A DESCRIPTION OF GRAVITATION

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A gravitational field is the spatial consequence of the intrinsic motion of time

(I recommend the reader consult the "preface" or "guide" to this paper, which may be found at "About the Papers: An Introduction" (section II); also: " Section 7: An Introduction to Entropy").

This paper has been translated into Bulgarian by Stoil Dragomirov. Many thanks, Stoil! http://bestcarmag.com

PART I

Note to Readers Concerning "Entropy":

See: "Spatial vs Temporal Entropy"

ABSTRACT

The rationale for gravity begins with the creation of the Cosmos - the negative energy of gravity is necessary to balance the positive energy of the "Big Bang" so that the "Creation Event" requires zero net energy. In a similar fashion, antimatter is also required to balance the charges of matter so that creation occurs from a state of zero net charge. Beginning in such a state of complete neutrality (perhaps as a

giant quantum fluctuation of the vacuum, an "inflationary bubble" within the Multiverse, or by Divine Fiat), the Universe must subsequently evolve into a state of complete conservation. (Details of the "Creation Event" are necessarily speculative, but as the available time is for all practical purposes infinite, and likewise the energy density and quantity, probably arguments are not applicable; conservation principles, nevertheless, must be respected.)

The gravitational rationale extends beyond the Creation Event to the creation of matter's time dimension and the conservation of the entropy drive and symmetric energy state of free electromagnetic energy (light). These secondary conservation roles (which manifest as the gravitational conversion of space to time, the gravitational conversion of bound to free energy via the nucleosynthetic pathway of stars and supernovas, the conversion of in-falling matter's potential gravitational energy to light in quasars, and Hawking's "quantum radiance" of black holes), are natural extensions of the mode of action of gravity's primary role, which is the creation of negative energy and a negative entropy drive via the contraction, heating, and destruction of space (creating time in the process), in contradistinction to the creation, expansion, and cooling of space by the positive energy and entropy drive of light.

Both primary and secondary gravitational roles hinge upon the conservation of light's "non-local" distributional symmetry. The non-local symmetric energy state of light is a consequence of light's intrinsic motion, "velocity c", which gauges both the distributional symmetry and the symmetric, "all-way" spatial entropy drive of free energy. In these conservation roles gravity, like inertia and charge, enforces the conservation of free energy's symmetric energy state, as required by "Noether's Theorem". (See also: "The Double Conservation Role of Gravitation".)

A "global" view of gravity's conservation role is that it creates an alternative entropic conservation domain (time/history) for local, massive, immobile matter, replacing the spatial entropic conservation

domain of light, which massive matter cannot use (since unlike massless light, massive matter has no intrinsic spatial motion), even though matter is primordially derived from high-energy light (via the asymmetric interactions of the weak force).

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The Origin of Gravitation

Gravity is a conservation force which arises in response (as required

by Noether's Theorem - see below) to losses or deficits in two intertwined "gauge" (regulatory) functions of light's dimensional and symmetric energy state: 1) the symmetric "all-way" entropy drive of space and free energy, producing the expansion and cooling of space; 2) the "non-local" distributional and metric symmetry of light, vanishing time, mass, gravity, and charge. Both phenomena are the product of light's "intrinsic motion", as gauged by "velocity c". The universal gravitational constant G is an entropy conversion gauge, determining how much space must be annihilated and converted to time (per given mass) to provide matter with its requisite historical entropy drive, as locally gauged by "velocity T". The intrinsic motion of time is the entropy drive of bound energy and creates the historic conservation domain of information and matter's "causal matrix". (Time is also ultimately gauged by c, since "velocity T" is defined as the duration (measured by a clock) required for light to travel a given distance (measured by a meter stick). G is therefore related to c through their entropic roles and their common factor, time.) Time is a local entropy drive required by bound energy for numerous conservation reasons consequent upon matter's lack of absolute motion (velocity "c"), including the conservation of energy and causality. (See: "Global-Local Gauge Symmetry in the 'Tetrahedron Model'".)

Secondary Gravitational Conservation Roles:
1) Entropy conservation role: creating matter's time dimension via the annihilation of space, extracting a metrically equivalent temporal residue. The intrinsic motion of time is the entropy drive of bound energy. The intrinsic motion of time creates history, the conservation domain of matter's causal information field, web, or "matrix" (historic spacetime).

The gravitational conversion of space to time:

a) conserves/converts the spatial entropy drive of free energy (the intrinsic motion of light), to the

metrically equivalent historical entropy drive of bound energy (the intrinsic motion of time);
b) creates the temporal, causal linkages of matter;
c) creates, through time's intrinsic motion, historic spacetime, the joint dimensional conservation domain of free and bound electromagnetic energy. History is the necessary conservation domain of matter's causal information field.
d) converts the expansion of space to the expansion of history (historic spacetime).

2) Symmetry conservation role: conserving the "non-local" metric and distributional symmetry of free energy (light) via the gravitational conversion of bound to free energy in stars, supernovas, quasars, and Hawking's "quantum radiance" of black holes - in effect, reversing the role and reaction in 1). Gravity's symmetry conservation role ultimately wins the contest with gravity's entropy conservation role via Hawking's "quantum radiance", and the complete gravitational conversion of mass to light.

The sign of G reflects the small energetic difference between the symmetric spatial entropy drive (S) of free energy (the intrinsic motion of light as gauged by "velocity c"), and the asymmetric historical entropy drive (T) of bound energy (the intrinsic motion of time as locally gauged by "velocity T"):

$$S - T = -G.$$

Equivalently, -G reflects the energetic difference between implicit and explicit time. (See: "Gravity Diagram No. 2" and "The Conversion of Space to Time").

It takes energy to create one-way temporal entropy from "all-way" spatial entropy, because an asymmetric, one-way temporal order must be imposed upon the symmetric, random spatial expansion. This

entropy-energy cost of time and history is the origin of the "negative energy" characteristic of gravity and the negative sign of "-G".

The intrinsic motion of light produces space and the expansion and cooling of space; hence the intrinsic motion of light is the entropy drive of free energy. Space is the conservation domain of light (free electromagnetic energy) created by light's entropy drive. Light requires one dimension each for its electric and magnetic fields, and a third for its entropy drive (forward motion, spatial expansion). Hence space is the entropic conservation domain of light. It is the function of entropy (in its primordial form and role as intrinsic dimensional motion - gauged by "c", "T", "G") - to create dimensional conservation domains (space and history) for free and bound forms of electromagnetic energy. In these domains, entropy's energy source (light or matter) can exist and be transformed, used, but nevertheless conserved. Change is allowed, but within a larger conserved framework which includes entropy and dimensionality (3-D and 4-D): this is the relationship between the 1st and 2nd laws of thermodynamics. Because the entropy drive and "non-local" symmetric energy state of light are both gauged by "c" (both are consequences of light's intrinsic motion), Noether's theorem will automatically require the conservation of light's entropy drive in any transformation in which light's non-local symmetry must be conserved - as in the conversion of free to bound energy, and/or the creation of matter. Conserving either the entropy drive or the non-local distributional symmetry of light conserves both linked functions by default. (See: "The Double Conservation Role of Gravitation".)

