Why Gravity? A Rationale for Gravitation

Gravity is matter's memory it once was light

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(Revised June, 2014)

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Abstract

The rationale for gravity begins with the creation of the Cosmos - the negative energy of gravity is necessary to balance the positive energy of the "Big Bang", so that the "Creation Event" requires zero net energy. This is the time when gravity is joined with the other forces in equal strength, and bound energy (mass) is created from free energy (light) and the structural metric of spacetime. Initially, bound energy is in the form of matter-antimatter pairs, so that creation is initiated from a state of zero net charge as well as zero net energy. Beginning in such a state of complete neutrality (perhaps as a giant quantum fluctuation of the vacuum, an "inflationary bubble", or Divine Fiat), the Universe can only evolve into a state of complete conservation. (All "Creation" scenarios are speculative, whether rational or intuitive.)

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

Introduction: Why Gravity?

Why does gravity exist as a force in the Cosmos? What is gravity's rationale and origin in the context of conservation law? These and other questions concerning gravitation are addressed in various papers

on my website (and linked below). Here I give only a brief summary of my major conclusions. (See also: "An Introduction to Gravitation".)

The first role and necessity for gravity is to provide negative energy to balance the positive energy of the "Big Bang". Our universe can be born only if it requires no net energy and no net charge in its initial state. All other gravitational roles are derivative and secondary to gravity's primary "midwife" role of energy balance and conservation during the "Big Bang".

Gravity also serves two secondary and related conservation laws - entropy and symmetry - (entropy immediately and symmetry eventually); because these in turn serve energy conservation and causality, gravity ultimately serves all four. (See: "The Tetrahedron Model".) Like the other fundamental forces of physics, gravity is characterized by a charge that originates as a symmetry debt of light (Noether's Theorem). Light has perfect symmetry, bearing no charges of any kind, but when light (free electromagnetic energy) is converted to matter or any form of bound electromagnetic energy (including simply momentum or kinetic energy), light acquires various charges as a bound form of energy. *The charges of matter are the symmetry debts of light*; these charges include spin and gravitation, among others. (See: "Symmetry Principles of the Unified Field Theory".)

The Gravitational "Location" Charge

In the case of gravity, the symmetry debt or charge is "location" (gravitational charge), and the broken symmetry of light represented by "location" charge is the "non-local" distributional symmetry of light's energy everywhere, simultaneously, throughout spacetime. As Einstein discovered, in its own reference frame, moving freely in vacuum at "velocity c", light's "clock" is stopped and meter sticks shrink to nothing in the direction of propagation. Hence in its own reference frame, light has forever to go nowhere, resulting in light's "infinite velocity" and "non-local" symmetric energy state. Einstein mathematically characterized light's non-local symmetric energy state in his equation of the spacetime "Interval": light's "Interval" = zero. "Noether's Theorem" states that the symmetries of a multicomponent field (such as the electromagnetic field or the metric field of spacetime) must be conserved, and so it is to conserve light's non-local symmetric energy state and the consequent equitable (symmetric) distribution of light's energy throughout spacetime that the gravitational force arises. (See: "A Description of Gravitation".)

We see this conservation argument expressed physically in two ways. The first is that the gravitational charge "locates" the undistributed mass-energy (E = mcc) of matter in spacetime, specifying in terms of inertial or gravitational force the 4-dimensional position of matter, including matter's total mass and density, all physical parameters reflecting matter's asymmetric spatio-temporal distribution (unlike light, matter has no (net) intrinsic spatial motion and matter's "Interval" is always greater than zero). Secondly, and clinching this argument, gravity acts to restore light's distributional symmetry through the conversion of bound to free energy, as exampled by stars, supernovas, quasars, and ultimately and completely, by Hawking's "quantum radiance" of black holes. This is the conservation rationale for gravity from the point of view of symmetry conservation, as required by "Noether's Theorem". (See: "Gravity, Entropy, and Thermodynamics.")

A Second Conservation Role

But gravity has another conservation role, intimately related to symmetry, which comes about because

the active principle of the gravitational "location" charge is time. Light has no time dimension but matter does, and matter's time dimension is conferred upon it and created by matter's gravitational field. Gravity creates the time dimension of matter by the annihilation of space and the extraction of a metrically equivalent temporal residue. The intrinsic motion of the time dimension so created marches off into history, dragging space along behind it. History is at right angles to all three spatial dimensions - space self-annihilates at the point-like entrance to the historical domain (at the "center of mass"), creating another temporal residue, which repeats the cycle. Gravity and time induce each other in an endless entropic circle. *A gravitational field is the spatial consequence of the intrinsic motion of time*. (See: "The Conversion of Space to Time".)

