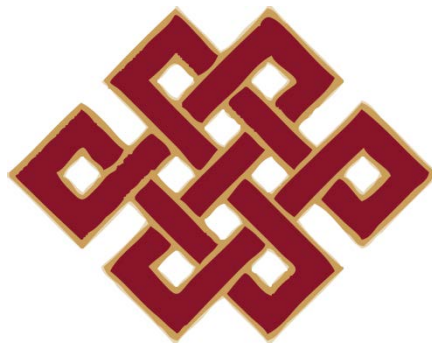


# **“Physics in Trouble”: Matter Behaving Badly**

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The progress of science has now reached a turning point. The stable foundations of physics have broken up... Time, space, matter...all require reinterpretation.

—Alfred North Whitehead

### **The Standard Model: Historical Prelude**

“It is difficult to locate a black cat in a dark room, especially if there is no cat” (Confucius). Perhaps the greatest challenge facing theoretical physics today (notwithstanding the noetic imperative to remain open and skeptical regarding our personal and collective “web of belief”) is an ongoing agglomeration of theoretical and mathematical inconsistencies of its minimalist yet robust “Standard Model” of particles and forces (p. 16 below). This fact is readily acknowledged by particle physicists. Nevertheless, this prodigious theory has succeeded in integrating both Special Relativity theory and quantum theory—if not the gravity of General Relativity—into a comprehensive view of the basal subatomic structure and forces of physical reality. The Standard Model has as well, notwithstanding the mathematical fudge of renormalization, unified the Electromagnetic Force with the Weak Force. These are indeed grand intellectual accomplishments.

Yet, what shall we make of a theory that, even on the account of its ideologues, fails to explain or even describe 95 percent of the total energy density of the universe? Recent dark sector cosmological theory claims that about 70 percent of the universe is dark energy, 25 percent is dark matter, and fully 5 percent of the universe is ordinary atomic matter/energy. The absurdities of dark matter and dark energy are hence theoretically required because the total energy density of the cosmos is so much greater than the energy density of mere ordinary matter.

Dark matter, if it can be presumed to exist, is invisible, undetectable, non-luminous, non-interactive matter that must be composed of a mystical new particle undreamt of in the Standard Model firmament.

Dark energy, if it can be presumed to exist, is "smooth"—it does not agglomerate in galactic or intergalactic structures—and it remains constant in the expanding universe, which with a new, mysterious inflation, actually accelerates the expansion of the universe, possibly at an ever increasing rate, resulting ultimately in a "Big Rip" wherein all matter is rent apart at the atomic level. Bad for the economy.

Efforts to understand dark energy are usually constrained to Standard Model quantum theory. That Einstein's General Relativity theory of gravity (inconsistent with Relativistic Quantum Field Theory) may deviate at the extreme large scale structure of the cosmos seems to be given short shrift. Perhaps a post-standard model theory of quantum gravity will come to the rescue. Superstring Theory, which fabulously predicts both Einstein's Gravity Theory and Supersymmetry particles, is the leading candidate.

Historically, Bohr and Heisenberg completed the quantum theory with their Principles of Complementarity and Uncertainty, respectively, in 1927. This was the foundation of their antirealist Copenhagen Interpretation (1929) of quantum mechanics. Dirac's astounding math-

ematics made the quantum theory consistent with Einstein's Special Relativity in 1928. Relativistic Quantum Field Theory (QFT) then evolved into the "renormalizable" relativistic quantum gauge field theory of Quantum Electrodynamics (QED) of Schwinger and Feynman in 1948. This marvelously synthetic theory unifies the hitherto separate forces of electricity, magnetism and light into a single unified force of nature.

In 1964 Feynman's erudite colleague, Murray Gell-Mann established the Quark Model that was nothing less than a new theory of the Strong Force or Strong Nuclear Force, namely, Quantum Chromodynamics (QCD, 1973). The Strong Force binds point-like fundamental quarks together within protons and neutrons. The fundamental boson force carriers are gluons. Quarks then are the strongly interacting particles that comprise the protons and neutrons of the atomic nuclei of physical reality. QCD was finally completed in 1995 with the experimental discovery of the long predicted Top Quark. However, QCD has at least one serious problem. It cannot account for neutrino mass, as we shall see.

**Strange interlude.** But again the micro-physical plot thickens. Enter, stage left, particles *within* the ostensibly zero-size point-like quarks and leptons! Shall we call them "preons". Two types of preon, with their anti-particles, are now hypothesized, namely, matter particles or fermions, and the force carrier particles or bosons, including the auspicious Higg's boson. Why preons? The twelve particles of the three generations of the Standard Model particle mind-scape reveal anomalies that suggest that none are fundamental. The presumed point-like, zero size indivisibility of hitherto fundamental quarks and leptons appears to be an error. A non-zero size for quarks and leptons, if such proves to be the case, is compelling evidence for sub-quark/sub-boson fundamental particles—preons. Boxes within boxes without end?

QCD with its Quark Model, now vexed by preons, reduced the theoretical composition of matter from a ludicrous 200 "elementary" particles to a particle family of two, namely, quarks (hadrons) and leptons (electron, muon, tau and their corresponding neutrinos). But QED with its "dippy hocus pocus" (Feynman) renormalization fairy dust (which bestowed the pragmatic, not so hocus pocus quantum gifts of the computer, the laser, the microwave and the bomb, not to mention the Nobel Prize in physics) resulted in the frail Electroweak Theory of Weinberg and Salam which presumed to unify the Electromagnetic Force with the Weak Interaction. The resulting Electroweak Force (1967), and the Strong Nuclear Force or "color force" (QCD) that binds quarks inside protons and neutrons, along with the force carrier particles, and antiparticles of the matter particles (e.g. electron/positron) became physics' Standard Model of particles and forces. The Standard Model was completed in 1977 with Lederman's discovery of the bottom/anti-bottom meson.

**In summary.** The waning Standard Model consists of the hitherto fundamental particles that are quarks and leptons, with their charges and masses (who can say how sub-fermion preons that may constitute quarks and leptons will impact the picture), the two, for now separate forces or interactions that are the Electroweak Force (QED/Electroweak Theory) and the Strong Force (QCD), their Force Carriers ( $W^+$ ,  $W^-$ , Z bosons, gluons), including the putative Higgs boson (p. 16 below), and finally the antiparticles of the fermions (electrons, protons, quarks, etc.).

**Toward unification.** With the increasing unification of the Standard Model emerged the hope of further unification, namely, a Grand Unified Theory (GUT) of the Electroweak Force and the Strong Force; and then the mother of all speculative theoretical hopes, a Theory of Everything. Such a TOE would completely explain the Standard Model and its core principles of force, energy, matter, space, time, through the theoretical unification of all three of Mother Nature's physical forces and their particles—let's not forget the Gravity Force and its force carrier, gravitons—into a mathematically unified, or rather, re-unified primeval singular, grand unified “mother force” that was the very cosmic ground of the symmetry breaking phase transitions produced by the putative Big Bang cosmogenesis.

Unfortunately, the Gravity Force of Einstein's General Relativity seems forever (a long time) mathematically incompatible with Relativistic Quantum Field Theory of the Standard Model. Einstein's classical gravity principle is relativistic, but violates Heisenberg's post-classical quantum uncertainty relations, thus requiring a new post-standard model physics paradigm that transcends yet includes the venerable Standard Model by formulating a quantized gravity theory, and resolving some of the puzzling gaps in the Standard Model.

The fabulous logic-defying (*ex nihilo*) trans-rational, blatantly supernatural Big Bang singularity instantly (at the Planck time quantum gravity  $10^{-43}$  seconds) resulted in the broken symmetries (spontaneous, acausal “electroweak symmetry breaking,” EWSB) of the ontologically prior and perfect cosmic symmetry or unity of the three seemingly separate forces of nature that then produced (nucleosynthesis) the spacetime material elemental things that stuff is made of.

