Essay

Critique of Physics Theory Inconsistencies

Alex Vary*

Abstract

We examine major inconsistencies of theoretical physics and effects of institutionalized physics on the publication of original innovative thinking in basic physics and on the generation of improved models of atomic nuclei and cosmology theory.

Keywords: Wave-particle duality, quantum gravity, high energy, collision physics, standard model, particle physics, nucleon shell models, M-theory, primordial cosmology.

Introduction

Theoreticians have formulated ingenious mathematical concepts and metaphysical objects - many virtually without empirical content but which help improve understanding of almost every aspect of the physical world. Theoreticians uncovered mathematical truths that illuminate empirical observations and discoveries - certainly contributing to knowledge of the physical world [1]. Based on a naive faith in mathematical truths and metaphors, concurring cadres of particle physicists have concluded that high energy particle collisions are mandatory for discovering the foundations of the cosmos and subatomic physical phenomena.

CERN's multi-billion-dollar facility, employing thousands of administrative. scientific, technical, staff members, is dedicated to provide particle acceleration and the infrastructure needed for research on the origin and nature of the primordial cosmos. High energy apparatuses, like CERN's Large Hadron Collider (LHC) extending 27 kilometers underground across the border between France and Switzerland, attempt to duplicate conditions assumed to have prevailed at the onset of a super-hot Big Bang origin of the cosmos. In 2012 it was announced that, during a rare collision event of subatomic particles in the LHC, the Higgs boson which imparts mass to other elementary particles throughout the cosmos was detected. The detection of the Higgs boson was attributed to the energetic burst separation of photons at the collision site of two opposing beams of protons. There are many reasons for photons flying apart due to proton beam collisions, the least of which is the presence of a Higgs boson [2].

The CERN LHC facility is being enhanced so that higher energies may be achieved - to produce an expected ~150 times more data than was possible to collect when the facility was shut down in 2013. It is anticipated that the more powerful LHC collider will produce a more convincing validation of the Higgs boson theory and the Higgs mechanism. When physicist Alexander Unzicker inquired why there was such a high enthusiastic expectation of capturing evidence of the theoretically imagined Higgs boson, the 'official' answer was that the expectation is founded on the accumulation of relevant Nobel prize-winning findings and literature. This flippant response is characteristic of managers and proponents of 'big physics' - a veritable 'physics

* Correspondence: Alex Vary, PhD, Retired NASA Scientist & Independent Researcher. Email: axelvary@wowway.com

industry' - based on abstractions supported by a type of theological hierarchy - a coordinated consensus stimulated by sociological pressures [2]. Virtually all purported LHC findings are based on metaphysical conjectures based in turn on high energy proton collision debris.

The technical details surrounding high energy collisions, the detection apparatus, data storage requirements, and computations have an unprecedented complexity - the amount of data is overwhelming. Consequently, the standard model of particle physics upon which the LHC is based has grown in complexity and has become unwieldy. All this tends to eclipse ongoing 'table top' physics and discoveries which have fostered useful engineering advances such as vacuum tubes, transistors, and microchips.

Roger Penrose contemplated the 'fashion, faith, and fantasy' which have entrapped theoreticians in their pursuit of truths about ultimate physical and transcendent realities [1]. Penrose reexamined the enfolding of mathematical truths with the minutest and largest properties and phenomena of the physical world and the remarkable effectiveness of mathematics in describing and predicting those properties and phenomena. But, Penrose cautions that discovering mathematical truths is not the same as discovering physical truths: ". . . as regards what is really going on in the physical world, there is something profoundly missing . . . we need a change in the physics, not just some clever mathematics, brought in to cover the ontological cracks!"

After an incisive critique of current theoretical and particle physics, Roger Penrose offers a 'new physics' embracing the central idea ". . . that space-time itself is to regarded as a secondary notion, constructed from something more primitive, with quantum aspects to it, referred to a twistor space." Penrose has in effect revived the notion of 'luminiferous aether' which in the late 19th century, was the postulated medium for the propagation of light. The negative outcome of the Michelson-Morley experiment suggested that the aether as a substance was non-existent and was therefore abandoned. Instead of characterizing it as a substance, Penrose's twistor space 'aether' is a substratum which corresponds to the transcendent mesostratum - a domain which together with the material physiostratum comprises the adjacent realities which we argue should be considered to complete our understanding of fundamental physical reality [3].

Physics Theory Rational Inconsistencies

The impact of theoretical inconsistencies and metaphysical paradigms is inestimable and may constitute a crisis in modern physics. We examine some major inconsistencies and discrepancies of theoretical physics, as given in Table 1. The discrepancies are primarily associated with metaphysical conjectures and outdated paradigms.

Hilton Ratcliffe notes that there are those who doggedly defend the prevailing paradigms and endeavor to convert undergraduate and graduate students to accept what are after all just philosophical models. The practice of the establishment is to a large extent a determined effort to constrain and compel acceptance of an agreed-upon philosophical world-view: for example, Big Bang cosmology. A full conversion to the faith is offered as the only realistic path to a degree in

Table 1 - Areas of Physics Theory Inconsistencies

Wave/particle duality concept	Myth based on incomplete quantum mechanics theory
Quantum gravity and gravitons	Misconception of the nature of gravitational fields
Higgs boson and mechanism	Superfluous, cannot predict electron, muon, tauon masses
Standard model of particle physics	Excess free parameters not derived from first principles
Electron/nucleon shell models	Esoteric quantum mechanics based on unrealistic models
String and M-theory objects	Unrelaizable in three-dimensional physiostratum space
Big bang inflationary cosmology	Debatable interpretations of cosmic background data

physics [4]. Ratcliffe quotes the late Professor Geoffrey Burbidge, ". . . the problem is really this: The administrators of education in space science will be extremely loath to abandon the Big Bang Theory, because if they do it will amount to an explicit admission that they actually know far less than they have led us all to believe. That's the problem. Their pride will simply not allow it." Indeed, whether metaphysics or climate change, the academic establishment tends to speak with ‘one voice’ to gain and maintain institutional and government funding.

Adjacent Realities Concept

The rational inconsistencies of theoretical physics may be best illustrated and explained in terms of the intertwining of two adjacent realities: the mesostratum and physiostratum, Table 2. We suggest that any further progress in physics depends on the understanding and development of the adjacent realities concept and of new innovative mathematics that describes their interrelation – always assisted by intuition and insights regarding fundamental phenomena that are supported by empirical findings.

