

## **Section 8: General Systems, Complex Systems**

(See also: Section 11: "[Religion and Science](#)")

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### **Abstract**

General Systems, as I use the term, denotes a repeating pattern of natural organization - a fractal algorithm or ordering principle in the Cosmos. While not enforced with the same stringency as a natural law (such as energy conservation), the pattern-forming impulse is nevertheless all-pervasive in nature and seems to proceed from such fundamental principles as resonance and the pathway of least energy or least resistance. It is just simpler, more efficient, and takes less energy to create a universe using self-similar repeating patterns than following any other plan. The "[Tetrahedron Model](#)" of cosmic order presents a General System based on a 4x3 universal fractal algorithm.

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#### **Introduction**

"...the spread, both in width and depth, of the multifarious branches of knowledge during the last hundred odd years has confronted us with a queer dilemma. We feel clearly that we are only now beginning to acquire reliable material for welding together the sum total of all that is known into a whole; but, on the other hand, it has become next to impossible for a single mind fully to command more than a specialized portion of it.

I can see no other escape from this dilemma (lest our true aim be lost forever) than that some of us should venture to embark on a synthesis of facts and theories, albeit with secondhand and incomplete knowledge of some of them -- and at the risk of making fools of ourselves." (Erwin Schrodinger 1944)\*

General Systems is the most synthetic of all the branches of systematized human knowledge. It is both science and art, and so manages to annoy both scientists and artists, and others whose intellectual discipline, territory, or special province of knowledge and expertise it treads upon. General Systems is a young science, founded as a distinct discipline in 1945 by Ludwig Von Bertalanffy, whose major book on the subject appeared in 1968.

I think of General Systems as a study of patterns in nature as well as in human thought. The fact that patterns exist in Nature and are reflected in human thought is demonstrated in the "Table of Natural Organization". The fact that a single 4x3 pattern can be identified at so many organizational levels of nature is quite astonishing, and potentially a very valuable observation - we can use this information

to help us bridge existing gaps in our knowledge and help us toward new discoveries.

As to why there should be patterns in nature, I can think of several good reasons. First, the base of natural law is very narrow (as for example, the metric structure of spacetime), and the framework of this foundation becomes projected upward through the succeeding levels of matter built upon it. Resonance is a physical principle which helps us understand how energy might be transferred and captured most efficiently through a chain of self-similar structures, resulting in a fractal hierarchy, like the famously nested sets of Russian dolls.

At the base of the cosmic fractal structure we find natural law (modeled here as a [4x3 tetrahedron](#)); above that we find light and spacetime; and if, as we presume, these basic structures are projected into matter, that is enough to establish a resonant chain of conservation laws and energy forms which evolves into the material Universe we know and love, including ourselves and our brains: "In the beginning was the Word...". Being part and parcel of this Universe, made from its substance and evolved from it, we, our brains, and our thought processes are also part of the universal 4x3 fractal pattern. This is why, through the ages, the intuitive mind has been so successful in discovering this resonant General System pattern.

Scientists will be shocked to discover that I include religion, mythology, the occult, the metaphysical, and perhaps worst of all, astrology (apparently the favorite "whipping boy" of science), as part of the great fractal pattern of the Cosmos, captured and reflected by the resonant mind of human intuitive genius; and conversely, all the metaphysical savants will probably be dismayed that I dare to suggest that science also reflects, in its rational way, the 4x3 General System algorithm of Nature.

Let it be said at once that General Systems is not worthy of its name if it fails or is afraid to encompass the metaphysical, religious, occult,

and mythological fields of intuitive thought. The fact that we are interested in the patterns of thought or phenomena exhibited by these fields does not constitute an endorsement of them. We are inclined to believe that the persistence of these belief systems or metaphysical fields over the millennia is in consequence of their 4x3 fractal structure rather than their specific content, whether that content is factual or fanciful. General Systems is interested in the patterns of these metaphysical fields; their content is of interest (to our methodology) only insofar as it elaborates, contributes to, or explains that general pattern.

