WHAT ARE THE GREATEST CHALLENGES FOR EVOLUTIONARY THEORY IN OUR TIMES?

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Summary

Intuitively everyone senses that everything in the universe is somehow connected. In the 1960`s and `70`s we saw scientific knowledge structured in such a way that it fostered a widespread awareness in the importance of global ecology. Since then we have seen substantial change in the behavior of individuals, and an alteration of many basic corporate and governmental policies to reflect this knowledge structure. Yet, it is important to note that this knowledge structure only encompassed biological systems on earth.

More recently, an "evolutionary systems theory" has emerged as a more encompassing structure of knowledge. Unlike Darwin`s evolutionary theory, what characterizes evolutionary systems theory is a linking and synthesis of recent advances in various scientific disciplines (especially physics, astronomy, chemistry, biology, genetics, paleontology, neuroscience and mathematics). This knowledge structure implies that there is a remarkably similar pattern of organization, development and change in major systems (i.e., astrophysical, biological, psychoneurobiological, sociopolitical and technological systems). Even more remarkable is the possibility that the rates of development and change in these systems may have a predicable relationship. If correct, then it is plausible that we can ascertain the boundaries and direction of evolution, and the mechanisms of change in major systems.

The implications of such a knowledge structure on the direction and choices available to civilization and academic research are staggering. For example, analysis of human history, the current changes in the former Soviet Union, and the present and future role of technology may all be subject to new and more reliable interpretation.

Thus, it is important to clarify the validity of evolutionary systems theory and its implications. My paper is an attempt to set out some of the technical and practical challenges that must be addressed by those in the field. This is critical because, unfortunately, intuition about an interconnected universe never embraced the potential impact of such knowledge on the course of human events.

These challenges include the following: consensual development of a common language and metaphorical map usable by the diverse disciplines incorporated; development of a methodology to refine the mechanisms and rates of change; and the need for widespread dissemination of this knowledge structure to heighten general awareness of its importance.

Abstract

It is the lack of a common, transdisciplinary language and a metaphorical map encompassing the existing major

systems that constrains progress on evolutionary theory. A modification of Eldredge and Gould`s model of "punctuated equilibria" can create such a map. This map should highlight a universal sequence for organizational change processes within and among systems. If this map combines this universal change sequence with the process of entropy and a preference for certain organizational configurations, it can reveal a trajectory of soft-determinism in evolution. Thus the primary information gap in evolutionary theory is discerning the precursors and mechanisms of nonlinear system transformation. However, the proposed map can be used to view all existing major systems as a single punctuated evolutionary system, with nested systems as scaled reflections. In this way a transdisciplinary language might illuminate a "Rosetta Stone" for discovering the mechanisms of system transformation. Since evolutionary theory may be the ultimate epistemological paradigm, the theory`s most important benefit illuminates new, useful insights into sociopolitical organization and its transformational process. If the map`s soft-determinism is correct, then the system is approaching its stage of nonlinear bifurcation. Moreover, for the first time the sociopolitical system is simultaneously vulnerable from within, from lower nested systems, and also from an emerging, higher level system. Success navigating this dangerous epoch may depend upon a general awareness of the evolutionary paradigm which then depends on the approach to disseminating this knowledge.

Key words: epistemology; paradigm; nested evolutionary system; transdisciplinary language; punctuated evolutionary map; qualitative soft-determinism; system transformational mechanisms; sociopolitical system; bifurcation; and sociopolitical change.

Great ideas do shape the world. However, the world is frequently in such shape that the ideas merely rationalize the obvious, intuitive or inevitable.

Introduction: One Man`s Ceiling is Another Man`s Floor

The above interpenetrating, idiomergent metaphor characterizes nested evolutionary systems. It also may apply to the topic question because information overload is pandemic today. Thus the perception of what constitutes a challenge may depend on the sense of utility researchers have for their respective discipline. On the other hand, serious futurists must be knowledge engineers with a vision capable of transforming information overload into something approaching wisdom. Of course, the degree of wisdom achieved depends upon the ability to simplify the subject`s dynamic context, relationships and implications. But in the end, the only measure of success itself is the ability to communicate the subject`s utility in a succinct, lucid manner.

A key use for evolutionary systems theory may be its role as the ultimate epistemological paradigm. As such it can provide a map to locate humanity`s position in space and time, the direction we are traveling, where the forks in the road will be, and the implications of following the respective branches. Thus the most distinctive and important potential application of the theory is the illumination of new, useful insights into sociopolitical organization, governance and the transformational process. Moreover, through such insights into the sociopolitical system, it is possible we may design our future. So along with stating challenges, this paper is a speculative attempt to synthesize a novel direction for meeting these challenges.