The goal of current theoretical physics then, is to explain the anomalies and unify the astonishing mathematical truths of the noble Standard Model paradigm with a post-standard model Super-String Theory/M-Theory and its resultant Supersymmetry of subatomic particles and forces; and of course to explain a quite problematic Big Bang cosmology with its *ad hoc* new inflationary “dark energy”.

The formalist intuitionist mathematics of such a string theory is horrendously difficult, and far from complete, but appears to predict General Relativity, is consistent with Relativistic Quantum Field Theory, and perhaps promises descriptions of cosmic realities—for example, a tweak in Einstein's General Relativity Equivalence Principle—that permits us to dodge such absurdities as “dark matter” and “dark energy”. But there's more! M-Theory may offer unification of the three (or four) forces, dodges the “problem of infinities” by yielding finite results, and appears to include the old paradigm Standard Model as a special low energy limiting case. Indeed, consummations devoutly to be wished.

It is useful here to note that a post-Standard Model superstring, or a quantum loop, like a Standard Model point particle, cannot *ex hypothesi* exist in physical reality. Rather, strings are mere formal mathematical models, not “real”, physical entities; a radical departure from the Platonic metaphysic of classical, orthodox, modernist Scientific Realism and Materialism. Not to mix our metaphysics, but strings seem ontologically closer to Eastern Indian *Upanishadic* Monism, and to Buddhist *Yogachara* Idealism than to Western philosophical Platonic and Platonist Scientific Realism and its ontic cohort Scientific Materialism (Scientism).

The Postmodern Science meta-narrative—this “naturalistic” materialist creation myth—is, exoterically at least, nearly identical to our primordial wisdom tradition’s binary, the Two Truths meta-narrative, namely the primeval duality that is relative form/matter (*samvriti satya* “concealer truths”, Kant’s phenomena), and ultimate Tao/emptiness/spirit, (*paramartha satya*, Kant’s *noumena*) in which, or in whom the dance of geometry arises and descends into objective spacetime (involution/ontogeny). Esoterically, the “eternal return” to the source or ground of physical and mental form occurs through matter/mind/spirit stages of evolution/phylogeny as material form, evolves life, self-consciousness, then “god-consciousness”, liberation/full bodhi through ascent again to its basal source condition, the unbounded wholeness that is our “supreme source” or emptiness ground, ultimate “reality itself.”

Just so, this all-embracing *kosmic* ground is the physical/material primordial cosmic symmetry/unity of modern cosmology’s pre-Big Bang grand unified “mother force” ( $10^{-43}$  seconds). These two views are variations on a perennial theme of nondual primordial unity. “The barrier between subject and object does not exist. Subject and object are only one” (Erwin Schrödinger). “There is no barrier. Everything being buddha nature, there is no gate through which to go in or out” (zen patriarch Hui Neng).

Objects altogether are whole, yet separate;  
Being itself coming together, yet apart;  
In harmony yet dissonant. Of objectivity,  
There is a great whole;  
And from this whole, all things arise.

—Heraclitus (author’s translation)

The “lucid mysticism” of Bohr and Pauli that represents this unfathomable perfectly subjective unbounded whole, by whatever name, was conceptually imputed and designated by 20<sup>th</sup> century quantum physics and cosmology to be the *de facto* subjective basis of our arising “objective” relative-conventional realities. This mysterious quantum reality was then subsequently theoretically reduced to a naturalized, ideological, purely physical/material deterministic reality that became the unabashedly mystical Higgs field. Its particle force carrier is the alluring Higgs boson—Standard Model desire itself (“desire is the creator and destroyer of worlds” —Bhagavad-Gita)—representing the putative interaction of the Higgs mechanism that in some wondrous way bestows mass upon the admittedly, necessarily and eternally unobservable and in principle empirically undiscoverable quarks and leptons (or strings or loops) that we have come to know and love, and that we can only hope comprises the whole exoteric physical cosmos (if not ultimate all-inclusive esoteric Pythagorean *kosmos*) of post-Aristotelian quantum discontinuous physical reality itself (Higgs, p. 16 below).

Quantum Electrodynamics (QED) is the relativized, quantized electromagnetic theory of Maxwell’s sublime 19<sup>th</sup> century mathematics. In 1929 Paul Dirac, in an equally astonishing bit of mathematics, unified Einstein’s relativistic mechanics with QFT—with its Schrödinger wave mechanics—to create QED, and predict the existence of anti-matter in the bargain!

This is also the year, as we've seen, that the Bohr and Heisenberg collaboration—Bohr's Principle of Complementarity and Heisenberg's uncertainty relations, his Principle of Uncertainty—resulted in their subjectively perspicuous, instrumentalist Copenhagen Interpretation of QFT/QED, with its devastating, paradigm busting result that the nature of physical reality cannot be deterministic—as Newton and Einstein would have it—but is merely stochastic: probable or statistical. This acausal quantum indeterminacy voids the sacrosanct principles of causality and objectivity, thus making shopping, and balancing our checkbooks quite problematic.

Einstein argued with Bohr for thirty years against this indeterminism of the Copenhagen view. "God does not play dice with the universe", preached Einstein. Replied Bohr, "Oh, Albert, stop telling God what to do".

Such quantum indeterminism negates the demarcation between our objective and subjective cognitive dimensions of reality (Kant's hitherto fundamental analytic/synthetic distinction), between mind and the natural world; and it challenges the very principle of causality (Boaz 2012, Ch. IV). This was, to say the least, a shock to Einstein's inner realist, and to the entire Modernist orthodoxy of Scientific Realism/Materialism.

Yikes! Objectivity and causality are kaput! With Gödel's and Turing's proofs that not even mathematics is logically consistent, certain and complete, we have, it would appear, a really spooky nihilism. What hath God wrought!

Responding to this dawning collective realization that hitherto objective Science and the reality it purports to causally explain are essentially subjective, the great physics master John Wheeler, creator of the fabulous "The Great Smoky Dragon" of quantum uncertainty (echoing Shakyamuni Buddha's *Heart Sutra* negation of objective form in subjective emptiness), confided to his journal (1.29.02): "No space, no time, no gravity, no electromagnetism, no particles. Nothing. We are back where Plato, Aristotle, Parmenides, struggled with the great questions: How come the universe, how come us? But happily we have around the answers to these questions. That's us" (nytimes.com 2.3.12).

**Brief mathematical excursus.** We must now ask, what is the nature of these mathematical entities that seem to dictate reality itself? Do mathematical objects exist independently of a sentient perceiving consciousness? Do we *discover* their properties, or do we *fabricate* them—*Constructivism*—through conceptual imputation and designation, as Madhyamaka Buddhists, and as Kant believed?

Mathematicians and philosophers of science have now concluded that the *logicism* of Frege, Russell and Whitehead has finally failed in its attempt to reduce mathematics to formal logic. And the *formalism* of Hilbert denies that mathematics does anything more than merely suggest "real" natural entities. Here, mathematics is purely syntactic and instrumentalist, resisting epistemic and ontic interpretation of its theories. The supersymmetry of Superstrings and M-Theory suggests such an ontologically relativist view. Here no theory-independently existent real mathematical entities are posited.

However, mathematical realist/Platonist Kurt Gödel assumed mathematical entities to be *independently* existing real objects. An absolute, universal triangle really exists "out there,"

in spacetime reality for our separate human intellect and experience to “discover”, just as Plato told. Young Wittgenstein’s (the *Tractatus*) *conventionalism* is such a realist view, and has often been utilized as an argument for mathematical realism in the sciences. The string theorists have abandoned such an adventitious realist interpretation. Even inveterate realist Stephen Hawking has deserted mathematical and philosophical Realism in his promising *Grand Design* (2010).