One of gravity's several roles, as mentioned above, is to conserve the spatial entropy drive of light (the intrinsic motion of light) by transforming it into the historical entropy drive of matter (the intrinsic motion of time). (See: "Spatial vs Temporal Entropy".) Time is created by gravity via the annihilation of space and the extraction of a metrically equivalent temporal residue, resulting in the deceleration of the spatial expansion of the Cosmos. Because the

spatial expansion is driven by the intrinsic motion of light, it is the spatial entropy drive (S), which ultimately funds the historical entropy drive (T):

$$-Gm(S) = (T)m$$

This conservation circuit between the entropy drives of the long-range force pair (gravitation and the electromagnetic force) may be expressed by a (quasi-mathematical) symbolic "concept equation":

$$-Gm(S) - (T)m = 0.$$

The conversion of mass to light by our Sun represents the closure of this same conservation circuit: (see: "Currents of Entropy and Symmetry"). The solar radiance announces that gravity, at last, has achieved its symmetry conservation goal.

> Because I assume the general validity of Einstein's gravitational equations (excepting his "cosmological constant" and the case of light in free space), it follows that I assume Einstein's formulation of the gravitational "warpage" of spacetime must be a mathematical description of the conversion of space to time (his "covariance" of space and time). For example, when Einstein tells us that meter sticks shrink and clocks run slow in a gravitational field, I assume that the missing space reappears as the extra time, such that the metric total remains constant - as is indeed the case in Einstein's formulation of the spacetime "Interval". Hence the actual mathematics behind my grossly simplified "concept equation" has already been done. (See also the paper "The "Higgs" Boson and the Spacetime Metric".)

Light Is Non-Local, A-temporal, and A-causal

"Velocity c" is the gauge of both the spatial entropy drive and the "non-local" distributional and metric symmetry of light (free electromagnetic energy). "Non-locality" is due to the fact, discovered

by Einstein, that light has no time dimension and no spatial dimension in the direction of its motion. In Einstein's mathematical formulation of this symmetry, the "Interval" of light = zero. (The "Interval" is an invariant measure of distance (between two "events") in 4-D spacetime, necessary to conserve causality. Two people shaking hands is an example of one "event" taking place at a specific place and time.)

Due to relative motion and the finite speed of light, some observers of a given pair of events will see them separated by more space, while others will see them separated by more time, and moving observers will generally not be able to agree on precisely when the events occurred. However, regardless of the observer's motions (including accelerated motions), if their 4-D coordinate data are entered into Einstein's mathematical formula, they will all find the same "Interval". It is the crucial function of Einstein's "Interval" to rescue causality from the shifting perspectives of Einstein's relativistic spacetime - which is why the concept and invariance of the "Interval" is so important. [3]. (See: "The Paradox of the Traveling Twins".)

Light is a 2-dimensional transverse wave whose intrinsic motion "sweeps out" a third spatial dimension. Lacking both a time dimension and one spatial dimension (in its direction of propagation), light's position in 3-dimensional space or 4-dimensional spacetime cannot be specified. Since both time and distance are meaningless to light, and yet light has intrinsic motion, light has in effect an infinite amount of time to go nowhere. Hence in its own reference frame (moving freely in spacetime (vacuum) at velocity c), light must be considered to be everywhere simultaneously. From this results the "non-local" character of light, light's zero "Interval", and the distributional and metric symmetry of light's energy - everywhere simultaneously.

The charges of matter are the symmetry debts of light, and light's "non-local" metric and distributional symmetry is conserved through the "location" charge of gravitation, of which time is the active

principle. The time charge and the gravitational field it induces identify energetically the specifiable (and hence asymmetric) coordinate position of immobile, undistributed mass-energy in 4-D spacetime, including the quantity and density of matter's distributional symmetry violation. Einstein's "Interval" of mass is always greater than zero, due to the presence of time and a third spatial dimension. The time charge breaks the metric symmetry condition of light's "zero Interval", while time's one-way intrinsic motion establishes the gravitational symmetry/entropy debt of bound energy. Gravity creates time via the annihilation of space and the extraction of a metrically equivalent temporal residue; in turn, the intrinsic motion of time (into history) pulls space along behind, creating the spatial flow of gravity, until the spatial dimensions annihilate each other at the center of mass ("center of gravity"). Time and gravity induce each other endlessly, analogously to the components of an electromagnetic field. *A gravitational field is the spatial consequence of the intrinsic motion of time*. (See: "The Conversion of Space to Time".)

Noether's Theorem

"Noether's Theorem" (Emmy Noether, 1918) states that in a continuous and multicomponent field (such as the electromagnetic field, or the metric field of spacetime), where one finds a symmetry, one will find an associated conservation law, and vice versa. Noether's Theorem is saying that in the conversion of light to matter, not only must the raw energy of light be conserved (as in the mass and momentum of particles), but the symmetry of light must also be conserved - not only the quantity but the quality of energy must be conserved. The theorem does not say exactly how this must be done, but in nature the matter-antimatter symmetry of light's particle form is conserved through the charges (and spin) of matter - charge conservation = symmetry conservation. The non-local distributional and metric symmetry of light's spatial or wave form is conserved through inertial and gravitational forces. (Quantum mechanical "spin" seems to be an (wholly conserved) intermediate or mixed state of

charge and inertial force. In neutrinos, spin-handedness (left vs right) functions like an ordinary charge to distinguish neutrinos (left) from anti-neutrinos (right).) The dual character of light's particle vs wave form seems ultimately derived from light's dual energetic parameters: frequency and wavelength. (Frequency multiplied by wavelength = c.)

I think of Noether's theorem as the "Truth and Beauty" theorem, in reference to Keat's great poetic intuition:

> "... Beauty is truth, truth beauty, - that is all
> Ye know on earth, and all ye need to know"
> ("Ode on a Grecian Urn": John Keats, 1819)

in which Beauty corresponds to Symmetry and Truth corresponds to Conservation.

The two common examples of Noether's Theorem enforced in Nature - charge (and spin) conservation among the particles, and inertial and gravitational forces in the spacetime metric - are the more enlightening because the former is an example of symmetry conservation and debt repayment deferred indefinitely through time, while inertia is an example of raw energy conservation in which the debt must be paid immediately. Furthermore, in the case of inertial forces, we see the implication that gravitation will also fall under the conservation mantle of Noether's Theorem, via Einstein's "Equivalence Principle". This indication is borne out and verified by the discovery that gravitation is indeed a symmetry debt of light, responding to and conserving the symmetry of light's "non-local" spatial distribution, a symmetry broken by the immobile concentrations of mass energy represented by matter (E = mcc). Because gravity bears both an entropy and a symmetry debt of light, its conservation role is carried out in two stages: 1) The immediate conservation of light's entropy by the creation of time (at any field strength, great or small); 2) The eventual conservation of light's symmetry by the conversion of bound to free energy (at high field

strengths, as in our Sun and the stars). (See: "The Double Conservation Role of Gravitation".)

