The Double Conservation Role of Gravity: Entropy vs Symmetry

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Note to Readers Concerning "Entropy":
See: "Spatial vs Temporal Entropy"

Abstract

Gravity has two conservation roles in nature:
1) Conserving light's spatial entropy drive (light's intrinsic motion), which is accomplished by the gravitational conversion of space to time (see: "The Conversion of Space to Time").
2) Conserving the non-local distributional symmetry of light's energy, which is accomplished by the gravitational conversion of bound to free energy in stars (partially), and completely in Hawking's "quantum radiance" of black holes (see: "Extending Einstein's "Equivalence Principle").

This double role is consequent upon Noether's Theorem and the double gauge role of "velocity c", which simultaneously regulates the entropy drive of free energy (the intrinsic spatial motion of light), and the non-local distributional symmetry of light's energy (vanishing time and the x spatial dimension). The entropy conservation role operates at all gravitational energy levels, while the symmetry conservation role requires an energetic threshold before nuclear fusion can begin.

Noether's Theorem requires the conservation of light's various symmetries: *the charges of matter are the symmetry debts of light*. Charge conservation = symmetry conservation. All massive, immobile particles (bound electromagnetic energy) bear a gravitational "location" charge which records the non-local distributional, metric, and entropic symmetry debt of the freely moving light (free electromagnetic energy) which created them. (See: "The Connection Between Gravitation, Time, Entropy, and Symmetry".)

At all energies, gravity pays the entropy-interest on the symmetry debt of matter by converting space to time, thus providing an alternative entropic domain in which charge conservation can have historical meaning. At high energy levels (as in stars), gravity also begins to pay the "principle" on matter's symmetry debt, converting bound to free energy. The universal spatial expansion is reduced by the initial entropic conversion, as space is converted to time; the original expansion is restored, however, when mass is converted to light, reducing the total gravitational field energy and producing the impression of an "accelerating" universe. "Dark energy" is therefore the reduction of the cosmic gravitational field by the conversion of bound to free energy in stars or by any symmetry conservation/restoration process (which may also be operating in "dark matter").

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Introduction

The charges of matter are the symmetry debts of light (Noether's Theorem) (see: " Symmetry Principles of the Unified Field Theory"), but unlike the other charges and their forces, gravity and its "location" charge carries both a symmetry and an entropy debt of light. This double debt accounts for most of the mystery surrounding the role and activity of gravitation. Both debts are paid simultaneously by the conversion of mass to light, as in our Sun, the stars, and Hawking's "quantum radiance" of black holes.

The origin of gravity's double conservation role stems from two conservation roles of the electromagnetic constant, c, which, among other regulatory functions, gauges both the "non-local" spatial distributional symmetry of light, and the spatial entropy drive of light (the intrinsic motion of light). The intrinsic motion of light creates, expands, and cools space (entropy role), while also establishing light's "non-local" energy state, including the symmetric distribution of light's energy throughout space, the latter accomplished by the vanishing of time and distance (x, t) (symmetry role). As Einstein discovered, clocks stop and meter sticks shrink to nothing at velocity c - light is a 2-dimensional transverse wave. Light's intrinsic motion (entropy drive) sweeps out a 3rd spatial dimension.

When free energy is transformed into bound energy, gravity records the symmetry (and entropy) loss of light's intrinsic motion and non-local distribution (via gravity's "location" charge) - as required by Noether's Theorem. The active, entropic principle of gravity's "location" charge is time, a charge with intrinsic dimensional motion.

"Velocity c" also acts as the gauge of metric symmetry and equivalency, establishing the metric relationship within and between the dimensions (one second of temporal duration is metrically equivalent to 300,000 kilometers of linear distance). Furthermore, c acts as the gauge of the energetic equivalency between free and bound energy: $E = h\nu$ (Planck), $E = mcc$ (Einstein), $h\nu = mcc$ (deBroglie). Finally, c is the gauge of causality, the "Interval", and the transmission of information.