Much has been made of the war (and attempted reconciliation) between science and religion. General Systems affords a most natural bridge between these subjects, without doing harm to either. General Systems sees them as simply the rational or intuitive resonance in the human mind of a single structure, fractal pattern, or dynamic cycle in Nature.

### **Chronology**

(See also: "[Chronology of Papers and Ideas](#)")

My first foray into General Systems was sometime in the early 1970s, when I was in my early to mid 30's. At that time, the thought dawned on me that the 4x3 pattern so evident in metaphysics generally, and in the I Ching and astrology particularly, might be connected, in the manner of a resonant or fractal General System, with a similar pattern in the rational or scientific version of the unified field theory - emerging, for example, as the 4 forces of physics. After all, both metaphysics and the unified field theory were all-encompassing "World Systems", one ancient and intuitive, the other modern and rational. Perhaps a study of the ancient, intuitive cosmological pattern could throw some light on the mysteries of the modern, rational cosmological system. It would at least be a novel approach and provide an intellectually stimulating hobby. Since I have no talent for math, General Systems, with its emphasis upon conceptual analogy, was my best hope of achieving any sort of synthesis in this difficult

but fascinating field.

I had been trained as a scientist in biology at Cornell University; when this hunch concerning the connection between General Systems and Unified Field Theory first awakened in my mind, I held a strong prejudice against metaphysics generally and astrology particularly. For excellent reasons of history and experience, most scientists are wary of the "thought control" which seems inherently a part of "faith based" metaphysical systems. But there eventually comes a point in any prejudicial judgment where "the baby is thrown out with the bath water". Discrimination combined with tolerance is perhaps the most important and difficult stance or attitude in life, science, or philosophy. There is - there must be - some element of truth in these ancient traditions so universally a part of human culture; otherwise we should have to discount human thought generally, of every sort. But what is the grain of truth in these ancient philosophies? From the perspective of General Systems it is, for the most part, simply their common 4x3 structural pattern.

Once I got away from the highly intuitive circular representation of astrology, and recognized its 4x3 matrix pattern (4 "Elements" x 3 "Qualities"), my scientifically trained mind saw the form of a Cartesian grid, or a Heisenberg matrix, or a Periodic Table, a form which my rational mind recognized and could order and think about in scientifically familiar patterns and terms. This simple transformation of a circular form into a matrix table allowed me to entertain the notion that a General System pattern at the level of cosmological law might possibly be present in the ancient intuitive "world system"; if so, this pattern could also be relevant to the modern rational world system - the unified field theory.

I decided on 3 courses of action, to be pursued simultaneously: 1) study the astrological pattern, in its major and classical aspects only, ignoring modern introductions (including the modern planets) and all trivial ("newspaper") aspects; 2) develop a 4x3 matrix of natural laws and principles for the rational form of the unified field theory, and

look for a "best fit" between the two systems; 3) look for other 4x3 patterns in Nature, attempting to confirm that such a pattern might reasonably be expected to exist. This last effort is based upon the notion that if in fact the unified field theory did have a 4x3 form, and the hypothesis of fractal resonance is correct, then the unification structure, because it is the foundation of all higher systems, should have spawned a great series of examples further up the natural hierarchy. In this view the unified field theory, or unification structure, acts through natural law as a generative pulse, fractal algorithm, or fundamental resonant note or iteration of energy, principle, and organization.

When these 3 projects were launched, my wife Esther and I were busy establishing our family, raising our three sons. I was also building a house for my mother, and working full time in the biology department at Cornell, where I was a research technician. Hence it was not until 1980 that the first tangible results of my efforts surfaced in "[The Table of Natural Organization](#)". By then I had completed a [large astrological study](#) (with negative result), begun serious reading of Einstein and general Physics, (1977), and found many other examples of 4x3 patterns in nature, which at my father's suggestion I put together (1980) as a "[Hierarchy of Natural Organization](#)" to present to a General Systems discussion group at the [Creative Problem Solving Institute \(CPSI\)](#), in those days held every June in Buffalo, NY. My late father, Prof. John C. Gowan, participated in CPSI as a teacher and authority on Creativity and Gifted Education. It was at this institute that Gus Jaccaci and I first met and became instant friends, colleagues, and collaborators.

