

SECTION VI: INTRODUCTION TO INFORMATION

(revised Aug., 2014 and Oct., 2018)

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Abstract

The term "information" as used in physics or communication theory has a very restricted meaning in terms of entropy and "bits" of information, a definition which makes the term amenable to mathematical formulation but which robs it entirely of its usual significance in the human context of knowledge, meaning, complexity, and consequence. This is equivalent to reducing the human body to its chemical elements (for the sake of simplicity) and ignoring its biological unity and function as a specific type of living organism. In these papers I am only interested in "information" in the latter complex sense. However, because the [hierarchy](#) is arranged by increasing size, its increasing information content is recognized in either case. "Information" is the most important concept connecting physics and biology, or the abiotic and biotic realms, including human spirituality. Information, the most mysterious and powerful parameter of the Cosmos, manifests first in the Periodic Table of the Elements, passes to carbon and DNA, evolving (locally) to an apex in humanity and our creations, both abstract and material, individual and social.

The "[Information Pathway](#)" was presented at "[CPSI](#)" in June 1999. The "Pathway" paper and the table "[The Information Ladder](#)" is simply the much older "[Fractal Table](#)" reinterpreted. Each realm of the fractal table can also be considered as a realm of Information; it is of considerable interest to note how far up this "ladder" of

Information human science, art, and philosophy have climbed. Humans have physically explored all 8 of the "[Microphysical](#)" and "[Biophysical](#)" levels, from particle physics to planet Earth. We are now exploring the first level of the "Astrophysical" realm - with Earth orbiting satellites, Moon landings, and robotic missions to various planets/comets/asteroids of our Solar System, including the Sun itself (level 9, Stars). Level 10 (Galaxies) remains in the domain of science fiction and art ("Star Trek", "Star Wars"), and of our observational and astrophysical sciences, (via telescopes and theory), as does level 11 ("Universe"). Level 12 ("Multiverse" or "First Cause"), is accessed only through theory: cosmology, religion, philosophy. The Metaphysical realms (human thought: levels 13 -16 and 17-20) are represented by the principles of the Unified Field Theory and/or the conservation laws of the [Tetrahedron Model](#) - in either case, the natural laws which underlie the manifest Universe (rational mode). In the intuitive mode, we find religious/mythological notions of Divine Law, or Plato's philosophic notions of the Eternal Verities and Ideal Forms which lie beyond, but are responsible for, the manifest Universe; we also find occult notions of cosmic order expressed in various "[world systems](#)" (the [I Ching](#), [Astrology](#), etc.). Some Eastern religious categories of these higher metaphysical levels are delineated in my late father's books: "[Operations of Increasing Order](#)" and "[Trance, Art, and Creativity](#)".

Viewing the "Information Ladder" table as an evolutionary sequence of information states, we see that each higher level necessarily encompasses all the information contained in the levels below. In this regard it is important to distinguish the planetary level information state of "Gaia" (level 8) from that of a lifeless planet, as the "Gaia" state would apply only to planets which support a biological information realm. Whereas the complex "Gaian" state is the last level (8) of the biotic realm, the simple abiotic or gravitational planetary state is the first cell of level 9 (Stars) in the Astrophysical Realm.

Humans seem to have "a foot on the rung" at every level of the ladder, if only by means of theory or observation. We are at level 7 or

8, considered as separate individuals (7) or as a globally distributed, "terraforming" species (8), just 2/3 up the 12 rungs of the physical ladder. Yet we have extended our influence, investigations, observations, and theories both upward and downward to the extreme limits of the "Information Ladder". The ladder clearly suggests that we will continue the upward physical climb, probably into level 10 (Galaxy) and possibly on into the Universe of level 11.

