Part I: The Intrinsic Motion of Time, Space, and Gravity

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Part I of this paper is in response to *Scientific American's* Special Issue: A Matter of Time" (Sept. 2002) and the article therein by Paul Davies: "That Mysterious Flow" (page 40-47), in which he claims that the motion of time is an illusion, that time itself does not actually move. In this, as in various other papers (see my website), I advance the contrary premise that space and time both exhibit intrinsic dimensional motions as gauged by the fundamental constants c, T, G (where c is the speed of light, T is the intrinsic motion of time (also gauged by c as the duration (measured by a clock) light requires to travel a given distance in vacuum), and G is the universal gravitational constant). Whereas "c" regulates the metric relationship between space, time, and light (free electromagnetic energy), "G" regulates the entropic relationship between space, time, and mass (bound electromagnetic energy). (See: "A Description of Gravitation".)

When Einstein developed his General Theory of Relativity, he found his gravitational equation implied the Universe of spacetime had intrinsic motion - it must either expand or contract, but it could not stand still. In order to quell this motion and bring his theory in line with the astronomical observations of the day, he "doctored" the equation with his infamous "cosmological constant". In 1929 Edwin Hubble discovered the expansion of the Universe, causing Einstein to withdraw the constant, declaring it to be his "greatest blunder". The expansion of spacetime as implied by the equations of General Relativity and as observed in the "cosmological red shift" remains the best theoretical and observational evidence for the intrinsic dimensional motions of space, time, and gravity. Because c, T, and G are all entropy drives/gauges (as we shall see below), the thermodynamic laws of entropy require the expansion or contraction of the Universe - since entropy must always increase, whether in spatial, temporal, or gravitational form, or some mixture of each. (See: "Spatial vs Temporal Entropy".)

When we observe the cosmological red shift of distant galaxies, we directly observe the expansion and hence the intrinsic dimensional motion of space, time, and history - our own, as well as that of the distant galaxies, since the law of reciprocity tells us that observers on those distant galaxies must see us just as "red-shifted" as we see them. Hence we have direct observational evidence that our own space and time are expanding, although we are generally aware only of the temporal component, the continual recession of time into an ever deepening historical record. It is simply a matter of scale and the gravitational bonds between nearby galaxies that renders the spatial expansion insensible to us, except through the macroscopic view provided by our giant telescopes. Another direct measure of the spatial expansion is provided by the temperature of the Cosmic Background Radiation, currently 2.7 degrees kelvin, and apparently falling. (See: spacetxt"A Spacetime Map of the Universe").

Intrinsic Motion c

The intrinsic motions of light, time, and gravity are the "metabolic life" of the physical Universe, the entropy drives of free and bound energy. (Gravity is the spatial consequence of time's intrinsic motion; time and gravity induce each other endlessly.) "Velocity c" has two components - wavelength and frequency - which represent the spatial and temporal parameters of the metric as established by free electromagnetic energy, or light. Light creates space through its intrinsic motion; light is a 2-dimensional transverse wave, which Einstein discovered has no time dimension and no spatial "x" dimension in its direction of motion. It is the intrinsic motion of light which "sweeps out" a third spatial dimension. In this intrinsic motion a temporal function is implied ("frequency"), and is necessary, at least on a global scale, to regulate (for purposes of energy conservation) the rate of expansion and cooling of the Cosmos, even a Cosmos composed only of light. The intrinsic motion of light can in essence be seen as the consequence of the symmetric, spatial, or "wavelength" component of light "fleeing" the asymmetric, temporal, or "frequency"

component - the phenomenon of light's "intrinsic motion" is therefore explained as a self-motivated flight from an internal asymmetric potential embedded in its own nature: so long as light remains in motion the asymmetric dimension of time - the "dark side" of light - cannot manifest. In this view, the intrinsic motion of light is caused not only by entropy, but also by symmetry conservation - light is conserving its own metric and distributional symmetry by "wavelength" fleeing (and so preventing) the temporal manifestation of asymmetric "frequency". Such are the intimate and intertwined relations between symmetry conservation, entropy, and the 1st and 2nd laws of theromodynamics. (See: "Symmetry Principles of the Unified Field Theory".)