1. Theoretical Development

A. Philosophy

Negentropic life is a struggle against entropy within an unfolding (or folding) quantum universe. It is a universe characterized by nested, idiomergent, nonlinear, turbulent dynamics within and among all systems. Therefore it is unlikely that the exact initial conditions for emergent self-organizing entities, bifurcating triggers and mechanisms of transformation are fully quantifiable. On the other hand, structural patterns and the sequence of organizational change within and among these events and processes may be identified qualitatively. So, to the extent that either reductionism or vitalism provide predictive or heuristic insight into evolutionary systems theory, both are useful. Thus any reductionist-vitalist debate takes us nowhere! Besides, evolutionary systems theory itself is a unifying and transcending philosophy.

B. Definition of Evolution

It is imperative that evolutionary systems theory fully integrate the scaled, nonlinear dynamics in all five major existing systems: astrophysical, biological, psychoneurobiological, sociopolitical and technological. Most formulations of evolutionary systems theory are superficial beyond entropy, chemistry and biology.

C. Terminology and Confusion

It is hard to overstate how detrimental disparate terminology and semantics can be. First, it undermines mutual understanding of the basic symmetries among the various disciplines that converge on evolutionary systems theory. For example, the terminology in chemistry and biology has created confusion. That is, they often confuse the processes complicating development within and among systems, with those adding complexity, which affects the onset of a nonlinear bifurcation. More importantly, such jargon creates an artificial entry barrier for potential contributors to evolutionary systems theory. Thus disparate terminology is slowing down both overall theoretical progress and practical application. Although this paper seeks to address this challenge, it too is flawed.

D. Map For the Territory

The biggest shortcoming in evolutionary systems theory is the absence of an agreed-upon metaphorical map. Such a map is necessary to simplify and demystify the nested context, levels, processes and relationships among and within the five major systems. It is also needed for transparent integration of quantifiable and qualitative events and processes observed in diverse, converging disciplines. As with the problem of terminology, the absence of such a map acts to obstruct the integration of relevant concepts and insights available in other disciplines.

While the writings of Allen, Barrow, Bronowski, Csanyi, Eigen, Gould, Jantsch, Laszlo, Malaska, Miller, Prigogine, Sagan, Salk, and others have moved in this direction, these efforts are still inadequate. The starting point for such a map might be found by making a literal distinction between Eldredge and Gould`s model of "punctuated equilibria" and that of "punctuated evolution." Such a distinction highlights a punctuated evolutionary map such that any emergent major system level punctuates the single evolving nested system. Thus the emphasis is on idiomergent organizational change as the norm rather than the structural equilibrium on any system level.

E. Qualitative Sequence of Organizational Change

The map will need agreement on the basic sequence of various organizational change processes. Despite diverse terminology, it appears that the interplay within and among all five systems is a hierarchically nested and scaled arrangement of five such change processes. Thus, from any perspective (within or among systems), the five stage sequence of change is qualitatively symmetrical and universal as follows:

stage 1. structuration (emergent self-organization); stage 2. dialectical development (with weak, reform creativity complicating the system, e.g., epigenesis or cybernetic functionality); stage 3. dialectical complexity (excess complexity within the system); stage 4. chaotic destabilization (systemic turbulence); and stage 5. bifurcating nonlinear transformation/break (with strong, creativity).

F. Soft-Determinism

It should not be particularly surprising to find a qualitatively universal sequence for organizational change processes. The more intriguing question is its source. By excluding divine intervention, we can conclude that

there is either a series of fortuitous random occurrences leading up to the present, or that preferred probabilistic processes exist. Generally speaking, examination of various self-organizing systems has concluded the random permutation approach is statistically implausible. In each case, the time required to explore all permutations for the best or selected evolutionary fit exceed the amount of elapsed evolutionary time.