The mesostratum reality may be described as a hyperspace, as a conceptual reality, like the infinitude of metaphysical, theoretical and mathematical concepts that demonstrably reside therein. We are certain that these mesostratum entities exist, but do not occupy space or time as do material objects in the physiostratum. We argue that the mesostratum is the transcendent foundation or substratum of our material world, the cosmos, and that cosmic physiostratum space-time is a granular discontinuum - that the physiostratum consists of oceanic array of tessellated space-time parcels [5].

Table 2 - Mesostratum/Physiostratum Adjacent Realities

Mesostratum reality (transcendent continuum)	Realm of energies and potentialities describable by theoretical physics and mathematical formulations: electromagnetic/electrostatic fields, the zero point field, wave equations, mathematical objects, quantum entities
Osmotic interface (signal/energy transmission)	Realm of transpiration between the adjacent realities: energy/information transfer/reception/exchange
Physiostratum reality (particulate discontimuum)	Realm of observable, tangible entities measurable by empirical procedures guided by theoretical concepts: agglomerations of quantumthings, spacetime/gravitation, inertia/action/motion/dimensionality/permanence

The mesostratum is real and verifiable; we cannot avoid being aware of the mesostratum reality. A concrete example is the experimental revelation of magnetic fields by their effect on iron filings. Magnetic fields exist solely in the mesostratum. The presence and geometry of a magnetic field is demonstrated by the alignment of iron filings that were originally randomly scattered on a cardboard sheet just before being placed over a magnet. The tiny particles of iron line up along imaginary lines of force, filling the space between the magnet's north and south poles. This illustrates the interaction of mesostratum continuum-things with physiostratum particulate-things.

We posit an osmotic interface through which mesostratum transcendent entities interact with physiostratum material objects. This interface is an assumed necessary boundary and filter between unmixable realities. Our consciousness apparently embraces and resides in both realities: We can conceive and theorize mathematical objects, waveforms, electromagnetic fields, cosmological models, and physical metaphors that reside ubiquitously in the mesostratum and associate them with empirically-observed features and phenomena of the physiostratum.

In a previous paper we explain how spacetime voxels that originate in the mesostratum may constitute the foundation of the physiostratum [6]. Within the physiostratum, consciousness separates spacetime into space and time. Consciousness assigns three dimensions to space and attributes unidirectional flow to time. Conceptually, space and time separately establish location and duration within the physiostratum material milieu. Space and time are, in this sense, constructs of consciousness. Consciousness assigns locations in space and an arrow or flow of time between localized events. Complementarily, displacement in space and the time flow contribute to the continuity of consciousness. The apprehension of the nature and foundation of our material world is consciousness-generated and this leads to some of the rational inconsistencies of physics theory discussed in this paper.

Wave-Particle Duality Concept

Imagine being on a remote observation platform isolated in interstellar or intergalactic space - far from any stars. Except for pinpoints of starlight or the distant glow of nebulae (perhaps the Andromeda galaxy) one is enveloped in total exquisite darkness. Yet, in all directions, the entire surrounding volume of space is flooded with light - with photons flying in every direction at an estimated rate of many billions per square centimeter per second. The only photons seen, or optically detected, are those that impinge the retinae. The only photons or electromagnetic waves that register in the physiostratum are those that collapse on or are intercepted by a material surface, a photosensitive film, a detector - quantum by quantum.

It is conventional to describe photons in transit as waves and photons that are detected as particles. A grain of sand is a real particle, claiming no wavelike attributes assigned to photons. It is better to admit that photons are photons and remain photons throughout the physiostratum. We may imagine protons as waves in the mesostratum continuum as a means of explaining and describing their behavior and evolution while in transit - applying mathematical resources of the mesostratum, e.g., the Schrödinger wave-function.

The Wheeler-Feynman path integral avoids describing photons as either waves or particles and replaces the classical notion of a single unique trajectory with a functional integral over all quantum-mechanically possible trajectories to compute an infinity of possible trajectories. Conventionally, cylindrical wave fronts are conjured to describe photon waves because they effectively predict the probable fringe pattern produced in the double-slit experiment. An enigma remains because the fringe pattern is built piecemeal, quantum by quantum, and evidently not by diffuse spreading accompanied by constructive and destructive interferences of continuously expanding wave fronts.

The wave-particle duality myth began with Young's double-slit experiment in which light, passing through two precisely cut and spaced parallel slits in a thin opaque plate, is collected on a photo-sensitive detector screen. The wave-particle duality myth is then perpetuated with the notion of photon-jumping between the adjacent realities: as mesostratum waves and as physiostratum particles. An alternative way to describe the transit of photons - or other quantum entities - is based on a Louis de Broglie concept adopted and developed by David Bohm. Bohm postulated that each photon has a well-defined trajectory and that each photon passes through exactly one of the slits. According to Bohm, photon trajectories are governed by a hidden configuration space which guides photons to their destinations. We suggest that the configuration space involves modified spacetime voxels and hidden variables that reside in physiostratum spacetime [6].

Quantum Gravity and Gravitons

John Archibald Wheeler formulated the concept of geometrodynamics, to describe spacetime and physical phenomena in terms of geometrics. The goal was to reformulate general relativity and to unify fundamental forces in terms of coordinate systems and a configuration space. Among Wheeler's goals was that of laying a foundation for quantum gravity and the notion of the

graviton - a hypothetical particle that mediates the force of gravitation in the framework of quantum field theory. The conjecture is that gravitational interaction is mediated by gravitons that modify the shape of spacetime and that gravity is a result of spacetime deformation.

To lay a foundation for quantum gravity and unification of gravitation with electromagnetism, Wheeler introduced the notion of geons, gravitational wave packets confined to a compact region of spacetime and held together by the gravitational attraction of the field energy of the wave itself. Wheeler proposed the possibility that geons could affect physical test particles much like a massive object [7]. Wheeler's geon is conceptually like an electromagnetic wave confined in mesostratum hyperspacetime by the gravitational attraction of its own field energy.

Perhaps the most salient indicator of the origin of gravitational mass is revealed by the arguments concerning spacetime voxel assemblages that emerge as massive electrons [8]. We conclude that emergence of gravitation mass is reciprocally related to localized modulations of spacetime, which are nano-scale versions of spacetime modulations affected by the sun, other stars, and black holes [9, 10]. There are no viable counter-arguments that dispute this notion. Gravitation is explained by Einstein's theory of general relativity, in which gravitational fields are described as curvatures of spacetime. Electromagnetism is explained by electrostatic or electromagnetic fields between charges and moving charges that exert electrostatic and electromagnetic forces between each. This permits the inference that gravitation is a unique and separate phenomenon and not amenable to description in terms of quantum field theory.