Noether's theorem tells us why all the forces of nature are busy converting matter to light: matter was created from light in the "Big Bang", but since light has greater symmetry than matter, it is to conserve light's (lost) symmetry that all the charges and forces of matter work to accomplish the return of bound energy to its original symmetric state. *The charges of matter are the symmetry debts of light*. These charges produce forces which act to return the system of matter to light (free energy). Our Sun is the archetypical example of gravitational symmetry conservation in nature.

Two Entropy Drives?

How can matter have 2 entropy drives - one positive (time) and one negative (gravity)? This is possible because matter's negative entropy is expressed spatially (the intrinsic motion of gravitation), while its positive entropy is expressed historically (the intrinsic motion of time). These two entropy drives exist simultaneously in matter due to the gravitational conversion of space and the drive of spatial entropy (the intrinsic motion of light) into time and the drive of historical entropy (the intrinsic motion of time). This possibility also exists because space and time are at right angles to each other. (Negative spatial entropy is at right angles to positive temporal entropy.)

Primordial entropy-energy, the energy of intrinsic dimensional motion, creates the dimensional conservation domains of free and bound electromagnetic energy (space, history). The intrinsic motion of light, as globally gauged by "velocity c", creates space; the intrinsic motion of time, as locally gauged by "velocity T", creates the historic conservation domain of information and matter's "causal matrix"; the intrinsic motion of gravity, as globally gauged by "velocity G", creates historic spacetime, the joint dimensional conservation domain of free and bound electromagnetic energy. (See: "Spatial vs Temporal Entropy".) (See also: "The Tetrahedron

Model".)

Gravity's negative spatial entropy drive is associated with a *symmetry* debt - light's lost "non-local" metric and distributional symmetry - as reflected by the "location" charge of gravitation (Gm), which in the aggregate records the spacetime position, quantity, and density of immobile matter's energy concentrations. Matter's positive historical entropy drive is associated with an *entropy* debt (light's lost intrinsic motion c, the entropy drive of free energy), which gravity's "location" charge replaces with time, the entropy drive of matter. Time is the active principle of gravity's "location" charge.

In our Sun (for example), both reactions go on simultaneously: gravity creates the Sun's time dimension by annihilating space, and yet creates new space by converting mass to light, a conversion which actually reverses the metric effect of the first reaction, and reduces the Sun's gravitational field as it reduces the Sun's mass. These reactions do interfere with each other to some extent, resulting in a standoff between the gravitational force of compression and the radiative force of expansion - a seesaw battle between the symmetry and entropy conservation roles of gravitation whose final resolution (in favor of symmetry) is expressed through Hawking's "quantum radiance" of black holes.

We need the concept of matter's entropy debt to explain gravity's insatiable, dimensional, universal, one-way character (at all field strengths), and the concept of matter's symmetry debt to explain gravity's "location" charge, the fact that gravity identifies the spacetime position, magnitude, and density of massive objects, and (at high field strengths) acts to convert mass to light (as in the stars). We also need the concept of gravity's symmetry debt to help unify gravity with the other forces of physics under the conservation umbrella of Noether's Theorem: *the charges of matter are the symmetry debts of light*. Finally, we note that gravity (partially) repays the "location" symmetry debt of light by converting bound to free energy in stars, supernovas, and quasars, and completely restores

light's symmetry through Hawking's "quantum radiance" of black holes. These conversions, of course, simultaneously repay light's entropy debt, restoring the spatial entropy drive (intrinsic motion) of light.

The Conversion of Space to Time

Let us consider in general terms the gravitational transformation of space to time (see Fig. 1 "The Gravity Diagram"). The gravitational annihilation of space is our common experience of gravitational force - space accelerating through us on its way to Earth's center. This we designate as the negative spatial entropy drive of gravity, because space is collapsing and warming, rather than expanding and cooling, as when driven by light. -Gm is the neg-entropic energy and -G is the universal gauge of the strength of the gravitational force. "G" determines (per given mass) how much space and spatial entropy drive is required to produce matter's time dimension and historic entropy drive. Within this collapsing space resides a metrically equivalent, but implicit, component of time. This temporal entropy component is not lost when gravity annihilates space, but is revealed as matter's explicit time dimension. Space is consumed by gravity, leaving behind a metrically equivalent temporal residue, producing matter's temporal entropy drive and the historic conservation domain of information and matter's "causal matrix" (historic spacetime), the joint dimensional conservation domain of free and bound energy. Gravity simply converts the implicit time of space to the explicit time of history. The cost of this transformation (per given mass) in terms of entropy energy is -Gm.

The continuing reality of "yesterday" and matter's historic "causal matrix" is absolutely necessary to uphold the reality of today and the "Universal Present Moment" of bound energy and human experience. This is (one of several) rationales for gravitation and the long-range character of its force. (See: "A Spacetime Map of the Universe".) We are all immortal in history. (See: "A Rationale for Gravity".)

-Gm is the negative entropy-energy required to produce m's time dimension from space. -Gm tells us how much gravitational entropy-energy is required to produce m's time dimension - in the metrically equivalent terms of the space which must be annihilated to create time. Hence the gravitational field energy of planet Earth is the entropy-energy required to produce Earth's time dimension - entropy-energy which is gravitationally subtracted from the spatial expansion of the Cosmos (by the actual conversion of space into time).

The dimensional structure of the Cosmos is established by the entropic "intrinsic" motions of light, time, and gravity. Hence it is the 2nd law of thermodynamics (entropy) which provides the spacetime foundation for the 1st (conservation of energy).

The intrinsic motion of free energy is the expansive principle of the spatial Universe, but it is time itself, implicitly present as the "frequency" component of the electromagnetic wave, which causes the spatial or "wavelength" component of the wave to move: wavelength "flees" the asymmetric temporal potential embedded in its own nature. This flight by "wavelength" from "frequency" at velocity c suppresses the explicit appearance of time, hence maintaining metric symmetry. Thus we come back to a combination of entropy and metric symmetry conservation, both in the service of energy conservation, as the ultimate principles causing the intrinsic motion of light. Time, whether implicit in light or explicit in matter, is the entropic driver of the Cosmos. (See: "The Conversion of Space to Time".)

