

TEILHARD DE CHARDIN - PROPHET OF THE INFORMATION AGE

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Abstract

Teilhard de Chardin's notions of the "Noosphere" and the "Omega Point" are explored in the context of current knowledge and theory, especially J.E. Lovelock's conception of "Gaia" - planet Earth as a superorganism. Space-faring humans are seen as the "seeds" or dispersal agents of Gaia's reproductive phase, carrying Earth-life into the Galaxy. "Noah's Ark" is a vision of the future, not the past.

Pierre Teilhard de Chardin

The Phenomenon of Man

French: Editions du Seuil, Paris, 1955

English: Harper and Row, New York, 1959

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Introduction

Teilhard de Chardin (May 1, 1881 - April 11, 1955) and Albert Einstein (March 14, 1879 - April 18, 1955) were almost exact contemporaries. These two great thinkers died a few days and a few miles apart (Chardin in New York and Einstein in Princeton), just a few weeks before I graduated from high school. I had not heard of Chardin at the time, because the Church would not allow him to publish his works (Pierre Chardin was a Jesuit priest as well as a paleontologist). Chardin's books became available only some years after his death. Chardin worked in China and was involved in the discovery of Peking Man, and so was rather more committed to the theory of evolution than the church fathers of his time.

Chardin's thesis is deceptively simple, and leads us quickly into deep water, both philosophically and scientifically, for Chardin was that rarest of men, a deep and articulate thinker who was both a master of science and of the spirit. While Chardin participated in the orthodox practice of both science and religion, he was at the same time a maverick thinker in both, and sought mightily to bring the two together without doing harm to either.

Chardin accepted evolution as the principle dynamic of the Universe, not only biological evolution, but physical evolution as well in the sense of the increase of entropy, the arrow of time, the expansion of the Cosmos, etc. He furthermore believed that the axis, vector, or goal of evolution is not the attainment of maximum entropy as assumed by physical science, but the attainment of maximum consciousness. Chardin maintains that the increase in entropy is just necessary payment to achieve this goal, and that the focus of science has been on the currency changing hands (energy), while ignoring the goods being purchased (information). Chardin makes a compelling argument that over evolutionary time we see information systems increase in complexity as the consequence of evolution, that this is the only interesting thing that is happening in the Universe, and that the concomitant increase in entropy is simply the cost of achieving

the real purpose of the exercise.

Chardin sees human consciousness as the (current, local, individual) pinnacle of information evolution, and he makes the argument that any attribute we see in the Cosmos today must, due to a principle of "unitarity", have an expression of some sort at every organizational level in the Universe. According to this thesis, consciousness, spirit, and even life exist in some form, however rudimentary, at organizational levels both above and below individual humans, from the atom to the galaxy (although the latter may not yet be fully evolved). "Emergent" properties, in this view, are the flowering of seeds which have existed from the very beginning of time and the atomic order.

In Chardin's view, organizational levels above the human individual include social man, or "Mankind"; the "noosphere" or the summation of knowledge on Earth; and a universal, far-future state of cosmic "at-one-ment" he designates the "Omega Point". My own work on the evolution of the "fractal" Universe contains many points of similarity with Chardin's evolutionary thesis, and in fact can serve as something of an updating and rephrasing of many of Chardin's ideas, which were written down in the 1930s. Accordingly, I offer several short essays which touch upon a few points of mutual interest, as well as a large table, the ["Information Ladder"](#), which is the main exhibit.

The "Information Ladder" table illustrates several of Chardin's principle notions:

- 1) the thrust of evolution is to develop information systems of ever greater complexity and inclusiveness. It is later than we think: already Gaia is reaching into the Solar System in her reproductive mode (level 9);
- 2) the same pattern is followed at every level of organization, above as well as below individual humans (the 4x3 fractal algorithm of cosmic evolution);
- 3) centers, nuclei, and closed systems are important evolutionary way-stations: atomic nuclei, cell nuclei, galactic nuclei; the brain, cities, society, galaxies, etc.; concentrations of energy and

information; defended system boundaries;

4) Involution and the limitation of resources have important evolutionary consequences, especially through intraspecific competition: the internal competitive struggle between members of the same species increases specialization;

5) Reflexions are the sign of a new fractal iteration, the pattern repeating at a new level of organization and/or on a new scale (the human appropriation of the natural evolutionary process through plant and animal breeding and genetic engineering is one example among many - mechanical locomotion on land, sea, and air, and electronic language and computing are others).

