

# Postscript to: Spiritual and Scientific Principles of the Cosmic Tetrahedron Model

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## Postscript: Causality vs Information in the [Tetrahedron Model](#)

While "Information" is a good and very general characterization of the fundamental significance of matter, both for the "[Tetrahedron Model](#)" and the Universe, it is not quite "active" enough in its meaning to successfully complement and connect to the other three conservation principles of the Tetrahedron Model. "Information" is an energy state or configuration, whereas the Conservation of Energy, Entropy, and the Conservation of Symmetry are aggressively protected conservation principles. Causality is also an actively protected conservation principle, and it connects with the other three in a very profound and illuminating way, as we shall hopefully see below. Meanwhile, although "Information" is to be demoted to a secondary position in terms of activity or action among the "Tetragrammaton" of conservation laws, it obviously remains of first importance as regards the description of the significance of the system in its entirety. It is in fact the potent combination of Causality and Information that makes up matter's "causal matrix" within the conservation domain of historic spacetime, the "Karma" and "Akashic Record" of metaphysical systems of thought. Causality and Information depend upon each other for much of their meaning, but the linkage to the remaining conservation laws is clearer and stronger in the case of Casualty. Finally, Causality necessarily implies Information, but not the reverse. Information therefore remains as a corollary of Causality. Information is a conserved parameter in quantum mechanics and in historical spacetime.

See also the two papers: "[Information vs Causality](#)" and "[Section 14: Causality](#)".

### Interactions of "Causality" with the Conservation Principles of the [Tetrahedron Model](#)

In the material realm of mass-matter or bound forms of electromagnetic energy, Causality refers to the temporal, sequential, and consequential linkage and ordering of events, including their energy and information content, within the historical "matrix" and metric of spacetime. Massive matter is local, temporal, and causal; massless light is non-local, atemporal, and acausal. Light is an absolute and invariant ("global") causal messenger; time is a derived, relative, and variable ("local") causal linkage. While light carries a causal message, it is not itself causal, just as light is the field vector of electric charge, but is not itself charged. Time, on the other hand, is a causally charged linkage because it is connected in a rigid one-way sequence (one event and moment leads to another event and moment, but one photon does not lead to another photon). Hence the "velocity of time" is variable between observers (who each have their internally linked individual histories or "time lines"), but the "velocity of light" is not (since light does not form causally connected chains with other photons). The variability of time (and covariance with space) is necessary to ensure the invariance of the intrinsic motion of light (as gauged by "velocity c") in all interactions between matter and light ("Lorentz Invariance"). Quantum-mechanical phenomena which apparently violate causality relations are primarily due to the non-local character of light and "virtual particles". (See: "[Global vs Local Gauge Symmetry in the Tetrahedron Model](#)".)

Causality in the material realm of relative (rather than absolute) motion requires:

- a) Einstein's Special Relativity and Einstein's invariant "Interval" to regulate and integrate the interaction of the relative local motion of matter with the absolute non-local motion of light (including "Lorentz Invariance"). Causality is one of the conditions that must be satisfied in the conversion of free energy to bound energy (a time dimension must exist or be created).
- b) The one-way, intrinsic, entropic motion of time as a metric ordering principle, including a

gravitational field to create and sustain matter's time dimension and historic spacetime. History is the conservation domain of matter's information field and "causal matrix" (the reality of today is the effect of yesterday's continued existence in the "causal matrix" of historic spacetime - see: "[A Spacetime Map of the Universe](#)"). Causality is one (among several) rationales for gravitation.

c) Charge conservation to create and preserve Information in the historic domain of spacetime (Noether's Theorem). In the material realm, Causality serves Energy Conservation by insuring that there is always a source for energy (causes must precede effects and every effect must have a cause); and by providing an historical entropy drive (time) for bound energy. The combination of causality, temporal entropy, and mass-matter produces bound energy's gravitational field and provides the field's center: *a gravitational field is the spatial consequence of the intrinsic motion of time*. (See: "[The Conversion of Space to Time](#)".) Finally, Causality orders information just as it orders the metric and energy, providing an evolutionary and developmental route in biology, as well as a gravitational pathway for the return of matter to light.

### **Causality and the Conservation of Symmetry**

There is a metric component and a particle component to (a) symmetry-keeping or (b) symmetry-breaking. The particle component produces (a) virtual particle-antiparticle pairs, or (b) charge and information (matter); the metric component produces (a) space, or (b) time and gravitation. The metric component of the symmetry pole yields gravitation via the distortion of the inertial field of spacetime by the "location" charge, whose active principle is time (this is the connection between symmetry, gravitation, and temporal entropy). The particle component of the symmetry pole yields charge and fermions, or information, via the weak force IVBs and the virtual particle-antiparticle "sea" of the spacetime vacuum.

Together, time, gravitation, and information create matter's "causal matrix", the long-range aspect of historic spacetime, the repository of "karma" or consequences, the causal influence of actions. The trigger for gravitation is the transformation from implicit to explicit time, creating gravity and the asymmetric (temporal) metric. This conversion can only occur if a massive, immobile particle (mass) is present to provide a center for the time or gravitational charge. Gravity, time, mass, charge, and information therefore always go together, and the causal relation applies to information as well as to action (together creating an "event").