The linkage between "causality" and "locality" is crucial to any understanding of the basis for gravitation. Gravity's time charge is required by energy conservation because immobile mass-matter is "local and causal": not only does matter require time to service its variable energy accounts of local relative motion, but matter requires temporal linkages between all events to maintain the order of cause and effect ("causal chains" - "karma"). Time identifies the 4-dimensional location of matter, setting in motion the gravitational field or collapse of space, which energetically and metrically (dimensionally) reveals the spacetime position, quantity, and density of bound energy (symmetry role). Time endlessly renews itself from the temporal residue of the annihilated space, creating matter's historical entropy drive and historic spacetime, the conservation domain of matter's causal information web or "matrix" (entropy role). (See: "The Conversion of Space to Time".) Light requires no temporal dimension because being non-local, light is also acausal. Because the temporal entropy drive is also part of energy conservation and causality, we have to acknowledge four conservation roles for gravitation: energy, entropy, causality, and symmetry. (See: "The Tetrahedron Model".)

The intrinsic, entropic motion of the time charge causes the gravitational field, which eventually collects enough matter (as in stars) to initiate nucleosynthesis and begin converting mass back to light, repaying simultaneously both the entropy and symmetry debt of light's lost "non-local" energy state. This double conservation role of gravity is not evident on Earth, where gravity only creates our planet's time dimension (entropy, causality, and energy conservation), having not yet accumulated enough matter in Earth to ignite the nuclear fires and initiate symmetry conservation. Entropy, energy, and causality conservation is gravity's primary role; symmetry conservation is gravity's secondary, but ultimate role. (See: "Entropy, Gravity, and Thermodynamics".)

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. This reciprocal gravitational action is possible simultaneously only because the first reaction is purely metric (entropy conservation) while the second involves particles (symmetry conservation). They 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. (See: "A Description of Gravitation".)

One of the more confusing aspects of gravitation is that it appears to be playing different roles at different energy levels - it manifests in different ways at different scales of phenomena. Let us examine these roles - as best we can - in sequence, beginning with the smallest.

Part I: A Hierarchy of Gravitational Effects

A) (atoms) At the microscopic or quantum-mechanical level, we have the initial (non-gravitational) production of time from space as a consequence of the collapse of a free electromagnetic wave to a bound energy form. "Frequency" multiplied by "wavelength" = c, the electromagnetic constant, the "velocity of light". Even though light has no time or distance dimension (x, t), both time ("frequency") and space ("wavelength") are implicitly present in the formulation or composition of an electromagnetic wave (light). The wave itself contains an implicit temporal element expressed as "frequency", which switches to an explicit condition when the wave collapses, revealing the entropic time "charge" of bound energy. The collapse is a transition from the spatial, "wavelength", and symmetric expression of free energy to the temporal, "frequency", and asymmetric expression of bound energy; a transition from the intrinsic motion (c) of light in which "wavelength" is explicit, to the intrinsic motion (T) of matter's time dimension in which "frequency" is explicit. This is a transition from 2 to 4 dimensions, a transition from non-local, atemporal, acausal light to local, temporal, causal, matter. The electromagnetic entropy "coin" flips from implicit time and explicit space ("velocity c"), to explicit time and implicit space ("velocity T"). (See: "The Conversion of Space to Time" and "Gravity Diagram No. 2".) This is a transition between the entropy gauges, coefficients, or drives (c and T) associated with the free and bound forms of electromagnetic energy, and the dimensional conservation domains created by their intrinsic motions (space vs history).

The capacity of electromagnetic energy to have both a free and bound expression in light and matter is also reflected in the dual nature of spacetime and its spatial vs historical entropy drives. Light, matter, space, and time are all creations of electromagnetic and gravitational energy.

Intrinsic *dimensional* motion is entropic motion (whether positive as in expanding space and aging history, or negative as in collapsing gravitational fields). The dimensions of spacetime are entropy domains, where both free and bound forms of electromagnetic energy can exist and be simultaneously used and transformed, but nevertheless conserved.