6) 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 shells 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: the Metaphysical. (See: "[The Fractal Organization of Nature](#)".)

"Social Knowledge" and Chardin's "Noosphere"

Most of the information in the Universe is developed upon the atomic foundations of the nuclei and electron shells of the 92 naturally occurring elements of the Periodic Table. The electron shell is a delicate and intricate structure, responsible for the chemical characteristics of the elements - that is, how they interact with one another. Nuclear interactions are millions of times stronger than chemical interactions, and are therefore far too energetic to support the delicate structures of living organisms; for this, we need a much gentler and lower energy mode of interaction, a possibility provided by the attenuated reactions of the electron shell, of which hydrogen bonding is one example.

In some respects the electron shell is like an antenna, raising the sensitivity of the atom to particular frequencies of light, which it can absorb and emit; in other respects it is like a patch of Velcro, allowing atoms to stick together in particular combinations; these combinations in turn can be even more sensitive to light and other external influences than their individual components (photosynthesis, eyes). The electron shell itself carries a great deal of information in terms of energy levels, charge, spin, magnetic moment, and other quantum-mechanical parameters. The chemical combinations electron shells produce of course carry more and more information as they grow in size and number of components (hydrocarbons, amino acids, proteins). What we see in the development of life is the growth of information and sensitivity into systems of absolutely immense complexity. A living cell is truly a "city" of information - the human body a "galaxy" of coordinated information systems. This is the physical aspect of the electron shell which I wish to emphasize - the evolutionary development of living systems representing astronomically huge quantities of coordinated, orchestrated, information sets with incredible levels of sensitivity.

In humans, there is another development, another superstructure, which is imposed upon this already gigantic physical base, which I refer to as the development of social knowledge and which Chardin named the "noosphere". To understand the concept of social knowledge, consider the difference between the knowledge carried in the beaver species and that carried by the human species. Beavers are very good at building their dams and lodges, far better in this specialized skill than I am. The "technical" information of building dams and lodges is known to every mature beaver - in fact, there is a one-to-one relationship between the knowledge carried by every individual beaver and that carried by the entire beaver species - each individual beaver possesses as much technical knowledge concerning dam and lodge building as does the whole beaver species.

In humans, however, there is an enormous disconnection between the knowledge - technical or otherwise - possessed by the species and the knowledge possessed by any human individual. The human species

knows how to build a Boeing 747, a particle accelerator, an atomic or hydrogen bomb, a moon rocket, a supercomputer, the Hoover dam and its hydroelectric generators (try that, beavers!), televisions, radios, telephones, radars, nuclear submarines, etc., etc., etc. I don't personally know how to do any of these things, but my species does. It is this knowledge possessed by the species that is over and above the knowledge possessed by its average member that I refer to as social knowledge. No individual human can hope to possess more than a tiny fraction of the social knowledge now carried by our species, and the gap grows larger daily with the development of new specialties, the publication of new technologies, and advances in every field of human endeavor.

Human social knowledge is carried largely in abstract form and is dependent upon the social development of symbolic methods of recording information - essentially the development of an artificial memory system - writing, printing, photographic and electronic storage and communication devices. We don't need to remember all these things because our books remember them for us; we simply look them up when we want to "remember" them. A library is a repository/conservatory of social knowledge. Social knowledge and technical "know-how" is created in schools, business centers, industrial factories and manufacturing sites, university and government institutions dedicated to teaching, research and development (including military applications), private sector research parks, etc.

Gaia

The concept of Gaia - the Earth itself as a self-regulating biological super-organism - was put forward by J. E. Lovelock in 1979, 24 years after Chardin's death, but had Chardin been aware of the concept I think he would have embraced it enthusiastically. In any event, it seems to me that the Gaia concept clears up some of the murky issues surrounding Chardin's views of the "hyper-Earth" or "ultimate Earth", in that it allows us to place the modern experience of humanity - which Chardin (and many others) have recognized as a

turning point, not only in the history of our species, but in the history of life - in the context of the biological evolution and ontogenetic development of Gaia herself.