For the mathematical *intuitionism* of Brouwer, mathematical entities are *constructed* by human intuition as Kant believed, but do not exist independently in reality. Aristotle’s fundamental logical “law of excluded middle” may be here replaced with von Pauler’s “law of connection”, that is, everything is connected to everything else (Boaz 2012, “Post-Quantum Logic”). This anti-essentialist view challenges 2400 years of the Western (Greek) presupposition of objective deductive certainty regarding the *absolute* independent separate existence of physical/material reality, including mathematical entities.

I have implied above that a non-absolutist, non-essentialist interdependent view treads a centrist middle way between the philosophical extremes of a Western independently existent absolute reality—existential absolutism—and an Eastern nihilistic denial of reality.

Most mathematicians and logicians now believe that Gödel and Turing have proven that the logicism of Frege and Russell, and the formalism of Hilbert, are not mathematically possible. It seems we are, as it were, stuck with a constructivist, intuitionist view of the nature of mathematical truth. This, of course, greatly displeased the Platonic mathematical realists (Gödel, Russell, Whitehead), as well as Einstein, Bohm and the “hidden variables” realists. It is refreshing here to observe the antirealist, anti-essentialist and constructivist development in the maddening mathematics of the post-Standard Model supersymmetry of M-Theory/String Theory, as a counter-balance to the orthodoxy of Standard Model Scientific Realism (Scientism”).

Now this all is intimately linked to physics’ Quixotic quest for “Einstein’s Dream,” an intrinsically vexed unifying Quantum Gravity that quantizes the Gravity Force of Einstein’s General Relativity, unifying it with Standard Model Quantum Field Theory (QFT) which includes Quantum Electrodynamics (QED) and Quantum Chromodynamics (QCD). Such a quantized quantum gravity would resolve the problem of anomalous mystical quantum non-locality or “quantum entanglement,” and with that the problem (for Scientific Realism) of anti-Realism. This attempted unification of gravity with QFT/QED/QCD, if successful would bridge the seemingly unbridgeable gap between the incomplete quantum world of the very small, and the incomplete cosmological world of the very large (with its logically impossible *ex nihilo* Big Bang cosmogenesis).

Hence, the mathematics of quantum theory in the realm of the micro-world, and the gravity of General Relativity Theory in the macro realm, have proven hopelessly incompatible. After a half-century of work, a futile, non-renormalizable quantum gravity results when the General Relativity Principal of Equivalence (the equality of uniform gravitational with accelerated frames of reference) is subjected to QED/QCD mathematics, making unification a long



way off, if it is logically possible at all (Gödel, p. 46 below). Recall, the Standard Model requires that QCD explain the inconvenient truth, which it cannot do, that neutrinos have mass.

The Standard Model is therefore not a finite theory. “Uncontrollable infinities” (Penrose 2003) arise when we attempt to derive the values of the mass and charge of the elementary particles the Model purports to provide.

The “fine structure constant” which governs the strength of the electromagnetic force interactions simply cannot be provided by the Standard Model. We must revise either the Standard Model’s Quantum Field Theory (QFT/QED/QCD) or the gravity of Einstein’s General Relativity (GRT). This revealing fact further opens the door to the emerging post-Standard Model physics and cosmology of the supersymmetry theories, namely M-Theory and Loop Quantum Gravity.

**Ontological relativity in physics and philosophy.** The ultimate purpose of theory, model or worldview is to facilitate and evolve a more subtle, elegant and inclusive theory, model or worldview. David Finkelstein has pointed out that a theory is a view from a relative cognitive position which necessarily introduces an “idol” or false absolute into the theory. Such tacit theoretical assumptions cannot be proven or corrected within phenomenological level or context of the theory, as the great dialecticians Gödel, Quine, Whitehead, Heidegger, Hegel, Nagarjuna and many others have told. Such false absolutes or idols must be relativised and embraced by a more inclusive theory. “Transcend and include,” in the gloss of Ken Wilber.

Finkelstein’s “universal relativity principle” (Wallace, ed., 2003) precludes grand unified theories of everything, the loftiest idol in the Modernist grail quest for objective, even deductive certainty about everything. This is essentially the Buddhist middle way *Madhyamaka* view: not grasping or clinging to anything, not even the highest, subtlest, most elegant or comprehensive view. Grasping and clinging beget ignorance (*avidya*), both exoteric and esoteric.

The rush to glory in the cognitive wake of unification is illumined by Julian Schwinger, developer, with Feynman and Tomonaga, of QED: “It’s nothing more than another symptom of the urge that afflicts every generation of physicists—the itch to have all the fundamental questions answered in their own lifetime” (in “How the Universe Works,” Crease and Mann, *Atlantic Monthly*, Aug. 1984).

Alas, there can be no “final theory.” All of our theories are necessarily incomplete. Only the whole is complete. We are at last coming to understand that nature cannot be reduced to conceptual, theory-independent real entities out there somewhere (Quine, Rorty, Buddhist *Madhyamaka*). Once again, relative spacetime reality arising from the unbounded whole that is its ultimate consciousness ground is relative-conventionally, conceptually rational and objective, but ultimately trans-rational and subjective. Human consciousness—even philosophers—are instantiations of this vast whole that is consciousness-reality-itself.

Physicist Geoffrey Chew, inventor of “Bootstrap Theory” (S-Matrix Topology) on the non-objective quantum theory:

Every ‘particle’ is related to every other ‘particle,’ a highly non-linear mathematical formalism... All concepts are ‘bootstrapped’—explained

through the overall self-consistency of the conceptual web... The existence of consciousness, along with all other concepts of nature, is necessary for the self-consistency of the whole... There is no continuous space-time. Physical...atomic...reality is described in terms of isolated events that are causally connected but are not embedded in continuous space-time. Space-time is introduced macroscopically, in connection with experimental apparatus, but there is no implication of a microscopic space-time continuum. You should not try to express the principles of quantum mechanics in an *apriori* accepted space-time. That is the flaw of the present situation (in F. Capra, *Uncommon Wisdom*, 1988).

This “flaw of the present situation” is the assumption that the quantum theory describes physically real objective spacetime phenomena. It presumes to describe matter's basic building blocks, for example the electron, as a classical physical entity extended in classical spacetime with intrinsic physical properties of mass, charge and spin, while *ex hypothesi* denying the electron an objective determinate physical spacetime momentum and location at the instant of collapse of the wave function during observation by an experimental apparatus and an observing consciousness. If the non-classical, non-objective wave/particles and fields of quantum reality have no physical extension in spacetime—no location and no motion—how can they be said to possess the classical physical properties of mass, charge and spin?

This confusion about the inherent subjectivity of the most successful scientific theory in history is revealing. It implies that our obsessive attachment to the physicalist, “scientific” totemic absolutes or idols of such concepts as mass, energy, force, space and time are in dire need of a revisioning, relativizing noetic synthesis.

Physicist Henry Stapp remarked, “Quantum entanglement is the most profound scientific discovery of all time.” Quantum Entanglement (quantum non-locality) is the supraluminal or faster than light quantum connectedness of a pair of particles in a single quantum system that may be separated by light years of space. This of course violates Einstein’s neorealist Special Theory of Relativity with its finite light speed limit, thus precluding the realist metaphysics of Modern Scientific Realism (Boaz 2012, Ch. IV). No small matter is at stake here. Platonic metaphysical Realism undergirds the entire edifice of the stridently “objective” physical sciences. And this in the epistemic wake of the profoundly subjectivist quantum theory. Paradigm shifts take a generation or two (Kuhn below).