The spatial and temporal components of light (wavelength and frequency), always combine such that their product = c, the "velocity of light". The spatial or wavelength component is *explicit* in free energy, whereas the temporal or frequency component is *implicit* or hidden. This situation is reversed in the bound form of electromagnetic energy (matter, mass): in matter, time ("frequency") is explicit and space ("wavelength") is implicit. The dimensional "seeds" or metric potentials of space and time are both contained in the primordial energy form of the Universe, light, manifesting as the entropy drives of their respective energy forms, and creating their respective dimensional conservation domains. (See: "Gravity Diagram No. 2".)

Entropy

The electromagnetic constant c is the gauge of light's metric and distributional symmetry, and also gauges light's entropy drive. The intrinsic motion of light vanishes distance and the asymmetric time dimension, governs the metric and distributional symmetry of light, and regulates the rate of spacetime's expansion and cooling. "Velocity T", the intrinsic motion of time, is the analogous temporal entropic drive for matter or bound energy, governing the flow of time, the aging of matter, the rate of information decay, and the expansion of the historic conservation domain of spacetime. History is the temporal analog of space, and the conservation domain of matter's "causal matrix" or historic information network.

The expansion and cooling of space reduces the Universe's capacity for work, hence "velocity c" gauges the entropy drive as well as the metric and distributional symmetry of light and space. The role of entropy is to protect energy conservation by preventing the abuse of energy: entropy forbids the use of the same energy twice to produce the same net work, preventing perpetual motion machines or machines that create net energy. It is only because of entropy that we can use energy at all; entropy allows the simultaneous use, transformation, and conservation of energy. The entropic role of intrinsic motion c is to create a dimension (space) in which energy can be both used and conserved. This is the connection between the 1st and 2nd laws of thermodynamics: the dimensions are entropy domains. This role is accomplished by virtue of the effectively "infinite" velocity of c, which ensures the spatial escape of radiant heat without hope of recovery, as well as the expansion and cooling of the spatial domain. Likewise, the metrically equivalent and one-way "infinite" velocity T ensures the temporal escape of opportunity, and seals the historical domain from any threats to causality (and hence energy conservation) via "time machine".

"Infinite" velocity c seals the dimensional boundary of space by preventing any tampering with causality via fast spaceship, providing a non-local gauge for the metric symmetry of spacetime. A non-local gauge of "infinite" velocity is required to protect energy conservation by ensuring the homogeneity (symmetry) of inertial metric forces (irrespective of universal expansion), and the prevention of uncentered "rogue" gravitational fields. The barriers to space and time travel imposed by c and T are absolute, because to exceed them would be to leave the dimensional conservation domains of free and bound electromagnetic energy. In a similar fashion, and for the same reasons, gravity, the entropy conversion gauge, seals the borders of spacetime via the "event horizon" and central singularity of black holes (where gravity takes over the metric regulatory functions of both c and t). The dimensions of spacetime are entropy/conservation domains created and defended by the intrinsic motions (entropy drives) of free and bound electromagnetic energy, c, T, and G. (See: "The Tetrahedron Model".)

The intrinsic motion of light, velocity c, is the crucial energetic constant of electromagnetic energy and our Universe. As Einstein discovered in his Special Theory of Relativity, even the constancy of space and time is less important to nature than the constancy of this energy gauge, the dimensions themselves combining in relative motion in such a way that the constant value of c is ensured, energy and symmetry are conserved, and causality is established and protected. ("Lorentz Invariance", the covariance of space and time in Special and General Relativity, also seen as "local gauge symmetry" effects or "currents" associated with relative motion and gravitational fields, protecting the invariance of causality, the "Interval", charge, and "velocity c".)

