

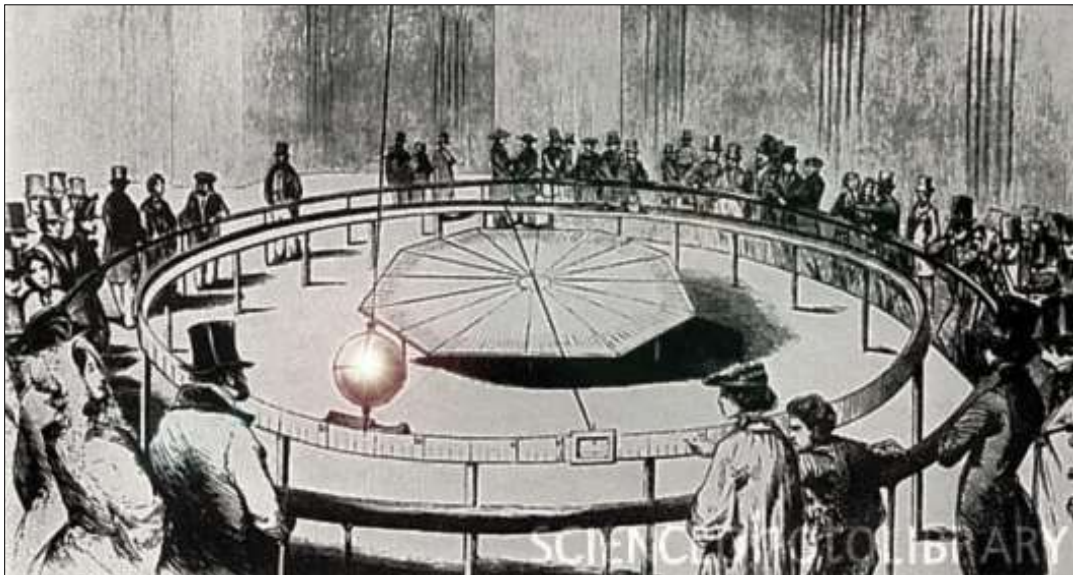
The Pit in the Pendulum

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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⁽¹⁾

While mathematics, selectively applied, may be remarkably well suited to the modeling of natural law, at large, it remains an abstract domain with an infinite host of objects, operators, and outcomes, and thus, lends itself to endless possibility; applicable formulations will likely be found forever. But science, ever assiduous, seeks those solutions bringing us closer to the "final" theories, and when theoretical correspondence with natural law is lost, any intended convergence has digressed. I submit that quantum-gravity research directed toward a "unified field" theory is just such a digression.



Imagine the swing of a giant pendulum, that grand, sweeping, silent arc through space, determined, continuous. With each accelerated pass is visibly marked a vanishing moment of time. 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, refined instruments are not required to locate the Earth's gravitational center—its "centroid". In fact, with perfect precision, any dumb plumb bob will forever point the way. So for millennia we've known for certain where the local source of gravity resides, and for centuries have calculated precisely what it does, but as for identifying what it *is*, most of the most informed, even to this day, confess uncertainty.

Consider the cord of our stationary pendulum, a "geometric vector" drawn taut to the center of the Earth, not only invisibly drawn, but endlessly extensible, its magnitude diminishing with distance but *never* vanishing entirely. Next consider the nature of the "geometric origin"—the 'pit', the center of mass tensing the cord, for if the pendulum bob is a hollow sphere, this 'mass' is resident in *empty* space. Now imagine following our invisible vector all the way down to the Earth's centroid only to find this mass is absent as well—the plumb bob now points toward the Sun! Centers of gravity are apparently nothing more than vanishing proxy in a magnitude continuum of mass attraction: pendulums to planets to stars to galaxies to... what exactly? How, and why?

Much of science has been directed to answering these questions, and those familiar with this quest know that the subjects of "matter" and "space" have been at odds the entire way. Isaac Newton was critical of how his contemporaries positioned celestial bodies relative to one another independent of any comprehensive context; ethereal "vortices" caused them to gravitate toward one another.^(2a) He postulated instead an "immovable space" and the "flow of time"⁽³⁾ *within* which massive objects attracted one another via a constant causal "force". Gravitation was thus most likely a "property" of matter—but of a nature unknown.^(2b) His critics accused him of resorting to the occult to explain his invisible, instantaneous, "action at a distance" across empty space.⁽⁴⁾

A better explanation appeared with James Maxwell's theory of light. His electromagnetic "field" was a dynamic potential similar to gravity—causal yet invisible, and Albert Einstein found that by adapting this concept to gravitation, several observations unexplained by Newton's theory could be explained, including instantaneity.^(5a) In Maxwell's equations light radiated at an invariant absolute velocity(c), and Einstein had discovered this would be the case for all observers only if variance was reintroduced into the equations of motion by making the coordinates of space and time subject to velocity. But then, at the speed of light, these values turned "imaginary"^(6a) and the equations faltered. When these transformation equations "go singular at c " a null interval subsumes the metric indicating locality has vanished and a state of *simultaneity* prevails.^(7,8a,9) Therefore, because Einstein's gravity waves propagated at lightspeed,^(10a) the gravitational field, like Newton's force, appeared to be instantaneous.