The intrinsic motion of matter's time dimension serves as the primordial form of matter's entropy drive (creating, expanding, aging and diluting the causal linkages of history), so the entropy drive of matter (time) is a gravitational byproduct of the conservation of light's distributional symmetry - or vice versa: symmetry conservation is ultimately the byproduct of the gravitational creation of time. In effect, the intrinsic motion of light (the primordial form of the entropy drive of free electromagnetic energy) supplies the energy to produce the intrinsic motion of time (the primordial form of the entropy drive of bound electromagnetic energy). The spatial expansion of the Cosmos is reduced in consequence of the gravitational conversion of space to time, funding its historical expansion. (See: "Spatial vs Temporal Entropy".)

Here we see gravity in its entropy conservation/conversion role, producing the time dimension and historical entropy drive of matter via the annihilation of space. Gravity functions as the mediating force between the primordial forms of the entropy drives of free and bound electromagnetic energy, converting one to the other in either direction and even simultaneously. For example, the gravitational field of planet Earth is busy converting space to time, supplying Earth's time dimension and historical entropy drive, while on the Sun the reaction is running in both directions at once, creating time from space on the one hand (as on Earth), but also converting mass to light (as in stars).

The double conservation role of gravity derives from the double gauge (regulatory) role of light: "velocity c" gauges both the primordial entropy drive and the "non-local" symmetric energy state of free energy. Light's intrinsic motion creates, expands, and cools space (entropy role), while simultaneously suppressing the time dimension, thus maintaining the inertial (dimensional) symmetry of the spacetime metric, as well as the "non-local" distributional symmetry of light's energy. The intrinsic motion of light is the direct cause of light's zero "Interval" or "non-local" symmetric energy state, so when gravity conserves and restores light's non-local energy state (via the conversion of bound to free energy in stars), gravity also conserves and restores (by default) the entropic role played by light's intrinsic motion. Because gravity conserves both the entropy and symmetry functions of the electromagnetic gauge "velocity c", gravity may be included under the conservation mantle of Noether's Theorem, arising like the other forces from a material charge ("location"), which reflects a symmetry debt of light (light's lost "non-local" spacetime distribution = the symmetric distribution of light's energy throughout spacetime). As we have learned from quantum mechanics and subatomic physics, matter is in fact an asymmetric form of light: one-half of a particle-antiparticle pair.

It is because the antimatter part of these primordial matter-antimatter particle pairs is missing in our post "Big Bang" universe that all matter's symmetry debts arise - from conserved charges that were originally intended to produce annihilation reactions with antimatter, and thus maintain the primordial

symmetry of the "light-only" Cosmos. The symmetry debt carried by electric charge I attribute to the missing antimatter of the Cosmos, whereas the gravitational symmetry debt and "location" charge I attribute to the (lost) "non-local" distributional symmetry of light's energy. (For a further discussion of the origin of gravity and the other forces as symmetry debts of light, see: "Symmetry Principles of the Unified Field Theory".)

Other Conservation Roles

An associated conservation role of gravity involves causality, obviously because gravity creates the time dimension of matter. The intrinsic motion of time creates history, just as the intrinsic motion of light creates space. Just as space is the conservation domain of free energy, so history is the conservation domain of information, matter's causal web, net, field, or "matrix". Historic spacetime is the creation of gravity and matter's entropy drive, the intrinsic motion of time. Combined with the intrinsic motion of light, historic spacetime creates and upholds the reality of matter's "universal present moment". The reality of today depends absolutely on the continuing reality of yesterday (because of the interwoven net of temporal, causal linkages: our "yesterday" is another observer's "today", and vice versa). This is a third conservation role and rationale for gravity as a long-range and universal force: gravity is necessary to create and maintain (through time) the causal reality and temporal linkage of matter with historic spacetime throughout the Cosmos ("karma"). (See: "A Spacetime Map of the Universe".)

