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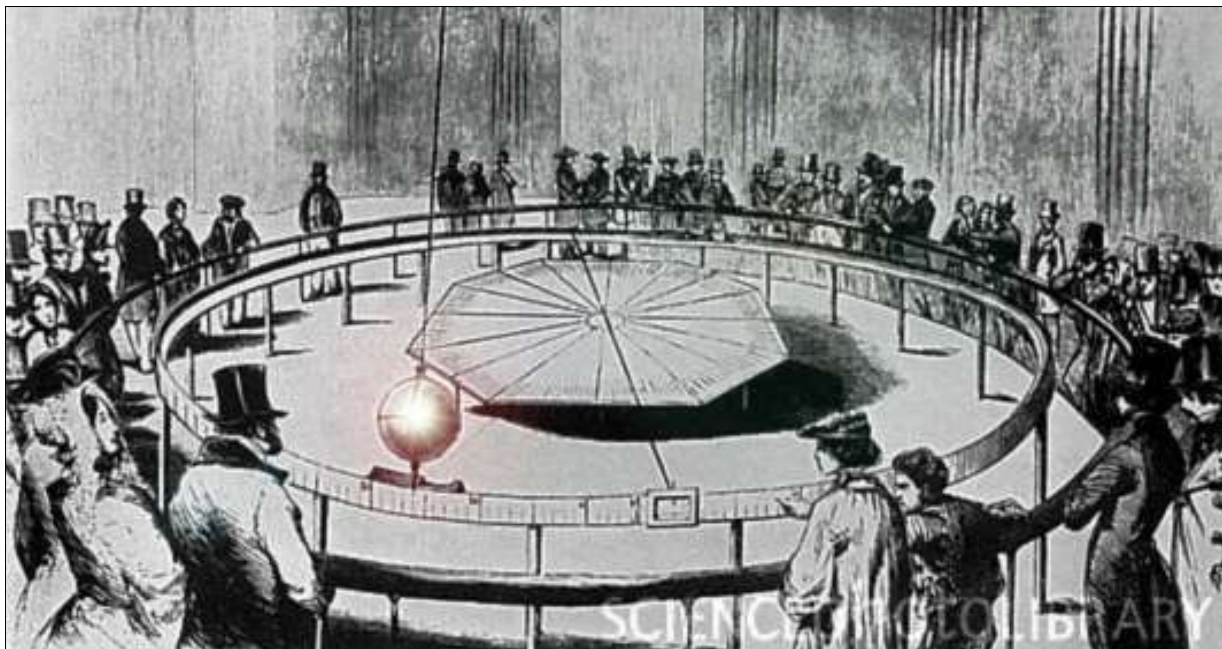
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## Abstract

"Books on physics are full of complicated mathematical formulae. But thought and ideas, not formulae, are the beginning of every physical theory." Einstein/Infeld<sup>(1)</sup>

While mathematics, selectively applied, may be remarkably well suited to the modeling of natural law, at large it remains an entirely abstract domain with an infinite host of objects and operators. As such it lends itself to endless possibility; applicable formulations will likely be found forever. But science, ever assiduous, seeks only those solutions bringing us closer to the 'final' theories, and when theoretical correspondence with natural law is lost, any intended intellectual convergence with reality has digressed. I submit that "quantum-gravity" research directed toward a "unified" theory is just such a digression. For unification efforts would be mistaken if quanta and gravity are found to be complementary counterparts of a fundamental dynamic *duality*.

## The Pit in the Pendulum



Imagine the swing of a giant pendulum, that grand, sweeping, silent arc through space, determined, continuous. With each accelerated pass is visibly marked the measure of a vanishing moment of time—*this* moment. Is it any wonder such a phenomenal thing was instrumental in the development of our scientific theories regarding mass, motion, time and space, and gravitation; for if left to its own devices, the swinging pendulum is one day found profoundly motionless, stationed directly over the Earth's "center-of-gravity".

Though more than six thousand kilometers away, remarkably, no sensitive instruments are required to locate the Earth's gravitational origin—its "centroid". In fact, with perfect precision, any dumb plumb-bob will forever point the way. So for thousands of years we've known for certain where the local source of gravity resides, and for centuries have calculated precisely what it does, but as to fully understanding what it really *is*, most of the most informed, even to this day, confess uncertainty.

Consider the cord of our imaginary pendulum, a "geometric vector" drawn taut to the center of the Earth, not only invisibly drawn, but endlessly extensible, its magnitude vanishing over distance but *never* vanishing entirely. And consider the nature of the "geometric origin"—the 'pit', the center-of-mass tensing the cord, for in the case that the pendulum bob is a hollow sphere, this 'mass' is resident in *empty* space. Now imagine following our invisible vector all the way to the Earth's centroid only to find this mass has vanished as well—the plumb-bob now points toward the Sun! Centers of gravity are apparently nothing more than mass proxies, stand-ins for the nearest larger mass. In fact, all centroids are vanishing proxy in a magnitude continuum of mass attraction. Pendulums to planets to stars to galaxies to... what's behind it all?