The "Information Ladder" reminds me of two things: 1) the Biblical story of "Jacob's ladder", extending from Earth into the Heavenly realms (Genesis 28:12); 2) Chardin's "Omega Point", a universal final state of self-knowledge and unity. In Chardin's view, information, not entropy, is the chief evolutionary vector of the Universe; entropy is just the way the accumulation of information is paid for. (See: ["Chardin: Prophet of the Information Age"](#)). In the ["Tetrahedron Model"](#), information is seen as an intentional, purposeful by-product of symmetry conservation (charge), providing the means whereby the Cosmos achieves self-awareness and further explores and evolves its creative energy and potentiality.

Causality and Information

Causality and Information share the 4th apex (matter, mass, bound energy) in the [Tetrahedron Model](#) of the conservation principles and natural laws underlying the unified field theory. Information is the concept that most comprehensively and succinctly characterizes the significance of matter; without matter, the information content of the Universe is zero. Information requires an asymmetry to exist; perfect symmetries cancel each other and so carry no net information - the prototypical example is the particle-antiparticle pair which self-annihilates (see: ["The Origin of Matter and Information"](#)).

Due to genetics, genes, the conservation of heritable units of molecular information (DNA) from one generation to the next, and the neg-entropic mechanism of Natural Selection, biological systems have become a major conservation domain of information, the molecular analog of the abiotic conservation domain of information and matter's "causal matrix", historical spacetime. Human abstract

information systems powerfully continue and extend this natural biological accumulation of information - through memory, language, writing, books, libraries, computers, educational institutions, social systems, etc.

Life, humanity, and history are all conservation domains of information. Spacetime itself is the ultimate storehouse and repository of historical information. The ancients referred to this aspect of spacetime as the "Akashic Record", and thought some of the adept had occasional access to it (oracles, seers, soothsayers). Science has likewise taught us that we are looking into history as we look outward into space and backward into time. (See: ["A Spacetime Map of the Universe"](#)).

When we stand back a little and look at the reach of humanity into every part, from bottom to top of the "Information ladder", it is difficult to comprehend the view of some scientists that humanity is not a special creature. I subscribe to the view of [Teilhard de Chardin](#) that consciousness and intelligence and information are the principle evolutionary axes of the Universe, and that on planet Earth, at least, humanity is the point of this "evolutionary arrow", the apex or tip of the evolving vector.

A human individual contains an enormous amount of information in the trillions of cells, DNA, biochemical systems, and interconnections of the nervous system. In terms of physical size, we are puny and insignificant; but in terms of information content, we are astronomical in magnitude, both as individuals and as a species. It is on the information scale that the significance of humans must be measured and compared to the other major players of the Cosmos - planets, stars, galaxies, etc.

It seems that abiotic information conservation may be limited to the historical component of spacetime. In terms of "hardware", information begins with charge. Information is most reliably stored as charge at the atomic level, but when charges annihilate, the information they carried is gone, except for the historical component, which is more durable, although evidently subject to the entropy of

"dilution" as its effects spread and divaricate, propagating throughout spacetime. At a certain high level of dilution, these effects will become subject to the operation of chaos and quantum uncertainty, further eroding their information content. Hence even though the effects of an action may remain forever in the Cosmos, it may after a time become impossible even in principle to trace an effect back to a single, definite original cause (in the absence of an "artificial" conservation intervention requiring external energy inputs, such as human record-keeping).

There seems to be no limit to the complexity or amount of information systems can attain, if enough energy is available. The primordial function of information (in the form of charge) is to lead matter back to its original symmetric energy state (light), upon a "straight and narrow path" of natural law via charge conservation. Hence we see the natural tendency of all material systems to convert bound energy to free energy, following the information pathway of the charges they contain (stars, supernovas, quasars, the quantum radiance of black holes, proton and particle decay, exothermic chemical reactions, the nucleosynthetic pathway, fission, fusion, matter-antimatter annihilations, etc.). Perhaps this is an explanation, in terms of physics, for the self-destructive behavior of humanity, which seems poised to end its evolutionary history in a flash of nuclear fusion and fission, imitating the stars.