Charge conservation is the principle which allows weak force "symmetry-breaking" during the "Big Bang", because it guarantees the eventual return of bound to free energy (symmetry restoration and conservation) in the historic dimension. *The charges of matter are the symmetry debts of light* (Noether's Theorem). The creation of information by charge conservation and the fermions of matter is the most obvious connection between Causality and Symmetry Conservation (in the sense of "karmic information"). One must have information at some level to have an effect linked to a cause. Causality requires at a minimum time and gravitation, bound energy, and information (mass, charge, time).

History is the temporal analog of space, produced by the intrinsic motion of time, just as space is produced by the intrinsic motion of light. Gravitation and electromagnetism are the long-range forces which bind together, order, and organize the Cosmos at large, the orbits of the planets, the structure of the galaxies, the dimensional scale and metric of the Universe. But information itself also requires a causal or temporal ordering component, no less than raw energy, and for the same reason, energy conservation. In the case of information, the route is through the conservation of symmetry (via charge conservation). The essential purpose of information is to provide a "map" back to symmetry and light for bound energy and matter in the absence of antimatter: *the charges of matter are the symmetry debts of light* and their purpose is to pay these debts by returning bound to free energy. Gravitation is one of these charges as we have seen ("location" charge), converting bound to free energy in stars, etc. Information must be time-ordered no less than energy and action if it is to fulfill its role of energy and symmetry conservation. Beyond the simple ordering of cause and effect, the non-commutative rule of matrix multiplication in quantum mechanics is a basic example of the

essential importance of order and sequence in both energy and information. The nucleosynthetic pathway in stars is another example. (See: "[The Information Pathway](#)".)

In the Biological Realm, we have multiple obvious examples of the importance of the sequential ordering of information: the letters of a word, the words of a sentence, the grammar and syntax of a language. Language properly ordered produces poetry and literature; mathematics properly ordered produces equations and rational or at least quantitative understanding; notes properly ordered produce music; DNA properly ordered produces butterflies, birds, and humans; ideas properly ordered produces science and technology, etc. The sequential biochemical, physical, emotional, intellectual, and social development of an individual human from fertilized egg through to adulthood is a prime example of why it is important to order information in time, no less than ordering simple energy or action. The evolutionary process itself is a further example of the importance of the sequential ordering of information through time. (See: "[The Fractal Organization of Nature](#)".)

Applying this example to the evolution of the universe, the problem posed by the creation of matter is this: can matter find its way back to its original symmetric energy state (light) in the absence of antimatter? The answer is yes, but it requires the extra dimension of time to work the problem through with the information provided by the charges of matter - which is only half the information contained in the original particle-antiparticle pairs. The problem can be solved either gravitationally and "socially" by the conversion of mass to free energy in stars, quasars, and Hawking's "quantum radiance" of black holes, or "individually" by the nuclear forces through particle and proton decay.

"Karma" - the notion of causality extended to include a historic chain of events that returns to impact the initiator, is an ancient metaphysical recognition of cause and effect in human affairs. Its basis in fact is that the past remains as an active influence in the effects we experience in the present. There could be no present without the active support of the past - the "Universal Present Moment" depends for its reality upon the continuing reality of "Universal Historic Spacetime", the conservation domain of Information and matter's causal matrix. Our past is part of some other observer's present reality and vice versa. (See: "[A Spacetime Map of the Universe](#)".) The "Golden Rule" is not only a symmetry statement for social behavior, but also a warning against the inexorable operation of Karma. Likewise, we are admonished against taking the law into our own hands, lest we set the karmic cycle in motion against ourselves: "Vengeance is mine; I will repay, saith the Lord" - Romans 12:19.

The biological evolution of Information appears as an auxiliary pathway, even a "sideshow" or tangent to the main symmetry-conservation work of the universe, which is simply to return bound forms of electromagnetic energy to light. Life is an incredible elaboration of this negentropic information pathway. The principle drive is simply the abiotic and eternal search of matter for antimatter, realized through the long-range electrical and gravitational forces. The evolution of information proceeds along the [fractal pathway](#), and the production of beauty and "enlightenment" is the equivalent of symmetry conservation in the biological realm. Life is the means by which the Universe becomes self-conscious, experiences itself, and explores (and grows) its creative potential, including the development of new forms of awareness, creativity, and beauty. Humanity has even learned to directly convert bound to free energy, mimicking the solar fusion process, in a most curious evolutionary convergence between the abiotic and biotic information pathways leading toward symmetry restoration in the universe. If we annihilate ourselves through nuclear warfare, we can always claim we were driven to it by the universal imperative of symmetry conservation, rather than our own culpable stupidity.

In a less technically developed age, and on a more positive and humanistic note, Socrates had this to say concerning the ordering of information, beauty, and its relationship to symmetry conservation and cosmic purpose (in Plato's [Symposium](#)):

"This is the life which man should lead above all others in the contemplation of beauty absolute ..... Dwelling in that realm alone, he will bring forth not images of beauty, but Beauty itself, and so would become immortal and be the friend of God."

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