PART II

The Universal Gravitational Constant G

gravity is a metric form of (negative) entropy, creating time by annihilating space

(See also: "Global vs Local Gauge Symmetries in Gravitation")

The *metric* equivalency between space, time, and light is "gauged"

(magnitude/relationship is established) by the universal electromagnetic constant "c". The *entropic* equivalency between space, time, and mass is gauged by the universal gravitational constant "G". (Alternatively stated: the energetic difference between the primordial entropy drives of space and history - the intrinsic motion of light vs the intrinsic motion of time - is gauged by Newton's constant G.) Time, the historical entropy drive of matter, is provided by the gravitational annihilation of space, extracting a metrically equivalent temporal residue from the collapsed space. G is related to c through time and entropy. -G reflects the small energy difference between the symmetric spatial entropy drive (S) of free energy (the intrinsic motion of light), and the asymmetric historical entropy drive (T) of bound energy (the intrinsic motion of time):

$$S - T = -G.$$

Equivalently, -G reflects the small energy difference between implicit (S) and explicit (T) time. Gravity is a metric form of (negative) entropy. (See: "Gravity Diagram No. 2".)

"Big G" is the universal gravitational constant, familiar to us through Newton's famous formula for the gravitational force acting between two bodies: F = GMm/rr, where Mm is the mass of the respective bodies, and r is the distance between their centers. G is a never-varying constant of force. I think of it as the gauge or determinant of the entropic relationship between mass, time, and space - gauging the energetic magnitude, in terms of an equivalent amount of spatial entropy-energy, of m's time dimension. It takes entropy-energy to create the time dimension of m, and G is the gauge constant that determines how much space and spatial entropy will be required (must be annihilated/transformed) to produce m's time dimension - per given mass (conceptually: Gm ---> Tm).

Because gravity creates matter's historical entropy drive by the annihilation and transformation of space, a "falling force" is created around a massive body by the accelerated motion of space (as time

pulls space into history) at the "center of mass"; this force diminishes with the square of the object's distance for simple reasons of spherical geometry and total energy conservation. For example, if the total gravitational energy is to remain the same at any distance from the mass center, then its local intensity per standard unit of surface area (square meter) on any concentric spherical surface must diminish as the square of distance from that center - simply because the surface area over which the total force must be distributed increases as the square of that distance. The same force law holds for electric charge (Coulomb's law) and the dimming of stellar luminosities, for the same simple reasons. Newton's difficulty proving this inverse square law was due to general ignorance (or lack of acceptance) of the energy conservation principle in his time. Einstein's modification of Newton's law was due to his realization that the appropriate geometry was 4-dimensional (including time) rather than 3-dimensional. Einstein represented the gravitational force with Riemann's tensor geometry as a metric "warping" or "curving" force ("four 3rd-order equations" - the changing rate of acceleration in x, y, z, t).

"Little g" ("surface gravity" or the "local" force of gravity) can take any value up to g = c. If the Earth were to shrink to the size at which it becomes a black hole (about the size of a ping-pong ball!), it is "little g", Earth's surface gravity, the local intensity of Earth's field, which changes in the process. "Big G" would be unaffected; the Moon's orbit, for example, would not change, since none of the three parameters of Newton's equation, G, m, or r, are changed by shrinking Earth (at least not from the Moon's perspective). The density of m changes, and that affects little g because r shrinks, but only from the perspective of Earth's (unfortunate) surface dwellers.

Einstein's "Equivalence Principle"

"Little g" is the local intensity of the gravitational field; for example, it measures the force or "weight" we feel standing on Earth's surface. Little g is much less on the surface of the moon, but "big G" is the same everywhere. "Little g" is also equivalent to the "g" forces of

acceleration experienced in sudden starts, stops, and sharp turns (Einstein's "Principle of Equivalence" of gravitational and accelerated reference frames). The equivalence holds because as we stand on the surface of the Earth, space accelerates through us toward Earth's center, while in the reciprocal situation (through the appropriate application of energy, as in a rocket ship), we accelerate through space. "g" forces vanish in "free fall" (or orbit) because we become co-movers with the field. Similarly, acceleration forces vanish when we "turn off the engines" of a rocket ship and coast freely in space with the metric's inertial field. An earlier version of the equivalence principle, attributed to Newton, noted only the unexplained equality between inertial mass and gravitational weight, which was invoked to explain the curious fact earlier discovered by Galileo that all things fall with the same acceleration (because their "inertial" resistance to acceleration is exactly balanced by the attractive force of their gravitational mass/"weight"). It is readily seen that Einstein's equivalence principle includes and explains its predecessor. (For more on this topic see: "Extending Einstein's Equivalence Principle".)

The Attractive Principle of Gravitation

In Newton's gravitational equation (F = GMm/rr) each mass is presumed to attract the other (along a straight line connecting their centers) with a force proportional to its mass (Gm). What the attractive principle was Newton refused to speculate. Einstein thought the attractive principle was a distortion of the spacetime metric, proportional to the total energy of a body, including any associated fields. However, why such a distortion should (must) exist was not explained. In the theory presented here, I assume Einstein's geometric formulation of the spacetime "warpage" is correct, but with the understanding that it represents not a static field, but the actual accelerated motion of spacetime. This assumption is allowed within the framework of Einstein's equations due to his own "Principle of Equivalence" of the forces of gravity and acceleration, and it reproduces all the usual gravitational phenomena. (However, there is a small physical difference (with major conceptual implications)

between my theory and Einstein's regarding the gravitational field produced (or not) by light freely moving in vacuum. See: "Does Light Produce a Gravitational Field"?)

The advantage of a moving (rather than a static) field interpretation of gravity is that the dynamic view allows us to discover (at least) two conservation reasons for the existence of the gravitational force: 1) the creation of the historical entropy drive of matter (the intrinsic motion of time), via the annihilation of space and the extraction of a metrically equivalent temporal residue, including the creation of the joint dimensional conservation domain of free and bound electromagnetic energy (historic spacetime); 2) the conservation of light's dimensionally and distributionally symmetric "non-local" energy state, via the gravitational conversion of bound to free energy (as in stars). Furthermore, the dynamic view allows us to postulate a simple attractive principle, namely the infall of spacetime to a center of mass, the infall due to the unbreakable connection between space and time. It is the intrinsic motion of time at the center of mass, at "right angles" to all three spatial dimensions, which pulls space after it as time moves into history, creating the accelerated, convergent infall of space that we recognize as a gravitational field. *A gravitational field is the spatial consequence of the intrinsic motion of time*.

Space and time are a dimensional entropic pair which cannot be completely separated, much like the electric and magnetic field of light. Indeed, these dualities are related phenomenal expressions of free and bound forms of electromagnetic energy.

In the dynamic view, the attractive principle is actually the intrinsic motion of time itself, which pulls space after it as time moves into history, because energy conservation will not allow these dimensional forms to be separated; they are the "faces" of a single electromagnetic entropy "coin".