Intrinsic Motion T (Time)
(See: "The Time Train")

"Velocity T", the intrinsic motion of time, is the entropic drive/gauge for matter or bound energy, the analog of (and derived from) "velocity c" for light or free energy. Like c, T is also an effectively infinite velocity, but it is produced at right angles to all three spatial dimensions, and hence only its constantly vanishing present moment is visible; we cannot see our own accumulating history. Just as Moses was denied a vision of the fullness of God's Glory, so we see only the "hinder parts" of time as it vanishes from space. We cannot see our own accumulating history, although the continuity of our lives and the influences we receive from our past are the evidence that yesterday remains real despite our inability to see it. Of course, we do see it through our telescopes - but these are views of other people's pasts, not our own; our past is, by the law of reciprocity, visible to those whose pasts we see (we can actually see (part of) our own past in a mirror). As stated earlier, this is direct evidence of the continuing reality of our past; if yesterday were not real, the link to our birth would be broken, and we would cease to exist today.

The "infinite velocity" of T is linked to and derived from c; one second of duration is defined as the clock time required by light to travel 300,000 kms in vacuum. Time has intrinsic motion because light has intrinsic motion. The "infinite" velocity of T is metrically equivalent to velocity c ("time flies"), and serves the analogous function with respect to entropy (energy as well as opportunity escapes in time), and with respect to causality and energy conservation. The one-way character of time is the crucial evidence for these related roles. For example, a fast spaceship can carry us into Earth's future, but not into Earth's past. The flexibility of the temporal dimension in its interactions with space, necessary to preserve causality, the "Interval", and the constant value of c, is limited to one direction only. (See: "The Paradox of the Traveling Twins" and: "The Time Train".)

Gravity - Static vs Dynamic Models

Due to Einstein's "Principle of Equivalence", it is possible to view gravity as either a static or dynamic field. In the static view, the field is seen as a "warpage" of the spacetime metric, a "curvature" of spacetime; in the dynamic view, gravity is seen as the actual flow or infall of spacetime. Either view is valid in terms of the equations of General Relativity, according to Einstein's "Principle of Equivalence" of the forces of gravitation and acceleration. This principle simply recognizes the reciprocal equivalence of the inertial forces associated with a mechanical acceleration of one "g" (32 ft/sec/sec) through spacetime (as experienced, for example, in a rocket ship), vs the gravitational "weight" associated with spacetime accelerating through us (as experienced standing on Earth's surface). This is the reason given to explain the fact that all (local, proximal) objects fall with the same acceleration in a gravitational field (all falling objects are at rest with respect to each other because all are carried along together as co-movers with the flow of accelerating spacetime). (See: "Extending Einstein's Equivalence Principle".)

While either view may be mathematically equivalent, the dynamic view is, in my opinion, far more interesting and heuristic. The dynamic view leads us first to the notion that infalling symmetric space is self-annihilating at the center of gravitational mass (whether atom or planet): +x annihilates -x, +y

annihilates -y, +z annihilates -z, leaving a residue of +t (time) which cannot annihilate since there is no -t (because time is asymmetric, one-way only). This +t is of course the metric equivalent of the space annihilated. Time remains as a residue because, as Einstein (and Minkowski) has shown, in our Universe space and time are one entity, spacetime, and one cannot be isolated from the other (again, frequency x wavelength = c, the intrinsic motion of light creating spacetime). This time residue has its own intrinsic motion and moves off at right angles to all three spatial dimensions, which, in effect, causes the one-dimensional time line to disappear from space into history. (See: "The Conversion of Space to Time".) The gravitational (or quantum mechanical) annihilation of space simply reveals or exposes the embedded *implicit* temporal component of the entropy drive of light and space; this same temporal component then becomes the *explicit* entropy drive for bound energy's historical conservation domain.

Secondly, the dynamic view leads us to the recognition that the gravitational flow of infalling space is caused by the intrinsic motion of time itself - it is the motion of bound energy's time dimension that is the mysterious source of gravitational motion or "attraction". When the time dimension exits space at right angles, it drags the spatial dimensions along with it. Again, this linkage between space and time is the intertwined nature of spacetime discovered by Einstein - if time moves, space must follow. (The recent experimental observation of "frame dragging" by the rotating gravitational fields of planets and stars is further confirmation of this linkage.) (See: "Entropy, Gravitation, and Thermodynamics".)