Much of science has been directed to resolving this question, that's why the GRF forum exists, and anyone familiar with this quest recognizes that mass and space—something and nothing, have been at odds the entire way. Isaac Newton was critical of how his contemporaries were positioning celestial objects relative to one another independent of any comprehensive context; it was thought that ethereal "vortices" were causing them to gravitate toward one another<sup>(3a)</sup>. He postulated instead the absolutes of an "immovable space" and the "flow of time"<sup>(4)</sup> within which corporeal bodies were attracted to one another via a constant causal "force". Gravitation was thus most likely a "property" of matter—but of a nature unknown<sup>(3b)</sup>. His critics accused him of resorting to the occult to explain his invisible, instantaneous, "action at a distance" across the vacua of empty space<sup>(5)</sup>.

A better explanation was imported with James Maxwell's theory of electrodynamics. His electromagnetic "field" was a dynamic potential similar to gravity—causal yet invisible, and Albert Einstein found that by adapting this concept to the effects of gravitation, several observations unexplained by Newton's theory could be explained—including instantaneity<sup>(2a)</sup>. In Maxwell's equations light radiated at an invariant absolute velocity(*c*), and Einstein had discovered the only way this could be the case for all observers was if variance was reintroduced into the equations of motion by making the coordinates of space and time subject to velocity. But then, on final approach to the speed of light, these values became "imaginary"<sup>(6a)</sup>. When these motion transformation equations "go singular at *c*"

a null space-time interval subsumes the metric indicating locality has vanished and a state of absolute *simultaneity* prevails<sup>(7)(8a)(9)</sup>. Therefore, because Einstein's proposed gravity waves spherically propagated at  $c$  <sup>(14a)</sup>, the gravitational field, like Newton's force, again appeared to be instantaneous.

Though both theories were derived geometrically, whereas Newton's was a product of classical Euclidian geometry, Einstein's field-model was a contemporary geodesic stretch: the four dimensional, tensor-curvature, of an energy-conformal, "space-time" continuum. Gravity wasn't a property of matter, it was contextual, the shape of the cosmos itself. Having no evidence that the Universe as a whole was contracting, or expanding, Einstein thought it necessary to balance the convergent tendencies of the gravitational constant, with a divergent "cosmological constant"—of a nature unknown<sup>(6b)</sup>.

As astronomy extended and improved, cosmologists began finding evidence that the observable universe actually *was* expanding apparently due to a vacuous, cosmic-scale, "dark energy" unseen, in effect a cosmological constant, but still of a nature unknown. Around stellar clusters observations began to implicate invisible halos of gravitating "dark matter", and then, at the inner-extreme, photometric data began pointing to vanishing "black holes" at the centroid of every galaxy—all nature's unknown! Why does the *source* of everything gravitational always appear to be an invisible, anomalous *unknown* in the act of vanishing?

"No machinery has ever been invented that 'explains' gravity without also predicting some other phenomenon that does *not* exist."

Richard Feynman (10a)

Consider a remedial thesis: Gravitational science implicates but cannot fathom its 'nature unknown' because there really is *nothing* there. The energy expansion of the Universe and its *empty reciprocal counterpart* are a dynamic duality on the grandest of scales and their elemental differential is the primary impetus driving the evolution of the universe. They form the most fundamental symmetry:

"As the universe expands... the positive matter energy is exactly balanced by the negative gravitational energy, so the total energy is zero."

Stephen Hawking (11a)

If the subject energies of the quantum and gravity field-theories, are indeed, absolutely diametrically opposed, then unification efforts are not only mistaken, but one may hope—for the sake of mathematical empiricism, certain to finally fail. Matter presents as local, discontinuous, and transient \ gravity as global<sup>(12)</sup>, continuous<sup>(2b)</sup>, and constant. Matter is the 'nature unknown' in gravity theories: Newton's infinitesimal centers-of-mass were fleeting "mathematical points"<sup>(3c)</sup>; Einstein's energy-densities are vanishing "field singularities"<sup>(13)</sup>. The space-time field, on the other hand, has a well-defined geometric structure<sup>(14b)</sup>, is flexible but entirely deterministic, and infinitely contiguous: between any two 'world-points' another exists. Einstein space-time can't be quantized because gravitation has absolutely nothing in common with energy!

The endless systemic infinities generated by the canonical incommensurability of these two theories has sent contemporary integration schemes spinning off into evermore abstract digressions. What is required for gravitation to co-exist with

quantum field theory is a *non*-geometric formulation infinitely amenable to reciprocating the Universal energy expansion. It so happens there exists an apposite field analogue already well integrated into theoretical physics: a "scalar vacuum potential"<sup>(15,16)</sup>.

Consider, then, a 'positive' energy expansion radiating *into* its contra-conformal counterpart—a 'negative' vacuum plenum. This dynamic manifold must assume a temporal identity because the defining reciprocity in the Einstein field is that distinguishing the 3-D "real spatial" coordinates of matter from the 4-D "complex temporal" coordinates of time. "Imaginary time", as such, is a global entity<sup>(11b)</sup> with axiomatic import: as the relativistic transform equations go singular at the speed of light, and the spatial values vanish, *imaginary time remains continuous*<sup>(17)</sup>. In the final analysis, time appears to be an elemental eternal dimension<sup>b)</sup>, and space a vanished conceptual utility having no connate cosmic correspondence; Einstein rejected the idea of an actual physical 'space' proffering instead the concept of "corporeal extension"<sup>(6c,d)</sup>. Most notably, the dynamic action-principle of a universal, scalar, "temporal vacuum potential", would be uniformly non-local, and therefore instantaneous.