Stapp also reminds us, echoing Chew, that elementary particles—or strings, loops, or branes—are not independently existing *physical* things or entities, but *information* in “a set of relationships.” The ultimate nature of reality now looks more socioculturally intersubjectively relational, informational, and pragmatically interdependent than a “scientific” theory-independent Realist/Materialist epistemology can explain. Clearly, the Science and Philosophy of the 21<sup>st</sup> century that unpacks this post-quantum ultimate reality will continue to move toward non-foundational holistic systems and relationship thinking.

Network Theory (Graph Theory) and the inter-disciplinary holism of a top-down dynamic systems methodology wherein the systemic whole gives rise to properties not present at the phenomenological strata of the individual nodes or atomic parts of the system—that is to say, “emergence”—will become increasingly important. Dynamism, not equilibrium, is the future.

The ideological quest of the Modern enlightenment project for objective external material substance and equilibrium has largely ignored the fact that process and continuous change or non-equilibrium is the norm in physical and social systems (Goldman 2004). Matter/energy, space/time, language/culture and human history are not static fixed entities, but ever changing, evolving interactive sociocultural relational webs or networks whose spontaneous and unpredictable emergent properties are a result of the interdependent prior causes and conditions that are necessarily constitutive of such relationships.

Matter, energy, force, space, time, meaning, science, mind, causality, reality: the terms are the same as they were 100 years ago, but the realities have profoundly changed. Newton's notion of mass cannot be mathematically fudged into Einstein's more inclusive mass/energy. They both work, but are conceptually and pragmatically light years away.

The linear, mechanistic, objective and reductionist causality of Hume and Kant could not conceive of the volitional causality—value, perception, context, karma—of the emerging noetic sciences. An integral noetic science requires sciences of subjective qualities—mind's volition, value, the qualitative, emotion and motivation, introspective contemplative and spiritual experience—as well as a science of objective quantities. Causality has a volitional component, and meaning, even ultimate meaning, is already mythopoetically, noetically embedded in perceived arising reality.

Moreover, noetic science requires *acausal* explanation, for example quantum microphysics, quantum nonlocality, Planck scale phenomena, "spiritually empirical" direct yogic spiritual experience (*pratyaksa*), etc.

Human conceptual cognition (but not pristine direct perception, *pratyaksa*) is inherently dualistic, binary/bivalent or dichotomous. The current momentous epistemic paradigm shift from 2400 years of epistemological bipolar Substance Dualism and Platonic and Representational (“Scientific”) Realism with their subject/object spirit/matter split, has now at least potentially liberated humanity from the cognitive curse of what Dewey termed “dichotomous thinking,” a not so attractive form of cognitive entanglement. The recognition and execution of this cognitive blessing in the lifeworld of the individual—now that requires constant vigilance, and perhaps a little contemplative “mind training.”

Such a consciousness shift begins with the awareness that our thinking and feeling awareness—our normal habit of mind—is preconsciously entangled with the emotional/conceptual exoteric, dualistic, dichotomous syntax of language. This is the self-created reality that we choose, moment to moment. To become immediately aware of the “always already present” cognitively subtler *esoteric* (preconscious emotional and mental), and even trans-conceptual “*innermost esoteric*” (supraconscious “spiritual”) strata of cognitive life is the cognitive paradigm shattering consummation to be wished. Our Premodern wisdom traditions

teach of the simultaneous unity of these three or even four consciousness dimensions: exoteric outer, esoteric inner, innermost esoteric, and nondual, which is utterly trans-conceptual. Any view which fails to consider all of these consciousness strata invites error and bias.

Since Aristotle, “man is the rational animal.” Twentieth century depth psychology (the psychology of the unconscious), and recent research in economics (Kahneman and Tversky) have demonstrated the “irrationality” of our “rationally self-interested” behavior. We are rather, the emotional animal, scarcely rational at all regarding our own desire and motivation. It is perhaps useful to stay present to this psychological truth of emotional cognitive entanglement when emotionally reacting to, or defending some concept or belief to which we cling, and of which we are relatively, or even absolutely certain.

As to Quantum entanglement, it was not an entirely welcome (Einstein and the “hidden variables” realists refused to accept it) cognitive aperture, that nevertheless opened into this incipient indeterminist pragmatic noetic holism in the epistemology of Science. To liberally paraphrase W. V. Quine, “Irrefragability, thy name is unbounded wholeness.” Thus are the epistemology of Science and the ontology of Philosophy “always already” intertextually entwined in an intersubjective interdependent network of physical, linguistic, sociocultural and genetic relationships.

*What physics needs now is a cognitively courageous theoretical leap (in fear and trembling) from the 2400 year old self-sealing dogmatic presumption of the metaphysical fundamentalism of foundational Scientific Realism and monistic Substance Physicalism/Materialism. This toward a perspicuous new ontological relativity, and a non-realist, non-materialist, non-idealist, nonlocal, non-logocentric, acausal, indeterminate, top down, observer-dependent, theory-dependent, background-dependent, interdependent centrist middle way physics paradigm that avoids skepticism and nihilism. That’s all.*

Alan Wallace (2007), leading edge philosopher of science and Buddhist practitioner and translator, describes the ontology and epistemology of such a non-essentialist centrist view thusly: “Everything that exists lacks an intrinsic nature and identity...and none bears a self-defining independent epistemology.” This is the epistemic pith and gist of the Buddhist Middle Way *Prasangika Madhyamaka* view, widely considered the pinnacle of the Buddhist *Sutrayana* view, and the foundation for the *Vajrayana* ultimate view of *Dzogchen*, the Great Perfection (Great Completion). Such an interdependent epistemology offers methodological advantages over theory-independent ontologies for, as we have just seen, it permits new emergent properties for us to “discover” that are absent in the basal particulars of a given system.

So things, processes, events and persons are not independently real, but abide in a relationship of *interdependence*. We participate together—whether we believe it or not—in an intersubjective interdependent *kosmic* harmony with all of nature, as Nagarjuna, Chandrakirti, Longchenpa, Dirac, Einstein, Bohr, Heisenberg, Bohm, Wigner, Wheeler, Stapp and Chew have observed. The relationship of our concept-belief systems to ontology—“what there is”—is always equivocal, relative and tenuous. Alas, our habitual objectivist “quest for certainty” is doomed to failure.

Perhaps then, we should not expect that ultimate reality (emptiness) correspond to or cohere with our objective spacetime (form) relative-conventional concepts about it. As the

Postmodern bumper sticker told, "Don't believe everything you think." (One might well add, "Don't cling to everything you believe".)

A judicious blend of relative truths, East and West,  
set in the primordial context of radical emptiness,  
is a very sane approach to the human situation.

—Ken Wilber

Further, as we have seen, spacetime "reality," the seemingly absolute existence of physical stuff (form) is dependent upon our atavistic self-reifying perceptual imputation and conceptual designation.

Moreover, as Alan Wallace reminds us, on the accord of the Indo-Tibetan Buddhist view, our concepts, names and terms (*namarupa*)—reality, existence, meaning, knowledge, truth, subject, object, experience, and the rest—all have different *practical* uses. None of these can be said to have an absolute meaning. Indeed they have no objective *independent* meaning beyond the definitions we stipulate, impute and designate to them. We *choose* these definitions pragmatically according to apparent practical efficacy in accord with our interobjective social and intersubjective cultural experience and concept/belief systems. They are not predetermined in some essential absolutely existent objective (or subjective) reality. This pragmatic Buddhist middle way parallels the view of the Postmodern ontological relativity of Quine and the Neo-pragmatists.

