

# Essay on Gravitation

Tom Ransom

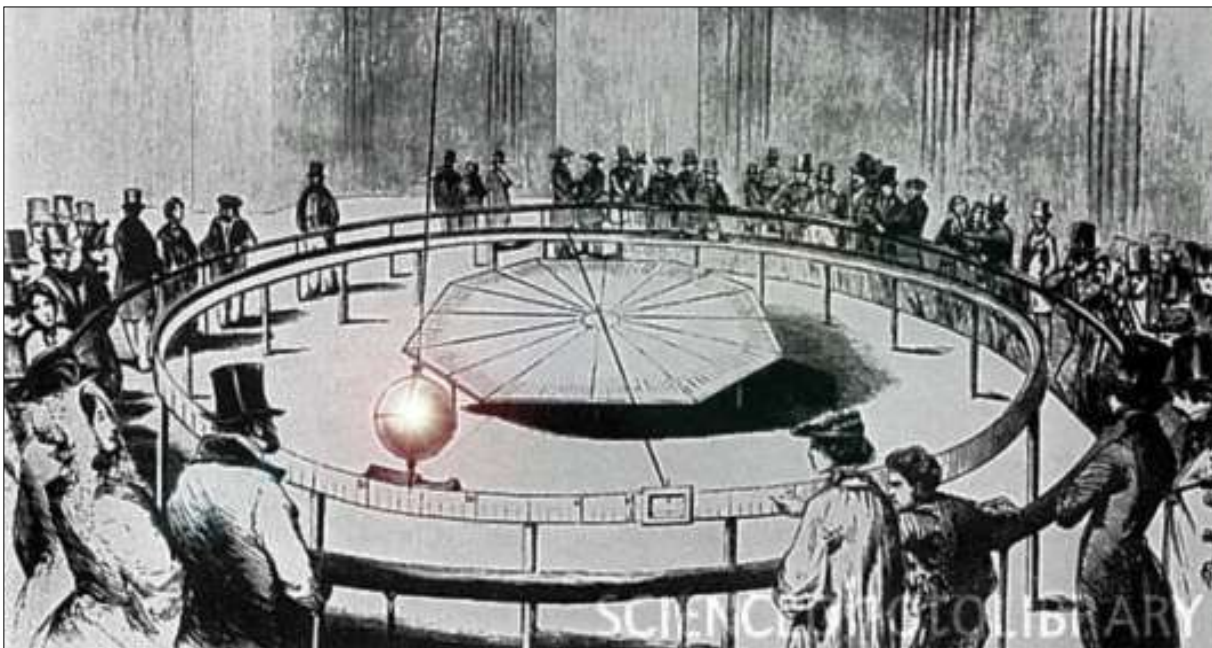
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## Abstract

"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 prove to be complementary counterparts of a fundamental dynamic *duality*.

To paraphrase Einstein/Infeld: "physics follows 'meta'physics".



# The Pit in the Pendulum

"A society which is uninterested in metaphysics  
will have no theoretical science." Mary Hesse <sup>(2a)</sup>

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 actually *is*, most of the most informed, even to this day, confess some 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 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 that 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 adjacent larger mass. In fact, all centroids are vanishing proxy in a magnitude progression of mass attraction: pendulums, planets, stars, galaxies, and then... what's at the bottom of it all? What's at the 'pit' of the pendulum and what makes it swing?

Much of science has been directed to resolving these questions, 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 with one another the entire way. Isaac Newton was critical of how the natural philosophy of his time simply positioned objects relative to one another independent of any comprehensive context; it was thought that ethereal "vortices" around celestial bodies was 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 then again—of a nature unknown<sup>(3b)</sup>. His critics accused him of resorting to the occult in order to explain his invisible, instantaneous, "action at a distance" across the vacua of empty space<sup>(5)</sup>.

The nature of gravitation was provided a better explanation in light of James Maxwell's theory of electrodynamics. His electromagnetic "field" was a dynamic potential similar to gravity—causal yet invisible, and it wasn't long before Albert Einstein found that by adapting Maxwell's field concept to the effects of gravitation, several observations unexplained by Newton's theory could be explained—including instantaneity. 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 standard 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, would appear to be instantaneous.

Though both theories were derived geometrically, whereas Newtonian gravity was a product of classical Euclidian geometry, Einstein's field-model was a contemporary geodesic stretch: the 4-D, complex, 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, and soon the 'meta'physics of its cosmological implications began shaping the theoretical physics. While having no evidence that the Universe as a whole was contracting, or expanding, Einstein simply *thought* it necessary to balance the universally 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)

I wish to submit a remedial thesis: Gravitational science implicates but cannot fathom its 'nature unknown' because there really is *nothing* there! Quantum theory and general relativity—matter and spacetime—are at theoretical odds with one another because they reside on opposite sides of a grand unification *equality*. 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 primal impetus driving the evolution of the universe. They form the most fundamental of essential symmetries:

"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 is global<sup>(12)</sup>, continuous<sup>(2c)</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 were vanishing "field singularities"<sup>(13)</sup>; contemporary quantum particles are indeterminate "probability amplitudes"<sup>(10b)</sup>. The space-time field, on the other hand, has a certain, well-defined geometric structure<sup>(14b)</sup>, is flexible but entirely deterministic, and infinitely contiguous: between any two "world-points" another exists... ad infinitum. 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 unification schemes spinning off into evermore abstract digressions.<sup>a)</sup> What is needed, if quanta and gravity are to conceptually co-exist as reciprocal, complementary, covariant counterparts, is a *non-geometric* space-time correlate, a structureless manifold amenable to the emergent formulations of a stochastic quantum Universe. It so happens there exists an apposite candidate field-analogue that is already well integrated into theoretical physics: that of 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 only defining reciprocity in the Einstein field is that distinguishing the 3-D "real spatial" (corporeal) coordinates from the 4-D "complex temporal" (imaginary) 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 the 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 a temporal "future"<sup>c)</sup>, a globally *divergent* influence. The action of the temporal "past", by which the present is vacuum tensioned, is that of the "gravitational constant", a locally *convergent* effect, because conserved at the centroid of every mass is their singular Origin. These seemingly converse manifolds of past and future, however, are actually the same extrinsic continuum of the 4th-dimension—a single dynamic vacancy<sup>d)</sup>. This means the gravitational 'nature unknown' that makes the pendulum swing is the action potential of the temporal dimension, and thus, true to form, a swinging pendulum actually *is* marking the measure of Time!

Reasoning back by way of the Einstein field, 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'!(<sub>8b</sub>) 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]. In other words, 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':  $10^{-10} \text{m} \cdot \text{s}^{-2}$  (<sub>19</sub>)), should finally prove to be conversely identical.<sup>e)</sup> The TCH qualitatively corresponds to Milgrom's MOND and Brown-stein/Moffat's MOG theories(<sub>19</sub>). It would redefine, respectively,  $a_0$ , and the Lagrangian action principle of the scalar tensor-vector field, in terms of a 4-D isometric "temporal vacuum potential" <sup>f)</sup>.

Additionally, the Pioneer spacecraft "acceleration anomaly" ( $8 \times 10^{-10} \text{m/s}^2$ )(<sub>20</sub>) 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>g)</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 (<sub>22</sub>)

- 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) This is the "de Sitter" universe scenario.
- d) 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!
- e) The basis of Einstein's equivalency principle: the gravitational acceleration of time-past and the inertial pull of time-future are opposite but equal.
- f) The inverse integral of an omni-expanding universal Hamiltonian?
- g) 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 of the expanding present, however, the Centroid is now distributed across the locus of every mass, so though there's only one temporal dimension, the vacuum potential of time-past appears to be converging there, while time-future remains globally vacuum expansive.

"Everything is atoms and the void." Democritus

# References

- 1) Einstein, A; Infeld, L *The Evolution of Physics* (Simon & Schuster: NY, 1966) p.277
- 2) Hesse, Mary *Forces and Fields* (Philosophical Library: NY, 1961) a:303 b:137 c:260
- 3) Newton, Isaac *Newton - Philosophical Writings* (Janiak; Cambridge U.Press:UK 2004)  
a:14-15 b:137 c:124 d:27-28
- 4) Newton, Isaac *The Principia* (Prometheus Books: NY, 1995) p.13, 15
- 5) <http://plato.stanford.edu/entries/newton-philosophy/> 2006 p.8
- 6) Einstein, Albert *Relativity* (Crown Publishing, NY, 1961) a:41-42 b:152-53 c:vii d:176
- 7) Schrodinger, Erwin *Space-Time Structure* (Cambridge Univ.Press: 1950) p.80
- 8) Rucker, Rudolf *Geometry, Relativity and the Fourth Dimension*  
(Dover Publications: NY, 1977) a:93 b:113-14  
a: "For someone going at the speed of light, every event ... happens at the same time—and in the same place!"
- 9) Redhead, Michael *From Physics to Metaphysics* (Cambridge Univ.Press: 1996) p.74
- 10) Feynman, Richard *Six Easy Pieces* (Addison-Wesley:Reading,MA,1995) a:109 b:134 c:37
- 11) Hawking, Stephen *The Universe in a Nutshell* (Bantam: NY, 2001) a:91 b:59-63
- 12) Dirac, P.A.M. *General Theory of Relativity* (Princeton Univ. Press: NJ, 1996) p.62
- 13) Einstein, Albert *On the Generalized Theory of Gravitation*  
(Scientific American, Nobel Prize Authors - Volume I 2009) p.29
- 14) Bergmann, Peter *The Riddle of Gravitation* (Dover Pub: Mineola, NY, 1992)  
a:136 b:178
- 15) Guth, Alan *Inflationary Universe: A Possible solution...* (Physical Review D, 1981)
- 16) Lockwood, Michael *The Labyrinth of Time* (Oxford Univ.Press: NY, 2005) p.100-01
- 17) Hawking, Stephen *A Brief History of Time* (Bantam: New York, 1998) p.144  
"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."
- 18) Ditchburn, R.W. *Light* (Dover Publications: New York, 1991) p.611
- 19) [http://en.wikipedia.org/wiki/Modified\\_Newtonian\\_dynamics](http://en.wikipedia.org/wiki/Modified_Newtonian_dynamics)  
[http://en.wikipedia.org/wiki/Scalar-tensor-vector\\_gravity](http://en.wikipedia.org/wiki/Scalar-tensor-vector_gravity)  
Moffat, John *Reinventing Gravity* (HarperCollins: New York, 2008)
- 20) [http://en.wikipedia.org/wiki/Pioneer\\_anomaly](http://en.wikipedia.org/wiki/Pioneer_anomaly)
- 21) Powell, Cory *God in the Equation* (Free Press: New York, 2002) p.84
- 22) From: *Philosophy, Mathematics and Modern Physics*  
(Rudolph & Stamatescu; Springer-Verlag: NY, 1994) p.111