The magnitude of G (the universal gravitational constant) is determined by the small energy difference between the symmetric spatial entropy drive (S) of light (the intrinsic motion of light as gauged by "velocity c"), and the asymmetric historical entropy drive (T) of matter (the intrinsic motion of matter's time dimension, as gauged by "velocity T"):

$$S - T = -G.$$

It takes energy to create a one-way temporal entropy drive from an "all-way" spatial entropy drive, because an asymmetric, one-way temporal order must be imposed upon the symmetric, random spatial expansion. This entropy-energy cost of time is the origin of the "negative energy" characteristic of gravity and the negative sign of "-G". This cost is subtracted from the expansive entropy-energy of the Universe (via the gravitational annihilation of space), causing a deceleration of the spatial expansion of the Cosmos. (See: "Entropy, Gravitation, and Thermodynamics".)

The intrinsic motion of light is actually due to the hidden or implicit presence of time. Time is an embedded property of the electromagnetic wave, implicit in "frequency", just as space is implicit in "wavelength". Wavelength multiplied by frequency = c: the intrinsic motion/velocity of light. But what is the source of light's "intrinsic" (self-motivated) motion? Symmetry conservation is ultimately responsible for the intrinsic motion of light, which is caused by wavelength "fleeing" frequency, which however, is an asymmetric aspect of light's own nature, the classic "bur under the saddle". The symmetric aspect of the wave ("wavelength" - space) is actually fleeing the asymmetric aspect embedded in the same wave ("frequency" - time). Only by constant motion at velocity c can light suppress the embedded asymmetric element of time. Intrinsic velocity c is just a symmetry condition (or "gauge", regulator) of free energy, maintaining light's non-local, atemporal, and acausal symmetric energy state. In the intrinsic motion of light we glimpse the seamless intertwining of four fundamental physical principles: energy conservation, symmetry conservation, entropy, causality. (See: "The Tetrahedron Model".)

When light stops moving and becomes bound energy, its non-local spatio-temporal symmetry is lost; time becomes explicit because bound energy, being local, requires the time dimension to establish and maintain its causal and relative energetic relations for reasons of energy conservation mentioned above. Causality requires time to be one-way; entropy requires time, like light, to move with an effectively infinite velocity. Symmetry conservation requires the gravitational response to matter, the undistributed lump of immobile, bound energy, the consequence of light's lost "non-local" distributional and metric symmetry. The gravitational extraction of time from space ensures that the intrinsic motions of light and time are entropic as well as metric equivalents, allowing light and matter to interact freely within their shared dimensional conservation domain of spacetime. (See: "A Description of Gravitation".)

B) (planets) At the energy level or scale of planet Earth, gravity is in its entropic, causal, and energy conservation role only, creating the Earth's time dimension and causally linking our expanding historic domain with the rest of cosmic spacetime. Time is fully incorporated into and linked with ordinary space because it is created directly from space. The historic domain (the past), remains linked to the present by causality, and by the gravitational linkage between space and time. Spacetime is visible in our great telescopes as we look out to distant galaxies and see their historic past unfold before us - just as they see our past unrolling before them. The intrinsic motion or expansive entropic drive of light is also visible as the cosmological "redshift" of the distant galaxies and expanding spacetime. Light is connected by space, matter is connected by time; gravity connects space and light with time and matter, converting the spatial entropy drive of light's intrinsic motion to the historic entropy drive of matter's time dimension - and vice-versa. (See: "A Spacetime Map of the Universe".)

C) (stars) At the energy level or scale of the stars, the symmetry conservation role of gravity comes into play, simultaneously with its entropic, temporal role. At the stellar level, gravity lights the thermonuclear

fires of the nucleosynthetic pathway and begins converting mass to light, bound energy to free energy. Here for the first time we see that gravity is doing more than creating time and the historic domain; gravity is also conserving symmetry, in particular, the non-local symmetric energy state of light. The only way to get rid of gravity is to convert mass to light - since light (having no time dimension) has no gravitational field. The gravitational field of the Sun is reduced as gravity converts the Sun's mass into free energy, which is radiated away into space. (See: "'Dark Energy': Does Light Produce a Gravitational Field"?)