W. V. Quine has pointed out in his enduring essay "Ontological Relativity," that *ontology*—"what there is"—is dependent upon the intersubjective cultural reality assumptions of our individual and collective "web of belief" (Wittgenstein's "forms of life"). For Quine there are no independently existing objective things, no facts, only semiotic linguistic meanings. Indeed, a paradoxical view for a physicalist ("Quine: ontological relativity" below).

**The perennial Two Truths: Buddhist emptiness and Scientific Realism.** *On the centrist pragmatic Buddhist view, in opposition to the objectivist, realist/essentialist metaphysic of Scientific and common sense Realism, phenomena have no objective, absolute, independent existence. However they do exist relative-conventionally, interdependently, in dependence upon prior relative causes and conditions arising within their primordial ultimate causal matrix. This perennial "two truths" ontology—objective relative truth/subjective ultimate truth—is not only a profound truth of our two realities, but as well, a pragmatically useful methodological tool.*

Therefore, let us consider henceforth that phenomenal reality does not exist independently and absolutely, but only interdependently and relative-conventionally, as a result of prior causes and conditions, and that phenomena are bestowed this reality via our perceptual imputation and conceptual designation. Our objective and subjective conventionally real spacetime realities are absent "any shred" (Nagarjuna) of absolute or intrinsic existence.

Does this mean that the cosmos we perceive is merely a construct of language? Are real trees and stars but the idealist product of mind created linguistic utterance? No. Within a given relative-conventional conceptual frame of reference—for example the belief system of both common sense realism and Scientific Realism—spacetime phenomena arising from the nondu-

al, nonlocal causal nexus or matrix that is the primordial emptiness (not nothingness) base of reality is not merely illusory; it is conventionally, really real. *Trees and stars exist. But it is how they exist that is in question. They exist not independently of a perceiving consciousness, but interdependently and intersubjectively, as a causal result of an indefinite number of interrelated preceding causal events*, as we have seen many times throughout this cognitive odyssey. They exist then, relative to these prior causes and conditions. But once more, this *relative* interdependent reality of objectively real things is utterly devoid of inherent intrinsic or *absolute* existence.

This Buddhist Middle Way (*Prasangika Madhyamaka*), then, suggests a centrist view between the philosophical extremes of the nihilism of Eastern metaphysical Idealism and the existential absolutism or substantialism of Western Modernist metaphysical Realism and Materialism. This view also eschews the pathological pluralism, independence and nihilism of Post-modern cultural relativity. So where does such noetic heresy lead us?

The Nominalism and instrumentalist anti-essentialist anti-Realism of the Copenhagen Interpretation of the Quantum Theory (Bohr, Heisenberg, Born, Pauli), along with W. V. Quine's (1969) work in logic and epistemology, the mathematics of Kurt Gödel and John Bell, the historical and sociological work of Kuhn and Lakatos, and Buddhist *Madhyamaka* epistemology are all steps toward such a post-Postmodern pragmatic ontological relativity in the brave new world of post-quantum, post-Standard Model physics, neuroscience and neurobiology, and in the social and behavioral sciences, including the emerging Science of Consciousness. How then shall we understand such a pluralistic view in light of the Spirituality Paradigm?

*We have seen that pragmatic Middle Way Buddhist (Prasangika) epistemology has clearly shown in its explication of the nature of our perennial Two Truths—relative and ultimate—that arising material reality may be interdependently relative-conventionally real, yet need not be independently ultimately real* (Garfield 1995, Wallace 2007, HH the Dalai Lama 2009). This is indeed a very useful conventional duality. Could such a centrist pragmatic, non-foundational relative-conventional Realism offer epistemic solace in the wake of the failed foundational or existential absolutist Realism of Modernity and its obsessive objectivist, physicalist Science and philosophy?

Again, for Tibetan *Vajrayana* Buddhism the spacetime manifold of relative-conventional *form* arises dualistically, as a result of prior causes and conditions, from the all-inclusive unbounded whole that is its nonlocal, nondual basal *emptiness* source or ground. Western analogues to this view are the Neopragmatists, especially Rorty, the quintessentially pragmatic and pluralistic William James' "Neutral Monism" ("twoness in one"), and the Quinean semiotic holism of Quine's student Donald Davidson in his supervenience theory of mind, "Anomalous Monism." Unfortunately, none of these has moved beyond the functionalist objectivist ontic limit of Physicalism/Materialism, although Rorty points the way.

However, with the pervasive but hidden metaphysics of monistic Materialism (with its taboo of subjectivity) as the default ontology for the culture of the prevailing stridently physicalist physics Standard Model paradigm, most scientists and others under sway of what Shel-drake terms the sinister "Science Delusion" (2012) shall never experience, or even suspect, any

esoteric subjective, ontologically subtler or deeper, even spiritual reality beyond the merely obvious exoteric, conceptual, objective spacetime physical dimension. And thus has Western spirituality been ruined.

If we are more than mere physical automatons, then becoming paradigmatically mired in this usually unconscious, dogmatic, linguistic epistemic presumption of mechanistic Scientific Realism/Materialism (“Scientism”)—a gothic observer-independent, theory-independent, background-independent utterly separate “real world out there”—is indeed horrific. We lonely separate observers are left out in the cosmic cold. As Ken Wilber quipped, “Is this any way to treat a universe?” Is this any way to treat ourselves?

Let us remember that it is the entering in to non-physical, nondual, nonlinear, chaotic, transrational, atemporal “spooky,” contemplative *now* that transforms separate observer/researcher/theorist into included, active, ontologically relative participant in this numinous vast unbounded whole that is ultimate Reality-Being Itself. The choice to open and enter into it is the integral noetic practice for both scientific and spiritual practitioners, and for those few who practice both.

This subtle nondual all-embracing Pythagorean ultimate *kosmos*/ground of the merely dualistic Apollonian physical cosmos is ontologically prior to physics’ Planck Scale (Planck time, Planck distance, Planck energy) epistemic limit and thus cannot, even in principle, be objectified and described or explained by physics and mathematics. So it often goes unrecognized.

*This ultimate reality ground or “supreme source” of arising spacetime reality is utterly ineffable to conceptual mind, but not necessarily to a noetically trained contemplative mind. The ignorance (avidya) of or reductive conflation of these two modalities of the one nondual reality is disastrous. This urgent relative distinction between objective concept mind and subjective trans-conceptual contemplative mind opens a centrist middle way to the resolution of many of our discursive concept mind’s metaphysical bivalent binary confusions, anomalies and paradoxes—the problem of consciousness, action and free will, other minds, etc.*

Again, the pragmatic resolution to this conundrum lies in *praxis*, the analytic and contemplative practice of objective and subjective recognition of the prior ontic unity of epistemological subject and object. We need no longer indulge the cognitive pathology of a bipolar, schizoid split between the inherent objective and subjective aspects of our nature. Recent neuroscience is now coming to understand this ([mindandlife.org](http://mindandlife.org)).

The “epistemology of presence” (Klein) is, conventionally speaking, the process of recognition of this prior ontological unity of here now “open awareness” presence (*vidya, rigpa, shekina*), our actual “supreme identity” with the nondual unbroken, unbounded whole of the *cosmic* primordial ground or source of being (*ontos, sein, bhava*). Our actual relationship to That (*Tat*, suchness) is one of identity. This bright presence abides and is cognitively embedded in the subjective depth of body, voice and mind of the human individual and thus of humankind. Its objective expression in our relative spacetime reality is the atavistic nondual wisdom of emptiness as spontaneous kind and compassionate lifeworld conduct. Here humanity is the numinous primeval subject of our collective primordial wisdom tradition in all of its Premod-

ern, Modern and Postmodern raiment; or so it is told through the differing metaphors of the subtlest “innermost esoteric” and nondual teaching of our Premodern primary wisdom traditions (Boaz 2009).