Gravity

Although gravitation is an abiotic force, it is nevertheless responsible, directly or indirectly, for every level of the fractal hierarchy, including the first: gravity provides balancing, complementary, negative energy for the "Big Bang", and helps create bound electromagnetic energy (matter, atoms) from light. Gravity creates the elements in stars, creates planets to support life and the stars which supply life's energy (including radioactive energy), and organizes the various levels of the Astrophysical Realm. Newton's Gravitation stands to the Fractal Hierarchy of Nature as Darwin's Natural Selection stands to the Theory of Evolution - gravity is the

neg-entropic engine which produces all the material realms. The fact that both these neg-entropic drives, and the [4x3 fractal algorithm](#), intersect in the replicating molecule of DNA, has enormous implications for the abundance of life in the Universe, amounting to a theory of, and a prediction for, exobiology. Gravitation, chemistry, and the operation of the 4x3 fractal algorithm are [universal abiotic forces](#) which inevitably produce 4x3 molecular structures including DNA whenever environmental conditions allow. *The information system of life is therefore not accidental, but a natural and predictable outcome of the operation of physical law, because of the universal presence and activity of the [4x3 fractal algorithm](#).* (See: "[Newton, Darwin, and the Origin and Abundance of Life in the Cosmos](#).")

The tendency of biological and material systems to create large and interconnected information structures (such as the biological web or matrix of Earth, and the dispersal of life into the galaxy) is apparently due to matter's never-ending quest for antimatter, as driven by charge and symmetry conservation, the long-range electromagnetic and gravitational forces, and matter's attempt to recreate in material systems the original connectivity, unity, and symmetry characteristic of light. [The charges of matter are symmetry debts of light](#) ("[Noether's Theorem](#)"): [atomic charges are matter's memory it once was light](#). The unity and connectivity of light are evidently also ultimately conserved correlates of light's state of perfect symmetry. (See: "[Symmetry Principles of the Unified Field Theory](#)"). The emergence of "beauty" in material and biological systems is an imperfect expression of symmetry conservation manifesting as best it can in an intractable medium.

The problem posed to the Cosmos by the asymmetric creation of matter is this: does asymmetric matter contain enough information, in the absence of antimatter, to return to its symmetric origin as light? Matter is only 1/2 of light's particle form, and so contains only one-half of the original information contained in particle-antiparticle pairs. The answer to this question is a provisional "yes": provided another dimension, time, is added to space to allow the working

through of the difficult return path. During this return journey, [the information pathway](#) develops as a consequence of matter's eternal search for antimatter, and appears to be an attempt to recreate in material form the original attributes and potentials of light, including its unity, connectivity, symmetry, and creativity (light creates space and helps create matter). The material realm is a parallel construction, an alternative form, a conserved proxy, an analog in matter composed of charge and information derived from the symmetric energy of the Universe of light: Heaven reproduced on Earth, [Chardin's "Omega Point"](#). The material universe is a laboratory in which the creative potential of symmetric energy (light) is explored and realized, through atomic charge and information, in material and specific form. It is perhaps of special interest to note that it is the symmetry component of the light universe which is conserved as charge and information. (See also: "[Comment on the Metaphysical Realm \(rational mode\)](#)".)

Our species' special position/power comes about through our discovery of Natural Law and the scientific method. Natural Law is the same everywhere in the Universe; hence a knowledge of the information content of Natural Law is a necessary prerequisite for a universal traveler, a galactic explorer and colonizer, a true Citizen of the Cosmos. The human "niche" has evolved from its beginnings in local Earth biology to a universal expression: the extraction of energy via the social apprehension and application of Natural Law. Our biological role is to be the seed of Gaia, dispersing earth-life into the galaxy via our space programs and rocket ships. Nor is it likely that Earth is the only planet in the Milky Way entering its dispersal phase. We need to stop fighting among ourselves, protect our fragile mother-planet, and move on to the new frontier that beckons us from above and is the evolutionary purpose, promise, and destiny of our species.