From this we see directly that symmetry conservation is actually the ultimate "goal" of gravity, since gravity will not vanish until it fulfills this role; similarly, we can say that symmetry conservation is also the most fundamental role of entropic time, since time vanishes when bound energy and gravity vanish. *A gravitational field is the spatial consequence of the intrinsic motion of time.*

Einstein thought that "gravity gravitates" (the energy content of a gravitational field produces more gravity). Since a gravitational field is caused by the intrinsic motion of time, and time is also the active principle of gravity's "location" charge, while the "graviton" is a quantum unit of time, we can understand the basis for this notion. Be that as it may, the same consideration does not apply to light, which has no time dimension. Light has no mass and produces no gravitational field (when traveling freely in "vacuum" or spacetime) - contrary to the views of the "establishment". Being a non-local energy form, light cannot provide a spacetime center for a gravitational field, and an uncentered gravitational field is a violation of energy conservation.

We note the sequence: symmetry conservation (manifesting through the intrinsic motion of light - and the electrical annihilation of virtual particle-antiparticle pairs) maintains the non-local, atemporal, and acausal nature of free energy. Symmetry-breaking converts free energy into immobile, bound energy. Due to the requirements of energy conservation and entropy, as well as the causal requirements of bound energy, and due to the local, asymmetric distribution of mass in spacetime - energy, entropy, causality, and symmetry conservation all demand that the time dimension (always implicitly present in space) must become explicit. This conservation demand is satisfied by "flipping" the electromagnetic entropy "coin" (wave vs particle), transforming time from its implicit to its explicit expression (see: "Gravity Diagram No. 2"). The explicit, intrinsic motion of time brings gravity into being; through the gravitational annihilation of space, time maintains itself and creates the causal linkage of the present to the cosmic domain of historic spacetime. Gravity conserves symmetry by returning bound energy to free energy (as in the stars, quasars, and the "quantum radiance" of black holes), completing the circle of symmetry and entropy conservation. (See: "Currents of Entropy and Symmetry".)

D) (black holes) At the energy level or scale of the black hole, we find space accelerated to velocity c, at the black hole's "event horizon", so that in effect, gravity succeeds in returning bound energy to light's velocity, but in a backhanded way that only Einstein's "Equivalence Principle" could love. Was this gravity's "purpose" from the beginning? We think not, since the field does not vanish at g = c (the black hole does not "swallow" its external gravitational field). Similarly, we expect that proton decay is so common inside the event horizon that black holes are filled with nothing but trapped light, solving the problem of the infinite compressibility of matter at the central "singularity". Even proton decay, however, does not seem to fulfill the original purpose of gravitation, because again the field does not vanish in the case of locally trapped and gravitationally bound light. Nevertheless, with space (and matter) accelerating at velocity c outside the hole, and matter converted to trapped light inside the hole, gravity is tantalizingly close to fulfilling its symmetry conservation goal. Finally, in the phenomenon of Hawking's "quantum radiance", we find the complete fulfillment of all gravity's conservation roles, in which the entire mass of the black hole is converted to free energy and radiated away, vanishing the gravitational field in the process. In this final reaction we also see the conservation of the symmetry of light and of light's entropy - the black hole is pure temporal entropy, but being one-way, temporal entropy has less symmetry than spatial entropy, which is "all-ways". Hence the conservation of the symmetry of light's entropy drive is another rationale for

Hawking's "quantum radiance", the ultimate gravitational expression and fulfillment of Noether's Theorem.

In the quantum radiance of a black hole, we once again find matter-antimatter annihilation reactions responsible for the conversion of the hole's bound energy to light (via virtual particle-antiparticle pairs created near the hole's event horizon by the extreme tidal effects of the intense gravitational field). So it appears that the symmetry conservation goal of gravity is always to form a black hole, because only in this way can matter finally be brought together with, and be annihilated by, antimatter. Another way to view "quantum radiance" is as the direct conversion of the negative energy and entropy drive of gravity into the positive energy and entropy drive of light. When g = c, temporal entropy begins to vitiate bound energy, just as spatial entropy enervates free energy.