Though both theories were derived geometrically, whereas Newton's force 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, "spacetime" continuum. Gravitation wasn't a property of matter, it was contextual, *within* the dynamic shape of space itself. Having no evidence that the Universe as a whole was expanding or contracting, Einstein thought it necessary to balance the generally convergent tendencies of the gravitational constant, with a divergent "cosmological constant"—of a nature unknown.^(6b)

As astronomy extended and improved, cosmologists determined that the observable Universe was apparently expanding due to a vacuous, cosmic-scale, "dark energy" unseen, in effect a cosmological constant, but still of an unknown nature. 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 natures 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⁽¹¹⁾

Perhaps it's time to reconsider a remedial thesis: Gravitational science implicates, but cannot fathom its 'nature unknown', because there really is nothing there! The radiant expansion of the 'Big Bang' and an *empty reciprocal counterpart* are a dynamic duality on the grandest of scales and their symmetrical differential is the primal impetus driving the evolution of the Universe.^{a)}

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

Stephen Hawking^(12a)

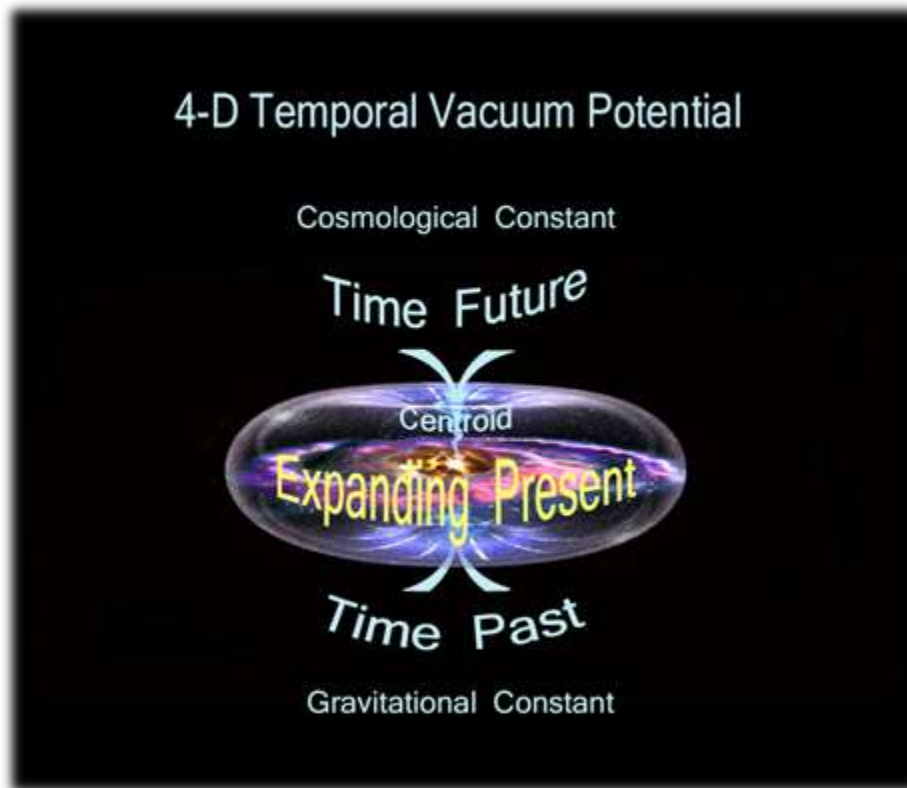
If the subject energies of the quantum and gravity field-theories, are indeed, diametrically opposed, then unification efforts are not only mistaken, but one may hope, for the sake of mathematical empiricism, certain to finally fail. Matter presents as local, discontinuous, and transient \ gravity as global,⁽¹³⁾ continuous,^(5b) and constant. Matter is the 'nature unknown' in gravity theories: Newton's infinitesimal centers of mass are fleeting "mathematical points";^(2c) Einstein's energy densities are vanishing "field singularities".⁽¹⁴⁾ Quantum 'particles' are uncertain, superpositional, probability events.^{b)} The gravitational field, on the other hand, has a well-defined geometric structure,^(10b) is flexible but entirely deterministic, and unlike quanta, infinitely contiguous—between any two "world-points"^(7b) another exists. Einstein spacetime can't be quantized because gravity and matter have absolutely nothing in common!^{c)}