In this proposal the "present" is an omni-radiant energy expansion into an eternally extant "temporal void". Moreover, this universal expansion is vacuum advanced by the "cosmological constant" of the temporal "future", a globally *divergent* influence. The action of the temporal "past", by which the expanding present is vacuum tensioned, is that of the "gravitational constant", a locally *convergent* effect. These seemingly converse manifolds of past and future, however, are actually the same extrinsic continuum of the 4th-dimension—a single dynamic vacancy<sup>c)</sup>, meaning the gravitational 'nature unknown' that makes the pendulum swing is the vacuum potential of the temporal dimension. And thus, true to form, a swinging pendulum actually *is* marking the measure of Time!

In the Einstein model, because the Universal cosmic expansion has been shaping conformal space-time ever since its Origin, a common evolute is conserved at the locus of every gravitational geodesic. In terms of vacuum potential this common evolute is the vanishing 'black hole' at the centroid of every center-of-mass. Either way, by space-time or vacuum plenum, in both these continua of the 4th dimension, the 'pit' of every centroid is a proximity proxy for every other because they're all the *same* 'point'!<sup>(8b)</sup> No wonder the theoretical action attribute of gravitation has always been instantaneous.

If this Temporal Continuum Hypothesis (TCH) is correct then the gravitational constant(G) of time-past and the cosmological constant(C) of time-future are resultants of the same scalar vacuum potential [see appendix]. We can expect, then, that the value of G ( $6.67 \times 10^{-11} \text{m}^3/(\text{kg} \cdot \text{s}^2)$ ), and the proximate measure of C (the accelerations produced by 'dark energy'  $\sim 10^{-10} \text{m} \cdot \text{s}^{-2}$  <sup>(19)</sup>), will finally prove to be conversely *identical*.<sup>d)</sup> The TCH qualitatively corresponds to Milgrom's MOND and Brown-stein/Moffat's MOG theories<sup>(19)</sup>. It would redefine, respectively,  $a_0$ , and the Lagrangian action principle of the tensor-vector field, in terms of a 4-D, isometric, scalar-field, "temporal vacuum potential" <sup>e)</sup>.

Additionally, the Pioneer spacecraft "acceleration anomaly" ( $8 \times 10^{-10} \text{m/s}^2$ )<sup>(20)</sup> is of the same magnitude as C. Consider that the effect gradient of a cosmologic future

vacuum potential would first regionally appear in a sufficiently solar-*radial* velocity measurement. As small as it is, this acceleration would have gone undetected in all previous solar system observations because, in a "Machian" sense, it's an indistinguishable component of planetary orbital angular momentum. Because the Future resultant expansively scales, however, it has a vast observable effect on the rotation of galaxies and their group interaction.

Lastly, this proposal lends intelligibility to considerations regarding entropy<sup>f)</sup>, the "arrow of time", cosmogenesis and destiny, for if the positive cosmic energy expansion, and its reciprocal negative counterpart—the temporal dimension, are symmetrically conserving, then the universal radiant 'inflation' reciprocates a 'deflation' of the temporal vacuum potential. Thus, as they encounter ever *less* time, cosmic spectra exhibit dilating frequencies—red-shifting wavelengths, relative to *time* distant<sub>(21)</sub>. This means rather than space expanding ever faster, the complementary inverse is in evidence: The expanding Universe is slowly running out of Time. Big 'bounce' anyone?

"... it is necessary, in the interest of science, to call the fundamental concepts again and again into question so that we are not governed by them without realizing it."

Albert Einstein (22)

- a) How many super-dimensions dance in the head of a pin!
- b) The Big Bang birth of time is the most comprehensive misunderstanding in contemporary cosmology.
- c) After all, every expansion requires an equivalent, corresponding *vacancy*. This means like its copendent centrifugal 'force', the point-source 'pull' of gravity is a "pseudo force"—there's really *nothing* there!
- d) The basis of Einstein's equivalency principle: the gravitational acceleration of time-past and the inertial pull of time-future are opposite but equal.
- e) The inverse integral of a point-source, omni-expanding, universal Hamiltonian?
- f) In fact, the TCH provides entropy with an actual ontological residence: An eternally extant temporal dimension of vacuum *potential*.

# Appendix



A Singular instantaneous energy pulse, omni-expanding at lightspeed, simultaneously, everywhere at once—*in time*. Hence, from the 4-D field-of-view of time, there's always only *one* energy Centroid—the Original Singularity. From our 3-D point-of-view on the surface of the expanding present, however, the Centroid is now distributed across the locus of every mass, so while the vacuum of time-past appears everywhere locally convergent, time-future remains globally expansive.

"Everything is atoms and the void." Democritus

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