Higgs Boson and Mechanism

The Higgs boson mechanism was incorporated into the standard model of particle physics. The standard model assumes that in the primordial cosmos at extreme temperatures electroweak symmetry is unbroken and that all elementary particles are massless. At a critical temperature, the Higgs field becomes a quantum field with imaginary mass, and symmetry is spontaneously broken and primordial W and Z bosons acquire their masses. Without the Higgs mechanism all fundamental particles are proported to be massless.

The CERN LHC (large hadron collider) was devised to produce measurements that show that W and Z bosons have relatively large masses of around 80 GeV. In following work, the LHC apparently produced a new particle that appeared to be the Higgs boson which constitutes the Higgs field that permeates all space, and which according to the standard model is crucial for the existence of gravitational mass. The problem is complicated and no theory of gravitational interaction reconciles with the standard model Higgs boson.

Interactions of the Higgs boson with itself are posited to generate the masses of theoretically inferred W and Z bosons as well as masses of actually observed leptons like those of the electron, muon, and tauon - all of which are prominently included in the standard model of particle physics. To date, there is no evidence that Higgs interactions can produce or predict the known masses of electrons, muons, or tauons. Consequently, the idea of the Higgs boson or a Higgs mechanism may need to be modified or abandoned.

We offer an alternative to the Higgs theory regarding the origin of gravitational mass with emphasis on electrons, muons, and tauons. We argue that emergence of gravitational mass is reciprocally related to localized modulations of spacetime - when certain assemblages of spacetime voxels appear as massive entities and exhibit self-gravitation attraction [8]. We elaborate with the example of the mass of a Generation 1 electron, based on a cubic lattice model, and show that it forms a foundation for predicting the mass of muons, tauons and other heavy electrons, as depicted in Figure 1. We adopt the idea that certain unique cubic lattice assemblages of spacetime voxels appear as heavy electrons.

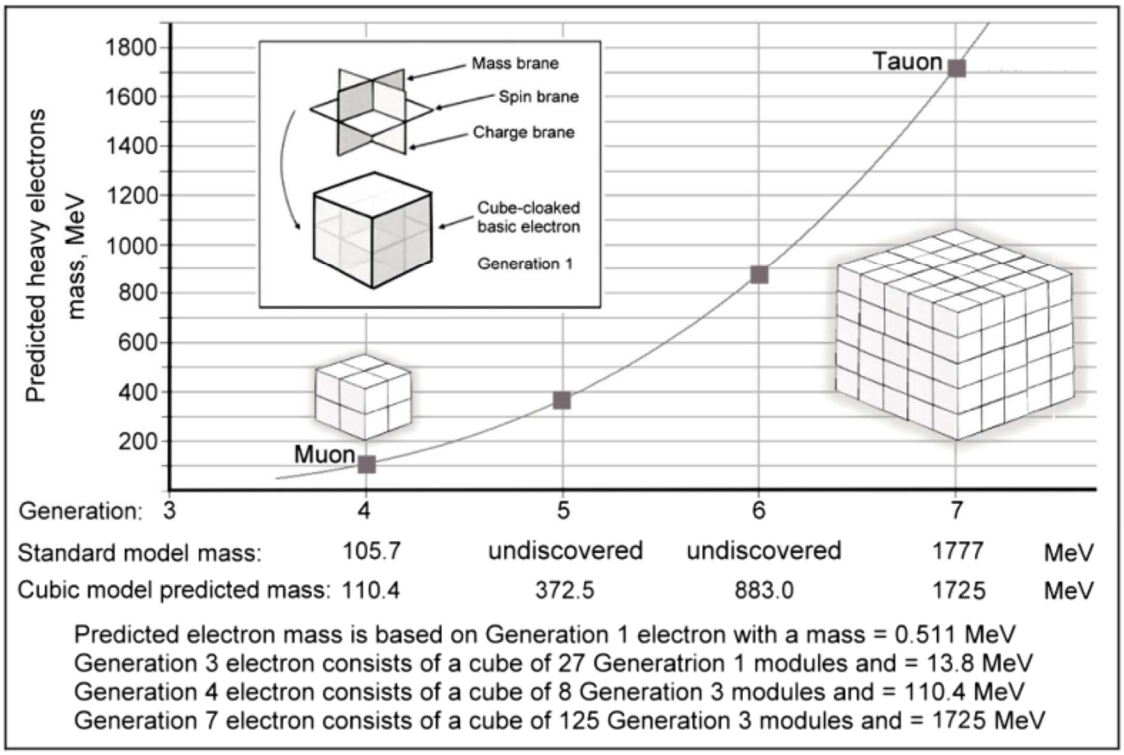

Figure 1 - Predicted muon and tauon mass based on cubic model electron.

The voxel-assembly cubic electron model not only predicts the muon and tauon masses, as in Figure 1, but also shows seven generations (with more generations possible) where the standard model assumes only two generations of heavy electrons: the muon and tauon.

We promote the notion that gravitational/inertial mass produces unique modes of spacetime deformation and argue that mass appears when specific voxel assemblages spin, detached from the adjacent spacetime fabric, and produce reciprocal localized spacetime gravitational deformation. Virtual spins of voxel assemblages inherently contain the energy that is measured as the mass of the assembly in the phyiostratum - measured as the mass of cubic lattice electrons, neutrons, protons. The accompanying deformation of the surrounding spacetime is sensed as the gravitational field of the spinning voxel assemblage. We reckon that spin, or angular energy/momentum, of voxel assemblages comprising electrons determines the mass of all leptons - such as the various generations of heavy electrons.

Standard Model of Particle Physics

The standard model, developed in stages throughout the latter half of the 20th century, classifies all known elementary and fundamental particles: fermions (quarks, leptons) and bosons (gauge bosons, Higgs bosons) where bosons mediate/force interactions among fermions. Prominent among the gauge bosons are W and Z bosons which mediate the weak interaction. According to the standard model, quarks are constituents of hadrons which are composites of quarks held together by the theoretical strong interaction. Of the hadrons, protons are stable, as are neutrons bound within atomic nuclei. Outside the nucleus, neutrons decay into protons, emitting an electron and neutrino.

