

## Letter to a Skeptic

Dear Sir,

I can't remember exactly how I got to the realization (on Nov. 10, 1998) that gravity and time are not just related, but actually create each other in an endless self-feeding process. A gravitational field (as per Einstein) is the wholesale accelerated motion of spacetime (not just space), leading to Einstein's celebrated "[Equivalence Principle](#)". It struck me that at the center of the Earth, of an atom, or of any bound form of energy, the spatial component of this flow (being symmetrically directed to the center of mass from all directions) would self-annihilate, leaving behind a metrically equivalent temporal residue, which could not self-annihilate since time is asymmetric (being one-way). This temporal residue would immediately march off into the historic domain (because of time's "intrinsic" motion), dragging space along with it (since the two dimensions are usually inseparable). But 3-D space cannot fit into the one-dimensional time line (which moreover is directed at right angles to all three spatial dimensions), and so space self-annihilates at the center of mass, leaving again a metrically equivalent temporal residue, which repeats the endless and entropic cycle. Thus gravity and time induce each other, somewhat analogously to the mutual induction of the electric and magnetic components of light, but by a very different process.

This is a rough-and-ready description of the gravitational conversion of [space into time](#), in terms of dimensionality and metrics which also has a quantum mechanical interpretation in terms of "wavelength vs frequency", and a thermodynamic interpretation in terms of [alternative entropy domains](#) for free and bound forms of electromagnetic energy, and an interpretation in terms of [general conservation principles](#). Einstein's equations of Special and General Relativity provide the mathematical context for such ideas - an interpretation foreshadowed by the flexible and interchangeable parameters of space and time necessary to maintain the constant value of Einstein's "Interval" (causality relations) in both theories. Note that by gravitational conversion of space to time a perfectly integrated spacetime metric is achieved, in which the entropy drive of light is completely conserved (although in an alternative form) as the entropy drive of time. See my website for papers on these topics if you are interested. (<http://www.johnagowan.org/index.html>)

I was led to these conclusions by considerations of entropy. It is a most interesting fact that there are three related "intrinsic" dimensional motions in nature, the intrinsic motion of light, the intrinsic motion of time, and the intrinsic motion of gravity, and all three are entropic motions, that is, they are dimension-creating intrinsic motions which produce metric/entropic conservation domains for their energy types: expanding and cooling space for free electromagnetic energy (light), expanding and aging history for bound electromagnetic energy (massive forms of matter), and contracting and heating gravitational spacetime (negative entropy - including black holes). Entropy is such an essential part of energy conservation that it is [fundamentally embedded in all energy forms](#) of our universe, its most primordial expression seen in the "intrinsic" dimensional motions of light, time, and gravity.

Now a very curious aspect of gravity is that it also creates a spacetime metric, a combined metric of space and time "gauged" by Newton's gravitational constant "G", whereas light itself only creates a symmetric spatial metric as gauged by the electromagnetic constant "c". The gravitational metric (as per Einstein) is "accelerated", "curved", or "warped" by the presence of asymmetric time, which as we

have surmised above is in fact created by gravity via the annihilation of space. As gravitational field strength increases, it goes from a "passive" condition (as on planet Earth) of simply creating the planet's time dimension (gravity's basic, low energy entropy-conserving role - converting the spatial entropy drive of light to the alternative historical entropy drive of matter). Hence the earth's gravitational field represents the (negative) entropy-energy required to create Earth's time dimension. At higher field strengths, gravity moves to its "active" condition as seen in our sun and the stars, in which (via the nucleosynthetic pathway) it begins to return bound energy to its original symmetric form, light. This is a [symmetry-conservation role](#) which continues on in supernovas, quasars, and finally in Hawking's "quantum radiance" of black holes, where gravity completely annihilates matter (rather than space), returning the entire bound energy of the black hole to symmetric light. [In this series](#) we see gravity obeying Noether's symmetry-conservation theorem, since free electromagnetic energy (light) is a much more symmetric form of energy than bound electromagnetic energy (matter): for starters, light has no time dimension .

Again, it is very curious that in the black hole gravity takes over and displaces all of the electromagnetic functions of light, including those of chemical and nuclear binding forces as well as those of the electromagnetic metric. [Gravity imposes its own metric](#) in the black hole, the metric of time and matter rather than the electromagnetic metric of space and light. But at the black hole's "event horizon", where  $g = c$ , we find that all forms of energy, including massive objects, move at velocity  $c$  and time stands still while meter sticks shrink to nothing in the direction of motion. But these are exactly the symmetry conditions imposed on light in free space by the electromagnetic metric. The "extremes meet" - both the pure electromagnetic metric of light and the pure gravitational metric of matter impose the same symmetry conditions upon the energy forms of their respective domains.

This puts the relentless drive of gravity toward the black hole in a new perspective: is the inexorable gravitational drive a manifestation of gravity's symmetry-conservation role (in obedience to Noether's theorem), or is gravity intent on producing its own (alternative) symmetric metric in the temporal domain of the black hole - a metric gauged by "G" rather than "c"?