Language and Information

Terence McKenna (*True Hallucinations* (1993) and *The Archaic Revival* (1991) MJF Books) has said he believes the universe is made from language - which is true enough of the biological realm, since

DNA is certainly a form of molecular/chemical language, by any definition. The question remains, therefore, is the abiotic realm similarly created by language, and if so: 1) is there an analog of DNA for the creation of the abiotic (particle/atomic) realm? 2) Is there a linkage between the language systems of the biotic and abiotic cosmos? I think the answer to both questions is yes: for the first question, the analog of DNA for the particle/atomic realm is the spacetime metric or "vacuum", which serves as a template for the production of elementary particles both during the "Big Bang" and currently (via virtual particle-antiparticle pair creation). (See: ["The Higgs Boson and the Weak Force IVBs"](#).) For the second question, the linkage is obviously through the carbon atom and its five levels of 4x3 fractal resonance, which also has its beginning in the 4-D metric of spacetime. (See: ["The Fractal Organization of Nature"](#).) These ideas resonate with notions such as "man created in the image and likeness of God", "in the beginning was the word", and the information potential stored in the "vacuum" of spacetime (as particle-antiparticle quanta), and in the all-symmetric Multiverse.

Matter is an asymmetric, conserved form of light (one-half of a matter-antimatter particle pair). (See: ["A Short Course in the Unified Field Theory"](#).) The language spoken in the conversion of light into matter is the language of conservation, which has three major modes, spoken simultaneously like the notes of a musical chord. These three conservation modes are 1) raw energy conservation (mass - momentum); 2) symmetry conservation (charge - inertia); 3) entropy conservation (spacetime - gravity - "intrinsic motion"). Light's primal form is simply pure energy, symmetry, and entropy - free electromagnetic radiation - manifesting as undifferentiated energetic photons which create a hot, expanding and cooling spatial metric due to their intrinsic (entropic) motion and symmetric (non-local) energy state. This is not (at first) a language but a primordial roar of raw power. The conversion of this primal thunder into atomic matter (via the symmetric template of spacetime and the asymmetric mediation of the weak force) produces a conserved set of elementary particles (quarks and leptons, identical and invariant within type) which combine with one another to form an alphabet of 92 letters, the

natural elements of the periodic table. These letters then combine into the words of molecular chemistry and eventually create the poetic language of life, with carbon and DNA as the connecting linkage between the biotic and abiotic realms. The 4x3 universal fractal algorithm regulates the formation and development of every level of natural organization, from its inception in the 4 dimensions of the spacetime metric and the 4 conservation laws of energy, symmetry, entropy, and causality-information, to the majestic galaxies and the evolution of life. (See: ["The Tetrahedron Model"](#).)

The periodic table is an abstraction, not a physical analog of DNA; so is the nucleosynthetic pathway, which we might also name. The physical object that creates the elements is of course a star, so apparently it is the stars (and the actions of the nuclear strong and weak forces) which are the abiotic physical analogs of biological DNA. In this analogy, galaxies play the role of multicellular organisms. Antecedent to the creation of the elements (and the galaxies/stars) is the "Big Bang" itself, in which elementary particles, including the first baryons (protons and neutrons) are created via the mediation of the weak force and the asymmetric decay of electrically neutral leptoquarks (see: ["The Higgs Boson and the Weak Force IVBs"](#); and: ["The Origin of Matter and Information"](#).) In this abiotic part of the analogy, identical nucleons in different combinations create 92 distinctly different letters (the elements); these letters are then strung together in meaningful molecular words by DNA - "genes" coding for amino acids and proteins.

Hence the conservation "word" which begins as light (pure electromagnetic energy), passes through (at least) three major stages: 1) the "Big Bang", where light is transformed to baryons via the template of spacetime and the asymmetric action of the weak force (see: ["The Higgs Cascade"](#)); 2) stars (in galaxies), where baryons (hydrogen gas) are converted to the 92 natural elements via the actions of all the forces, but especially the strong and weak forces (the nucleosynthetic pathway, including supernova explosions necessary to create and disperse elements heavier than iron); 3) the creation of DNA (on planets orbiting stars in galaxies) via the organic

chemistry of carbon. The 4x3 universal fractal algorithm is active at all levels (see: ["Nature's Fractal Pathway"](#).)