The standard model is currently considered the best description of the subatomic world. The model is sustained by particle physics experiments using high energy collisions of protons or nuclei of heavy elements to simulate effects of quarks and gauge bosons in the debris produced by the collision showers. The inferred gauge bosons are among the heaviest particles yet discovered. It should not be surprising that the W and Z boson masses of 80.4 GeV and 91.2 GeV, respectively, are about 100 times as massive as the colliding high energy protons which produce them.

In a 2002 lecture, Stephen Hawking declared that the standard model is unsatisfactory, " . . . it is ugly and ad hoc. The particles are grouped in an apparently arbitrary way, and the standard model depends on 24 numbers, whose values cannot be deduced from first principles, but which have to be chosen to fit the observations . . . . The second failing of the standard model, is that it does not include gravity." [11]. Hawking's resolution relies upon advancing mathematics: "I'm now glad that our search for understanding will never come to an end, and that we will always have the challenge of new discovery. Without it, we would stagnate. Godel's theorem ensured there would always be a job for mathematicians." In *The Grand Design* Hawking explains that ". . . understanding of the [mathematical] laws governing us and our universe [may] lead to a unique theory that predicts and describes a vast universe full of the amazing variety that we see." Hawking imagines laws of the universe which are so exquisitely formulated that they govern the assembly of the cosmos down to the minutest details of quantum particles, forces, and fields [12].

The mesostratum reality may be regarded as a mathematician's playground, where new concepts, paradigms, mathematical metaphors can emerge and perhaps delineate phyiostratum realities. Mathematical objects exist as *a priori* essences in the mesostratum. What the eye sees in the phyiostratum is not a continuous mathematical mesostratum object, such as a circle or sphere, but a tangible discontinuous article that resembles the idealized object: e.g. a moon, a planet, a soccer ball. This suggests that mesostratum elementary mathematical objects are but metaphors of physiostratum particles or phenomena. As an alternative to the sixteen-plus standard model elementary and fundamental particles, we offer but one conceptual, mesostratum-idealized entity, the primordial neutron, as depicted in Figure 2.

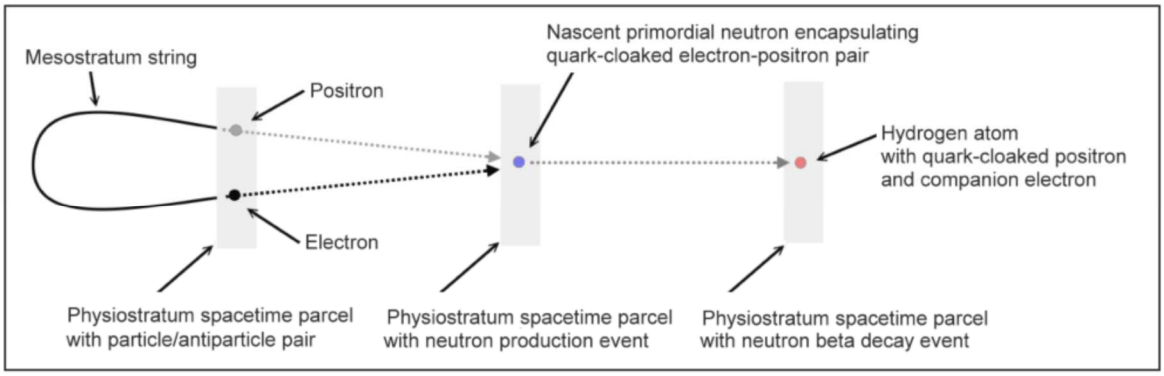

Figure 2 - Formation of primordial neutrons whch decay and populate the cosmos with atomic matter.

We postulate that primordial neutrons in vast abundance ultimately populate the observable cosmos (the physiostratum) with atoms and all other species of particles cataloged by the standard model. Additional interesting particles and particle-like things appear or are coaxed out during LHC experiments. Despite the triumphs of mathematical physics, intuition, and imagination, we recognize that it may not be possible to formulate a standard theory of the universe in finite number of statements or even to validate concepts such as the primordial neutron and its resultant massive, cosmological progeny. Theories and formulations should meet Karl Popper's test of falsifiability.

Electron/Nucleon Shell Models

Hydrogen, the most abundant substance in the cosmos, constitutes approximately 75% of all baryonic mass. The commonest hydrogen isotope is protium, with one proton accompanied by one orbital electron. We contemplate the quantum mechanical model of the protium atom before addressing more complex atoms.

The Schrödinger wave equation allows one to calculate the development of quantum systems with time and gives analytical characterizations of the hydrogen atom. The Hamiltonian wavefunction of the hydrogen atom encompasses the radial coulomb attraction force between the positive proton and negative electron. The time-independent Schrödinger equation, yields a partial differential equation which can be solved in terms of spherical coordinates. Solution of the Schrödinger equation for hydrogen provides an expression for the hydrogen energy levels and thus the frequencies of the hydrogen spectral lines. It also yields the shape of the electron's orbital wave function for the various possible quantum-mechanical states.

The Schrödinger equation also applies to more complicated atoms and molecules. If there is more than one electron or nucleon the solution is no longer analytical and either elaborate computer calculations or simplifying assumptions must be made. Since the Schrödinger equation is only valid for non-relativistic quantum mechanics, the solution it yields for the hydrogen atom is imprecise. The Dirac equation of relativistic quantum theory is an improvement because it accounts for special relativity in the context of quantum mechanics and for the fine details displayed by hydrogen spectra.

Under quantum mechanics theory, the protium electron cannot collapse into the proton as might be expected due to negative-to-positive charge attraction. The Hamiltonian and Schrödinger functions suggests an analogy with a bicycle wheel - with all the spokes in tension - representing circumferential radial coulomb attraction which holds the orbital electron in place. This implies that the orbital electron assumes a cloud-like form, and an effectively ridged toroidal aspect comparable to the rim/tire surrounding the hub of a bicycle wheel. According to the quantum mechanics formulation, the toroidal cloud notion represents the probability of finding the electron at any given location and that the electron does not actually orbit the nucleus but is diffusely distributed around the protium nucleus/proton.

We intuit that the protium electron has the properties of a Parson magneton, a plasmoid, a vortex ring. The Parson model treats the electron not as a single orbiting charge, but as a toroidal collection of infinitesimal charge elements which circulate in a continuous loop that may assume any shape, but tends toward a circular form due to internal repulsive electromagnetic forces. In this stable configuration, the electron charge elements circulate, but do not radiate energy. The Parson magneton is assumed to produce a magnetic field due to the current of moving charge elements [13].