I haven't yet tried to explain all this to a five-year old, since if I could I would have to wonder why it took me 70+ years to understand it myself. I have tried to come up with a few simple aphorisms, however: "Gravity is matter's memory it once was light"; "A gravitational field is the spatial consequence of the intrinsic motion of time". Whether these phrases would mean anything to a five-year old I don't know; I do know that the sun in our sky is telling us something - its glorious radiance announces that gravity's [symmetry-conservation agenda](#) has taken its first step!

Ultimately, we are able to place gravity and the conversion of space to time (as on planet earth) and vice versa (as on the sun) within the context of a [much wider theory](#) which unifies all four forces of physics beneath the symmetry-conserving mantle of [Noether's theorem](#): "The charges of matter are the symmetry debts of light."

I know this is all inadequate as an explanation of my [general theory](#), but for that I have labored mightily to produce a more comprehensive explanation in various papers on my website, to which I must refer you for further details:

<http://www.johnagowan.org/index.html>

Best wishes,  
John A. Gowan  
Aug., 2014

PS: As with most phenomena associated with gravity, it is easier to see what is going on at large (astrophysical) scales rather than small. For example, it is simple enough (on the planetary scale of Earth) to imagine that the one-way spatial vector of gravity ("falling downward" toward the "center of mass") is converted into the one-way causally directed temporal vector of history ("forward" into the future) - a direct swapping of one asymmetric dimensional entropy drive for another. There is also conservation going on here at several conceptual levels: space is annihilated by gravity (at the center of mass) but nevertheless converted/conserved in an alternative entropic form as history: the entropic drive of light (manifest as the "intrinsic motion" of light causing the expansion and cooling of space), is conserved/converted to the alternative entropic drive of time (manifest as the expansion, decay, or aging and dilution of history). Mathematically, we have the positive entropy drive of light and space (free electromagnetic energy) neutralized by the negative entropy drive of matter and gravity (bound electromagnetic energy), but conserved nevertheless in alternative form by conversion to the positive entropic drive of history, creating historic spacetime - the conservation domain of matter's causal information field. One positive entropy drive is gravitationally neutralized and converted to another. (The conversion also runs in the opposite direction via the conversion of mass, time, and gravity to light and space in stars.) You can't destroy space without creating time, just as you cannot destroy matter without creating light - not even in a black hole, as Hawking's "quantum radiance" and the entropic character of Bekenstein's "event horizon" demonstrate.

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Time and gravity are intimately linked, in that gravity creates time from space to form an alternative, causal entropic domain (history) for massive objects (bound forms of electromagnetic energy - atomic matter), the temporal analog of the spatial, a-causal entropic domain of free (massless) forms of electromagnetic energy - light. Expanding, cooling space is the entropic conservation domain of free electromagnetic energy; expanding, aging history is the analogous temporal entropic conservation domain for bound forms of electromagnetic energy. These two entropic conservation domains are connected by gravity, which converts either into the other, giving us historic spacetime, a composite entropic conservation domain in which both free and bound forms of electromagnetic energy can find their conservations needs met in an appropriately expanding metric.

Time and causality are real parameters in a macroscopic world for obvious reasons of energy conservation, and likewise entropy. Entropy drives the universe, energy and symmetry conservation regulate it.

Gravity is connected to the other forces through Noether's Theorem: *the charges of matter are the symmetry debts of light*. Electric charge reflects the symmetry debt of missing antimatter - the other half of light's particle-antiparticle form. Gravity is the symmetry debt of light's (symmetric) non-local distribution in space, lost when free electromagnetic energy is converted to bound electromagnetic energy during the "Big Bang" (or at any other time and place). The weak force reflects light's lost symmetry of "anonymity" (all photons are alike), when light is converted to distinguishable, massive, elementary particles. Neutrinos are explicit forms of this weak force "identity" charge; heavy

neutrinos coding for the identity charge of baryons (leptoquark neutrinos) are the "dark matter" of the Cosmos. Left/right handed spins distinguish neutrinos from anti-neutrinos. Neutrino "oscillation" is possible because within spin type (matter vs anti-matter), only mass differences distinguish one neutrino from another. The strong force color charge reflects the symmetry debt of fractional elementary (unitary) charges, and ensures they never become explicitly revealed (quark confinement), as no currency exists to pay such partially charged symmetry debts. Quarks appear to be subdivisions of primordial elementary leptonic particles (leptoquarks).

The relentless gravitational conversion of mass to light (a symmetry-conserving reaction), reduces the total gravitational energy of the universe and is the "dark energy" causing "acceleration" of the cosmic expansion. The gravitational metric of black holes is an alternative symmetric temporal metric for condensed matter and bound electromagnetic radiation, vs that of space, light, and free electromagnetic radiation. In the pure, extreme case of each metric, all energy forms move at "velocity  $c$ " and are effectively massless. Hawking radiation nevertheless converts the temporal metric of the black hole to the spatial metric of light because the "all-way" entropic drive of light's spatial metric is more symmetric than the "one-way" entropic drive of matter's temporal metric.  
JAG (Oct. 2014)

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