

Negentropic Information

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In physics today, the term "information" is largely synonymous with "entropy". Systems with greater entropy contain more information; an ice cube contains less information and less entropy than the same molecular system liquified, simply because it requires more information to specify the location or momentum of all the water molecules in the liquid vs the solid state. As a gas, the molecular system contains even more entropy, energy, and information. However, in the "[Tetrahedron Model](#)", as presented in these web pages, we are not interested in information as entropy, rather we are interested in information in the sense of order, which is to say, negentropy. In the example given of liquid water vs the ice cube, we are more interested in the crystal than in the liquid (or gaseous) phase. We are especially concerned with information in the sense of biological information, the highly complex order that characterizes living systems. Biological systems are negentropic systems, and in the only example we know (Earth-life), these systems have their energetic origin in the negentropic action of gravitation and the energy released by this force through our Sun.

The conversion of a purely entropic and symmetric flow of energy (such as a freely expanding system of photons or light), into a lesser entropic and finally negentropic flow of energy, is suggested by a trend among the three intrinsic motions listed at the "Entropy" vertex of the "[Tetrahedron Model](#)". First we list the intrinsic motion of light (as gauged by velocity c), the purest pos-entropic (and most symmetric) form of energy. Secondly, we list the intrinsic motion of time, which, because it is one-way and causally connected, has less degrees of freedom and is a more orderly (historically collimated and entangled) system entraining less positive entropy than pure light. Temporal systems will necessarily contain matter, that is, bound electromagnetic energy, whereas light is free electromagnetic energy. Finally, temporal systems necessarily contain gravity (since they contain matter), the final intrinsic motion we list at the Entropy vertex. Gravity, being a spacetime contractile force (or collapsing geometry), is as completely and purely neg-entropic as light is completely and purely pos-entropic. Time seems to be halfway between these extremes, and indeed, time is created by gravity from light's intrinsic motion and light's spatial conservation domain. Gravity creates time via the annihilation of space and the extraction (or revelation) of a metrically equivalent temporal residue. (See: "[The Creation of Time from Space by Gravity](#)".) The dimensions of spacetime are entropic conservation domains for free and bound forms of electromagnetic energy, created by the intrinsic (entropic) motions of light, time, and gravitation. (See: "[Spatial vs Temporal Entropy](#)".)

The creation of a local system of negentropic order from a non-local system of posentropic light is the story of the creation of our material Universe. Light is born with a spacetime metric: "In the Beginning", light and spacetime are created together, spacetime acting as the entropic conservation domain for light's energy. Spacetime and its metric are created by the intrinsic (entropic) motion of light: light is the only energy form which can create its own conservation domain from nothing (via its own intrinsic motion). The combination of light and its dimensional metric has (as we have discovered during the last century) another energetic expression or form, manifesting as "virtual particles", typically elementary particles (such as electron-positron pairs) which flash into existence and then annihilate within the Heisenberg time limit for such virtual productions. These particle-antiparticle virtual pairs are simply the elementary forms of bound

electromagnetic energy (matter) - the alternative form of free electromagnetic energy (light) - trying to manifest, knocking on the door, trying to gain a foothold in light's conservation domain, trying to establish its own alternative conservation domain (historic spacetime). Usually this attempt by the bound electromagnetic energy forms to manifest an alternative (and less symmetric) 4-D conservation domain is firmly suppressed via matter-antimatter annihilation reactions in which the bound elements destroy each other and return to their original form of 3-D light or free electromagnetic energy (a primary example of light conserving its own symmetric energy state).

It is an intrinsic and unexplained (a "given") characteristic of our universe that its principle energy form (electromagnetic energy) consists of two interchangeable types, free (light) and bound (atomic matter). The conversion of light into atomic matter has happened only once, during the "Big Bang", whereas the reconversion of matter into light has been ongoing ever since, a process of symmetry conservation or recovery, of which our Sun provides the prime local example.