Jacob Bronowski was speaking about organizational structures when he suggested a general cosmological principle similar to soft-determinism. That is, there are relationships between ordered flows that are more stable than others. Thus, even with a chance shuffling of the flows, the inherently stable, preferred evolutionary configurations will be hit upon sooner or later. So long as there remains a potential of stability that can become actual, there is no other way for chance to go. It is as if nature were shuffling a sticky pack of cards which hold together in longer and longer runs. [Laszlo, 1987]

So it seems there are two recurring qualitative evolutionary organizational patterns: preferred structures and a universal change process. By adding entropy, as an arrow of time, we can visualize an idiomergent, soft-determinism in evolution. Idiomergence is a continuous blending of an individual system`s autonomy with the collective forces in the punctuated evolutionary system. This blending is displayed as a trajectory or direction extruding the emergence of new systems and their change over time. While I prefer the term soft-determinism, there are many similar ideas, such as Csanyi`s cognitive universe, Sheldrake`s morphic resonance, Barrow and Tipler`s creative universe, Waddington`s creodes, or even cosmic strings.

Whatever we call soft-determinism, it also implies a nested pattern of three scaled, overarching dialectics acting as super evolutionary transducers. These overarching dialectics have consisted of two polar systems. Thus a punctuated evolutionary map of soft-determinism might resemble the following:

I. Negentropic Dialectic: 1. Astrophysical system -- entropy a. decoupling era, b. galaxies, c. supernovae, d. negentropic entities/DNA

2. Biological system -- negentropy a. replicating structural plasticity/cells, b. multicellular systems, c. multi-system structures, d. multi-system integration via brains

II. Sociopolitical Dialectic: 3. Psychoneurobiological system -- sociobiology a. sensory mechanism, b. neural networks, c. multi-system integration via brains, d. novelty seeking chaotic processor via minds 4. Sociopolitical system -- social biology a. hierarchy as interpersonal order, b. land as legal property, c. capital as control over change, d. information technology as cybernetic development

III. Cybernetic Dialectic: 5. Technological system -- human extensions a. external symbolic storage, b. flexible energy generating systems, c. integration of digital systems, d. biotechnology

Based on the soft-determinism above, we can speculate on the bifurcating branches leading to the sixth major system as corresponding to the following:

Design System -- extending humanity a. sociopolitical information system integration, b. cybernetic chaotic processors, c. assembler technologies, d. emergent evolutionary system design

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Cyborg system -- extending technology a. biotechnology, b. thinking machines, c. assembler technologies, d. successor "artificial" life species

G. Bifurcating Mechanisms

The hardest, yet most critical, theoretical challenge is the development of an adequate understanding of the mechanisms and precursors of a system`s transformation. Clearly the work done on catalytic cycles, hypercycles, scaling, topological and boundaries features by those cited above in chemistry, biology, nonlinear turbulent dynamics, chaos and systems theory have marked progress in this area. To summarize, the known

bifurcating effects and mechanisms are:

Effects: 1. The precise transformational break is a phenomenon that bypasses the functional optimum of complexity blocking dialectical developmental at a given system level. [Allen, 1990] 2. The attractor that self-organizes the new system`s structure emerges from the preceding system. At least in advancing negentropic systems, the attractor is always farther from thermal equilibrium. 3. The new organization is still essentially an existing structural scheme, implying some proportional (perhaps fractal) scaling between the old and the new systems. 4. There is a consistency in the pattern of converting energy from existing lower level systems into organizational structures at higher levels of potential system complexity. 5. The new organization is simpler thereby affording greater system complexity, yet will exercise greater efficacy in subsystem control. This effect is characterized by:

a. the maintenance of an energy flow by catalytic cycles; b. the capture of free energy fluxes and decreased entropy; and c. the creation of more ephemeral bonding, yet greater subsystem interaction. [Laszlo, 1987]

6. The net result of suitably turbulent transformational conditions is that evolution is both driven by and leads to microscopic diversity. Thus the relevant parameters are those of size, shape, organizational level, scale, attractor, energy, bonds, level of complexity and control.

Mechanisms: 1. Within the organization of any system is a dynamic attractor sensitive to minute internal and external changes via a basin (or field or sphere of influence). When a system bifurcates its attractor migrates into a new system or phase within the trajectory of punctuated evolution`s soft-determinism. For an attractor to go elsewhere is tantamount to extinction. Selection of a particular branch at the bifurcation is influenced by the amplification of three corresponding, interactive sets of micro forces and fluctuations as follows:

a. In response to the drag or friction caused by excess complexity and entropy production in the existing system, nested lower level systems push toward transformation into a higher level, simplified organization. b. In response to the ability to capture free energy at a higher organizational level, environmental pressures favor persistent competing feedback loops. The result is to pull toward transformation. c. Survivability requires hypercycles, chaotic processors and mutations in the system actively explore and create new organizational configurations.