The systemic infinities generated by the canonical incommensurability of these two theories has sent contemporary unification schemes spinning off into evermore abstract digressions.^{d)} What is required is a *non-geometric* formulation for gravity that not only reciprocates the infinitudes of a Universal energy expansion, but able also to integrate all of its theoretical unknowns. It so happens an apposite field analogue is prescient in theoretical physics: a scalar "vacuum potential".^(12c,15,16a)

Consider, then, a 'positive' energy expansion radiating into its contra-conformal counterpart—a 'negative' vacuum plenum.^(17a) Moreover, this dynamic manifold would assume a *temporal* identity: When the relativistic transform equations go singular at c , while the real-spatial coordinates vanish, the complex-temporal coordinates of time remain *continuous*,⁽¹⁸⁾ revealing, that in the *final* analysis, time is an eternal ontologic dimension, and space a conceptual utility having no connate cosmic correspondence.^{e)} "Imaginary time",^(12b) as such, is a global identity with axiomatic import—a ready candidate for our gravitational 'nature unknown'.

What's more, the dynamic action principle of a scalar "temporal vacuum potential" would be uniformly non-local, and therefore, instantaneous. Which means, true to form, a swinging pendulum actually *is* marking the measure of Time!

In this proposal the "present" is a radiant energy expansion *within* an eternally extant temporal void.^(16b,7b) This expansion is vacuum advanced by the "cosmological constant" of the temporal "future". The action of the temporal "past", by which the present is vacuum tensioned, is that of the "gravitational constant". These seemingly opposed manifolds of past and future, however, are really one and the same continuum of the 4th dimension—a *single* dynamic vacancy.^{f)}



The singular Present, an instantaneous energy pulse omni-expanding at light-speed, simultaneously, everywhere at once. Hence, from the 4-D 'view' of Time, there's always only one centroid—the singular Origin. From our 3-D view on the surface of the expanding present, however, this centroid has since been apportioned to every center of mass, so while gravity-past appears to converge everywhere locally, inertial time-future, in a global "Machian" sense,^(17c) is everywhere else.^{g)}

In the Einstein model, because the cosmic energy expansion has been shaping conformal spacetime continuously ever since its Origin, a common evolute is conserved at the locus of every gravitational geodesic. In terms of vacuum potential this common Origin is the vanishing 'black hole' at the centroid of every center of mass. Either way, by spacetime 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 *one* and the same!^(8b) No wonder the theoretical action attribute of gravitation has always been instantaneous.

Finally, this proposal lends itself to considerations regarding entropy^h), the "arrow of time", cosmogenesis and destiny, for if the radiant energy density and the temporal vacuum density are conversely equivalent and symmetrically conserving,⁽¹⁹⁾ then a universal 'inflation' corresponds to a 'deflation' of temporal potential. Therefore, as they encounter ever *less* time, cosmic spectra exhibit dilating frequencies—red-shifting wavelengths, relative to *time* distant.⁽²⁰⁾ 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⁽²¹⁾

Everything is atoms and the void. Democritus [400 bc]

- a) After all, every *expansion* requires an equivalent corresponding *vacancy*.
- b) Proposed "gravitons"—the theoretical spin-2 bosons that mediate gravity, are not only unknown, they're on the wrong side of the gravity/matter duality.
- c) "Gravity... is never partial, but always whole. Radiation is always packaged. Gravity is the inside-outness of energy-as-matter... the sum of all the no-points embracing all the points." Buckminster Fuller⁽²²⁾
- d) How many dimensions dance in the head of a pin!
- e) Einstein: "There is no such thing as an empty space... space-time does not claim existence on its own, but only as a structural quality of the field."^(6c)
- f) The vacuum resultants of the past and future are one and the same, however, the global cosmological constant presents as the inverse integral of the point-source gravitational constant.
- g) The basis of Einstein's equivalency principle: the gravitational pull of time-past and the inertial pull of time-future are opposite and equal. Likewise for the centripetal and centrifugal "pseudo forces".
- h) In fact, this proposal provides entropy with an actual ontological residence: an energy-reciprocate dimension of empty *potential*.

* This essay was submitted to the Gravity Research Foundation 2010 and 2018 essay competitions—*revised*.

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"In real time, the universe has a beginning and an end at singularities that form a boundary to space-time and at which the laws of science break down. But in imaginary time, there are no singularities or boundaries. So maybe what we call imaginary time is really more basic."
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