It is convenient to speak of shells and subshells of electrons around atomic nuclei of atoms more complex than protium. The fluorine atom represents an illustrative example. Fluorine with atomic number 9 is the most electronegative element, it is extremely reactive. Almost all other elements, including some noble gases, form compounds with fluorine. In the shell model, the fluorine atom has 2 inner shell electrons and 7 outer shell electrons. According to the Lewis structure bond model, fluorine forms compounds by acquiring the extra electron needed for completing the outer shell - with a specified total of eight electrons. The extra itinerant electron must overcome the repulsive force of fluorine's seven resident electrons.

We are confronted with a similar quandary with currently accepted models of other more complex atoms in which the orbital electron shells are replaced by teardrop-shaped, doughnut-shaped, and even more complicated cloud-like geometries. Given the shell model and these alternate configurations it is necessary to explain how electrons may comingle despite their mutual electrostatic repulsion. The quandary is putatively resolved by application of theoretical mathematics and quantum mechanics stratagems which provide a computationally consistent base for comingling electrons in shells or in diffuse cloud geometries.

The shell model must provide a way to overcome mutual repulsive forces of electrons commingling in orbitals surrounding the atomic nucleus. The model invokes the Pauli exclusion principle which states that two or more identical electrons in orbit around the atom nucleus cannot occupy the same quantum state within a quantum system simultaneously. Quantum mechanics theory resolves the electron charge repulsion problem with rules associated with four quantum numbers. It is impossible for two commingled electron orbitals to have the same values of the four quantum numbers: the principal quantum number, the angular momentum quantum number, the magnetic quantum number, and the spin quantum number. If two electrons within the same orbital, share identical values of the first three quantum numbers, then their fourth quantum number must differ, say, they must have opposite spins of +2 and -2. No two electrons may share the same allowed permutations of the four quantum numbers. Thus. the electron shell

model comingling quandary is resolved by allowing each electron to assume a different quantum state - with no two electrons sharing the same set of specified quantum numbers.

We are confronted with a comparable problem with the currently accepted model of the atom in which the nucleus and nucleons are assumed to be essentially point-like or spheroidal. In the standard model depiction, protons which would mutually repel are held tightly together by a postulated strong attractive force that binds the quarks of which protons are composed. This assumes gluons that mediate strong interactions among quarks. Gluons are posited as gauge bosons that act as the strong force for holding together quarks.

The nuclear shell model which is analogous to the electron shell model uses the Pauli exclusion principle to describe the structure of the nucleus in terms of energy levels. The shells for protons and for neutrons are independent of each other - making neutrons extraneous and unimportant. Quantum mechanical formulation of the nuclear shell structure allows a limited number of energy states in which a nucleon moves within an effective potential well created by the forces of all the other nucleons. This leads to energy quantization requiring the postulation of potential wells for the modeling observed energy levels.

We are in effect obliged to imagine a less complex and contrived structure for the nucleus and to discover the nature and arrangement of orbital electrons associated with that structure. The cubic lattice nucleus model is offered as a viable approach for depicting atomic nuclei and for depicting the Parson magneton orbitals in a way that avoids the esoterica of quantum mechanics [13].

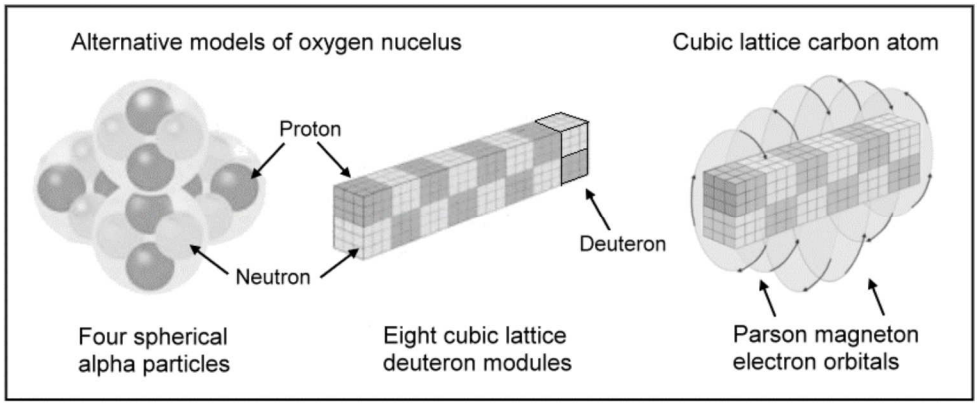

Figure 3 - Concepts of cubic lattice oxygen nucleus model and carbon atom model.

As indicated in Figure 3 the cubic lattice nucleon deuteron module is a fundamental building block. The checkerboard pattern of coupled neutron-proton deuterium modules is essential to and is replicated in the nuclei of all stable atoms - except protium and helium-3, which are stable, consisting of one proton or an extra proton, respectively. In neutron-rich isotopes, additional neutrons bond to open/unused facets of cubic lattice protons. In neutron-poor isotopes 'orphaned' protons are unstable - decaying quickly by beta plus β+ emission. Although protium is neutron-poor it is obviously stable and the most abundant substance in the cosmos. In all heavier atoms the deuteron configuration assures the stability not only of the attached protons but of the attached neutrons which would quickly beta minus β- decay in the unattached 'free' state.

In the cubic lattice nucleus model, unlike the conventional shell and cloud models, neutrons are essential components of deuteron module building blocks. In the checkerboard array depicted in Figure 3, neutrons between protons assure the nuclear bonding integrity and stability that is experimentally evident and which requires immense impact energy to break and to produce nuclear fission. This may be attributed to the perfect tessellation of nucleons – protons, neutrons, deuterons – in the cubic lattice model.

As exemplified by the cubic lattice carbon atom in Figure 3, each Parson magneton electron commands a specific orbit and need not assume a different quantum state to satisfy the Pauli exclusion principle, that is, the Parson magneton electrons do not comingle in the cubic lattice model – Parson magneton electrons mutually repel electrostatically and magnetically. The cubic lattice atom model may claim superiority over the conventional models because it requires no extraneous parameters such as various specified nucleon or electron shell quantum states, the Pauli exclusion principle, weak interactions or the strong force for holding together nucleons [5].