We all have come to recognize that the modern era is a time of peculiar crisis and enormous change of a very fundamental kind in the long history of life (at least of Earth-life). Man is now in control of the evolutionary process itself, he creates new elements, tames the nuclear fires of the atom, understands natural law, creates artificial intelligence, sends rockets to the planets, etc. The Earth has never seen anything like it. But what does it all mean? From the viewpoint of Gaia, the answer turns out to be quite simple - which is perhaps the best reason for adopting this or any other hypothesis - Gaia is flowering, and we are her seeds, to be dispersed into the solar system and as far into the galaxy as we can reach. This is precisely the great change that every thinking person recognizes has come over the earth: in man, Gaia finally found the species she was looking for to carry her life into the galaxy and colonize new territory, for like every other life form Gaia has a limited life span (the Sun or the asteroids will eventually kill her), which can only be extended by reproduction and dispersal. With man as her agent, Gaia has entered her reproductive phase, and put at man's disposal all her stored energy for this mighty effort. Will Gaia, like the salmon, perish in one great reproductive effort, with all her reserves exhausted, or will she, like a great tree, produce seeds for many generations to come? It is up to us to ensure that the latter course is followed.

The hyper-life form that Chardin envisioned forming above social Man is in fact Gaia (level 8 - Earth plus Man), and the final separation and exodus of this hyper-life form from Earth "at the end of the world" is in fact the reproduction of Gaia through Man as he colonizes new planets in the galaxy (levels 9+). Even though Chardin considered but rejected (as too difficult) the prospect of space travel, it is exactly what he was seeing intuitively, without recognizing it.

Every attribute of humanity and our whole history, indeed our whole future, is contained and explained in this single hypothesis, and much

of Chardin's rather murky views of the future of Earth can be translated into clearer terms under this strictly biological scenario. Chardin rejected the notion of space travel in his day (he wrote in the 1930s), but I do not think he would do so today. Consummate biologist and systems thinker that he was, I believe Chardin would have embraced the notion of Gaia as an evolutionary unit, which like every other biological entity, is born, matures, reproduces, and dies. In this we see the great responsibility and privilege laid upon our species - Gaia lives or dies with us. We carry Her hopes for the future with our own.

Consciousness as the Integration of Perception

Chardin saw consciousness as the goal of evolution, with human abstract thought and its reflexive self-awareness as the current (local) acme of development. Chardin then makes the argument, of crucial importance to the theme of his whole work, that because human consciousness and thought exist today, they must, due to the "unitary" character of the Cosmos, and the necessarily unbroken chain of evolutionary development, exist in some essential, primordial form in every part of the Cosmos.

With this I am inclined to agree, especially as it is in perfect accord with my own fractal hypothesis. However, I am also inclined to modify the argument very slightly, and perhaps only semantically; my own view is that perception is the goal of evolution, and consciousness is simply an elaboration of perception, an outgrowth (emergent property) of the integration of perceptual abilities into system function. In the human brain (or any brain) we see this directly, with large areas devoted to the various sensory inputs (vision, hearing, touch, taste, smell, etc.), while the concentration of these perceptual functions in the cranium allows their efficient integration by the remainder of the neural tissue. In humans, this integrated function has been raised to a level at which it too becomes an organ of perception - self-perception, self awareness, the perception of perception and of thoughts and ideas. There is no external sensory organ which allows us to perceive an idea - it is a

function of the internal organization, complexity, and integration of the brain itself. It is, nevertheless, a perceptual ability - perhaps unique to man - allowing us to "see" abstract relationships in mathematics, translate language, music, and energy into symbolic form, question the nature of reality, discover the laws of Nature, and probe the secret places of the Cosmos.

One reason for changing slightly the focus of the evolutionary thrust from consciousness *per se* to perception is that it is much easier to follow Chardin's postulated evolutionary trail down to the atom in the case of perception. For a rudimentary example of perception, we need only find a mechanism in the elemental constituents of matter that can respond to a stimulus - receive an input and then respond with an output - and we find just this in the electron shells of atoms, which can absorb and emit specific wavelengths of light. Indeed, the electron shell is a most curious structure whose principle function seems to be to provide a way for atoms to respond to and interact (communicate) with light and other atoms. In energetic terms, as "alternative charge carriers", electrons allow the creation of compound nuclei by balancing the electrical charges of protons (in the "beta decay" of neutrons to protons or vice versa): in the creation of compound nuclei significant amounts of free energy are released - witness our glorious Sun. In turn, the electron shell itself can combine with other electron shells in exothermic chemical reactions to release more free energy (as in the burning of wood or the metabolism of food), although in quantities insignificant compared with nuclear fusion/fission.