The charges of matter are symmetry debts of light ("Noether's Theorem"), and it is the charges (electric, color, identity, flavor, spin, parity) that give the atomic letters and molecular words their distinctive character and form. "In the beginning was the word", and the word was a conserved form of light - an atomic word which eventually became the flesh of Man, filling his mind with wonder. In this context I also recall the story of Aslan, the magical lion of C. S. Lewis' imagination, singing the world of Narnia into existence. This, I submit, is the physical interpretation of Terence McKenna's inspired assertion that the Cosmos is constructed of language.

(Added July 2014)

Matter - Energy - Life ([Teilhard de Chardin](#))

Bound electromagnetic energy (atomic matter) - free electromagnetic energy (light) - Information (["Tetrahedron Model"](#))

"Information" is the connecting idea between *life* and *spirit* - between science (biology) and religion (metaphysics). Princeton physicist John Archibald Wheeler famously characterized the ontological role of information: "it from bit".

"Spirit in nature" is the "information" content of nature, as found in the great repository of the 92 elements of the Periodic Table, and elaborated by the living, reproducing molecules of RNA/DNA in biological organisms. While the ultimate source of information is the Multiverse (the scientific stand-in for "God"), in our cosmos information begins with the asymmetric creation of matter via [weak force symmetry-breaking](#) during the "Big Bang". Antimatter is annihilated, while a residue of matter composed mostly of hydrogen and helium atoms is left to form our stars and galaxies. Information creation continues in stars and supernovas through the production of all 92 natural elements (following a 4x3 fractal pattern - as embodied in the "alpha particle" (helium nucleus), the "brick" or building block

of the [nucleosynthetic pathway](#)).

We revere the sun and stars not only for their heat and light, but because they are also creators (factories) of information. Information is stored in atoms primarily as charge and spin in two linked systems: 1) as orbital parameters of the electron shells (low energy information useful to planetary life); 2) the configurations of its nuclear constituents (protons and neutrons - high energy information useful to stars). Even the geometry and shape of large molecules may contain biologically significant information (as in the proteins). The concept of "Information" allows us to produce a General Systems bridge between a religious/spiritual vs a scientific/material view of the Cosmos.

[Teilhard de Chardin](#) was the great expositor of this view, although he did not use the concept of "Information" (he used "spirit" instead), as "information" was only just coming into general use as a recognized physical parameter during his lifetime.

What connects life and information? Life begins and evolves from information contained in specific molecular forms (combinations) - RNA/DNA - that "know how" to reproduce and maintain themselves, and successfully compete with other living forms (even those of its own kind), retaining this information for its own use and passing it on to its offspring. While these complex chemical systems begin as purely "mechanical" forms of information replication, storage, and processing, competition and evolution (even at the molecular level of organized chemical systems) soon favor "individuals" (specific molecular combinations) with an aggressive "personal" agenda for survival and reproduction - resulting in "self-interest", "identity", and "personality" - even in very early living systems. (Later, social organisms will find they must adhere to a more altruistic behavior.) (See: "[The Fractal Organization of Nature](#)".)

A 4x3 fractal algorithm is involved in the evolution of information, from helium to carbon to DNA to the genetic coding for the amino acids of proteins, seamlessly connecting the atomic and biologic

realms. Finally, we note that the astonishing Biblical assertion that Man is created "in the image and likeness" of God, is best understood as a statement of the fractal organization of the Cosmos from top to bottom. (See: "[Nature's Fractal Pathway](#)"; See: "[Newton, Darwin, and the Abundance of Life in the Cosmos](#)".)

The universe explores, knows, and enlarges itself through the "[Information Pathway](#)" of life and humanity. Our role is to help the universe understand, explore, and appreciate itself, and further develop its emergent, nuanced, creative powers and productions, including higher expressions of symmetry, harmony, love, and beauty.