String and M-Theory Objects

The most striking feature of mathematical objects in string theory is the requirement of extra dimensions for mathematical consistency. Superstring theory requires ten-dimensional spacetime and M-theory requires eleven-dimensional spacetime. In bosonic string theory, spacetime is required to consist of twenty-six dimensions. Mesostratum mathematical objects like a sphere and torus or lines and circles may be represented by objects or parts of objects in the three-dimensional space of the phyiostratum. To realize real physical objects based on string theory mathematical objects, it is necessary to imagine a physiostratum in which extra dimensions exist but are experimentally unobserved. String theorists suggest that these extra dimensions are ‘curled up’ infinitesimal extensions of physiostratum space. We argue that although the mesostratum hyper-spacetime may accommodate multi-dimensional string and M-theory objects, only three-dimensional portions or versions of these may appear in phyiostratum space-time.

In particle physics the application of quantum field theory to mesostratum objects, such as electromagnetic fields, form a basis for understanding elementary particles, which are modeled as excitations of fundamental fields. The starting point for string theory is the notion that assumed point-like physiostratum particles of quantum field theory can be modeled as the space-time intersections of one-dimensional strings. These interactions of strings are defined by a generalized Feynman perturbation theory.

Feynman perturbation theory describes a complex quantum system in terms of a simpler one by starting with a simple system for which a mathematical solution is known, and adding a perturbing Hamiltonian representing a weak disturbance to the system. The various physical quantities associated with the perturbed system can then be expressed as corrections to the original system. The more complicated system can be studied based on knowledge of the simpler one by describing a complicated unsolved system using a simple, solved system. Unlike quantum field theory, current string theory does not have a consistent perturbative definition and many theoretical questions remain unresolved.

Various models of particle physics based on string theory require an enormous number of extra-dimensional spacetimes, each with different properties or substratum vacuum states and each with a different assortment of particles and forces. Unbridled theorists imprudently claim that there are precisely 10^{500} substratum vacuum states each of which may accommodate almost any phenomena that might be experimentally inferred [14]. Peter Woit argues that this large number of different physical scenarios renders string theory vacuous as a framework for constructing models of particle physics - obstructing the probably of predicting anything. By picking one from this enormous set, it is likely there still will remain a huge number from which one can get whatever value one wants for the results of any new observation [15].

Some string theorist argue that string and M-theory with their multiplicity of substratum vacuum states provide copious resources for producing the particularly fine-tuned anthropic cosmological constant that assures terrestrial life. An ongoing debate is concerned with whether the laws of nature are determined by mathematical relations, which by mere chance happen to allow life, or whether the laws of physics have been determined by the requirement that intelligent life be possible. According to Leonard Susskind, the multiplicity of substratum vacuum states of string theory might produce different cosmoses that arise from the substratum of a boundless universe [16]. Regardless, we doubt that our inventions and manipulations of string theory can reveal or foster any changes needed for fine-tuning of our corner of the cosmos.

The problem of extra dimensions continues to plague string theory, even with the compactification idea, wherein the extra dimensions curl up undetectably in physiostratum space-time. The problem is exacerbated by the introduction of complex Calabi-Yau manifolds with six extra dimensions added to the four of spacetime. Introduced by Edward Witten in M-theory, an anticipated benefit of Calabi-Yau manifolds is that the extra folded-dimensions give credence to new particles that may be predicted with the standard model of particle physics. Clearly, Calabi-Yau manifolds are elaborations of mesostratum spacetime voxels which also need to be folded into physiostratum space-time; wherein four-dimensional spacetime voxels appear as three-dimensional entities that oscillate in the extra, essentially hidden, time dimension [6].

The notion of mesostratum spacetime voxels folded into physiostratum space-time suggests a unification of general relativity and quantum mechanics theory because it incorporates the Planck-Einstein hypothesis of quantization with deformable spacetime elements which when combined manifest gravitational fields that define mass. The magnitude of the physical property of mass assumes discrete quantized values that are integer multiples of one quantum, which are measurable in terms of a gravitational field: a physiostratum space-time field based on a mesostratum spacetime field.

Mass can be quantified in terms of energy by means of the Planck-Einstein relation, $E = hf$, which indicates that energy can be calculated in terms of an electromagnetic frequency (f) - or as an incremental mass by multiplication of a quantum of energy/mass: $\varepsilon = hf = mc^2$ by an integer multiple of Planck's constant (h). The integer multiple maintains the quantum aspect and yields a counterintuitive insight: Mass even on the scale of large material objects (massive agglomerations of quantum-things) is intrinsically related to h - the constant of action, which

Planck first used to describe the vanishingly small energy (momentum/mass) content of individual photons. A photon in motion, through a transparent medium, with velocity (**v**) has momentum (***p***), where the proportionality constant (m) is the photon's virtual mass, so that $\boldsymbol{p} = m\mathbf{v}$.

Big Bang Inflationary Cosmology

To explain why the point of origin of the cosmos is unobservable, Big Bang theory asserts that the cosmos was initially opaque - that it consisted of a plasma which strongly absorbs electromagnetic radiation of all wavelengths: plasma is opaque. To explain the isotropy of the cosmos in all directions, including toward its presumed point of origin, virtually instantaneous expansion or inflation of the subsequently transparent cosmos is conjectured by Big Bang theorists. The inflation scenario is based on a bold extrapolation of the Hubble-Friedmann distance-redshift expansion observed in the current cosmic epoch.

Big Bang theorists choose to attribute the over-all near zero-degree Kelvin temperature of the current cosmos to inflation. The currently-observed cryogenic cosmic background is posited as a relic of the radiation transparency epoch of a suddenly-expanding cosmos: as merely background radiation from the rapid expansion and cooling stage of the original extremely hot Big Bang epoch. The nature of the cosmic background radiation depends on the portion of the spectrum observed. A prominent component is the cosmic microwave background which consists of redshifted photons that putatively emerged when the cosmos inflated and became transparent to radiation.

In physical cosmology, the age of the cosmos is taken as the time elapsed since the Big Bang. The current estimate of the age of the cosmos is ~13.8 billion years. The estimate is based on studies of the microwave background radiation, measurements by the Planck satellite, the Wilkinson Microwave Anisotropy Probe and other probes. The estimated age of the cosmos is intuitively based on the cosmic microwave background (CMB) radiation which gives the cooling time of the universe since the Big Bang, and measurement of the apparent expansion rate of the cosmos which gives an approximate age by extrapolating backwards in time.