In addition to providing a downward path for the release of free energy, the electron shell provides an upward path for the storage of information - the ascent of Chardin's "within" or "radial" energy, funded by the dissipation of the "without" or "tangential" energy - through the shell's capacity for bonding with other atoms in particular combinations, notably the organic polymers of carbon which eventually lead to life. Hence it is in the electron shell of the atom that we find the evolutionary base of both perception and life, just as Chardin postulated.

The usefulness or function of perception is obvious in living systems - it allows us to find food, mates, and avoid danger, and so has enormous evolutionary value in terms of survival and reproductive success. In its primitive stages in atoms, it helps one atom find a bonding partner or a particle find an antiparticle, and so release free energy. Hence from the very beginning of perception at the atomic level we can also ascribe to this function an evolutionary value in terms of the release of free energy (symmetry conservation and restoration as well as increasing entropy) that gives perception the initial push "from below" in its long upward journey toward self-reflective consciousness.

We should also note that human social knowledge, or Chardin's "noosphere", has enormously increased our perceptual abilities, not only in terms of our ability to intellectually perceive natural law by means of mathematics and the abstractions of science, but physically, in terms of telescopes, microscopes, computer imaging, television, photography, recording devices, chemical sensors, remotely sensing space vehicles, radar, sonar, communication systems of all kinds, etc. Hence perception itself continues its evolutionary thrust in the "noosphere", and in consequence of our socially enhanced perceptual abilities we have been able to raise our consciousness from the circumscribed boundaries of Earth to a future which "pulls" us from the galaxy above.

The Soul and "Identity" Charge

According to Chardin's "principle of unitarity", if we find a phenomenon expressed at one organizational level of the Universe (for example, in humans), we must find at least rudiments of it at every organizational level, as all things in the Universe are products of the internal growth and development of its own native potentiality: everything is in place from the beginning, if only as seeds, and nothing is ever truly new (in the sense of foreign or alien) in the Cosmos.

On this principle we traced the beginnings of perception/consciousness back to electric charge and the electron

shell of atoms. Obviously we could have run the check forwards as well - asking what higher organizational attribute grew out of the responsiveness and sensitivity of the electron shell to light and the electric and magnetic fields of other atoms. While the prediction of emergent, higher level phenomena is impossible from this basis, with the benefit of hindsight we can look back over our evolutionary landscape and see what this potential actually produced. And we can do it for other attributes of matter in addition to electric charge - in particular, the "identity" charge which is the companion to electric charge and [characterizes the weak force](#).

"Identity" charge (also known as "number" and sometimes as "flavor" charge) is of equal or even greater importance to the formation of matter as electric charge, because identity charge provides the critical "symbolic" characterization of matter's essence, allowing the identity of a massive elementary particle to be carried in an alternative form (the neutrino), and so escape annihilation by antimatter. Identity charge is carried by neutrinos (a neutrino is nothing more than a "bare" or "explicit" alternative form of identity charge), and it is only due to the alternative charge-carrying function of the neutrinos that matter is able to balance its charges without antimatter partners, avoid annihilation, and so form the material Universe. The leptonic field of elementary, "alternative charge carriers" provides electrons to carry electric charge, and neutrinos to carry identity charge. It is only through the services provided by these alternative charge carriers that the quark field can manifest (rather than self-annihilate as matter-antimatter particle pairs), producing baryons, the triune nuclear foundation of matter. (For more on the role of neutrinos in the formation of matter, see: ["The Formation of Matter and the Origin of Information"](#)) and ["The Weak Force: Identity or Number Charge"](#).

We have traced "perception" back to electric charge, the electromagnetic field, light, and the electron shells of atoms. What do we trace back to the electron's companion - the "identity" charge and the neutrinos of matter? (Alternatively - what might identity charge produce if we trace it forward to humans?) A little reflection gives the answer - identity charge is the origin of the human "soul", our

essential personal identity - and most fittingly derived as the inevitable companion to perception - that is, the electron and its neutrino, electric charge and identity charge, are a linked pair - they occur together, or not at all (a union also realized in the recently formulated "electroweak" force unification).

That the "soul" and perception should be found linked together from the very beginning in the elementary particles of matter is somehow exactly as it should be, exactly what we expect, if such things can be discovered in their physical, elemental stages at all. Chardin, I think, would be pleased.