Chardin - "Inner" vs "Outer" realm of atoms = information/spirit vs force or energy field. What Chardin referred to as the "inner" essence of the atomic world we would refer to as the "information" content of atoms. It is this information content that eventually produces the emergent property "Life". In religious terms, we might identify information with the "Holy Spirit" and the information content of humanity as the "Divine Essence" of humanity ("God incarnate" - God is Life). The universal "vector" in evolution is self-knowledge/self-awareness by the universe; locally, the vector seems to include the evolution of creatures capable of building rocket ships, both to protect Earth-Life from asteroid strikes (such as destroyed the dinosaurs), and to disperse Earth-Life into the larger galaxy.

Chardin saw man as the natural culmination of evolution. Man is necessary to understand, explain, and control evolution - as well as to see and review its whole history in the fossil record. Man's control of evolution is the fractal iteration that demonstrates the end of one fractal cycle and the beginning of another in the physical world - natural selection giving way to artificial selection of various sorts - not only plant and animal breeding but direct genetic manipulation/engineering via gene splicing, etc.; encompassing not only physical genetics/genes but also the abstract theory of genetics,

leading to the complete human control of biological evolution. We are see a similar fractal iteration in the abstract information realm, via computer language and digital simulations of reality. A new fractal level of reality is evolving in the information domain. There should be a 4x3 resonance at its core: (I recall reading something about the significance of 64 bits (4 cubed), which is also the potential number of amino acids.)

The most amazing emergent phenomenon is human consciousness and creativity. But all life is an emergent phenomenon. What is an "emergent" phenomenon? You can see a good example in a mirror. You are "star stuff", you are composed of trillions of cells, myriad species of bacteria, multiple organ and sensory systems of great sophistication (although you lack one-half of a complete reproductive system), you encompass incredibly complex biochemical pathways and mechanisms, and yet (if you are a normal, healthy individual) you have a single integrated body, identity, personality, agenda, and action. You require a mate to complete your "agency", however (a curious if not disconcerting aspect of our biology - useful for good evolutionary reasons).

Beethoven (and other geniuses) are emergent phenomena of the human species and human social organization (human level of natural organization). Human intellectual abstract mental activity and creativity is an emergent phenomenon of the human brain - language, art, science, religion, etc. "Mind" is an emergent phenomenon of brain. "Genius" is the ability of a single local brain/mind to contact plural universal mind - even the information field of the universe. This subtle feature of the electromagnetic realm is poorly understood (communication via resonance?), but characterized symbolically as the "muse" of the arts and sciences. (For more on this topic, see "[Trance, Art, and Creativity](#)" and other of my late father's books linked at the bottom of this page).

The atom, composed of a linked system of electron shells and nuclear particles, presents a most remarkable example of hierarchical

information domains, the nucleus containing information useful to stars and the process of element-building, the electron shell containing information useful to biology and the process of species-building. Thus are the planetary and celestial domains united from the beginning by the information architecture of their constituent particles: the Microphysical, Biophysical, and Astrophysical realms of physical reality. Human consciousness adds an emergent 4th level: the Metaphysical realm. (See: "[The Fractal Organization of Nature](#)".)

(added Feb., 2015)

The "Information Pathway" of the Cosmos eventually leads to life, humanity, language, abstract modes of consciousness, communication, knowledge, imagination, thought, fantasy, mythology, religious ideology, the arts, science, mathematics, and technology. The Information Pathway is the means whereby the Universe knows and experiences itself, enlarges and fulfills itself, evolving a human co-creator who is capable of developing new forms of beauty and exploring new modes and avenues of creativity - even, perhaps, of providing companionship - or at least an interesting evolutionary drama. While biology is firmly embedded within the electromagnetic force, if we were to designate a 5th force of Nature it would have to be the Life Force - born of information and propelled by evolution - the information force of the Universe awakening to itself and exploring a new mode of creative expression.

