The Conversion of Space to Time

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Abstract

Gravity has two principle (and linked) conservation roles in Nature: 1) the conversion of space to time (the role we see on Earth); 2) the conversion of bound to free energy (in stars and via Hawking's "quantum radiance" of black holes). The first role conserves the entropy drive ("intrinsic motion") of light (free electromagnetic energy); the second role conserves light's "non-local" distributional and metric symmetry (obeying Noether's Theorem).

Introduction

The intrinsic motion of time (the primordial drive of historical entropy), can be regarded as a "local" form of entropy, conserved or transformed from the intrinsic motion of light (the primordial drive of "global" spatial entropy), by the gravitational annihilation of space and the extraction of a metrically equivalent temporal residue. The action of gravitation converts a global metric of space, light, and absolute motion gauged by c, to a local metric of history, matter, and relative motion gauged by G. Time is the local compensating component of the gravitational field vector ("graviton" or quantum of spacetime). Time is the local gauge symmetry "current" - conserving energy, and protecting the invariance of the "Interval", causality, and "velocity c" ("Lorentz Invariance"). Time is necessary for energy conservation because of the relative motion and variable energy content of matter. In this role, time is the functional analog of the magnetic component of the electromagnetic field (which protects the invariance of electric charge). (See also: "Global vs Local Gauge Symmetry: Part I".)

Part I: The Conversion of Space to Time

The collapse of a free electromagnetic wave (light) to a bound state of energy (a particle, an excited electron shell, the momentum of matter, etc.), confers "mass" upon that bound energy state, and an associated gravitational field (-Gm). This gravitational field is the consequence of the transformation of the spatial component of the wave, with its expansive spatial entropy drive (the intrinsic motion of light), to time and time's expansive historical entropy drive (the intrinsic motion of time). The intrinsic motion of matter's gravitational field is the spatial consequence of the intrinsic motion of matter's time dimension. Somewhat in the manner of the electric and magnetic components of an electromagnetic wave, time and gravity induce each other endlessly.

Examined at the microscopic level of quantum mechanics, the conversion of space to time involves the simple "switch" of implicit time to explicit time, the switch of the "wavelength" or spatial component of the electromagnetic wave to the "frequency" or temporal component of the wave. The presence of both space

and time are implied in the standard formulation of the velocity of light: "wavelength" multiplied by "frequency" = c. Even though light has no time dimension, the implicit presence of time in the wave is clearly indicated by "frequency". Time is the implicit driver of the intrinsic motion of light: the symmetric spatial or "wavelength" component of the wave "flees" the asymmetric temporal or "frequency" component, which is, however, an embedded element of the wave's own structure. Symmetry conservation (of the wave's "non-local" spatial component and of metric space) is therefore the root cause of the intrinsic motion of light, which simultaneously serves as the primordial entropy drive of free energy. Implicit time is thus the proverbial "bur under the saddle" which causes the eternal and "intrinsic" (self-motivated) motion of light, the expansion and cooling of spacetime, and the spatial entropy drive of free energy. This same temporal element becomes explicit when light loses its intrinsic motion and becomes bound energy in a stationary particle or similarly immobile energy form. (See: "Gravity Diagram No. 2".)

In bound energy, the roles of the spatial and temporal components of the electromagnetic wave are reversed, as space is pulled by the intrinsic motion of time into the historic domain (at right angles to all three spatial dimensions), creating the gravitational collapse of spacetime. This explicit temporal component becomes the active principle of the "location" charge of gravitation, comprising in a single charge the entropy, causality, and symmetry debts of light consequent upon the conversion of massless free energy's "non-local" symmetric energy state to the local, temporal, causal, and asymmetric energy state of massive bound energy. So long as light continues to move at velocity c, time remains suppressed to an implicit state, maintaining both metric symmetry plus the "non-local" distributional symmetry of light's energy content throughout space. The suppression of time is a major role of "velocity c" as the symmetry gauge of the spatial metric. The intrinsic motion of light is caused in principle by the conservation of symmetry and the principle of entropy, both in the service of energy conservation. Time, whether in its implicit or explicit form, is the active agent or energy principle ("frequency") driving the primordial entropy expression of the universe, whether as spatial expansion and cooling or as historical aging and causal dilution.