### **The Three General System Forms or Models**

In my General Systems work, three distinct forms or models have emerged over the years, each type with its particular virtue and area of application. In order of their discovery and appearance in the work, they are: 1) the 4x3 (or 4x4) "[Matrix](#)", "[Grid](#)", or [Table](#) (recording categories and hierarchies of phenomena); 2) the

["Hourglass" or "Grail"](#) diagrams (illustrating interactions and relationships among the 4 forces of physics); 3) the ["Tetrahedron"](#) models (representing interactions and relationships among 4 conservation laws and principles of physics). Gus Jaccaci collaborated in the development of the "matrix" and "Tetrahedron" models, while the "Hourglass" models are entirely my own (see ["Introduction to Fractals"](#) for more on this issue). Gus has often helped me with the General System aspects of the work; the "scientific" content is my own responsibility.

### **The Grid, Matrix, or Table**

The first General Systems model discovered or formulated, and perhaps the one of greatest practical utility, is the table, "grid", or "matrix". The grid begins in a 4x3 form but becomes elaborated to a 4x4 table in order to express emergent properties of complex systems, as well as to represent the resolution of system operation, or the completion of a cycle. The core structure of the grid form is nevertheless 4x3.

The grid was the first form (1980) I used to join a rational and an intuitive system in a 4x3 General System model. This was the ["coordinated mapping"](#) or overlay of the scientific system of "4 forces and 3 energy states" upon the astrological system of "4 elements and 3 qualities", producing the basic conceptual [table or matrix of the unified field](#) in terms of both structure and dynamics. Despite the fact that these are very simple systems involving the overlay of only 12 cells each, it took me many years to settle on a configuration that I was completely satisfied with. The grid was also developed into the large tables of the ["Fractal Organization of Nature"](#), the ["Information Ladder"](#), Gus' abstract ["Metamatrix®"](#), and also provided the necessary foundation and basic conceptual framework for the more intuitively integrated ["Hourglass Diagrams"](#) and ["Tetrahedron"](#) models which followed, both years later and with years between.

The great benefit of the matrix, and the great benefit of the General

Systems method, is that it provided me with a restricted form which forced me to think about the physics both in new ways and in its most essential terms. There is no "fat" in a 4x3 matrix, not when it purports to incorporate a completely satisfactory cosmological model of the operation of the whole of physical law. Hence the General System form is an extremely strict discipline, not unlike mathematics, and quite similar, for example, to the Periodic Table of the Elements in its power to both organize and inform. This is why it took me so long to match up the two systems; I had to learn enough physics to reduce the whole of it to a sensible [4x3 \(or 4x4\) matrix](#).

Much of the mathematics of the theory has already been done; I certainly can make no contribution in that area. Nevertheless, I expect the conceptual synthesis I have achieved will offer important clues toward a future mathematical formulation of the theory. In that case we will (hopefully) have the theory in English first, and in mathematics afterwards. And as we must expect of any good methodology, the understanding I have gained in one area has influenced other important areas of knowledge as well, physical, social, and metaphysical. The 4x4 matrix form culminated in two large papers: "[Symmetry Principles of the Unified Field Theory](#)", and "[A General System Approach to the Unified Field Theory](#)". These remain the most complete statements of the conceptual unification, although particular topics are more extensively covered in other specialized papers (gravity, entropy, the weak force, proton decay, gauge symmetry, cosmology, etc.).