The Information Pathway begins with light (electromagnetic radiation) which exists in two forms: a waveform consisting of mutually induced electric and magnetic waves/fields, and a particle form consisting of matter-antimatter pairs of many kinds of elementary particles, such as leptons and quarks, neutrinos and mesons, baryons and hyperons, leptoquarks, and various connecting particles (field vectors) such as gluons, photons, gravitons, and Intermediate Vector Bosons. This "zoo" of elementary particle-antiparticle pairs (which may include the "Higgs boson" and other high-energy particles as yet undiscovered), and their associated field vectors and "co-workers", exists in the "void" or "vacuum" of

spacetime as an alternative (conserved) form of light waiting only for enough energy to make itself manifest. Particle pairs continuously form and annihilate each other (alternating between their light and "virtual particle" forms) within the Heisenberg/Dirac time/energy limit of the "Uncertainty Principle". This is the great primordial, symmetric reservoir of information that exists with light from the beginning of the Cosmos, manifest through the "Big Bang" as an alternative, material, conserved-by-charges form of light. During the "Big Bang" or "Creation Event" the symmetry of the primordial particle-antiparticle charge pairs is broken by asymmetric interactions within the weak force - probably [asymmetric decays of electrically neutral leptons](#). The Universe is not born "stupid", but full of information, waiting for symmetry-breaking by the weak force to set it free on a [cosmological evolutionary pathway](#). The "Big Bang" is an explosion of charge-conserved information as well as of [space, time, matter, and light](#). Our Universe is apparently an [electromagnetic subsection of the "Multiverse"](#), an asymmetric "breakout" engineered by the weak force, made possible only because it is wholly conserved (by charges) and can therefore, eventually but surely, "return to the fold" of its origin (complete symmetry conservation as light).

The Information Pathway is seen explicitly in the Periodic Table of the Elements, in the nuclear and electron shells of atoms, the inorganic chemistry of the mineral world, and finally in organic chemistry and the molecular architecture of DNA and the genetic code of biology. It is elaborated through evolutionary time as the plants and animals of living systems on planets such as our own beautiful Earth, and makes a triumphant emergence from matter in abstract form through the symbolism of human language and the mental capacity of the human brain. Its proliferation in abstract form is essentially without limit. The notion that Information is an actual physical force (with energy content) can be seen from the effects of life on our planet, including the works, mental and physical, of humans (apparently this also is, or related to, the idea behind the "Force" of the "Star Wars" movies). But we don't need science fiction movies to convince us of the power of the "Information Force": we,

ourselves, and our technology are the existential proof of its potency and efficacy. What the information age will bring to us next via our computers is an issue of extreme importance, not just for us but for life itself (with many books devoted to this subject). John Wheeler's "It from Bit" is a succinct expression of the creative power latent in the Information Force, as recognized by leaders of modern physics.

The Information Pathway is not a "random walk", but follows a 4x3 (sometimes 4x4) General Systems resonance, pattern, or algorithm that begins with the elementary virtual particle-antiparticle pairs of the "vacuum" (three families each of 4 elementary particles), passes through the carbon nucleus and electron shell (4 nucleons each of three quarks ("alpha" particle), four binding positions in the third electron shell), and ends with the genetic code of biology (four nucleotides code in triplets, producing amino acids). It can also be seen in the [foundation principles of Natural Law](#). The emergence of life from inanimate matter is therefore programmed into the Universe from the beginning, [and we expect to find it abundantly](#) wherever environmental conditions permit. (See: "[The Fractal Organization of Nature](#)"; see also: "[The Information Pathway](#)".)

Postscript

WEAK FORCE IVBs, NEUTRINOS, AND INFORMATION
(IVBs = "Intermediate Vector Bosons": the strange, massive field vectors (force carriers) of the weak force)

In the domain of the weak force, we find two types of elementary particles: 1) the (relatively) massive electrically charged leptons (electron, muon, tau); 2) their associated "identity charges", the (relatively) massless and electrically neutral neutrinos. Neutrinos are the "bare" identity charges of their massive leptonic namesakes, one for each type of massive lepton (the electron, muon, or tau neutrino). Although the three types of neutrinos resonate from one identity to

another while in flight (apparently because their only distinguishing characteristic is a slight difference in mass), they will only interact with their own specific massive and charged namesakes, during transformations or the creation/destruction of *single leptonic elementary particles*. Neutrino "identity charges" (the characteristic charge of the weak force) provide the foundation for the information content of the cosmos - just as the *weak force asymmetry* provides the matter surplus of the cosmos.