Niels Bohr seems to have understood this “innermost esoteric” truth. Despite his perfunctory instrumentalist attempts to “save the appearances,” Bohr, author of the quantum Principle of Complementarity, has demonstrated a thoroughgoing understanding of the pragmatic, logically circular complementarity—the mutuality—of the Taoist *yin* and *yang* that represents the prior unity of Modern objective reason and Premodern subjective mysticism. The human concept-mind requires complementary metaphors—wave/particle, *yin/yang*, subjective/objective, esoteric/exoteric, becoming/being—in order to understand the acausal subjectivity of the ultimately non-conceptual, non-pictorial/non-objectivist nature of the quantum description of appearing reality present to its consciousness. Just so, our habitual dualistic concept-mind needs such complementary cognition to understand its relationship of identity to the unbounded whole that is the very nature of mind.

This new quantum reality, unlike the corresponding classical relativistic view (Bohr’s Correspondence Principle) cannot be conceptually pictured. However, Bohr, who used the *yin/yang Tai Chi* as his Danish coat of arms must have seen this profoundly noetic symbol as representing his view of reality. Bohr was considered a mystic by many of his colleagues. Pauli quipped that the quantum theory itself is “lucid mysticism.”

The discovery of non-Euclidian geometries in the 19th century (Lobachevsky, Riemann) mathematically proved that deductive logic could not grasp ultimate reality. Just so, 20th century quantum theory—Heisenberg’s matrix mechanics and Schrödinger’s elegant wave mechanics (Schrödinger proved that the two are mathematically equivalent)—terminated the logical link between deductive (if not inductive) reason and this nature or essence of mind that is ultimate reality itself.

Bohr explains, “What we observe is not nature itself, but nature exposed to our method of questioning... Everything we call real is made of things that cannot be regarded as real.” Again, the anti-essentialist, anti-realist, ontologically relative Copenhagen Interpretation of Bohr and Heisenberg (1929) holds that the epistemology of Science (physics) describes an interdependent relationship of human experience, not an independently existing objective reality “out there.”

Curiously, the observer/theory-dependent, subjectivist Copenhagen Interpretation enlists the now defunct observer/theory-independent, objectivist “verification principle” of the Logical Positivists (Carnap, Ayer, Wittgenstein of the *Tractatus*) to buttress its radical epistemic indeterminism. This is indeed curious, for, although Logical Positivism was at its zenith, Bohr was an astute philosopher of science with a pronounced anti-realist, even mystical cognitive inclination that drove Einstein up the proverbial wall. Peer pressure perhaps?

*We can now see that this notion of the unitary complementarity of logically opposed or contradictory conceptual principles, and paradigms—the dualistic binary horns of dilemma—is key to a propitious, centrist, pragmatic, pluralist and contemplative resolution of the perennial Science/Spirituality, matter/mind conundrum, and to the “problem” of soteriology or psycho-spiritual awakening/liberation.*



Indeed, this radical awareness of the mutual complementarity of the slings and arrows of the outrageous duality of human existence, our two ways of being here—objective and subjective—is an extremely useful cognitive habit, a practical ongoing lifeworld meditation, an analogue, or even a precursor to the subject-object unified perception of nondual Buddha cognition.

We have seen that these two conceptual paradigms—objective and subjective—correspond approximately to the perennial Two Truths of the wisdom traditions: Relative Truth (*samvriti satya*/"concealer truths") of physical/mental form, and the emptiness/openness of its originary primordial ground or Ultimate Truth (*paramartha satya*). These Two Truths abide in the unified utter simplicity and primordial symmetry of the cognitively transcendent but not spacetime transcendent singular, interdependent nondual one truth—"invariant across all cognitive frames of reference" (Wallace)—the "one taste" of the all-embracing perfectly subjective unbounded whole.

This vast whole of reality transcends our epistemic concepts, yet ontologically embraces the various views of the traditions in which it arises; for example, the perfect sphere of Buddhist *Dzogchen*, or of Essence *Mahamudra*, or of *Mahashunyata*/great emptiness, or of Shankara's nondual *Nirguna* (empty of attributes) *Brahman*, or of Bohr's Tao that is beyond heaven and earth. This unbroken whole is often viewed in the traditions as the fundamental ontological unity—by whatever name—of all bifurcated (*avidya*) dualistically appearing physical and mental objective spacetime phenomenal reality.

We must here note that while this nondual one truth transcends, subsumes, and embraces these many conventional names (*namarupa*) and conceptual designations for the ultimate basis of reality—that is to say, nondual Reality Itself "as it is" prior to our concepts and beliefs about it—these sacred designations are decidedly not, from the relative view of the practice of the spiritual path, "all the same."

Yes, we are taught by the masters that awakening, enlightenment, liberation, Buddha Nature is "already accomplished" at the heart (*hridayam*) of each human being. Yet, if one is to realize and actualize this liberating potential of the Path in the everyday lifeworld, one must commit to practice just one path, and that under the guidance of, and with great devotion (*bhakti*) to entering in the primordial mindstream of a qualified master in the context of a specific spiritual lineage and community. Without such a relaxed feeling practice commitment, the spiritual path is, I suspect, mostly social pastime or scholarly self-stimulation. I can attest that both of these limits may be temporarily useful.

It is as well, useful to remember while engaging one's relative path—conscious or even unconscious horizontal, or supraconscious vertical—that from the nondual, ultimate view, the liberating Result or Fruition of the Path does not have a relative cause. While Buddhism's "interdependent arising" of mental and physical form (*pratitya samutpada/tendrel*)—the future arises in dependence upon what is happening now—always obtains, yet from the ultimate or nondual view, being good now with the intention to achieve a future reward is not so good.

Indeed, Dōgen's and Suzuki Roshi's "gaining idea," our various egoic seeking strategies for the ultimate happiness goal of some future enlightenment may derail one's practice by

ignoring and negating the eternal *now* that is liberation itself. As Chekawa Yeshe Dorje points out in his *Seven Points of Mind Training*, “Surrender any hope of fruition.” Thus do we “make the *path* the goal.”

Let us remember—moment to moment—the great teaching that there exists only this moment *now*. Past is past. Future is future. The ultimate happiness that is liberation (*vidya*) from ignorance (*avidya*) is recognition of that numinous presence “always already present” — here now and nowhere else—and thus cannot be *caused* at some future time (Dōgen 1986) and Boaz 2009, “Does Buddhahood Have a Cause?”).

Thus we “just sit,” and practice mindfulness, and the active wisdom of kindness in our everyday lifeworld. This irony of being fully present to what arises *now* might well be called the paradox of the path.

So let us now depart such unbridled ontic speculation—a pragmatic, if not logically irrefragable way of knowing (and clearly not for the metaphysically squeamish)—and continue our exploration by briefly considering some recent developments in theoretical physics, mathematical logic, consciousness studies, and a Buddhist centrist epistemology that may further our integral noetic view. First, physics.

## Revisoning the Standard Model of Particles and Forces

Materialism is that form of philosophy which leaves the universe as incomprehensible as it finds it.

—C.S. Peirce

We have seen that the venerable, robust Standard Model of particles and forces, with its relativistic quantum field theory (QFT/QED) is inconsistent with Einstein's classical (non-quantum) gravity theory as expressed in his General Relativity Theory (GRT). The theoretical fix here requires a post-standard model quantum gravity theory. But there are as well, glaring inconsistencies within this prodigious theory:

1) The free constants, the values which define the properties of particles—their masses and the strength of the forces—remain unexplained.

2) Neutrino sector anomalies: neutrino oscillations and their non-zero mass is a problem for quantum chromodynamics. The mass asymmetry between neutrinos and anti-neutrinos violates Relativistic Quantum Field Theory (Special Relativity); and now the electrifying, but yet to be confirmed result (CERN 2011) of the apparent supraluminal velocity of neutrinos.