Because one and the same temporal element causes (in its implicit state) the intrinsic motion of light (the spatial entropy drive of free energy), and causes (in its explicit state) the intrinsic motion of time (the historical entropy drive of bound energy), the conservation circuit between the primordial drives of spatial and historical entropy as mediated by gravity is extremely simple and immediate (see: "Currents of Entropy and Symmetry".) The gravitational transfer of the expansive energy of the spatial Cosmos to the expansive energy of the historical Cosmos, with its consequent deceleration of the universal spatial expansion, occurs locally and instantly with the "switch" of the temporal element of an electromagnetic wave from an implicit to an explicit condition. This simple switch or "flip" of the electromagnetic "entropy coin" is the whole difference between the positive spatial expansion or entropy drive of the intrinsic motion of light, and the spatial contraction or negative entropy drive of the intrinsic motion of gravity. The action of gravity reduces the spatial expansion of the Cosmos not just because the spatially expansive entropy drive of light is transformed to an historically expansive entropy drive of matter, but because gravity annihilates space while creating time.

The gravitational annihilation of space produces a metrically equivalent temporal residue which becomes the entropy drive of bound energy, the intrinsic motion of time. Conversely, the gravitational annihilation of mass (in stars and by Hawking's "quantum radiance" of black holes), converts the same temporal entropy drive back to light's intrinsic motion and the entropy drive of space and free energy. The primordial entropy drives of free and bound electromagnetic energy - the intrinsic motions of light and time (creating space and history) - are convertible in either direction by gravity. This dynamic "trinity" of energy and entropy gauges - c, G, T - creates and regulates our dimensional reality, and essentially rules the physical evolution of our Universe. (See: "The Tetrahedron Model.")

It takes energy (entropy-energy: the energy of intrinsic dimensional motion) to produce either space (S) or time (T), and -G measures the energy required (per given mass) to transform (S) into (T). Using the same

symbols, the gravitational conversion of space and the primordial entropic drive of spatial expansion (S), to metrically equivalent time and the primordial entropic drive of historical expansion (T), can be represented in a "concept equation" as:

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

It takes energy to create the one-way temporal entropy drive from the "all-way" spatial entropy drive, because an asymmetric, one-way time order must be imposed upon the symmetric, "all-way" spatial expansion. This entropy-energy cost of time is the origin of the "negative energy" characteristic of gravity and the negative sign of "-G". (See: "Entropy, Gravitation, and Thermodynamics".) The gravitational metric has a lower symmetry and a lower entropy than the purely spatial metric, so we should expect a gravitational metric to evolve toward a purely spatial metric - as indeed we see happening spontaneously in the stars and via Hawking's "quantum radiance" of black holes.

It is ultimately the expansive energy of the spatial Universe that funds the expansive energy of the historical Universe (historic spacetime). The spatial expansion is gravitationally decelerated accordingly. Conversely, as matter is converted to light in stars, the Universe recovers a portion of its former rate of expansion, appearing to "accelerate" (rebound) as it ages (because freely moving light does not produce a gravitational field). (See: "Gravity Diagram No. 2".)

Part II: The Gravitational Creation of Time from Space

Gravity creates time by the annihilation of space and the extraction of a metrically equivalent temporal residue. The entropic, expansive principle contained in space (visible through large telescopes as the cosmological "red shift" of distant galaxies), is due to the "intrinsic" motion of light, which is converted by gravity (via the annihilation of space) into the entropic, expansive principle contained in history - which is due to the "intrinsic" motion of matter's time dimension. Whereas c is the gauge (regulator) of the metric relationship between space, time, and light, G is the gauge of the entropic relationship between space, time, and mass. c determines how much space, per given time, light must traverse to maintain its "non-local" symmetric energy state (c also gauges the entropic rate of spatial expansion); G determines how much space, per given mass, must be annihilated to provide matter's temporal or historical entropy drive. Thus the spatial entropy drive is the source of the historical entropy drive: implicit time is the source for explicit time.

The intrinsic motion of light is the primordial entropy drive of free electromagnetic energy (light). The intrinsic motion of time is the primordial entropy drive of bound electromagnetic energy (matter). Gravity is the force that converts either entropy drive into the other, although on planet Earth we only experience the gravitational conversion of space into time. In the Sun and stars, we also see the reverse conversion going on simultaneously - as mass with its associated time dimension is converted to light with its associated spatial dimension. (See: "The Double Conservation Role of Gravitation".)