The original and one-time conversion of light into matter requires both extremely high energy and breaking the symmetry of the primordial light universe via the weak force. (See: ["The Origin of Matter and Information"](#)). Some of the original particle-antiparticle pairs (about one in ten billion) do not annihilate each other; the antimatter member (probably an electrically neutral leptoquark) self-annihilates and leaves its matter counterpart without an annihilation partner, essentially isolating it in "real" time and the 4-D universe. The charges of the stranded partner, however, remain with it and are conserved (charge conservation). These are the same charges that were intended to produce an annihilation reaction with its antimatter mate, thereby returning the system to light and its original symmetric energy state. The conserved charges are therefore light's symmetry "debts", symmetry transformed to a manifest, 4-D particle form of conserved charges which are held indefinitely in the temporal dimension until they can find a suitable annihilation partner, that is, reunite with their lost antimatter mate or its equivalent. Order and information (in the negentropic sense) are built upon charge conservation - the symmetry debts of light - symmetry transformed from a 2-D (or 3-D) atemporal, non-local, massless free energy form (light) to a 4-D, temporal, local, and massive bound energy form (charged elementary particles). With charge comes quantized mass, time, and gravity - the asymmetric "gang of four" necessary to conserve all the energy, entropy, and symmetry of the light that created atomic matter. (See: ["A Short Course in the Unified Field Theory"](#).)

The charges of matter are the symmetry debts of light: this is a realization of "Noether's Theorem", and it is the pathway by which a purely posentropic system of light becomes transformed into an orderly system of atomic matter, conserved charges, and negentropic gravity. (See: ["Entropy, Gravity, and Thermodynamics"](#).) Free electromagnetic energy becomes transformed into bound electromagnetic energy via the asymmetric action of the weak force, but the indefinitely conserved charges of the bound atomic form are the symmetry debts of the free light form, charges which will act at every and any opportunity to return the derived bound system of lesser symmetry to the original free system of greater symmetry - in accordance with "Noether's Theorem". (See: ["Symmetry Principles of the Unified Field Theory"](#).) Noether's Theorem states that in any continuous, multicomponent field, such as the electromagnetic field (or the metric field of spacetime), where we find a symmetry we will find an associated conservation law, and vice versa. Charge conservation in matter and the inertial forces of spacetime are common examples of Noether's Theorem enforced in nature. The importance of symmetry principles in physics is precisely because they are associated with conservation laws. This is the great "Truth and Beauty" theorem, first realized in intuitive, poetic form by John Keats (1819) and in rational, mathematical form by Emmy Noether about a century later (1918).

Conservation laws and symmetry principles can be expressed mathematically, thus allowing the rational, abstract, and quantitative investigation, comprehension, and harnessing of natural law - humanity's universal

niche, the key to man's dominion over nature: mind over matter.

We do not understand the mechanism of weak force primordial symmetry-breaking (although I speculate upon this issue in "[The Origin of Matter and Information](#)"), nor do we understand its magnitude. Both seem to be "givens" of our Cosmos, perhaps determined randomly at the Multiverse systems level. This would amount to an "anthropic" explanation for these parameters - only in the subset of life-friendly material universes (all electromagnetic?) could the Cosmos become self-aware through creatures ("agents") like us and speculate about such issues. (See: "[The Information Pathway](#)".)

Negative and Positive Energy and Entropy

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The positive entropy drive of light (the "intrinsic motion" of electromagnetic radiation or free electromagnetic energy) creates space and the expansion and cooling of space - as "gauged" (regulated) by the universal electromagnetic constant "c". The energy gauge "c" also establishes the metric of space and its symmetric "non-local" energy state (suppressing time, mass, gravitation, and explicit charges).

The negative entropy drive of gravitation (the "intrinsic motion" of gravitational space associated with any mass/matter or bound form of electromagnetic energy) creates time and the expansion and dilution of history - as gauged by the universal gravitational constant "G". The gravitational gauge "G" modifies the metric of space by converting some space to time, establishing an asymmetric (one-way) dimensional temporal component which "warps" the original non-local symmetry of space and creates local centers of energy concentric upon mass/matter or the bound (immobile) forms of electromagnetic energy. (See: [Entropy, Gravitation, and Thermodynamics](#).)

Whereas the positive entropy drive of light causes the expansion and cooling of space, the negative entropy drive of gravitation causes the contraction and heating of space, and the aggregation of matter and all forms of bound energy toward a common central massive local point. The actual intrinsic motion of gravitation or gravitational space is caused by the intrinsic motion of time, which is the entropy drive of bound electromagnetic energy, just as the intrinsic motion of light is the entropy drive of free electromagnetic energy. The intrinsic motions of light and time are both gauged by velocity c , establishing a spacetime metric in which one second of temporal duration is metrically equivalent to $\sim 300,000$ kilometers of linear spatial distance (the time component of spacetime is suppressed in the absence of bound energy forms). The motion of time is one-way into history (matter's causal information conservation domain) and symmetrically concentric upon the center of any mass. (Time is necessarily one-way due to its function as the causal linkage between material events. Matter is connected by one-way causal history, light is connected by all-way acausal space.) Time's intrinsic dimensional motion drags space along with it to the center of mass where time disappears into the historical 4th dimension (at right angles to all three spatial dimensions), causing the spatial dimensions to self-annihilate (3-D space cannot follow 1-D time through the point-like center of mass into history). (See: "[A Description of Gravitation](#)".)