The "entropic charge" of time (by "entropic charge" I mean a

symmetry debt with intrinsic dimensional motion), which is *implicit* in free energy or light (for example, implicit in the "frequency" component of the wave), becomes *explicit* when free energy collapses to a bound (stationary) form (such as a massive particle). In such a collapse, light loses its symmetric and intrinsic state of motion, as gauged by "velocity c". The entropic time charge "picks up" the lost intrinsic motion or spatial entropic drive of light, and conserves it as the intrinsic motion of matter's historic entropy drive, time. (See: "Gravity Diagram No. 2".) (Note: The energy of the (collapsed/transformed) light is conserved as the mass/momentum of the particle; the symmetry of light is conserved as charge; the entropy of light is conserved as time/gravity) - all transformed/alternative conservation parameters consequent upon the transformation of free electromagnetic energy to bound electromagnetic energy.)

The intrinsic motion of time is directed one-way at "right angles" to all three spatial dimensions, and its motion into history drags space after it, as the connection between space and time cannot be broken. 3-D space is forced to collapse to a point at the center of mass, squeezing into the zero-dimensional (point-like) beginning of the 1-D historical time line. The symmetric spatial dimensions self-annihilate at the point-like center, leaving a metrically equivalent but asymmetric ("one-way") temporal residue. The explicit-implicit states of the entropic gauges of space and time are reversed by the spatial annihilation (see the "Gravity Diagrams"). This renews the always-moving time charge at the center of mass, which again moves down the time line into history (the one-way dimensional motion of a point charge creates a line), pulling space after it, and so on forever. Time continuously renews itself via the extraction of new temporal residues from the space annihilated by time's own intrinsic motion - a self-feeding cycle producing an enduring gravitational field, matter's temporal entropy drive, and an historical conservation domain for bound energy and matter's causal information field.

The spherical symmetry of the gravitational field is due to the fact that all the spatial dimensions are equivalently connected to the time

dimension; this allows the spherically opposing spatial dimensions (+x, -x, etc.) to match up exactly at the center of mass where they self-annihilate "cleanly", leaving a metrically equivalent temporal residue. The self-annihilation of space reveals its implicit temporal component, which cannot self-annihilate because time being "one-way" asymmetric, there is + t but no -t. Gravity's accelerated motion is due to the constant application of a force, the constant intrinsic motion of time. Time's one-way motion is necessary for the protection of causality and the continuous updating of matter's raw energy accounts, especially those due to matter's relative motion.

The point-like center of mass, which is just the beginning of the time line seen "end on" (because time is at right angles to all three spatial dimensions), is the germ of what, in extreme circumstances of density and gravity, will grow into the surface area or "event horizon" of a black hole.

Hence the spatial motion due to gravity is the consequence of the intrinsic motion of time; the convergent, accelerated flow of space is the principle of gravitational attraction; this spatial collapse continuously feeds the time line which forever pulls more space after it. The conservation of energy, entropy, symmetry, and causality requires the time dimension for matter; gravity creates time (and spacetime) by producing time from space. The annihilation of space decelerates the spatial expansion of the Cosmos; therefore, matter's time dimension or historical entropy drive is ultimately funded by light's intrinsic motion or spatial entropy drive. The entropy drive expressed as free energy's spatial expansion (S) is gravitationally converted to the entropy drive expressed as bound energy's historical expansion (T), a transformation which (as we have seen above), may be symbolically represented by a (quasi-mathematical) "concept equation" as:

$$-Gm(S) = (T)m$$
$$-Gm(S) - (T)m = 0$$

(See: "Currents of Symmetry and Entropy".)

The Mechanism of Gravitation

Gravitation is both a symmetry debt and an entropy debt of light, unique among the charges and their forces. This double conservation role is reflected in two different mechanisms, both of which convert space to time, one at the microscopic quantum level of charge - the entropy debt, involving time, causality, and energy conservation, and one at the macroscopic level of gravitational force - the symmetry debt, involving mass, "location" charge, and symmetry conservation. (See: "The Double Conservation Role of Gravitation".)

The collapse of an electromagnetic wave confers a quantized time charge on a massive particle. This time charge is derived from the collapsed spatial component or spatial equivalent of the wave, similarly to the process of the gravitational extraction of time from space. This is the "primary" or quantum mechanical process of producing the entropy debt or time charge. We can visualize this as a switching or flipping of the "wavelength" or spatial aspect of light or the moving electromagnetic wave, to the "frequency" or temporal aspect of the particle or stationary wave (see: "Gravity Figure No. 2"). This is just the change from implicit to explicit time, as time is always present as the implicit or hidden driver of light's intrinsic motion (see: "The Conversion of Space to Time".) Once this time charge is gauged and placed, the "secondary" or symmetry aspect of gravitation comes into play: this is the cyclic, continuous flow of space as it is pulled toward the center of mass by the intrinsic motion of time marching into history, producing the macroscopic gravitational field (see fig. "Gravity"). The continuous secondary process simply copies or reproduces the time charge set and gauged by the one-time primary process. We can visualize this secondary process as the actual symmetric flow and annihilation of the spatial dimensions, leaving in their place a metrically equivalent uncanceled time residue whose intrinsic motion into history - at right angles to all three spatial dimensions - pulls space after it, producing the

continuous spatial collapse that is a gravitational field (see fig. "gravity 1").

Finally, we can visualize the ephemeral nature of the time charge as a manifestation of its actual motion from the spatial dimensions, where it is initiated, to the historic causal domain, where only information can follow. It is the intrinsic motion of the time charge which "pulls" space after it and produces the gravitational flow. Hence *a gravitational field is the spatial consequence of the intrinsic motion of time*. The collapse of space leaves a metrically equivalent temporal residue whose intrinsic motion pulls more space after it, in an endlessly repeating cycle. The intrinsic motions of gravitation and time continuously induce each other, much as the oscillations of an electric and magnetic field induce each other. In both cases, the motion of a current, either moving space or moving electrically charged particles, produces a field at right angles to the current flow (time or a magnetic field). Conversely, a moving time or magnetic field produces a spatial (gravitational) or electric current. This is the analogy between electromagnetism and gravitation which so intrigued Einstein.

The two mechanisms are distinct but linked, and both are part of the gravitational conversion of space to time, connecting the quantum-mechanical aspect of gravitational charge (the entropy debt) to the macroscopic aspect of gravitational flow (the symmetry debt). Both are linked by time, their common gauge c, and Noether's Theorem requiring the conservation of light's "non-local" symmetry. The gravitational charge, "location", is unique among charges in that its active principle is time. The gravitational charge is an "entropic" charge, a charge with intrinsic dimensional motion. It is the temporal, entropic nature of the gravitational charge which connects the microscopic quantum mechanical (charge-frequency-particle-entropy) and the macroscopic dimensional (location-time-mass-symmetry) aspects of gravity. In turn, the double nature of the gravitational charge gives gravity a double conservation role, on the one hand conserving the spatial entropy drive of free energy (the

intrinsic motion of light) by converting space to the historical entropy drive of bound energy (the intrinsic motion of time), and on the other hand conserving the non-local distributional and metric symmetry of light's energy by converting bound to free energy (as in stars, supernovas, quasars, and finally and completely, via Hawking's "quantum radiance" of black holes). This duality extends backward in a conservation chain to the dual role of velocity c, which gauges both the "non-local" distributional/metric symmetry and the spatial entropy drive of light. Gravity must conserve both effects of light's intrinsic motion if it conserves either one - as "Noether's Theorem" requires. (see: " The Double Conservation Role of Gravitation").