Time is one-way and one-dimensional. We can think of the timeline exiting space at right angles to all three spatial dimensions to produce the historic temporal domain; the increase in the age or expansion of this historic temporal domain is the analog of the expansion of space. Because time is linked equally to all three spatial dimensions, but time itself is one-dimensional, the motion of time forces all three spatial dimensions to "squeeze down" into the point-like beginning of the time line at the gravitational center of mass of any material object - be it atom or planet - rather like water exiting a bathtub down the drain line. It is this constant motion of the time line dragging space after it which causes the accelerated, converging infall of space to the enter of Earth (for example) that we recognize as a gravitational field, explaining in one simple mechanism both the dimensional character of gravitation and its spherical, accelerated dynamic (the application of a constant force - the intrinsic motion of time - produces the spatial acceleration). (See: "A Description of Gravitation".)

On the energy conservation premise that the surface of a sphere surrounding a gravitational center of mass must contain the same total gravitational energy whether that sphere expands or contracts (much as a balloon contains the same amount of rubber whether inflated or deflated), we see that the gravitational energy in such a concentric surface must be concentrated or diluted proportionally to the square of the sphere's radius. The radius is the only variable in Archimedes' formula for the surface area of a sphere (4pirr), leading to Newton's gravitational force law (F = GMm/rr). Einstein's modification of Newton's law depends on his realization that gravity affects time as well as space, or in other words, the relevant geometry is 4-dimensional rather than 3-dimensional.

In fact, gravity and time induce each other, for as time drags space into the point-like beginning of the time line, space must self-annihilate to "squeeze in", which "strips off" a (metrically equivalent) temporal residue; this residue moves on down the time line dragging more space after it, and so on. Hence once set in motion (as by the gravitational annihilation of space, or the quantum mechanical collapse of an electromagnetic wave), time is self-perpetuating, creating history, just as a light ray also propagates itself indefinitely, creating space. In the case of light, space is "pushed" by time; in the case of gravity, space is "pulled" by time. (See: The Gravity Diagrams #1 and #2.)

Spacetime

When we look at the Andromeda galaxy, we see it as it was 2.2 million years ago - the light from

Andromeda having required that long to reach Earth. We see Andromeda's past, just as they see our past, proving the continuing reality of the temporal dimension. But if we ask ourselves where Andromeda is situated "now", we realize there is an historical gap, into which we cannot see, of 2.2 million years between us and Andromeda. This history has already been formed and is quite real, but it is invisible and will only be revealed to us, second by second, over the next 2.2 million years. This gap is the dark "place" where time goes when it exits 3-dimensional space. This place is "historic spacetime", and is quite visible (in part) to other favorably situated observers, just as we are able to see moments in the past of other distant stars and galaxies.

Andromeda's past is revealed to us in perfect sequential order on the wings of light; this is the intrinsic motion of Andromeda's time line that we watch unfolding from our distant perspective. It is a curious thought that if Andromeda were a mirror rather than a galaxy, we could watch the motion of our own time line, as it unfolded second by second, 4.4 million years in our past! (See: "A Spacetime Map of the Universe".)

Part II. The Conservation Role of Time and Gravitation

In part I we have cited the evidence for the "intrinsic" and entropic motion of the time dimension, and speculated upon the mechanism of gravitation - gravitation is the spatial consequence of (and hence the evidence for) the intrinsic motion of time. But what is the conservation role of time and gravitation? Why do they and must they exist? Fundamentally, gravitation exists as a form of negative metric energy necessary to balance the positive energy of mass/matter or bound forms of electromagnetic energy. This balance is required to allow the creation of matter from zero net energy during the "Big Bang", the "Creation Event" of the Cosmos. As for time, bound energy (matter, mass) requires a time dimension to establish and protect causality as well as for simple energy conservation, as in the conservation of momentum, which depends upon velocity and hence upon an explicit time dimension. Even free energy (massless light) requires at least an implicit time dimension to regulate the inertial and symmetric properties of the metric (otherwise every photon could have its own unique velocity), and the energy conservation of the expanding and cooling spatial domain (the rate of expansion and cooling must be regulated). The simple mechanical, thermal, or kinetic necessity for a time dimension and temporal metric is not difficult to discover from the perspective of energy conservation for either bound or free energy. But there is a somewhat subtler conservation reason as well, from the perspective of the 2nd law of thermodynamics, involving the fertile concept of entropy.

