the Mandelbrot set which demonstrates a boundary between fractal and wave structures) would imply that such a complex QCE as the heart should show evidence of "cycles of chaotic/fractal working" see also [12]. It could be expected therefore that these cycles would be dynamically tuned in relation to the pumping of the blood, so as to match the many different rhythms of the body blood fluid complex of organs, veins and arteries in the most efficient way so as to maintain the organism in health. It would also say that the blood itself is a phaseonium or active fluid in the sense of possessing partial quantum coherence and indeed its own actual macroscopic quanta, its red blood cells, so as to be able carry the vital supplies of oxygen to those places where at any particular time they are most needed, and similarly its white cells in the case of the immune system.

Other properties of QCE machines beyond those of CCEs, are also known from the extensive research of Dubois [12] to constitute universal fractal, incursive, hyperincursive and anticipatory computation; new conceptions which have now found considerable academic support.

All the above evidence in relation to the postulate of living systems as QCEs, suggests that QCE are optimally controlled quantum systems or machines, see [13].

5. Brains as Quantum Carnot Engines

The fact that QCE can operate at constant temperature and maybe 'hot running'[1] completely invalidates the "often invoked" argument that brains as hot thermodynamic systems cannot operate in accordance with quantum mechanical principles.

Further support (in addition to this & the fact that DNA can be most appropriately modeled as a quantum Carnot engine) for the postulate of the brain as a QCE phaseonium [14], comes, for example [14]a from the ANDCorporation, where 3D holographic face recognition software based on quantum mechanical phase models, has been realized on conventional digital machines, so as to demonstrate that such phaseonium based face recognition does work and offers significant advantages over non quantum mechanical designs, even though the essentially non-local quantum mechanical aspects of such computations cannot then be realized. It can therefore be postulated as already argued in general for living systems, that such features of the human brain as the mind and consciousness, absent from classical machines constitute the difference between the quantum Carnot engine and its classical thermodynamic counterpart. This defines precisely for the first time, what constitutes a "Zombie" or robotic machine, as distinct from a conscious machine. That is to say, that the brain's structure constitutes, like models of the Universe and DNA as proposed here, a QCE with a phaseonium working by quantum mechanical base holography so as to perceive the structure of the Universe (on a particular scale) in terms of 3+1 space-time holographic images as was first proposed by Pribram [14]b. The latter being the concept from which the AndCorporation designs [14]a have proceeded.

This would then infer in this case that there is again an almost perfect dynamical balance in the quantum Carnot engine that controls our thought processes between say the classical neural workings of a brain, and its additional quantum phaseonium workings, postulated here to be what is known as the mind (as the additional field of phase energy determining the quantum brain's mental arrows of thought). It is therefore a balance, that can be changed at will via the suitable application of a source of energy to this field, so as to produce the required mind-brain interactions in response to say data arriving at the senses or as retained in memory. And since it is to be supposed that this whole brain-mind works now as a single heat bath governed by a single phase parameter, then this would explain why consciousness functions as an essentially serial phenomenon in relation to the mind's control over the brain. For example, the glial cells[14]f or the well known microtubular approach of Hameroff and Penrose [14]h, which have been postulated as the media for the regulation of this controlling energy.

6 Conclusion

The authors believe that this limited presentation of examples of some of the critical evidence in favour of a theory of Everything grounded on the model of the Universe as a QCE is more than sufficient to merit an extended research programme of validation to test out the extended hypotheses based on the model, as set out above, referenced below, and as presented in other papers at this very symposium, including amongst others those of Rowlands, entitled "Symmetry Breaking and the Nilpotent Dirac

Equation”, Bounias and Krasnoholovets “The Universe From Nothing: A Mathematical Lattice of Empty Sets, both to be published in the AIP Proceedings of CASYS 03, and Diaz & Rowlands “A Computational Path to the Nilpotent Dirac Equation” in this IJCAS Proceedings.

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