The "graviton" or field vector of the gravitational charge is a quantum unit of temporal entropy (or negative spatial entropy), the "flipped" or transformed entropy drive or intrinsic motion of the photon - implicit spatial time transformed to explicit historical time. (See: "Gravity Diagram No. 2".)

PART III

The Conservation Roles of Gravitation

The conservation roles of gravitation include:

1) Energy: A) Providing sufficient negative energy to balance the positive energy of the "Creation Event" or "Big Bang";
B) the creation of the "local" metric of historic spacetime, the joint dimensional conservation domain of light and matter (by creating time from its metric equivalent, space).
2) Entropy: the conservation/transformation of free energy's spatial entropy drive - by converting light's intrinsic motion to time's intrinsic motion (the historic entropy drive of bound energy). (Gravity collapses space and extracts a metrically equivalent temporal residue.)
3) Causality: creating the causal (temporal, historical) linkages of matter and hence also protecting energy

conservation; time is required to accommodate/regulate the energy and causality accounts of matter's relative rather than absolute motion.
4) Symmetry: the payment of light's "non-local" distributional/metric symmetry debt (including light's spatial entropy debt) by converting bound energy to free energy - as in stars, supernovas, quasars, and ultimately and entirely, Hawking's "quantum radiance" of black holes. Matter carries the debt in the form of "location" charge (Gm), but the source of the debt is the broken "non-local" symmetric energy state of light (consequent upon the transformation of light to bound energy forms).

The energy conservation role of gravity is to create a local, temporal metric of variable strength (depending upon the magnitude and density of mass and the distance to its center), which can conserve energy in a mixed system of free and bound energy. This gravity accomplishes by converting the absolute global metric of light and space (as gauged by the electromagnetic constant c), into the relative, local metric of matter and historic spacetime (as gauged by the universal gravitational constant G). Time provides the entropic drive of matter's historical dimension, the causal linkages of matter, balances the energy budget of matter in relative motion, and accommodates the flexible metric of Special and General Relativity, as well as maintaining the invariance of matter's positive "Interval" ("Lorentz Invariance"). This satisfies the 1st and 2nd laws of thermodynamics and matter's causality relations. A financial metaphor is perhaps usefully applied to the discussion of gravity's energy conservation role: In producing matter's time dimension, gravity only pays the "interest" on matter's symmetry debt, since the gravitational field is unaffected thereby (as on planet earth); in converting bound to free energy gravity pays off the "principle" of matter's symmetry debt, since the gravitational field is reduced as mass is reduced (as in the Sun and stars). The gravitational field vanishes when mass vanishes, indicating the final retirement of the symmetry debt (as in the total evaporation of "black holes" via

Hawking's "quantum radiance").

The symmetry conservation role of gravity is to conserve the non-local distributional/metric symmetry of light (in satisfaction of Noether's Theorem), by converting bound to free energy in stars and supernovas via the nucleosynthetic pathway, in quasars via the direct conversion of gravitational potential energy to light, and in black holes via proton decay (?) and Hawking's "quantum radiance". Gravity has a double conservation role because gravity conserves all metric symmetries associated with velocity c, including the symmetric "non-local" spatial distribution of light's energy, and the symmetric ("all-way") spatial entropy drive of free energy (the intrinsic motion of light). (See: "The Double Conservation Role of Gravitation".)

Gravity performs the first (entropic) conservation role (creating the time dimension of matter) for all bound energy forms regardless of size, and the second (symmetry) conservation role (converting bound to free energy) for all sufficiently large accumulations of matter (stars, supernovas, quasars, and black holes).

The full conservation role of gravitation is complex on the one hand, in that (in today's universe) gravitation has two primary conservation roles, one involving light's spatial entropy drive (light's intrinsic motion), and another involving an aspect of light's symmetric energy state (light's "non-locality"). "Non-locality" produces a complete distributional symmetry of light's energy within light's spatial conservation domain - the spatial Cosmos. On the other hand, gravitation's conservation role is simplified because both light's spatial entropy drive and non-local symmetric energy state are consequences of the "intrinsic motion" of light, producing light's a-temporal, a-causal, and "non-local" character. The gravitational restoration of bound to free energy in stellar processes, quasars, and the "quantum radiance" of black holes pays both the symmetry and the entropy debts of light, simultaneously. (See: "Currents of Entropy and Symmetry".)

Time and its asymmetric intrinsic motion is the pivotal feature of the entire process, providing both the active principle of gravity's "location" charge, and producing matter's positive entropy drive, including the historic conservation domain of matter's causal information field. Finally, time is also the implicit or "hidden" driver of light's intrinsic motion. (See: "The Double Conservation Role of Gravitation".)

Black Hole

A black hole is the 4th dimension made visible.

In the limiting case of a "black hole", the gravitational conversion of space to time becomes physically expressed in the surface area of the hole's "event horizon", according to the Bekenstein-Hawking theorem, which relates the surface area of a black hole to the entropy of its mass. (See: Jacob D. Bekenstein *Information in the Holographic Universe* Scientific American Vol. 289#2 Aug. 2003 P. 58-65.) We understand the necessity of the relationship because increasing the area of the event horizon surface is the only way to increase the time/entropy domain of the black hole for any additional mass inputs - this because further acceleration of the gravitational field is forbidden beyond the already realized limit of velocity c. (Similarly, if the flow of water through a pipe is already at some theoretical maximum pressure and velocity, the volume of flow can be increased only by enlarging the cross-sectional area of the pipe.) The "event horizon" of a black hole is a time-entropy surface which displaces space somewhat (not exactly) as a ship displaces water.

Matter, and matter's associated charges, exist only in the present moment of time, and do not participate in the entropic expansion of historic spacetime. The charges of matter, as well as the energy content of matter, are therefore protected from *spatial* entropic enervation or dilution. Small (non-radioactive) atoms simply do not age, and charge magnitudes in all cases are invariant through time. Charge quantization also plays a significant role in the "non-aging" of matter; atoms cannot disintegrate by continuous degrees, but only in

discreet quantum units: proton decay can go forward only if all the proton's conserved charges are actually annihilated. Nevertheless, when gravity becomes strong, we begin to see the *temporal* entropic erosion of matter's bound energy (but not matter's charge) in stars, and when gravity reaches black hole strength (g = c), the complete destruction of (charge-neutral) matter via temporal entropy becomes possible (Hawking's "quantum radiance").