Entropy (again)

(See: "The Conversion of Space to Time")

Thermal entropy is expressed as the reduction in the capacity for work by any isolated system over time; entropy prevents the abuse of energy by forbidding the use of the same energy twice to produce the same net work. Essentially, entropy allows us to use energy because it prevents us from abusing it - and by abuse I mean non-conservation. Entropy allows the simultaneous use, transformation, and conservation of energy. Without entropy, we would not be able to use energy at all - the 1st law of thermodynamics, energy conservation, would forbid it. In the case of free energy, this entropy drive is realized as the intrinsic motion of light gauged by "velocity c". The intrinsic motion of light creates space and causes the expansion and cooling of the Universe.

The "work done" at the beginning of the Universe is the creation of asymmetric matter from symmetric light; never again will the Universe be hot enough to create (baryonic) matter. Gravity is the entropy-energy "interest" on the local symmetry debt of mass, creating the time dimension (from space) in which the symmetry debt is maintained and held (charge conservation) until it can be paid by reconverting mass to light - all as required by Noether's Theorem. The cooling of spacetime is caused by its expansion, which is

gauged by velocity c. Both the entropy drive and the "non-local" symmetric energy state of light is gauged by "velocity c". It is the function of entropy to create a dimensional conservation domain for its energy type in which that energy can be used, transformed, and conserved simultaneously. This is the fundamental connection between entropy and the conservation of energy, and it is true for negative as well as positive forms of entropy. Gravity (negative spatial entropy, "velocity G") creates time and spacetime; time (positive temporal entropy, "velocity T") creates history; light (positive spatial entropy, "velocity c") creates space.

One of gravity's several conservation roles is to convert the spatial entropy drive of free energy (light's intrinsic motion) to the historical entropy drive of bound energy (time's intrinsic motion) - when light is converted to matter, or free energy is by any means converted to bound energy. The consequent gravitational deceleration of light's 3-dimensional cosmic spatial domain provides the energy to produce matter's 4th temporal dimension. In its symmetry conservation role, gravity reverses the reaction above, converting matter and matter's time dimension to light and light's spatial dimensions (as in stars, quasars, and Hawking's "quantum radiance" of black holes). The gravitational conversion of space and the spatial entropy drive of free energy (the intrinsic motion of light) (S) to time and the historical entropy drive of bound energy (the intrinsic motion of time) (T) can be represented in a "concept equation" as:

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

Entropy is always associated with an intrinsic dimensional motion. In the case of c and T, these velocities are effectively infinite; in the case of G, it drives toward a "lowest energy" state of total temporal entropy which is also effectively infinite, the "event horizon" of a black hole, where g = c and local time appears to stand still, because time is being replaced by space as fast as time moves away into history. The event horizon of a black hole is simply a time surface displacing space somewhat (not exactly) as a ship displaces water. The hole is "black" not only because of the intense gravity, but also because there is no space there, and we cannot see into the time dimension. The Bekenstein-Hawking theorem relates the entropy of a black hole to its surface area. The black hole is the physical demonstration of the notion presented here, especially regarding the gravitational conversion of space and the intrinsic motion of light to the intrinsic motion of time and history. These ideas also find support in the formalism of the Bekenstein-Hawking theorem, and in the symmetry-conserving reactions of Hawking's "quantum radiance" of black holes. (See: "A Description of Gravity".)