Perception and identity - the principle psychic elements of the Cosmos - huddled together like embracing angels at the elemental root of the World; and these, no less, are the very attributes which are required by physics (in the form of electric and identity charge, the elementary leptonic field of alternative charge carriers) to create particles from light. This, then, is the stunning physical evidence which wholly supports Chardin's thesis that the principle axis of evolutionary progress in the Cosmos is not simple entropy, but information, perception, identity, consciousness, and spirit (and this is manifest from the very beginning of the atomic realm and the Periodic Table of the Elements), gathers strength at every organizational level, in structures both inferior and superior to humanity, from Alpha to Omega, pushed from below, and pulled from above.

I do not claim that this is a "rational proof" of the existence of the human soul; I do claim that this is as close as we are going to get to one. It is provided on the one hand by the General Systems analysis of unified field theory, and on the other by the insight and perspective of Chardin, for if anyone could turn the trick, it would be he, master of both realms, science and the spirit.

The Physics of "Spirit"

"Spirit" resides in "information" (of which "identity" is one parameter), as well as in the connections between things. Our sense

of "spirit" is our sense of personal identity plus our connection to the Universe. When the Universe consisted only of light (and symmetric particle-antiparticle pairs), this connection was complete. When this primordial "non-local" symmetric state of free energy was broken by the asymmetric production of matter in the "[Creation Event](#)" ("[Big Bang](#)"), this universal connectivity was disrupted, and took a different ("alternative") form, retreating to the conserved charges of matter (including electric and identity charge, spin, and gravitation) - [the symmetry debts of light](#) - which constitute the conserved information content of elementary particles and a "memory" of their symmetric origin. The native "creativity" of the universe is driven by the restoration of its original symmetry and unitary connectivity in material form. (See also: "[The Time Train](#)" which explores further aspects of the peculiar disconnection between matter, its entropy drive (time), and its conservation domain (historic spacetime).)

The "[Information Pathway](#)" is the story of "spirit" reestablishing its original universal light-connectivity, but now within the realm of matter. In the process, spirit reveals the infinite variety of information which existed only potentially in the primordial symmetric state. The development of the information pathway to a total material expression of universal, physical connectivity would correspond to Chardin's notion of the "Omega Point", the physical expression of divine identity and unity, God's kingdom made manifest, not only "heaven on earth", but heaven throughout the material universe.

The function of the symmetry debts or charges of matter remains unaltered from their function in the particle-antiparticle pair - to return the physical system to the symmetry of light by means of the forces they generate. Because these charges constitute information as well as produce forces, we see that the function of information is also to return the physical system to symmetry. In other words, matter is born with an information content (in the form of conserved "charge") which is an unfailing "memory" of its original symmetric state and which functions to return it to that state. This is the rationale for information - information is the "how to" instructions or "road-map" for matter to return to its original symmetric energy state *in the*

absence of antimatter.

Chardin's "Omega Point" is the asymptotic zenith of a negentropic drive, revealing the latent information potential of light through the organized systems of matter. This information content becomes expressed through a fractal hierarchy of structures whose emergent products continue to reveal new levels and modes of information through interaction and communication at successively colder temperatures and lower energy thresholds for interaction. Thus we pass from particle formation in the Creation Event to nuclear fusion in stars, to chemical interactions in water, to genetic codes in cells, to the molecular information of hormones in organisms, electrical signals in nervous tissue, then to memory and abstract communications such as light signals, language, and writing, to the global communications of human satellite systems, artificial intelligence, and finally to communications between planetary systems via the radio signals of their intelligent life forms, until the entire Universe is connected by a web of (psychic?) communication and interaction (perhaps already involving the inspirational "muse" of the arts and sciences). (See Also: ["DeBroglie Matter Waves and the Evolution of Consciousness".](#))

The [Information Pathway](#) is light exploring its potential information content through matter, through the descent into manifestation, time, charge, gravitation, and negentropy. We have become aware of this process through what we call our spiritual intuition or spirituality, which is a scaled-up or "emergent" version of the memory of our symmetric and unitary form which every elementary particle carries as a conserved charge, symmetry debt, and information bit (identity and electric charge). Because light carries no information or identity itself (being perfectly symmetric), there is no built-in limitation, other than available energy, to the complexity or size of information that systems may develop over the course of evolutionary time.