The question posed to the Cosmos after the Big Bang is precisely this: how can the asymmetric residue of matter be returned to the symmetric energy state of light in the absence of antimatter? Gravity has the answer to this question in the "quantum radiance" of black holes, and the gravitational creation and capture of matter-antimatter particle pairs directly from the spacetime metric itself - which is perhaps how they were originally created during the "Big Bang".

The planets and stars are just way-stations along gravity's journey toward the black hole, the gravitational creation of antimatter, and "quantum radiance". We also see in the final annihilation, as in the initial creation, that spacetime plus energy is the source of particles. It seems, therefore, that in the black hole, gravity is simply returning the material system to some sort of initial symmetry state to recover the original source of antimatter. This is actually similar to the strategy employed by the weak force IVBs when (by means of their great mass) they recapitulate the energy density of the Electroweak Era force unification symmetry state of the "Big Bang", in order to accomplish transformations of leptons and baryons (again, by means of particle-antiparticle pairs extracted from the spacetime metric or virtual vacuum "sea"). (See: "The Higgs Boson and the Weak Force IVBs".)

E) (galaxies) At the galactic level we have the mystery of "dark matter", which is evidently necessary to account for the observed gravitational binding with respect to the large rotational velocities of stars in galaxies, and likewise with respect to the rapid movements of galaxies relative to each other. No one knows what this dark matter might be, but it may consist of unknown massive neutrinos (the leptoquark neutrino?), exotic elementary particles (supersymmetry, strings?), or possibly small black holes or other gravitational or "metric" particles originating in the "Big Bang". There may also be something wrong with our understanding of the gravitational field laws at very large scales ("MOND"). "Dark matter" remains a major outstanding mystery in physics, astronomy, and cosmology.

F) (cosmos) At the energy level or scale of the Cosmos, gravity reduces the expansion rate of the Universe, annihilating space, and in the process converting space and the drive of spatial entropy into metric equivalents of time and the drive of historical entropy. Hence the spatial expansion of the Cosmos provides the energy for the expansion of the historic domain of matter. Here we see the mediating role of gravitation as the force which both converts and conserves the primordial drives of entropy in either form and direction. As the stars radiate their mass away, we can expect a small acceleration of the Cosmic expansion over the life of the Universe (if "dark matter" also converts bound to free energy by any process, this effect will be magnified). The "dark energy" or "cosmological constant" driving the "accelerated" cosmic expansion is simply the consequence of billions of years of constantly reducing the total gravitational energy of the Cosmos. On the other hand, if there is enough matter in the Universe, gravity will cause the final collapse of the Cosmos in a "Big Crunch". This will result in a new "Big Bang" when there is no more space left from which to create matter's time dimension, and the gravitational containment of light trapped in a cosmic-mass black hole will fail. Current observational data suggest, however, that the Universe will continue to expand forever. (See: "The Connection Between Inflation and the 'Big Crunch'".)

On the Cosmic scale, the gravitational conversion of space and the drive of spatial entropy (S) (the expansive property of space, originating with light's intrinsic motion) to time and the drive of historical entropy (T) (the expansive property of history, originating with time's intrinsic motion), can be represented by a "concept equation" as:

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

G) (metric vs entropic equivalency of space and time: c vs G) The *metric* equivalency between space, time, and free energy (light) is gauged (regulated in magnitude) by the universal energy constant c; the *entropic* equivalency between space, time, and bound energy (mass) is gauged by G, the universal gravitational constant. The quantity of time (the amount of temporal entropy-energy) allocated per unit mass is gauged by the strength of G. This temporal requirement is satisfied via the gravitational annihilation of space, extracting a time residue which is metrically (and entropically) equivalent to the annihilated space. (See also: "Global vs Local Gauge Symmetry in Gravitation".)