We have already noted the strange fact that the "W" IVB, which weighs the equivalent of about 80 proton masses, is required to regulate the creation, transformation, or destruction of *single* charged leptons, even though an electron is lighter than a proton by a factor of nearly 2,000. *We have explained* this enormous "overkill" of available energy as due to the necessity to return to the original environment in which electrons were created, in order to ensure that every electron ever made - past, present, or future - is absolutely identical (for reasons of energy and symmetry conservation - for example, they must always be able to replace each other, or to annihilate with an exact antimatter counterpart).

With respect to the neutrinos, whose mass is still unknown but may be as little as one-millionth that of an electron, we find an even more extreme mismatch between the "Z" neutral IVB and the particles whose transformations it regulates: the "Z" neutral IVB weighs about 90 proton masses. As in the case of the "W" IVB, we explain the huge mass of the "Z" as necessary to recreate the original energy environment in which neutrinos were created, and for the same reason: within type, every neutrino ever created - past, present, and future - must be exactly alike. If this hypothesis is correct, it suggests that the neutrinos were created before the massive leptons, in an earlier, smaller, and hotter universe, closer in time to the actual origin of everything.

But of course this only makes sense: the identity charge must be ready before the arrival of the massive lepton it will delimit and

characterize. The mold must pre-exist the substance poured into it. The massive leptons would not "know" what form to take without the neutrinos to guide them. The presence of the neutrino precludes potential chaos during the initial "packaging" of energy into discreet, massive leptons during the Big Bang. Think for a minute, and you will realize that "Identity" is, and must be, matter's most primitive and basic charge (otherwise matter could not recognize and annihilate with antimatter - energy, symmetry, and charge conservation would be lost). How our matter-only universe manages to achieve conservation despite this glaring asymmetry is the major subject of this website.

[In the spirit of General Systems](#) in which this webpage is founded, I wish to note the following concordance: neutrinos are evidently the first elements of information to appear in our cosmos, and as we have suggested above, necessarily pre-exist the massive elementary leptonic particles for which they provide "[identity charges](#)" (implicit in the massive leptons, explicit in the neutrinos). To use an analogy, it is almost as if the neutrinos are the "souls" of the massive particles they code for - presenting us with a natural example of Platonic dualism. While the rational mind has only recently discovered massive leptons, neutrinos, identity charges, and the scientific concept of Information, the intuitive mind long ago recognized the fundamental ontogeny of the cosmos in a single, simple statement: "In the beginning was the word".

Further in the same vein: when Moses asks God what his name (identity) is, God replies: "I am that I am". This is nothing less than a statement of absolute identity, sufficient unto itself, underived from any prior, higher, or more universal source. God simply IS, and cannot be encompassed, captured, or otherwise diminished by a name or category. When we refer to God, we refer to that which *cannot* be named. God is simply the "Almighty", the "First Cause" or "Prime Mover", the "One", the "Creator". We are all subdivisions of the eternal "I AM", the everlasting, living, "Creative Principle".

And what are we to make of the notion that humanity is created in the "image and likeness" of God? To me, this suggests the idea of God as the central, single, all-encompassing "Identity" of the cosmos, from which the souls (identities) of His creations are derived - much as the "Big Bang" is the central single source of the neutrinos bearing identity charges of the elementary particles they will characterize. We are created in the image and likeness of our universe. This is something [Chardin understood](#).

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Books by my late father Prof. John Curtis Gowan

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(See also: [Section 3: "Fractals"](#); Section12: "[Man's Role in Nature](#)"; Section 14: "[Causality](#)")

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