Readers familiar with the theory of "Chaos" may recognize a familiar pattern in the "matrix" model: beginning with a "linear" or simple input (cell 1), passing to a stage of bifurcation (cell 2), progressing to a stage of greater complexity including secondary bifurcations (cell 3), and finally a "chaotic" stage (cell 4) which predictably settles in the "fractal basin" of a 4x3 (or 4x4) "strange attractor" (the precise physical nature of the attractor, however, is unpredictable). Like a true fractal algorithm, the output of one level becomes the input of the next, the self-feeding iterations producing new self-similar



expressions at ever-higher levels of information and system complexity. Finally, the model is also scale-invariant, not only vertically with each row, but also with respect to the four major realms. (See: "*Chaos: Making a New Science*" by James Gleick, Viking Penguin Inc., 1987)

### The "Hourglass" or "Grail" Diagrams

Despite the great practical utility of the 4x4 grid representation of the unification theory, it is not an aesthetically pleasing pictorial model. I had "circle envy" when I thought about the beautiful traditional representation of the zodiac wheel. It was also difficult to lecture from the grid, and laymen did not respond well to its form - it was easy for me, with a scientific background, to think in those categorical terms, but not for the general public - my intended audience. Hence I began an active search for another more integrated and intuitively pleasing form (like a "mandala") which could present the relationships between the different parts of the theory in diagrammatic rather than matrix form. It took about a year before I hit upon the form I had been looking for, the "Hourglass" or "Grail" diagrams. This form was developed out of two sources - one was the diagonals of a square I was attempting to convert into a model; the other was the Christian Cross. This latter connection got me to thinking about the shape of the diagram as a Grail cup, the upper half holding the clear "spiritual water" of energy and principle, the lower half holding the transformed and inverted "wine" or "blood" of manifestation.

I was (and remain) immensely pleased with the [Hourglass or Grail diagrams](#); they showed exactly the relationship between the forces, charges, and particles of physics that the grid had revealed, and they showed it in a perfect 4x3 form - 4 triangles. Finally, they showed the fractal relationship between the 2 spacetime and 2 particle forces - the structure of spacetime was carried over into the structure of matter - the short-range force pair of matter reflecting the relationship between the long-range force pair of spacetime. The [paired diagrams](#)

evolved into two conjoined diagrams, one of them [2-dimensional](#) and due to me, and the other [3-dimensional](#) and due to my (very smart) wife Esther. While the 2-D diagram is lovely, the 3-D diagram is striking in that upon revolution it actually becomes a goblet - the conceptual model becomes the physical goblet or hourglass it purports to represent.

The "Hourglass" diagrams highlight the relationship between space and light, gravity and time, and the strong and weak forces, with their quarks and leptons. They also do something the grid cannot do well or at all: they distinguish the spacetime and particle forces as separate but interrelated force pairs, joined by matter. They also distinguish "power centers" or "mass centers" of system organization, the paired charges at the "waist" or centers of the hourglass, the locus of matter, charge, and massive particles. Hence the hourglass diagrams bring a new sense of relationship and organization into the unification theory. Matter appears as a central organizing/transforming principle which accepts inputs from the symmetric spatial/energetic realm "above", and transforms them into asymmetric outputs "below" in the material/particle realm. Thus an attribute of light (free energy's entropy drive, light's "intrinsic motion") is transformed into a characteristic of time (bound energy's entropy drive, time's intrinsic motion), and the symmetric spatial metric of light is transformed to an asymmetric gravitational metric by the presence of mass. Quarks become baryons and compound atomic nuclei, while leptons create the electron shells of chemistry and the periodic table, both produced from leptoquarks and baryons by the transformations wrought by the central massive IVBs of the weak force ([Intermediate Vector Bosons](#) - the W, Z, X). The extent of the structural parallel between the spacetime and particle forces as suggested by the congruent hourglass diagrams is extensive, and more fully explored in [Section 4: "Introduction to the Weak Force"](#).