H) (weakness of gravity) Why is gravity so weak? Because mass is connected to its entropic conservation domain of historic spacetime only by the tangential point of the "present moment" (time is at right angles to all three spatial dimensions). Gravity creates only enough time to provide the temporal entropy drive for this point-like tangential connection between matter and its historic conservation domain. The size of this connection for the entire mass-energy of the Earth is approximately the size of a ping-pong ball - the size of a black hole's "event horizon" containing Earth's mass. This point-like contact is necessary to protect charge invariance and the energy content of matter from the vitiating effects of entropy. However, because this gravitational contact point between history and the spatial entropy domain of "velocity c" is slightly greater than zero, there remains a (very small) potential for the direct entropic vitiation of matter by time and "g" - just as the spatial entropy gauge "c" enervates the energy of light. This small potential is actually realized in "proton decay" and Hawking's "quantum radiance" of back holes: diamonds are almost, but not quite, forever. See: "The Half-Life of Proton Decay and the 'Heat Death' of the Cosmos".

I) (entropy vs symmetry) When I refer to the "spatial entropy drive of light", or simply to "spatial entropy", or "light's entropy drive" or "light's entropy": I am referring to the expansive property of space, originating with the intrinsic motion of light, as "gauged" or regulated by "velocity c". The "intrinsic motion" of light (free electromagnetic energy) is the entropy drive of light and of light's expanding conservation domain, space. Space is the creation of light's entropy drive, created by light's intrinsic motion explicitly for the conservation of light's energy (and symmetry) content. This universal spatial entropy drive or expansive property of light, although imperceptible locally, is directly observable in large telescopes as the cosmological "redshift" of distant galaxies. We are, or course, also aware locally of "velocity c" (or at least we think we are). But it is not light itself that gravity is converting to time, but light's intrinsic motion, the entropy drive of light, the principle that causes light to move, the "intrinsic" or self-motivated component of light's motion. As we have seen, this entropic, intrinsic, or self-motivating principle of light's mobile, symmetric, non-local, free energy state is actually implicit time, the same temporal component which becomes explicit when light stops moving and assumes the form of bound energy. It is the same implicit form of time that gravity reveals, lays bare, or exposes in its explicit form via the annihilation of space. The explicit form of time not only produces the entropy drive of matter, but also becomes the active principle of gravity's "location" charge. (See: "Spatial vs Temporal Entropy".) *A gravitational field is the spatial consequence of the intrinsic motion of time*. (See: "The Conversion of Space to Time"; and "Gravity Diagram No. 2".) (See also: "A Description of Gravitation"; and "Entropy, Gravity, and Thermodynamics".)

It is indeed a curious thought that the two great lights in our sky, the Moon and the Sun, which are so nearly equal in apparent size, also serve as examples of the two major conservation modes of gravity, which are so nearly equal in importance. In the Moon, we see (as on planet Earth) only the entropy conservation role of

gravity, the creation of matter's time dimension via the annihilation of a metrically equivalent quantity of space. On the Sun, however, we see (in addition) the symmetry conservation role of gravity, the liberation of free energy from its bondage in mass-matter. The glorious difference between the Moon and Sun is just the difference between an entropy debt passively borne and a symmetry debt actively repaid.

Part II

A) Spontaneous Entropic Processes

In his book "Four Laws That Drive the Universe" (Oxford University Press, 2007), Peter Atkins offers a definition of the 2nd law of thermodynamics (page 62): "In any spontaneous process, the entropy of the universe must increase."

How does this appealingly simple definition accord with our presentation of gravity and time as the ("spontaneous") entropy drives of bound energy (matter)? And especially - does this definition accord with our equation of the gravitational conversion of space to the time dimension of matter?

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

The intrinsic motion of light, the entropy drive of free energy, which motivates the expansion and cooling of the spatial universe, certainly fits this definition; and there can also be no doubt that both time and gravity, which we have classified with light as intrinsic dimensional motions and hence entropy drives, also qualify as "spontaneous" changes. Gravity is characterized in most standard treatments as both negative energy and as a negative entropy drive (associated with bound energy), causing the contraction and heating of the spatial universe in direct opposition to the expansion and cooling caused by the positive energy and entropy drive of light. I have elsewhere characterized time as the positive entropy drive of matter and bound energy generally (see: "Spatial vs Temporal Entropy"). Time is created by gravity through the annihilation of space and the extraction of a metrically equivalent temporal residue.

As for our equation - I will consider 3 examples - atoms and planet Earth, the Sun and stars, and the Cosmos.