When the spatial dimensions self-annihilate, they leave behind (or reveal) a temporal residue which is the metric equivalent of the annihilated space (because "space" is really "spacetime", containing a hidden or suppressed temporal component, as Einstein discovered). This temporal residue, having its own intrinsic (entropic) motion, immediately marches off into history, dragging more space behind it, etc., the self-feeding cycle continuing forever. Hence time and gravity induce each other somewhat in the fashion of the electric and magnetic components of an electromagnetic field, but yielding in this case a field of spacetime with a gravitational metric (a spatial metric with an explicit (rather than implicit) asymmetric "warping" temporal

component). (See: ["The Creation of Time from Space"](#).)

In our sun, the negative energy and entropy of gravitation not only produces heat but causes the fusion of hydrogen into helium, releasing huge quantities of positive nuclear energy which balances the negative gravitational energy of the sun's mass, providing a steady and long-term source of radiant energy for life on earth. The negative gravitational energy of the sun holds the planets in their orbits, provides heat and light, and builds the elements of the periodic table which life will need for its full expression (the heavy elements are built in larger and hotter stars than our sun, including supernovas which also disperse the elements throughout our galaxy).

On planet earth, negative gravitational energy has built up the planet from the debris of the solar accretion disc, including violent early periods of heavy bombardment by massive meteorites, comets, asteroids, and even planetesimals (the latter apparently creating our moon), during a primordial era when fragile living forms could not have existed on our planet. But when the bombardment ceased and the planet cooled, with its precious load of heavy elements and water created by the negentropic work of stars and supernovas throughout the Milky Way galaxy (itself a gigantic negentropic assembly), life rapidly burst into existence under the light and heat of the sun, following a negentropic evolutionary/information pathway culminating in humanity. (See: ["The Information Ladder"](#).) Hence the patient work of both positive and negative entropy and energy, within the entropic conservation domains of space and history, as provided by the intrinsic dimensional motions of light, time, and gravity (gravity being but the spatial consequence of time's intrinsic motion, and the conversion force (in either direction) between the spatial and temporal entropic drives of free vs bound electromagnetic energy), have allowed the Cosmos to achieve self-awareness through living systems containing enormous quantities of sophisticated, coordinated, and purposeful (self-interested and reproducing) information. Living information systems have their own peculiar form of intrinsic motion - Darwinian organic evolution - and their own equally peculiar entropic pathways - disease and death. (See: [Newton and Darwin: The Evolution and Abundance of Life in the Cosmos](#).)

While the negentropic energy of the sun builds the elements and produces a huge positive outflow of heat and light, the negentropic energy of the earth, being a much weaker field, produces instead the complex systems of life (with help from the sun's energy), but the earth does not produce much radiant energy of its own, other than reemitting most of what it receives from the sun. There is of course a small thermal entropic flow leaving the planet from exothermic chemical reactions (especially wildfires), radioactivity, volcanoes, electrical discharges, and residual cooling of the planet's interior, but nothing even vaguely comparable to the massive positive outflows of energy from our sun. We have compared this difference to the gravitational payment of "interest" on matter's symmetry debt (in the case of the earth) vs the gravitational payment of "principle" on matter's symmetry debt (in the case of the sun). In both cases, gravity creates the time dimension of matter, but only in the case of the sun does gravity actually convert bound to free energy, paying off the principle of matter's symmetry debt in accordance with Noether's Theorem. This [symmetry-conservation role of gravitation](#) goes to completion in Hawking's "quantum radiance" of black holes. (see: ["The Double Conservation Role of Gravity"](#)). However, the living organic information systems of earth, the creations of negentropic energy from both the earth and the sun, do emit thermal and electromagnetic energy to the distant cosmos from both wildfires and human technological activities - the latter have come to include releases of both fusion and fission nuclear energy, as if we are trying to mimic the sun's activity. Continuing this theme, we have even created new heavy ("transuranic") elements. Humans are furthermore sending satellites and spaceships into orbit, other planets, and interstellar space. Hence the information component of the earth's living system is producing its own small contribution to the positive entropic outflow from earth's surface, which in the course of time, may yet prove to be the most valuable product of the negentropic

energies of our solar and galactic systems.

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