Free and Bound Electromagnetic Energy

Our Universe is composed of two types of electromagnetic energy, free (light) and bound (matter). These types are interchangeable - matter is created from light in the Big Bang (via weak force symmetry-breaking), and light is created from matter in nucleosynthesis, proton decay, Hawking's "quantum radiance" of black holes, and matter-antimatter annihilations. Matter is simply an asymmetric particle form of light, essentially 1/2 of light's complete (symmetric) particle-antiparticle form. Einstein related the two forms energetically through his famous E = mcc. Later, DeBroglie combined Planck's expression for the energy content of light with Einstein's expression for the energy content of matter: hν = mcc (where h = Planck's constant and ν = frequency). In any case, it is to be noted carefully that these expressions are only raw energy relations; they don't mean that light and matter are the same thing. As everyone knows, light and bowling balls have very different properties and behaviors; specifically, they differ in respect to dimensionality, from which flows a host of consequences. Among these consequences are the charges of matter, which all represent symmetry debts of the light from which matter was originally created. Hence also light has intrinsic motion in space but not in time, while matter has no (net) intrinsic spatial motion, but its time dimension moves instead. Among these differences is the fact that while bowling balls produce a gravitational field, light does not - despite the "establishment's" belief to the contrary . (See: "Dark Energy: Does Light Produce a Gravitational Field?") (For a broader discussion of the consequences of converting

dimensionally symmetric light into dimensionally asymmetric matter, see: "Symmetry Principles of the Unified Field Theory").

Noether's Theorem

"Noether's Theorem" states that the symmetries of a multicomponent field (such as the electromagnetic field of light, or the metric field of spacetime) must be protected by conservation laws: the great theorem manifests as charge conservation in the particle realm and the inertial and gravitational forces of the metric in the dimensional realm. *The charges of matter are the symmetry debts of light*. This notion applies also to gravity, but note that it would appear to apply to gravity both as a charge of matter (the "location" charge of light's broken "non-local" distributional symmetry), and to gravity as an inertial or dimensionally active force, "warping" the spacetime metric. Both effects are due to the change from implicit time in free energy to explicit time in bound energy. Time is the active, entropic, asymmetric principle of gravity's "location" charge. See: "The Double Conservation Role of Gravity".

Einstein's Interval

Einstein discovered that space and time covary, flexibly transforming into one another ("Lorentz Invariance"), producing the composite dimensional conservation domain of spacetime, but he also discovered the truly invariant element or unit of spacetime - the "Interval". The Interval is the invariant unit of spacetime that all observers, regardless of their relative motions, will agree upon, in both Special and General Relativity. The Interval of light = zero, which is Einstein's formal statement of light's dimensional symmetry condition (light's "non-local" character); this establishes velocity c as the electromagnetic gauge of metric symmetry. All massive objects (matter) have positive "Intervals" greater than zero (because they have both time and distance dimensions). Einstein's invariant Interval is necessary to rescue causality from the shifting dimensional perspectives of Einstein's relativity. See: "The Paradox of the Traveling Twin".

A fundamental consequence of light's zero "Interval" is the fact that light carries no charges, including no gravitational charges: light does not produce a gravitational field, despite "establishment" statements to the contrary. Light's "zero Interval" is light's dimensionally distinguishing feature (which results from light's lack of a time and a "x" spatial dimension - "distance" or the direction of propagation). The "zero Interval" means that light is "non-local"; a free photon must be considered to be everywhere in the Cosmos simultaneously. Being non-local, light cannot provide a defined center for a gravitational field; an uncentered gravitational field violates energy conservation, so light cannot produce one. (See: "Does Light Produce a Gravitational Field?") However, if light is absorbed by an atom, then light's energy becomes bound, light loses its intrinsic motion c, light loses its zero Interval, and light loses its non-local character: then (and only then) the energy of the absorbed and localized photon contributes to the gravitational field of the atom. (If every type of energy had a gravitational field, gravity would have no conservation role, the Big Bang would be snuffed out immediately in a black hole, and free and bound electromagnetic energy would lose their most fundamental distinction). (See: "Entropy, Gravitation, and Thermodynamics").

The "Location" Charge of Gravitation

As a symmetry debt of light, the gravitational "location" charge is in response to the breaking of the "non-local" distributional symmetry of light's energy when free energy is converted to bound energy. Moving at velocity c, the electromagnetic gauge of metric symmetry, light's energy is non-local, and (within light's own reference frame) enjoys a symmetric distribution of its energy - everywhere simultaneously within spacetime. Light loses this distributional symmetry when it is converted to or absorbed by matter, since in bound form light loses its intrinsic motion c and its "non-local" character. The "zero Interval" of light then becomes the positive nonzero Interval of matter and bound energy. Matter is a highly localized, hence asymmetric, concentration of immobile (mass) energy.