In the case of bound energy in the form of atoms up to and including cold planetary-sized bodies such as the Earth (that are spherical but not yet large enough to become stars), we simply find the gravitational conversion of space to time. This is gravity's entropy conservation role but not yet its symmetry conservation role. Earth's gravitational field creates Earth's time dimension. The historical entropy domain so created is metrically equivalent to the spatial entropy domain annihilated by gravitation - or so we hypothesize. The spatial entropy drive of light (light's intrinsic motion) is converted to and conserved as the historical entropy drive of matter (time's intrinsic motion), via the action of gravitation. This conserved attribute of matter is demonstrated by the further action of a gravitational field in the Sun and stars, where bound energy is converted to free energy, and with this energy conversion, the conserved temporal entropy drive of matter is also reconverted to the spatial entropy drive of light. (See: "Entropy, Gravitation, and Thermodynamics".)

On the cosmic scale - the "Big Crunch" returns the Universe to its original configuration as a "singularity" of infinite energy density. In such a completely reversible and isolated system, the total entropy change from beginning to end is zero. Gravity is a universal conservation force which conserves entropy and the non-local symmetric energy state of light at all scales, in both matter and spacetime.

B) The attractive principle of gravitation is one of its great mysteries. The notion of gravity as an agent of negative, temporal, or historical entropy does not help us understand the origins of this force, for in terms

of entropy, the action of gravity seems country to the usual laws of thermodynamics: in gravitational processes, we see a decrease rather than an increase in entropy. While it is true that historical or temporal entropy increases with gravitational action, this is at the expense of an at least (according to our equation) equal amount of spatial entropy, since gravity acts by the annihilation of space, extracting a metrically equivalent temporal residue, and as a consequence causing the contraction and heating of the remainder of spacetime. Hence we apparently cannot discover in gravity's entropic action any motivating principle for the attractive action of gravitation, such as a natural increase in (spatial) entropy might provide.

Explaining gravity's attractive principle is exactly where the double conservation role of gravity is so necessary to our understanding. In gravity's symmetry conservation role we can see the origins of its attractive principle, even at the level of an individual atom. It is the universal character and peculiar utility of all species of symmetry debts (charges), be they gravitational, electrical, identity, color, or spin, that they are produced and exist in a conserved state that is held indefinitely through time as a sort of promissory note, payable on demand in some future era, specifically upon the request of antimatter (charge conservation). Therefore, if we can discover that gravity originates as a symmetry debt of light, like the other charges and forces of matter, the mystery of its attractive principle may be solved, for we can find its rationale or conservation role in its future rather than present activity. In other words, we can see the rationale for gravitation in the activity and radiance of the Sun, rather than in individual atoms (or even cold planets), without concerning ourselves about the energetics of getting from individual atoms to stellar accumulations of matter - the motivating force or attractive principle on the level of the individual atom is through a symmetry debt or charge, not through the temporal entropy drive of matter. Gravity is a "spontaneous" force not because of the entropy debt represented by its "location" charge, but because "location" charge also carries a symmetry debt.

Gravity's double conservation role again becomes necessary to our understanding when we inquire about the exact nature of this symmetry debt. We find it originates as the (broken) non-local distributional symmetry of light's energy throughout spacetime (everywhere simultaneously), in direct contrast to the undistributed, concentrated lump of energy represented by mass-matter, locally present in the "here and now". The active principle of gravity's "location" charge is time itself, which unlike any other charge or symmetry debt of matter happens to be an "entropic" charge with intrinsic dimensional motion, and one-way motion at that. Time marches into the historical domain to provide matter (bound energy) not only with its primary entropy drive, but also with a causal conservation domain (historic spacetime), and a metric accounting parameter for balancing the energy accounts of matter's relative rather than absolute motion.