### [The Tetrahedron Models](#)

The [Tetrahedron models](#) were discovered by Gus and I during a

conference at Dick Spady's "[Forum Foundation](#)" in Seattle, Washington (Oct. 2000). The Tetrahedron models had been a long time coming, for both of us. For years I had been working with triangle diagrams of the holy Christian "Trinity", trying to get a physical interpretation; and for years before that Gus had been nagging me to produce a 4x3 model of the principles underlying the unification theory. In the Tetrahedron models we both got everything we asked for, and a good deal more besides .

The Tetrahedron models are very simple and very powerful. They are models of the relationship between the principles and conservation laws which underlie the forces and charges of matter and the Unified Field Theory. They are also 4x3 models of the metaphysical realm. Whereas (in General Systems terms) I think of the hourglass diagrams as representations of the "Grail", I think of the Tetrahedron diagrams as representations of the "Word".

The [tetrahedron diagram](#) is the foundation of all other 4x3 models, and is even more basic than the unified field theory figures which the matrix and "hourglass" forms represent. Nevertheless, since the tetrahedron is composed of 4 triangles, it manages to encompass simultaneously the relationship between the fundamental conservation laws and the higher level physical forces, energy states, and natural phenomena which are consequent upon them as resonant iterations of the cosmic pattern.

The four physical principles of the tetrahedron model are: 1) The Conservation of Energy; 2) The Conservation of Symmetry; 3) Entropy; 4) Causality (law of cause and effect - "Karma"). The points of the tetrahedron are identified with the 4 principles, and the 3 lines emanating from each point are identified with the charges, forces, and associated energy states and phenomena of nature. Even the [faces have been interpreted](#); the entire tetrahedron represents electromagnetic energy in its primeval conservation parameters, energy states, and forces.

Mathematically, the Tetrahedron Model represents a "symmetry group" of transformations between free and bound forms of electromagnetic energy (light and matter). This connection with "group theory", the mathematics of unification, tends to confirm my belief that the Tetrahedron Model is a valid representation of the Unified Field Theory, which may some day be translated into its full mathematical form. In physical terms, the unifying theme of the model is light itself: all forms of energy begin as light and eventually return to light's symmetric energy form. *The charges of matter are symmetry debts of light.*

Like the Hourglass diagrams, the Tetrahedron consists of 4 equilateral triangles. All lines and connections in both diagrams are equivalent, although in the hourglass diagrams we see the first expression of the massive organizational or "power centers". The physical evolution or operation of the models or forms is envisioned in the reverse order in which they were discovered: the [Tetrahedron](#) is first, the "Word" of energy and natural or conservation law which initiates the Cosmos. Second is the [hourglass or "Grail"](#) diagram, an unfurling of the tetrahedron into the forces and charges of Nature; here the Cosmos is divided into symmetric and asymmetric aspects, the realms of primary light and derivative matter, representing the transformation of spirit or principle into the material realms: the "fall" or devolution of light, symmetry, and connectivity into matter, asymmetry, and isolation. Finally the hourglass is elaborated, through evolution both physical and biological, into the ["matrix" form](#), including the ["Fractal Table"](#) and its human permutation, the ["Information Ladder"](#). In the latter representation, in its endless search for antimatter, and via its "memory" (charge), bound energy tries to recreate in material form the unity and connectivity it knew as light. The attempt by humans to create Utopia or "Heaven on Earth", and our space program reaching outward into the Solar System, are both emergent expressions of this drive, which Chardin saw as the universal struggle of matter toward an asymptotic zenith of information, connection, and knowledge, his "Omega Point" of cosmic evolution. (See: ["Chardin: Prophet of the Information Age"](#).)