When we look up at the stars and the great Milky Way at night, what we should see is not the isolation of Earth in space, but a vast galactic city and a new frontier in which we humans, in terms of our social

information content, are one of the most significant parts and players. When we look inward, we should sense not the isolation of our individual identity, but our connection with all things, some greater, some lesser than ourselves, but all part of the information pathway that extends from light to the intergalactic community of the Universe, the manifest information highway through which spirit is exploring myriad aspects of its manifest forms, and patiently reconstructing its primordial unity.

Enlightenment

We see on the one hand that the information pathway will eventually physically extend to encompass whole galaxies and probably the whole Universe, certainly through observation, probably through communication, possibly through trade. The intellectual content of our theoretical knowledge of the Universe will continue to grow; our "social knowledge", stored in libraries, will embrace an ever larger proportion of the information content of the Cosmos, reaching finally to the Unified Field Theory itself, the Universe captured in an equation. The complete understanding of natural law is the Omega Point of the rational mind. Like the space program, it is the masterwork of a species rather than an individual.

On the other hand, shamans, spiritualists, and saints have been telling us for thousands of years that there currently exists a direct, individual, intuitive pathway to this "cosmic connectivity" through meditative practices or genetic gift, the state of "enlightenment" of the sages and mystics. It seems possible that not only the great religious figures of history, but also the great geniuses of art and science, are better "connected" than the rest of us, not only in the sense of internal brain function but in the sense of a "psychic" connection to the Universe at large. Perhaps the internally well-connected brain can act as a superior "antenna" to catch the whispered resonances of the information content of spacetime. I have myself had one such experience of coming into a "state of knowledge" of incredible detail for which I have no other explanation. I was deeply emotionally upset at the time but

completely drug-free.

It seems possible therefore, that future evolutionary development of the human brain may lead to a more common and direct psychic connection between man and the Universe, the "Omega Point" of cosmic connectivity reached through psychic mental function individually, as well as socially and physically through space travel and the information content of our social knowledge. This putative development accords with the notion of higher levels of interaction proceeding from lowered energy thresholds, and may herald the coming of another information explosion, not only through super-cooled quantum computers, but also in the psychic heavens of the superconducting astrophysical realm - the "still small voice" of "cosmic consciousness".

"ESP"

As for the question of ESP - extra sensory perception - I cannot do better than recommend my father's several books on the subject, [available in full on his memorial website](#). The human brain is so complex that as yet we have almost no idea of what its actual perceptual capacities or limits may be. It is obvious that the Einsteins, Picassos, Beethovens, and Shakespeares of this world possessed intellectual perceptual and synthetic abilities which far surpass those of ordinary men, much of which we class as intuition, for lack of a better understanding of the phenomena. But intuition is clearly a very high-order form of perception, which may well extend into areas of spirituality, mysticism, and the occult. Who "invented" Astrology and the I Ching? Obviously men of extraordinary intuitive perception, geniuses of the intuitive realm. Are the great spiritual leaders likewise geniuses of a spiritual domain? What is the source of inspiration, revelation, the perceptual flash, the elusive "muse", that creates a master work of art, science, philosophy, spirituality, or cosmology? What of the elevated mental states of the Eastern mystics, the Western saints, or the claims of "channelers" who communicate with the dead and with other worlds?

All the above are possible perceptual abilities of higher

consciousness, unusual to be sure, just as is any form of genius; but I would discount none of them. Modern physics has conclusively demonstrated that the Universe is a very strange place indeed, while human genius demonstrates conclusively that our perceptual abilities can on occasion rise to incredible levels of acuity. It is in human genius then, that we see the pinnacle of the perceptual thrust of evolution on an individual scale; on the social level we find that our space telescopes, atomic microscopes, particle accelerators, satellites, supercomputers, interplanetary probes, genetic catalogs, etc., are being integrated by the internet into a "noosphere" of social information that will propel us to new worlds. The artificial communication satellites that now surround planet Earth represent the "electron shell" of the noosphere, producing and receiving signals, a fractal expression of the atomic perceptual level absorbing and emitting photons, exactly as foreseen by Chardin.

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Books by my late father Prof. John Curtis Gowan

["Trance, Art, Creativity" An Investigation of the Numinous Element and the Metaphysical Realm. A Book by Prof. John C. Gowan, Sr.](#)

["Operations of Increasing Order" Further Investigations of the Numinous Element and the Metaphysical Realm. A Book by Prof. John C. Gowan, Sr.](#)

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