As to mass asymmetry, CP (charge/parity) violation is the broken symmetry between matter particles and antiparticles—matter/antimatter asymmetry. Symmetry means equal amounts of matter and antimatter in the cosmos. So where is the antimatter? Why are we composed of matter instead of antimatter? Without this symmetry breaking we would not be here, nor would anything else. If matter and antimatter have a mirror (parity) symmetry, then theory requires that, with the creation, sometime ago, of each and every matter particle there must be an antiparticle. Where are they? We can account for very few, although some of them are in our positron emission tomography (PET) scans. The Standard Model cannot explain this asymmetry of matter and antimatter.

3) Is the recent discovery of a “Higgs-like” particle (CERN 2012) indeed the advent of the holy grail that is the magical Higgs boson. This theoretically omnipresent diaphanous zero spin, zero charge Higgs boson ( $H^0$ ) will be a perturbation in the putative Higgs field—the grand desideratum which proves the existence of the Higgs Field which is the result of the Higgs Mechanism for electroweak symmetry breaking (EWSB) through which—in a mysterious yet still to be fully explained manner—particles acquire mass. Thus was the Higgs boson bestowed by physicist Leon Lederman—discoverer of the bottom quark—with the unfortunate epithet “the God Particle.”

This mystical field is omnipresent in all of the matter/energy throughout the physical and material cosmos. It is present in the inner space of the nuclei of all atomic structure. It is present throughout cosmological outer space, even of the quantum vacuum. It is the physical matrix ground—analogueous to the trans-physical basal emptiness matrix ground of Buddhist Dzogchen, and of Nirguna Brahman of Advaita Vedanta—of all physical spacetime existence.

Standard Model unification of the Weak Force with the Electromagnetic Force in order to become the Electroweak Force requires the Higgs field. Without it, or something like it, electroweak symmetry breaking does not occur, there is no mass, and physical matter does not arise. If we decline to presume that being, and even intelligence, is only physical, we need not despair that the absence of mere matter is nothingness. (Although without matter, finding a parking space should be less problematic.) We shall see that throughout this matter/mind/spirit odyssey, there are more things in heaven and earth than are dreamt of in materialist philosophies.

The perfect symmetry of the unbroken whole must be very beautiful. But not without an observing consciousness. Most of us, given our present evolutionary stage of psychospiritual development, tend to favor a consciousness that is physically embodied. Thus the explanatory urgency of the Higgs field. The Standard Model needs the Higgs field. Without it the consistency of the theory collapses (more on Higgs below).

4) The Standard Model cannot explain, or even explain away the *ad hoc* utterly mystical Dark Matter and Dark Energy that together constitute about 95 percent of the known physical universe (the Cosmological Constant Problem).

In 1900 Lord Kelvin spoke of only “two small clouds” on the horizon of physics. Those two clouds portended the Quantum Theory and General Relativity leading to the paradigm shift from classical deterministic Newtonian Mechanics to the epistemic indeterminism of Quantum Mechanics. Dark Energy, gravitons, and consciousness may now represent the “small clouds” that portend that next shift to a more inclusive paradigm that transcends, subsumes and unifies QFT/QED with GRT in an emerging 21st century revolution that includes our inherent individual and collective noetic consciousness.

5) General Relativity and the Quantum Field Theory—the two pillars of the Standard Model—are mathematically incompatible (attempts to merge the equations result in the “problem of infinities”) at or near the Planck length ( $10^{-35}$  centimeters) and the Planck time ( $10^{-43}$  seconds), logically precluding research on black holes, and the mystical, biblical First Cause physical singularity called the Big Bang. “What happened before the Big Bang” is here an improper question, and forever cloaked (*vikshepa*).

Moreover, the continued failure—after prodigious seeking—of the now ten year old quest for gravitons, the gravity force carrier, portends a radically revised theory of gravity. Perhaps such a revision will make GRT consistent with QFT. The *continuous* spacetime curvature of Einstein’s GRT in the large scale structure of the cosmos logically and epistemologically contradicts the extreme spacetime curvature of action at the miniscule *discontinuous* quantum scale;

6) QFT/QED remains problematic with its present “dippy hocus pocus” (Feynman) “mathematical fudge” (albeit a pragmatically useful fudge for which he was awarded the Nobel prize) of QED *renormalization*, with the unhappy result that the Electroweak Interaction theory is still dubious, protracting into the far distant future, if at all, any truly Grand Unified Theory (GUT) of the three fundamental forces of nature, namely the Electromagnetic Force, the Strong Nuclear or color force, and the Weak Force; and without such a GUT a Theory of Eve-

rything (TOE)—that learned hubristic consummation to be wished—that unifies these three forces with Einstein’s Gravity Force is logically and empirically precluded;

7) The Quantum Uncertainty Principle and quantum nonlocality (quantum entanglement) remain unexplained.

8) The Standard Model seems unable to explain the serious theoretical and philosophical problems of a blatantly supernatural Big Bang cosmology (Lerner 1992, Boaz 2012). This includes the perennial Big Bang problems of; 1) the logical and physical impossibility (breach of laws of logic and laws of physics) of an *ex nihilo* Big Bang singularity; 2) the large scale smoothness problem; 3) the flatness problem; 4) the age paradox (a 12 to 15 billion year old universe is but half the age of some of the galaxies it contains); 5) the continued failure in the mathematics of Big Bang inflation theories (Lerner 1992); and 6) increasing inflation/acceleration driven by what? Dark energy?

More recent Big Bang problems involve inflation theory’s missing mass, microwave background radiation (MBR) misinterpretation and red shift anomalies, deceleration, and much more (google “Big Bang Problem”).

Further, if the recent (2011) astonishing but doubtful Neutrino Sector revelation at CERN continues to be confirmed—that neutrino velocity is supraluminal, that is, exceeds Einstein’s Special Relativity light speed limit that is the very backbone of the QFT/QED Standard Model—then QED/QCD Theory that grounds the Standard Model is not just incomplete, but radically flawed. Moreover, the Standard Model does not predict recently discovered neutrino mass (1998) casting doubt on QCD theory.

**Brief excursus on the Higgs.** The Standard Model desperately needs the theoretical boost of a "real", physical Higgs boson. The “5 sigma” certainty “discovery” of a heavy “Higgs-like boson” at about 125–126 GeV is no doubt a new boson that is “consistent with the Higgs boson,” but, despite all the hopeful hype, neither CERN’s CMS nor ATLAS teams have claimed definitively that it is indeed *the* Higgs boson. And is it the only one? As is always the case with such “discoveries”, considerably more work must be done to determine whether the characteristics of the new particle are consistent with the theorized Higgs parameters. Does it have the requisite zero spin and zero charge? And if so, can it be fabricated to fit one of the current versions of the Standard Model? Does it interact with purported dark matter? If this mystical new boson cannot be confirmed as the Higgs, then the beautiful Standard Model paradigm with its inflationary Big Bang cosmogenesis that is theoretically linked to the Higgs Field, will be gradually subsumed by more inclusive theories, and a new post-Standard Model physics paradigm dawns, if it has not already dawned.

But there are further problems with the fifty year old Higgs grail quest. 1) Does the epistemic fudge in the incomplete mathematics of the Higgs Field render it pragmatically useful, like the fudge of QED renormalization (with its gifts of the transistor, the laser, the semiconductor), or does this bit of theoretical conjuring relegate the God Particle to that class of semiotic entities fabricated by the conceptual imputation and designation—under duress of Big Science—of the prodigious intellectual hubris of human discursive concept-mind? Let’s

remember that the trillion dollar Higgs sector—key to the entire Standard Model— is under a bit of funding pressure to produce results.