The three General System models - actually 4 considering the embedded [Land-Jaccaci GRST dynamic](#) - all work together to describe the workings and evolution of the Universe at successively deeper levels of phenomena, force, and principle, and it is no accident they were discovered in reverse order of their significance. The surface description of the phenomenal Universe and its GRST dynamics in the matrix, Gus' abstract "Metamatrix"®, and their elaborations through the "Fractal Table" and the "Information Ladder", are the most obvious manifestations of the creative energies of the Cosmos (actually seen also in the models of "chaos" theory). Secondly, I discover the Hourglass or "Grail" diagrams, the representation of the interrelated forces of Nature whose operation produces the phenomenal surface level; and finally, beneath the forces themselves, lies the ultimate level of energy and conservation law, controlling the operation of the forces and initiating the formation of the Universe. Our [model of the Unified Field Theory](#) is just one example - although a fundamental one - of the operation of the 4x3 fractal algorithm in Nature. We place it in the Metaphysical Realm, Rational Mode, of the "[Table of Natural Organization](#)", as an abstract or symbolic product of human rational or "scientific" thought.

## **The General System Papers**

General System papers include the series of [6 fractal papers](#), the "[Human Condition](#)" paper, and the Information papers, with the "[Information Pathway](#)", "[Nature's Fractal Pathway](#)", and the "[Chardin](#)" papers, among others. These we have discussed in earlier sections ([3](#) and [6](#)). The [unified field theory paper](#), based on the 4x4 matrix format, is also a General Systems paper, including a version with a more explicit [General Systems summary](#) section (see the discussion of this paper in [Section I: Unification](#)). The "[Hourglass Diagrams](#)" paper explains some of the physics behind the diagrams, although to avoid repetition, most of the physics exposition is left to other chapters and papers.

The only papers on my website (<http://www.johnagowan.org/index.html>) that are not (at least indirectly) the result of the General Systems investigation of the unified field theory, are the "[Spacetime Map](#)" paper and the "[Weak Force Mechanism](#)" paper concerning the "W" IVB. (Recently, however, (spring 2007), even the weak force has been modeled in a 4x3 General Systems format. See: "[The Higgs Boson and the Weak Force IVBs](#)".) All the other papers on gravity, symmetry, and entropy, etc., are the consequence of General Systems thinking in terms of the 3 major models: the Matrix, the Hourglass, and the Tetrahedron. The message here is that this is a heuristic, productive, creative way to think and formulate questions. And why not? One is just placing oneself in harmony with the natural fractal pattern of the Universe, "in the resonance" ("good vibrations"), which includes our minds and thought processes. Furthermore, one is forced to reduce the clutter of natural phenomena to their most essential, generative, and powerful elements.

I mention here three more related works: one is a scholarly treatment of the metaphysical realm, done entirely from the viewpoint of the psychic or spiritual element in man (including "Transpersonal Psychology"), by my late father, Prof. J. C. Gowan, in his books "[Trance, Art, and Creativity](#)", and "[Operations of Increasing Order](#)" available in their entirety on-line in his [memorial website](#); the second is a wholly mathematical General System, again in a 4x4 format, quite independently created by [Stewart Dodd](#), a mathematician and statistician, available on my website and also reproduced in the appendix section of my father's book (see links to both below). Finally, a study of the Chinese "Book of Changes" (the "I Ching") and its relationship to the human genetic code has recently been brought to my attention, and is [appended here](#). The I Ching is an important Oriental example of the 4x3 fractal pattern expressed in human thought.

## **Links and References to some General Systems and Metaphysics Papers and Books**

## References

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- Ervin Laszlo, "Science and the Akashic Field", Inner Traditions, 2004
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- James Gleick, "Chaos: Making a New Science". Viking Penguin Inc., 1987.
- Menas Kafatos and Robert Nadeau, 1990. *The Conscious Universe: part and whole in modern physical theory*. Springer-Verlag, New York, Inc.
- \*Quote from *Great Physicists* by William H. Cropper, 2001, Oxford Univ. Press, page 291.

## Related Papers:

[The Fractal Organization of Nature](#)

[The Information Pathway](#)

[Nature's Fractal Pathway](#)

[A General Systems Approach to the Unified Field Theory: Part 1](#)

[A General Systems Approach to the Unified Field Theory: Part 2](#)

[A General Systems Approach to the Unified Field Theory: Part 3](#)

[The Tetrahedron Model Diagram](#)

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