All modern modes of telescopic and satellite observations, reaching backwards in time, reveal that in its earlier and even its preliminary stages, the cosmos appears virtually identical to our local ~13.8 billion year-old environment. Over that enormous span of time, there seems to have been no significant evolutionary change in the distribution or the nature of galactic content. This agrees remarkably with the cosmological principle which holds that the spatial distribution of matter in the cosmos is homogeneous and isotropic when viewed on a large-enough scale. On the scale of the age of the cosmos, there has been no observable change in the isotropic structure or the constituents of the cosmos. We conclude that observers throughout the extent cosmos will calculate that they exist in a ~13.8 billion year-old environment.

We propose a dispersed emergence theory to account for all the astrophysical data on the nature of the cosmos. The dispersed emergence theory holds that the cosmos materialized piecemeal - quantum by quantum - as diffuse entity, consisting of uncountable minute energy-matter

eruptions from an immense voluminous, unbounded universal substratum: the zero point field (ZPF) of the mesostratum. Figure 4 contrasts the Big Bang with the dispersed emergence theory in which primordial neutrons appeared and beta decayed to form primordial hydrogen, in the manner depicted in Figure 2. This process dynamically populated the cosmos with hydrogen, helium, and more complex atomic matter flux – including the flux of stars and galaxies.

Observational data suggest that particulate cosmic flux may be represented by F = A/m, where the mass flux parameter A = 10^{-18} g/cm^{2}s [17]. The parameter A applies to the particulate content of interstellar, intergalactic, and intragalactic space, over the entire mass range 10^{-30} to 10^{50} g. Evaluation of the F = A/m relation indicates that it is a strange attractor which governs the cosmic mass flux of discrete 'particles' from electrons to galaxies and that it corresponds to the CMB radiation and the cryogenic nature of the cosmos with its kinetic temperature of ~3^o Kelvin [18].

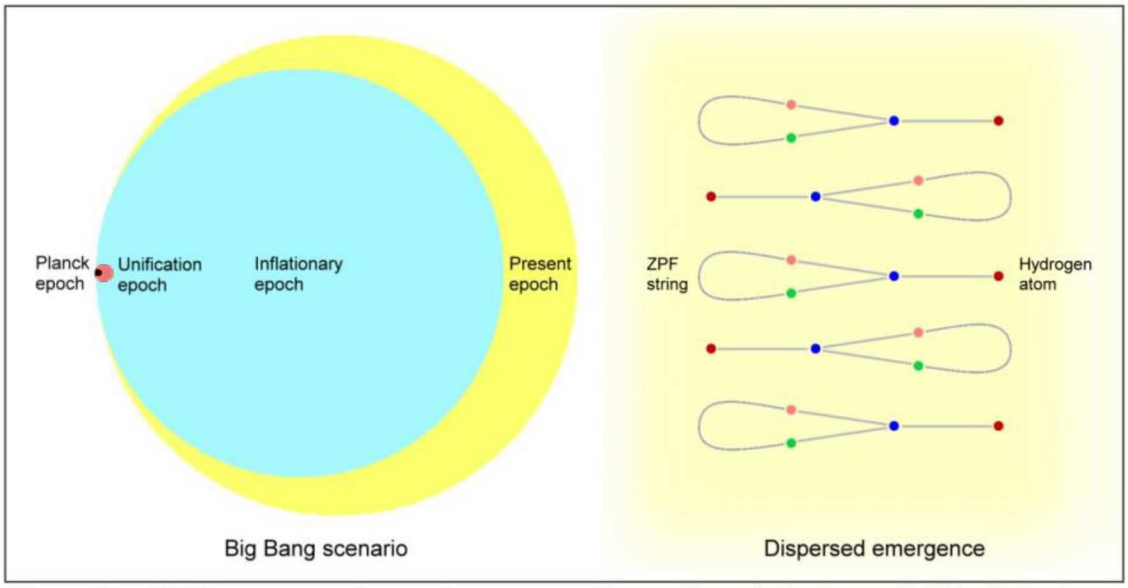

Figure 4 - Big Bang versus dipersed emergence from unbounded universal ZPF substratum.

We infer and argue that the universal substratum - the mesostratum - produced the foundation of physiostratum space-time which, in turn, formed the foundation of a cryogenic cosmos - which exists to the present epoch, as is evident from the cosmic background temperature of ~3 degrees Kelvin. The dispersed emergence theory holds that the nascent cosmos emerged as a Bose-Einstein condensate, consisting of non-luminous matter. The dark matter subsequently agglomerated with the nucleosynthesis of baryons which provided the initial conditions for the formation of galactic nuclei, most likely consisting of the cryogenic black holes that are currently postulated as galaxy nucleation sites.

The cosmic microwave background blackbody radiation temperature is evidently a relic of the nascent cosmos which began as a vast Bose-Einstein condensate that fractionated, expanded, and agglomerated hierarchically, ultimately systematically forming cryogenic dark matter galaxies which subsequently spawned the stars that illuminate them [18].

Discussion

There is evidence that stars formed from heavy elements, under cryogenic conditions, in nebulae that pre-existed them. Star-forming nebula typically exhibit more mass than the stars which they produce. There is also evidence that, well beyond helium, nucleosynthesis (e.g., sulfur from oxygen) occurs in cryogenic Bose-Einstein condensates in which quantum mechanical tunneling occurs. A fraction of the Bose-Einstein condensate may tunnel through the coulomb barrier, which in the cubic lattice nucleus model is so configured that it promotes nuclear fusion [5, 18]. This process may involve the Josephson Effect where a fraction of condensate nuclei can tunnel through and fuse a fraction of the condensate tunnels through any barrier. Another important Bose-Einstein condensate property is coherence. Because of this property, it is possible to treat the whole condensate as a wave analogous to a coherent electromagnetic wave. Thus, it is possible for Bose- Einstein condensate molecules and their nuclei to constructively interfere and result in nucleon fusions. The cryogenic cubic nucleon fusion process does not require hot nuclear collision interactions such as those in stars and assumed for the Big Bang nucleosynthesis.

The planets Jupiter, Saturn, Uranus, and Neptune are obvious relics of the cryogenic nascent cosmos, a primordial Bose-Einstein condensate dark matter cosmos. Jupiter, Saturn, Uranus, and Neptune evidently remain cryogenic at their cores. Jupiter is an excellent example, composed primarily of hydrogen with a quarter of its mass being helium. The atmospheric proportions of hydrogen and helium are close to the theoretical composition of the primordial solar nebula. Jupiter is thought to consist of a dense hydrogen core, a surrounding layer of liquid metallic hydrogen with some helium and an outer layer predominantly of molecular hydrogen.