Indeed, if the Postmodern, mature Wittgenstein, Quine, and the Neo-pragmatists are correct—that scientific knowledge is necessarily corrigible, conjectural contingent and linguistically socioculturally constructed— then none of its core theoretical conclusions can be necessary, certain and universal. Such results must be validated, or vindicated on purely pragmatic grounds. And that's OK. But let this Postmodern truth of “ontological relativity” be acknowledged in the hallowed halls of Modern physical and social sciences.

Such an awareness shall then reveal and heal Science's epistemic pretention to absolute objective certainty—Dewey's “dichotomous thinking” with its habitual fearful “quest for certainty”—along with its related presumption of an objectivist metaphysic of foundational absolute existential Realism/Physicalism/Materialism.

Thus may this frightful beast of the Modernist "scientific" urge to objective certainty be tamed through a more pragmatic, centrist epistemology wherein Science permits itself an ambitious new methodological freedom that includes the study of consciousness; that includes not just mere third person empirical objective data, but first person introspective, even subjective contemplative evidentiary fields, in the noble spirit of the “radical empiricism” of Wundt and James.

Physics' Standard Model odyssey into the brave new world of inherently subjective, unobservable trans-empirical phenomena—the conceptually, even mathematically ineffable quantum world of quarks, leptons and Higgs bosons and their fields—is a profound adaptation toward such a centrist outcome. Perhaps, with this new inchoate noetic physics “rising culture” (Toynbee), forced as it is, by the inevitability of radically subjectivist Relativistic Quantum Field Theory, the diaphanous, omnipresent Higgs, and the “spooky” (Einstein) nonlocal nondual nature of quantum vacuum cosmology, all will be well in the noble house that physics built.

2) Let us assume the Panglossian view that there was no error in the Atlas and CMS processing of trillions of points of recorded data in order to "discover" the fabulously fleeting production by an unstable decaying particle of just two high energy photons. And if there were an error, who would or could really know? Moreover, Atlas reports many more such two-photon events than theory predicts. CMS has not. So let's see what particle products emerge from the new boson's decay. This will take time, and patience. A rush to judgement will be counter-productive. The Taoists call such patience "gentle cooking".

3) The physics by which the mystical Higgs Field provides the perfectly precise quantity of mass to each massive particle, while leaving the mass-less particles unchanged, is not at all understood, if it can ever be conceptually understood. That is to say, the core theory of the Higgs Mechanism remains mathematically incomplete (Zebuhr, Hotson, Phipps, Gulko, *Infinite Energy*, Vol. 18/105, 2012). We must remember that Standard Model methodology utilizes precious little cause and effect empirical, observational reasoning. It is rather, a necessary speculative concatenation of theoretical and mathematical assumptions where, due to the minute scale of the data—beyond the empirical reach of sense experience, empirical

experiment, and the bivalent reach of conceptual mind—hard experimental results are virtually precluded. Well and good. That is the intrinsic nature of this subjective beast. But it must give us pause.

Hence, should the physical and mathematical parameters of the putative new boson actually meet the physical expectations of the CERN physicists, and it is thereby declared to be the Higgs particle, we still do not know how, or if it is responsible for all of the mass in the timeless cosmos. Does such a theoretical conjecture admit of scientific or mathematical proof? How it is that this wondrous particle creates or bestows mass, like you and me, is of course, the trillion dollar question of this half century adventure. Higgs miracle, or Big Science Higgs farce? Let us therefore follow this queer undertaking with a modicum of informed healthy skepticism.

**In summary.** The several “small clouds” that portend a paradigm shift from Standard Model physics to a more inclusive post-standard model view: 1) a non-renormalizable QCD which fails to predict neutrino mass; 2) dark matter and dark energy (the problem of the cosmological constant); 3) the Big Bang problems; 4) gravity theory problems (no gravitons); 5) Higgs uncertainty; 6) the apparent discovery of sub-quantum "preons"; 7) the problem of the non-objective nature of consciousness.

**An historiographic note.** Remember that theory—scientific or otherwise—is evolutionary and historiographic; it is perspectival and its interpretations change and evolve over time. Nearly all current scientific theories have evolved from earlier theories that are now considered incorrect. Professor Steven Goldman has pointed out that none of the scientific theories of today were extent two hundred years ago. The theories of today have entirely replaced, or at least subsumed yesterday's theories. Should we not then assume that the scientific theories presently in vogue will be incorrect two hundred, or one hundred, or even twenty-five years hence? Our notions of dark matter and dark energy are less than twenty-five years old. And physics' Standard Model of particles and forces is clearly undergoing Thomas Kuhn's Scientific Revolution paradigm shift.

Perhaps then, science does not provide us with knowledge or truth, but highly informed opinion. Perhaps no scientific theory—no matter the research, capital and belief invested in it, no matter how sacred, or how elegant, or how practical the results—should be considered certain universal knowledge or truth. Perhaps then, as suggested above, scientific theory is informed socio-cultural history, not indubitable foundational truth. Indeed, I have here throughout presumed this unproven and unprovable metaphysical assumption. I suspect that many particle physicists and cosmologists, if not always working scientists, would agree.

As to our species fearful perennial “quest for certainty” (Dewey), I have here argued, with the Postmodernists and Premodern Buddhist middle way *Prasangika*, that scientific knowledge, indeed all concept/belief relative-conventional knowledge is a construction or fabrication of the intersubjective (cultural) and interobjective (social) consciousness of the inherently non-rational, and usually irrational beautiful mind of human beings, and therefore always involves non-objective evaluative ideological and institutional socio-cultural assumption and belief networks—Wittgenstein's "forms of life", and Quine's "web of belief".

Science can no longer claim to "discover" a pre-given, pre-existing independently existent reality "out there". Scientific knowledge is perspectival, and is inextricably embedded in society, economics and culture, especially its own culture, as Thomas Kuhn so forcefully demonstrated in his paradigm busting Postmodern opus, *Structure of Scientific Revolutions* (1969). We must however, be cautious in generalizing Kuhn's critique of the science paradigm to other socio-cultural and developmental paradigms. Not all knowledge paradigms are as incommensurable. Indeed, I have argued here and elsewhere, that we can and do sometimes choose our personal and even collective knowledge paradigms. Children and adults outgrow their old paradigm webs of belief. Societies outgrow certain destructive modes of belief, and the prejudices and practices that follow there from.

Moreover, we tragically limit our individual and collective knowledge—objective intellectual, scientific and philosophical knowledge, and as well, our emotional psycho-spiritual growth—by our subjective largely preconscious emotional attachment to and defense of these ubiquitous deep background cultural concept/belief systems. Quine referred to this cognitive bias as our deep background, cultural "web of belief". The core of this conceptual/belief system is 2400 years of Platonist foundational Realism, and its ontic cohort "scientific" Materialism, the fundamentalist belief in an objective, theory-independent, monistic only physical "real world out there" (RWOT), existing somehow entirely independently of our theories, concepts and beliefs about it.

A new era of post-Standard Model physics is now upon us (super-symmetrical super-string theory, quantum loop gravity, etc.). The noble Standard Model has served us well. Let us now open unto the brave new world of the emerging new physics paradigm that includes both our knowledge voices—objective and subjective, exoteric and esoteric, matter and mind, Science and Spirituality—at once. We need a perspicuous objective science of matter and mind, and an East/West science of consciousness. Buddhist contemplative science with its 2500 years of contemplative technology offers a profound contribution.

Thus does our new paradigm unified science prepare us to return again and inter in John Wheeler's "Great Smoky Dragon" of the unknown, and as T.S. Eliot told, "know the place for the first time".

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