The active principle of gravity's "location charge" is time; time fixes the location of matter in spacetime, adding the final 4th dimensional specification to matter's very local positive Interval. Light is spatial: non-local, atemporal, and acausal; matter is historic: local, temporal, and causal. Light is connected by space; matter is connected by time. Matter acquires a time dimension by the collapse of an electromagnetic wave during either particle creation or during the simple absorption of light by atomic matter (see: "Gravity Diagram No. 2"). An electromagnetic wave carries an implicit temporal component ("frequency"), which becomes explicit upon collapse (see: "The Conversion of Space to Time"). But time, uniquely among the charges of matter, is an "entropic" charge; time has intrinsic dimensional motion. As soon as this charge becomes explicit, its intrinsic motion produces the spatial flow of a gravitational field, in the self-perpetuating mechanism described earlier. The interesting fact here is that the collapse of light's wave produces a local symmetry debt which is in the form of an entropic charge, so that while c gauges both the non-local metric and distributional symmetry, and the entropy drive of light, gravity's "location" charge functions as both a symmetry and an entropy debt of light. (See: "The Double Conservation Role of Gravitation".) The magnitude of G is determined by the small energy difference between the symmetric spatial entropy drive (S) of free energy (the intrinsic motion of light as gauged by "velocity c"), and the asymmetric temporal entropy drive (T) of bound energy (the intrinsic motion of time as gauged by "velocity T"):

$$S - T = -G$$

Viewed from another perspective, both free and bound electromagnetic energy require an entropy drive and gauge, and these gauges must be metrically and energetically equilibrated if light and matter are to interact and coexist in their joint dimensional conservation domain of spacetime. The gravitational extraction of time from space ensures the metric and energetic equivalence of these drives and gauges. "G" is the gauge of the entropic relationship between space, time, and bound energy, regulating the conversion of space and the drive of spatial entropy to time and the drive of historical entropy, in a fixed proportion per given mass (Gm). Again, the electromagnetic analogy of wavelength and frequency is helpful; to strip the frequency from a light wave is to ensure it is the electromagnetic equivalent of the wavelength. Thus, because velocity c unites space and time as a universal constant (one second of time is metrically equivalent to 300,000 kms of space), the intrinsic motion of time, by dragging space after it, will ensure that each time unit replaces itself with an exact copy, a copy that is the metric equivalent of the space annihilated. This is another example why the invariance of c is so important. (See also: "Proton Decay and the "Heat Death" of the Cosmos".)

The Conservation of Light's Entropy

Because of the dual character of c, gauging both the metric and distributional symmetry of light as well as light's entropy drive, conservation of the entropy drive of free energy is brought under the formal mantle of Noether's theorem, for by conserving the non-local metric and distributional symmetry of light via the "location" charge, gravity automatically also conserves the entropy drive of light, converting the intrinsic spatial motion of light into the intrinsic historical motion of matter's time dimension. Noether's theorem therefore requires the conservation of light's entropy drive as well as light's metric and distributional symmetry. Hence we see both velocity c and gravity in two gauge/conservation roles, symmetry and entropy. In the case of light this manifests as charge conservation, the inertial forces of the metric, and the expansion and cooling of the Cosmos through the creation of space by light's intrinsic motion; in the case of gravitation, the result is the conversion of matter to light, the "warping" of the metric, and the contraction of the Cosmos by the conversion of space to time. In the gravitational conversion of mass to light, begun in stars (via the nucleosynthetic pathway), quasars (via the direct conversion of gravitational energy to light), and finished in black holes (via Hawking's "Quantum Radiance"), we see gravity completely and simultaneously repaying the entropy and symmetry debts of light, debts incurred during the conversion of free to bound energy. Hawking's "quantum radiance" demonstrates that even the symmetry of entropy is

conserved: the evaporation of black holes is driven by symmetry conservation. (See: "A Description of Gravitation"; see also: "The Intrinsic Motions of Matter".)

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Gravity Diagrams

- A New Gravity Diagram
- The Gravity Diagram
- The Three Entropies: Intrinsic Motions of Gravity, Time, and Light

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