Gravity's time charge ("location" charge) identifies the spatial location of matter's concentrated lump of immobile and undistributed mass-energy, indicating by the charge's relative strength and intensity the location, quantity, and density of the offending, asymmetrically distributed (undistributed) lump of energy. (These are just the parameters relevant to matter's lack of spatial distributional symmetry, or the broken non-local distributional symmetry of light's energy). This spatial identification or "location" is actualized by the forceful action of a gravitational field which points to the center of mass of the lump of matter from everywhere in the Cosmos - the gravitational field is universal in its spatial extent. This gravitational force-field is mechanically caused by the intrinsic, entropic flow of time into history, the historic domain being located at right angles to all three spatial dimensions. Since time and space are connected, being aspects of one another, the flow of time into history pulls space along with it. This spatial flow is what we recognize as the gravitational field.

A Gravitational field is the spatial consequence of the intrinsic motion of time. The moving time charge enters the historic domain at the center of mass of the atom, planet, or star, causing the spherical collapse of space (because time is equally connected to all three spatial dimensions) as space tries to follow time into history. However, three-dimensional space cannot squeeze into the point-like beginning of the one-dimensional and one-way historical time line, and self-annihilates at the gravitational center, exposing a

new temporal component, the exact metric equivalent of the annihilated space. (The one-way time component of spacetime cannot self-annihilate because unlike the spatial dimensions, there is + T but no - T.) This new temporal unit immediately marches off into history, repeating the entropic cycle, etc., forever. The acceleration of gravity is due to the constant application of a force - the intrinsic motion of time. (See: "The Conversion of Space to Time".) This interpretation of gravitational action is completely in accord with Einstein's General Relativity through his own "Equivalence Principle".

The "payoff" for all this activity does not become apparent until we see sufficiently large gravitational accumulations, such as the Sun, where we find mass-matter being converted to light, that is, the restoration (conservation) of the non-local symmetric energy state of light. The "location" charge of gravity, whose active principle is time, is therefor acting like any other charge of matter (or symmetry debt of light), paying or discharging its symmetry debt by restoring bound and asymmetric energy (mass-matter) to its free and symmetric energy state, light. This gravitational process begins with the nucleosynthetic pathway of stars and goes to completion in Hawking's "quantum radiance" of black holes. Hence it is only through the application of the concept of gravitation as both an active entropy and a deferred symmetry debt of light that we can fully comprehend the source of gravity's attractive action and conservation roles, and also bring gravitation under the symmetry conservation umbrella of Noether's Theorem, with all the other charges and forces of matter.

This amounts to a unification of gravitation with time, which is how we unite gravity with the other forces of physics, and General Relativity with Quantum Mechanics. The "graviton" or field vector of gravity is a quantum unit of negative entropy, or time. *The charges of matter are the symmetry debts of light*. All forces act together to return asymmetric matter to its original symmetric energy state, light. (See: "Symmetry Principles of the Unified Field Theory.")

Gravity pays the entropy-energy "interest" on the symmetry debt of matter through the creation of matter's time dimension - the only dimension in which charge conservation has meaning. Because gravity slows the spatial expansion of the Cosmos (via the annihilation of space), we see that matter's time dimension or historical entropy drive is actually funded by the intrinsic motion or spatial entropy drive of light, with gravity acting as the conversion (conserving/mediating) force.

Links:

Unified Field Theory

- Symmetry Principles of the Unified Field Theory (a "Theory of Everything") - Part I
- Symmetry Principles of the Unified Field Theory (a "Theory of Everything") - Part 2
- Principles of the Unified Field Theory: A Tetrahedral Model
- (Postscript and Commentary on paper above)
- Synopsis of the Unification Theory: The System of Spacetime
- Synopsis of the Unification Theory: The System of Matter
- Light and Matter: A Synopsis
- Global-Local Gauge Symmetries and the "Tetrahedron Model"
- Global-Local Gauge Symmetries: Material Effects of Local Gauge Symmetries
- The "Tetrahedron Model" vs the "Standard Model" of Physics: A Comparison

Gravitation

- Section II: Introduction to Gravitation
- A Description of Gravitation
- Global-Local Gauge Symmetries in Gravitation
- The Double Conservation Role of Gravitation: Entropy vs Symmetry
- 12 Summary Points Concerning Gravitation
- Extending Einstein's "Equivalence Principle"