The weakness of gravity is due to the fact that matter is connected to its entropic conservation domain (historic spacetime) only tangentially, via the single "touch" of the universal "present moment". Time and history are at right angles to all three spatial dimensions, simultaneously. Gravity creates only enough time to service this tangential connection. On this view, we would expect gravity to be stronger if the unit of time (the "tangential touch") were greater - which is exactly what General Relativity predicts. Time slows down (seconds become of longer duration) in a gravitational field, and time actually stops at the event horizon of a black hole, where the "present moment" becomes the "eternal now", the tangential point of contact between matter and the temporal dimension becomes infinitely enlarged, and g = c. For a further discussion of the weakness of gravity, see: "Proton Decay and the 'Heat Death' of the Universe".)

Finally, the 1st law of thermodynamics, energy conservation, can be regarded as the primary role of gravitation, with entropy, causality, and symmetry conservation as corollaries, since the role of the spacetime metric is first and foremost to conserve energy. We saw above that the "global" function of the gravitational metric is to provide negative energy to balance the positive energy of the electromagnetic metric (during the "Creation Event"). This global function has a "local" extension or counterpart in the latter-day cosmos as well. The action of gravitation converts a global metric of space, light, and absolute motion gauged by the universal electromagnetic constant "c", to a local metric of time, matter, and relative motion gauged by the universal gravitational constant "G". Time or historical entropy can be regarded as a "local" form of entropy drive, distilled from the "global" spatial entropy drive of light (by the gravitational annihilation of space and the extraction of a metrically equivalent temporal residue). Time is the local compensating component of the gravitational field vector (spacetime) - the local gauge symmetry "current" - protecting the invariance

of the "Interval", causality, and "velocity c", accomplishing energy conservation despite the variable and relative motions of matter, and the variable gravitational metric of historic spacetime. To this end, time itself must be flexible and co-vary with space (as per the "Lorentz Invariance" of Special and General Relativity). In this regard, time is the functional analog of the magnetic component of the electromagnetic field. ("Lorentz invariance" produces a magnetic field when associated with electrically charged particles in relative motion, and both time and magnetism function as "local gauge symmetry currents" protecting the Interval, causality, the invariance of charge, and the invariance of "velocity c".) (See: Robert Resnick: *Introduction to Special Relativity*. John Wiley and Sons, Inc. 1968 pp. 175 - 177.) (See: "Global vs Local Gauge Symmetry and Gravitation".)

Time and Magnetism

As magnetism is the invisible, "intrinsic" projective electrical force ("electro-motive" force) of the loadstone, so gravity is the invisible, "intrinsic" projective dimensional force ("inertio-motive" force) of the ordinary rock. In the case of magnetism, we trace the force back to the moving (and aligned) electric charges of the electrons in the loadstone; in the case of gravity, we trace the force back to the moving (and one-way) temporal charges ("location") of the bound energy in the rock. A moving electric charge creates a magnetic field; a moving temporal charge creates a gravitational field. In both cases the field is produced at right angles to the current. The relation is reciprocal as well: moving magnetic and spatial fields (gravity) create electric and temporal currents (time). Finally, time and gravitation induce each other endlessly, as do the electric and magnetic field components of light, and both time and magnetism function as "local gauge symmetry currents". This is the analogy between gravitation and electromagnetism which so intrigued Einstein. (See: "Global-Local Gauge Symmetries and the 'Tetrahedron Model'".)

Black Holes

At the "event horizon" of a black hole, both clocks and light come to a halt, as the electromagnetic metric is completely replaced by the gravitational metric. Within the event horizon, all former functions of the electromagnetic metric are either defunct or performed by the gravitational metric, including those of the the binding forces between particles. Also absent are the primordial entropy drives of space and history, the intrinsic motions of light and time. Hence the black hole is just that physical environment in which entropy, in its usual electromagnetic expressions, does not exist, and hence no change is possible as we ordinarily experience it. But gravitation is also a form of (negative) entropy, and indeed we find, just at the boundary between the electromagnetic and gravitational domains, entropy operating to convert the mass of the black hole entirely to light - via the mechanism of "Hawking radiation". This is the ultimate expression of Noether's symmetry conservation theorem, the complete gravitational conversion of bound to free energy, definitively revealing the final conservation rationale for gravitation, and by extension, for time as well.

Postscript Diagram: Nodes of the Gravitational Metric

Links

Unified Field Theory