Jupiter radiates 1.5 to 2 times more energy than it receives from the Sun, Saturn radiates 2 to 3 times more energy, Uranus radiates 1.06 times more, and Neptune radiates 2.6 times more. The source of the excess thermal radiation is conventionally attributed to leftover heat from planetary formation, gravitational contraction, and from frictional heating. Our inference is that Jupiter, Saturn, Uranus, and Neptune formed in situ from a primordial cryogenic phase that existed from the earliest stages of the cosmos. The excess heat is probably primarily from ongoing deuteron fusion to alpha particles, that is, fusion of hydrogen-2 to helium-4 by cryogenic Bose–Einstein condensate fusion [18].

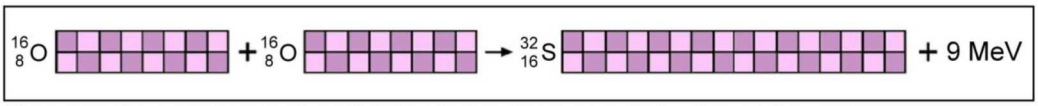

Figure 5 - Conceptual cryogenic cubic lattice fusion of oxygen nuclei forming a sulfur nucleus.

Figure 5 shows a concept of fusion nucleosynthesis of sulfur from oxygen based on the cubic lattice nucleus model. The oxygen-to-sulfur transmutation process is evident in star-forming nebula. Most emission nebulae are about 90% hydrogen, with the remainder helium, oxygen, sulfur, nitrogen, and other heavy elements. Studies of two regions of the Orion nebula show intensities of about 220 emission lines for C+, N+, N++, O°, O+, Si+, Si++ and S+, some produced by recombination and others by fluorescence. It was found that the ratio of sulfur to oxygen in Magellanic clouds is about 0.8, which agrees with the antecedence of oxygen required

for fusion to sulfur to proceed [5]. The O2 fusion requires precise orientations of nuclei and appropriate electron orbital resonances. The fusion depends on the affinity between deuteron modules that are coupled harmonic oscillators, which is possible in a Bose-Einstein condensate [19]. The required proximity and alignment of nuclei already exist with O2 molecules. When an O1 deuteron fuses with an inverted O1 deuteron, the combined oscillators are damped with the emission of energy. Jupiter's sulfur satellite Io may be the spinoff of a cryogenic oxygen to sulfur fusion process.

Conclusion

Pre-Copernican epicycle-based mathematics provided a *geocentric* argument which was found *computationally equivalent* to Kepler's *heliocentric* argument based on Tycho Brahe's empirical facts - where the Sun is one of the foci of elliptical planetary orbits. There is a rather stark lesson in the cost of allowing persuasive metaphors and mathematical models to run too far ahead of the empirical facts [4]. Although the language of mathematics can enthrall and entrap it can also enlighten and systematize understanding [20]. Mathematical and logical reasoning make explicit what is implicitly contained in a set of premises - mathematics is indispensable as an instrument for the validation and for the linguistic expression of empirical findings.

We offer alternative conjectures on the cosmological background, the origin of the cosmos, and the nature of subatomic entities and atomic nuclei based on a foundational universal substratum from which the observable cosmos emerged diffusely, incrementally [5, 18]. We posit the mesostratum - a transcendent substratum - which together with the material physiostratum comprise adjacent realities which we argue should be considered to augment our understanding of fundamental physical reality [3].

Received April 16, 2018; Accepted April 30, 2018

References

1. Roger Penrose, *Fashion, Faith, and Fantasy in the New Physics of the Universe*, Princeton University Press (2016).
2. Alexander Unzicker, *The Higgs Fake: How Particle Physicists Fooled the Nobel Committee,* CeateSpace (2013).
3. Alex Vary, Theoretical Physics between Adjacent Realities, *Prespacetime Journal*, Vol. 8, Issue 14 (2017).
4. Hilton Ratcliffe, *The Static Universe: Exploding the Myth of Cosmic Expansion*, Apeiron (2010).
5. Alex Vary, Cubic Lattice Cryogenic Nucleosynthesis in the Nascent Cosmos, *Prespacetime Journal*, Vol. 8, Issue 9 (2017).
6. Alex Vary, Hidden Variables, Diffraction, and Spacetime Topology, *Prespacetime Journal*, Vol. 8, Issue 2 (2017).
7. John A. Wheeler, *Geons, Physical Review*. 97 (2): 511 (1955).
8. Alex Vary, Mesostratum Geometrodynamic Gravitation, *Prespacetime Journal*, Vol. 9, Issue 2 (2018).
9. Alex Vary, Solar Spacetime Topology and Titius-Bode Law, *Prespacetime Journal*, Vol. 8, No 4 (2017).

10. Alex Vary, Redshift, Planck Action & Spacetime Change with Cosmic Age, *Prespacetime Journal*, Vol. 8, No. 7 (2017).
11. Stephen Hawking, Gödel and the End of the Physics, lecture given at the Center of Mathematical Science, Cambridge University, July 20, 2002.
12. Stephen Hawking and Leonard Mlodinow, *The Grand Design,* Bantam Books (2010).
13. Alfred Locke Parson, *A Magneton Theory of the Structure of the Atom*, University of Michigan Library (2009).
14. Jim Baggott, *Farewell to Reality: How Fairytale Physics Betrays the Search for Scientific Truth*, Constable (2013).
15. Peter Woit, *Not Even Wrong: The Failure of String Theory and the Search for Unity in Physical Law*, Basic Books (2007).
16. Leonard Susskind, *The Cosmic Landscape: String Theory and the Illusion of Intelligent Design*, Back Bay Books (2006).
17. Alex Vary, Heuristic Assessment of Cosmic Structure and Energy Density, *Prespacetime Journal*, Vol. 7, Issue 1 (2016).
18. Alex Vary, Cryogenic Origin & Nature of the Cosmos, *Prespacetime Journal*, Vol. 7, Issue 5 (2016).
19. Alex Vary, Cubic Lattice Bonding of Graphene, Benzene, and Ozone, *Prespacetime Journal*, Vol. 8, Issue 10 (2017).
20. Alex Vary, Language Enlightens & Entraps Intellect, *Journal of Consciousness Exploration and Research*, Vol. 8, Issue 9 (2017).