At the black hole surface, clocks stop and meter sticks shrink to nothing, the same metric condition as originally seen for light at velocity c: in the triumph of the temporal over the spatial metric, matter returns to intrinsic motion c via gravity, rather than as light via the electromagnetic force. Furthermore, when g = c, matter's bound energy is subject to the same entropic vitiation as light's free energy, and proton decay is probably commonplace inside black holes, in which case a black hole is simply gravitationally bound light, solving the problem of the infinite compression of matter. In any case, we see the complete conversion of matter to light via Hawking's "quantum radiance". It thus becomes evident that the real purpose of gravity's single-minded insistence upon pushing the temporal metric to the black hole limit is actually to restore light's original symmetry by means of force pathways alternative to the electromagnetic annihilation of matter vs antimatter (weak/strong force "proton decay", gravitational "quantum radiance").

It is to be noted that although in our frame of reference (as "outside" observers) the evaporation of a black hole is very slow, nevertheless, within the black hole's reference frame, because its "clock" is stopped, the evaporation takes place essentially instantaneously - that is, explosively, irrespective of the hole's size. (This relativistic phenomenon is related (it is the opposite perspective) to that in which a (theoretical) observer inside the black hole sees the entire history of the "outside" universe in the instant before he is converted to photons - or otherwise destroyed - by the singularity.) The temporal parameter of the universe is significant only for those whose "clock" is actually running. This understanding confirms the symmetry-conserving role

of gravitation, the black hole, and Hawking's "quantum radiance".

From another perspective, the black hole offers an alternative temporal/gravitational metric which is the polar opposite of the spatial electromagnetic metric. In both cases, in their pure or extreme forms, energy within either metric moves at "velocity c". "The extremes meet", showing there is a negative as well as a positive way to conserve symmetry and satisfy Noether's theorem. Hence we can view gravity's relentless pursuit of the black hole as either a quest to achieve the conversion of mass to light through Hawking radiation, or alternatively, to establish its own version of a symmetric energy state, a metric in which even massive objects move with "intrinsic motion c", and/or baryons decay to light.

The event horizon of the black hole is the physical demonstration of the gravitational conversion of space and the drive of spatial entropy to time and the drive of historical entropy - complete with the mathematical formalism of the Bekenstein-Hawking Theorem. Just as a rock is the visible evidence of light's energy bound in an asymmetric stationary mode - light's energy transformed to atomic matter, chemically bound, and brought to rest ($h\nu = mcc$) - so the event horizon of a black hole is the visible evidence of light's entropy drive in an asymmetric stationary mode - light's intrinsic motion transformed to one-way time, gravitationally bound, and brought to rest. A black hole is time made visible:

$$-Gm(S) = (T)m.$$

If Earth's gravity or temporal entropic drive were the full equivalent in strength to light's spatial entropic drive, then Earth would be a "black hole". In other words, the "black hole" condition is just that in which g = c. If the mass of the Earth were compressed to the condition of g = c or a "black hole", the Earth's event horizon would be about the size of a ping-pong ball! The surface area of this ball = the pure time dimension or temporal entropy of the Earth's entire "rest mass", as translated into equivalent spatial entropy terms (g =

c), allowing us to quantify time by measuring the surface area of the space it displaces. This illustrates dramatically just how small the temporal entropy component of bound energy really is. The gravity we feel on Earth's surface is the spatial pull caused by the intrinsic motion of that same time dimension, in effect, the tiny (theoretical) "black hole" at the gravitational center of the Earth, but the surface of that "ping-pong ball", in terms of its gravitational force, is diluted over the surface of the entire Earth. (See: "The Half-Life of Proton Decay and the 'Heat Death' of the Cosmos.")

Gravity is weak because matter is connected to its historical conservation domain only tangentially via the "universal present moment". The tiny size of the (theoretical) black hole at the center of the Earth represents this tangential contact point for the entire mass of our planet, in which spatial and temporal entropy are fully equivalent (g=c). Gravity creates only enough temporal entropy (for any given mass) to establish this tangential contact point, whose size is to be compared to the whole of historical spacetime, the "bulk" remainder of matter's entropic conservation domain or "causal matrix". This notion accords with the observation of P. A. M. Dirac that the ratio of the strength of the electromagnetic force to the gravitational force is the same as the ratio of the radius of the Cosmos to the radius of an electron - in which the electron represents the physical size of the "tangential" point of contact between matter and historic spacetime. (See: " A Spacetime Map of the Universe".)

> At the "event horizon" of a black hole, both clocks and light come to a halt, as the electromagnetic metric is completely replaced by the gravitational metric. Within the event horizon, all former functions of the electromagnetic metric are either defunct or performed by the gravitational metric, including those of the the binding forces between particles. The black hole is just that physical environment in which entropy, in its usual electromagnetic expression, does not exist, and hence (at least for the outside observer) no change is possible as we ordinarily experience it. But gravitation is

> also a form of (negative) entropy, and indeed we find, just at the boundary between the electromagnetic and gravitational domains, gravity operating in both its entropy and symmetry conservation roles to convert the mass of the black hole entirely to light - via the mechanism of "Hawking radiation". In Hawking's "quantum radiance", even the "all-way" symmetry of light's entropy drive is conserved. This is the ultimate expression of Noether's symmetry conservation theorem, the complete gravitational conversion of bound to free energy, definitively revealing the final conservation rationale for gravitation, and by extension, for time as well. (See: Science vol. 337 3 Aug., 2012 pp. 536 - 547: special section on black holes.)

Black holes actually convert a relatively large percentage of the rest mass of in-falling matter into light - as the brilliance of quasars demonstrates. This conversion of mass to light is considerably more efficient than nucleosynthetic conversion in ordinary stars (up to 28% of the in-falling rest-mass energy), and so forms a distinct, major conversion category at both the stellar and galactic structural levels. (See: Caleb Scharf *Gravity's Engines* Scientific American/Farrar, Straus and Giroux 2012 p 76.) This is yet another stepping stone in the inexorable gravitational pathway leading toward total mass conversion and complete symmetry conservation, culminating, as we have seen, in Hawking's "quantum radiance". (See: "Nodes of the Gravitational Metric".)

Buy Now - Pay Later

Charge conservation acts as the "credit card" of the Cosmos - "buy now, pay later", with gravity paying the entropy-interest on matter's symmetry debt by creating matter's time dimension via the annihilation of space. The notion of charge conservation would be moot in the absence of time. Gravity pays off the "principle" on matter's symmetry debt by the conversion of bound to free energy in stars, supernovas, quasars, and finally and completely via Hawking's

"quantum radiance" of black holes - since the gravitational field is reduced as bound energy is reduced, and completely vanishes when mass and its associated symmetry debt completely vanishes. It is interesting to note the convergence of fundamental principles here: symmetry conservation thrust into the time dimension by the mechanism of charge and charge conservation; the resulting necessity for the invariance of matter's charges through time; the gravitational creation of time from space and the consequent deceleration of the cosmic expansion; the ultimate gravitational repayment of symmetry debts with the consequent "rebound" of cosmic expansion (as recently observed). Of course, Special Relativity also tells us that matter cannot move with the metric equivalent of "velocity c", and that therefore the time dimension must move instead, while matter remains stationary and rides the "time train". There are multiple reasons for matter's isolation in the "universal present moment", illustrating the seamless interweaving of all natural law, and raising again Einstein's question: is there any latitude in the construction of our Universe? From the perspective of the "Anthropic Principle" (natural law and the physical constants must allow human life), the answer is apparently "no".