The gravitational annihilation of space with the extraction of a temporal residue causes the deceleration of the spatial expansion of the Cosmos. Thus matter's time and historical dimension is created at the expense of (is funded by) light's spatial entropy drive and spatial conservation domain. Gravitational energy and temporal entropy-energy are equivalent. Gm, where m represents the mass of the Earth, is the entropy-energy required to produce Earth's time dimension. Gravitational energy is provided by the deceleration of cosmic spatial expansion - caused by the gravitational consumption of space. Space (which contains implicit time) is the "food" the gravitational engine "eats" to create matter's historical dimension. The expansion of matter's historical domain is funded by the contraction of light's spatial domain. A compound conservation domain of historical spacetime is formed by light, space, time, and gravity, in which the purely spatial expansion of the Cosmos is reduced to accommodate the addition of a temporal dimension (at right angles to

all three spatial dimensions), and the coordinated expansion of historical spacetime.

As we have seen, matter's temporal entropy drive is fully funded (and metrically equilibrated) by the gravitational annihilation of space and the consequent deceleration of the cosmic expansion. Because space and time are connected, the flight of time into history pulls more space into the point-like beginning of the one-way, linear time line. At the center of mass, the symmetrically collapsing spatial dimensions (time is connected equally to all three spatial dimensions) annihilate each other (+x annihilates -x, +y annihilates -y, etc.), leaving an uncancelled temporal residue (because asymmetric time exists only as +t). This self-feeding annihilation reaction continuously extracts temporal quanta, and will maintain the entropic cycle forever, unless some symmetry-conserving process converts mass back to light. *A gravitational field is the spatial consequence of the intrinsic motion of time*. (See: "Entropy, Gravitation, and Thermodynamics".)

The Entropy Drives of Light, Time, and Gravity

The reader may wonder how this theory translates into practice. Suppose I take a flashlight into a closed room and turn it on. In so doing, I have caused the production of light from a chemical reaction in the flashlight batteries. But surely (you say), I have not thereby influenced the expansion or contraction of the Universe - the light cannot get out of the room! However, it is not true that the physical consequence of converting bound chemical or electromagnetic energy (mass) to free electromagnetic energy (light) - and vice versa - remains in the room, for the significant entropic effect of this reaction is gravitational, and cares nothing for the walls of the room, but extends instead to the limits of the Universe, traveling at "velocity c" as a non-local effect.

The conversion of bound chemical energy into light reduces the rest mass of the chemical batteries, and so decreases the gravitational field associated with and proportional to the rest mass of the flashlight (Gm). Conversely, the interaction of the light with the atoms and molecules of the room's walls sets them vibrating, and this increase in bound energy causes an increase in the equivalent mass-energy of the atoms and molecules, and so increases the gravitational field associated with and proportional to the rest mass of the atoms (Gm). If all the batteries' chemical energy transformed to light remains bound in the vibrating atoms of the walls, then the two effects will be equal and counter each other, cancelling in sum, but in either case these propagating gravitational effects certainly will not be locally confined by walls of any kind.

Regarding the entropic expansion of space - is local space also expanding? Space is created by light's intrinsic motion and hence always contains light's expansive, entropic energy principle. Because of the presence of matter in the Cosmos, the expansion of space is coordinated with the expansion of time (through the action of gravity), to produce the expansion of historic spacetime. Since we are composed of matter rather than light, we experience only the temporal component of this expansion, the intrinsic motion of time, the aging of history, and the local gravitational force converting space to time. The spatial component of the expansion, however, is visible (in large telescopes), as the "redshift" of distant galaxies. This is a reciprocal view, in which those distant galaxies also see us as equally "redshifted". (See: "A Spacetime Map of the Universe".) Meanwhile, the cooling of space has been measured (by radio telescope and satellite) as the 2.7 Kelvin "background radiation" remaining from the (much hotter) era of the "Big Bang". Locally, the expansion and cooling of space is overwhelmed by the influence (gravitational and thermal) of the large concentrations of matter in the Earth, Sun, Solar System, and our Milky Way galaxy. Our experience of the universal expansion of spacetime is therefore mostly through its temporal component: historical aging and the intrinsic motion of time. Nevertheless, the expansion and cooling of space on a universal scale (the spatial entropy drive) can be directly measured by our astronomical instruments as the "redshift" of distant galaxies and the temperature of the "cosmic background radiation".

For a discussion of the several conservation roles of gravity (including entropy and symmetry) see: "The Double Conservation Role of Gravitation". For a discussion of the weakness of gravity (the tangential "hit"

of the "present moment" upon bulk historical spacetime) see: "[The Half-Life of Proton Decay and the 'Heat Death' of the Cosmos]".

Links:

Unified Field Theory

Gravitation

Entropy

Gravity Diagrams