The Ratio 1/4 x 10(42) (42 powers of ten)
(Why is Gravity so Weak?)

(See: "The Half-Life of Proton Decay and the 'Heat Death' of the Cosmos".)

Summary
(See also: "12 Summary Points Concerning Gravity"; and "About Gravity")

The problem to be solved by the material Universe is how to return to the original symmetry of light in the absence of antimatter. The information carried by the charges of matter is just 1/2 of the original information intended to solve this problem (the other half belonging to antimatter, now absent). Nevertheless, the half carried by matter is

still sufficient to do the job, but only if an additional dimension or degree of freedom - time (and the gravitational field of matter required to produce it) - is added to accommodate the much more complex pathway back to antimatter this reduced information set now requires. (This alternative pathway requires the gravitational conversion of bound to free energy rather than the electromagnetic annihilation of matter vs antimatter. Proton decay (via the strong and weak nuclear forces) is another possible - but even more difficult - pathway.)

The charges of matter are the symmetry debts of light (Noether's Theorem). Symmetry debts in the form of charges are conserved through time, and may be paid at any future moment. Gravity pays the entropy-"interest" on matter's symmetry debts by creating matter's time dimension via the annihilation of space, decelerating the spatial expansion of the Universe in consequence. The tiny tangential connection between historical "bulk" spacetime and the ephemeral, ever-moving "present moment" accounts for the weakness of gravity.

While the slow liberation of free energy from the storehouse of bound energy is progressing (by various astrophysical processes, and by radioactive, particle, and proton decay), there is plenty of time and energy for the information systems of matter to become self-aware, explore their creative potential, and experience and enjoy the glory and beauty of the Universe. Living, biological information systems seem to be evolving toward a unity, beauty, and wholeness of their own, a fractal expression of the unity, symmetry, and wholeness of the Cosmos of light from which they came - "as above, so below". Life is a molecular conservation domain of information, combining the negative entropy of Natural Selection with heritable genes. Life is a physically realized historical information domain, a sort of molecular iteration of historical spacetime, carrying the condensed, coded, historical information of its species and of life generally within DNA and a heritable genome. Humanity has vastly extended the molecular information conservation domain of biology into the abstract realm of memory, language, writing, libraries, museums,

school systems, social systems, the arts and sciences, technology, mathematics, computers, electronic language, etc. We have also actively participated in the cosmic drive to liberate free energy from its bondage in matter - by harnessing chemical, electrical, gravitational, and nuclear (fission/fusion) forces. (See: "Newton, Darwin, and the Origin and Abundance of Life in the Cosmos".) (See also: "The Information Pathway" and "The Information Ladder".)

Whether this curious result is due to the simple physics/chemistry of matter's relentless search for antimatter, the elemental "memory" of a fractal, unifying algorithm, a Divine Plan, or some combination of these or other forces, the Cosmos at large has awakened to itself through life. Our self-consciousness is the self-consciousness of the Universe: "I and the Father are one". Earth's biological information systems (and their products) are now beginning to reach out into our Solar System, and (barring self-destruction) will continue evolving until they eventually encompass the entire galaxy, or encounter a competing alien expansion. This is Chardin's "Omega Point", the Cosmos evolving a universal, material Self, a Super Organism, a reflection in matter of its spiritual organization, in which the Universe becomes cohesive, self-aware, and intelligent, with individuals playing the role of biological cells, planets playing the role of individuals, and galaxies playing the role of nations - a future already visualized in our science fiction. (See also: "Chardin: Prophet of the Information Age"; "The Fractal Organization of Nature"; "de Broglie Matter Waves and the Evolution of Consciousness".)

Philosophical Connections of the "Tetrahedron Model"
(See: Maudlin, Tim. *Philosophy of Physics: Space and Time* 2012 Princeton Univ. Press.)

In a beautiful convergence between philosophical tradition (both ancient and modern) and the gravitational physics of the "Tetrahedron Model", Tim Maudlin (see citation above) points out that since empty 3-D space is perfectly symmetric, there is no point/place in it that can be preferred over any other point/place. Hence God could not decide

"where" to place the Creation. In the "Tetrahedron Model", massless light can (therefore) only be symmetrically distributed throughout the spatial domain, and simultaneously at that, since light and 3-D space both lack a time dimension. Hence light and space are equivalently symmetric, and indeed, we think of light as creating space for its own conservation needs. The intrinsic motion of light is the fundamental expression of entropy in free electromagnetic energy, creating, expanding, and cooling the primary dimensional conservation domain (space) of free electromagnetic energy (light). Light and space both lack a time dimension, and hence both also lack a space-warping gravitational field. (See: "Does Light Produce a Gravitational Field?") The electromagnetic constant "velocity c" also "gauges" (regulates) the metric symmetry of light's spatial conservation arena. (See: "Symmetry Principles of the Unified Field Theory".)

Contrast this situation with that of massive forms of bound (rather than free) electromagnetic energy, from atoms to galaxies, which all produce space-warping gravitational fields whose exact effect is to identify in the undeniable energetic terms of metric-warping inertial force the precise spatial location of the massive system's "center of mass/gravity". Since massive particles, completely lacking the intrinsic spatial motions of massless light, cannot distribute themselves symmetrically within the volume of 3-D space, some way of selecting/identifying a particular place within that spatial plenum must be found. This is accomplished by time and the gravitational field of the particle(s), which induce each other. (See: "The Conversion of Space to Time".) The extra time dimension is added to 3-D space to break the spatial symmetry and identify a specific location within the spatial domain, which becomes a 4-D spacetime continuum with an infinity of identifiable points due to the addition of the extra time dimension. Time has "intrinsic" (entropic) motion, the analog of light's intrinsic (entropic) motion, except in time's case it is one-way motion to provide completely distinguishable points ("events") within an infinite and expanding historical spacetime. Because the entire universe begins as a unit at "time zero" in the "Big Bang", the spacetime designations of gravity are historically unique.

History is the temporal analog of space, the conservation domain of matter's causal information field. Light is connected through space, matter is connected through history, gravity connects everything, converting space to time and vice versa. (See: "A Description of Gravity".)

There is a similarity in function between the color charges and gluon field of the strong force, and time and the gravitons of gravity: both provide an extra dimension ("degree of freedom") in which to separate and distinguish particles in what would otherwise be an overcrowded field of fermions. This is another view of the connection between the spacetime and particle "metrics" of free and bound forms of electromagnetic energy, and the activity of their field vectors as "currents of local gauge symmetry".

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See: *Science* vol. 337 3 Aug., 2012 pp. 536 - 547: special section on black holes.