Efforts to accelerate discovery of the missing pieces in system transformation toward higher levels require movement in two areas. First, the basic goal must be to produce a bidirectional "Rosetta Stone" of sorts. This explicitly means establishing a transdisciplinary synergism. Second, an attempt must be made to locate scaled relationships between and among the nested systems and the single punctuated evolutionary system.

H. Predictability

The most far reaching challenge is to ascertain any quantifiable scaled ratios within and among the nested systems and the punctuated evolutionary system. This might include for example, ratios regarding the topologies of new structures, the sequence of organizational change, the duration of precursors of bifurcation, etc. Obviously any such predictive capability holds significant implications.

2. Practical Applications

An Evolutionary Context for Sociopolitical Organization: You Ain`t Seen Nothin` Yet

As noted, the sociopolitical system is the fourth level major system nested within punctuated evolution. Also, as noted, every system goes through a fiv stage sequence of organizational change processes before a nonlinear system transformation occurs. Thus, in an evolutionary context, all human history constitutes only four linear, epigenetic-like stages of sociopolitical organization. Sequentially, the four stages and their attractors might be:

stage 1. Structuration: hierarchy as interpersonal order; stage 2. Dialectical development: land as legal property; stage 3. Dialectical complexity: capital as control over change; and stage 4. Chaotic destabilization: information technology as cybernetics.

The third stage above (dialectical complexity) began around the time of the Enlightenment. This stage saw the emergence of planned observation and experimentation that gave rise to today`s specialized disciplinary languages and information. It also produced the so-called revolutions in industrial and sociopolitical organization. Today`s manifestation of this reflects the fourth stage (chaotic destabilization) as the so-called information explosion. These developments have accelerated the pace of dialectical change to such an extent that the sociopolitical system became inherently unstable.

The instability was inevitable. In order to accelerate the engine of capital growth (thereby increasing control over change) required an even faster pace of information growth. Characteristic of this is a comment attributed to Walter Wriston, former chairman of Citicorp. "Information about money is more valuable than money." The central difficulty was that the sociopolitical system`s development did not keep pace with the information explosion. Specifically, sociopolitical institutions did not develop the capacity to value or compare information as competitively as capital related institutions.

So, we built up excess complexity in the sociopolitical system. And, excess complexity is the core problem leading to chaotic destabilization. It should be apparent that information technology epitomizes the fourth stage and revolves around the "strange attractor" of cybernetic development. Thus, at some point in the recent past, the sociopolitical system entered its fourth stage and is headed toward its fifth, bifurcating stage.

Sociopolitical Organization Today: Rearranging Deck Chairs on the Titanic

There can be little question that the information overload within the sociopolitical system produces extraordinary complexity, confusion and anxiety. Daily the news assaults each individual`s idiomergent sense of wellbeing. News converges from the global village like an avalanche that creates a growing sense of helplessness and inevitable trouble. Thus information overload also triggers remarkable fluctuations in the sociopolitical subsystems (i.e., institutional organizations).

In the United States there is now widespread agreement that our sociopolitical institutions are unable to understand or cope with excess complexity adequately. So, often institutions appear fundamentally outdated, counterproductive, and thus unstable. To wit, they are unable to respond even to basic problems such as health, environment, energy, rights, technology, crime, ethics, and economics. Cumulatively, these problems show a system running out of creative energy and exhausted from the pace of dialectical change (i.e., complexity).

Meanwhile, special interest capital drives administrative operations, and the judiciary makes policy decisions. Unfortunately, this approach to policy making must conform to the hierarchical order, the legality of property ownership and the preservation of the role of capital (as control over change). In other words, current policy making only addresses the first three stages of the organizational change sequence. There is either an inability or unwillingness in our institutions and their actors to respond satisfactorily to issues of transformation. As witnessed in election campaigns politicians avoid espousing substantive sociopolitical visions. The reason is simple. To state such a vision would reveal too many unpredictable details (i.e., complexities). Moreover, in a short, mass media campaign period, such details lend themselves to emotional polemics and thus political defeat. Consequently, elections plumb the safe but meaningless depths of personality politics and negative advertising. However, in the end, all these third stage contrivances only serve to increase complexity while holding us all hostage as we approach the system`s fifth, bifurcating stage.

The United States is not unique, however. We can see transformational efforts in virtually every nation and region displaying the same inept and ineffectual responses to the new information dense environment (e.g., countries of the former Soviet Union and Eastern Europe, China, India, the Middle East, Africa, etc.). None of these countries have the slightest idea where they are headed. Nor do any of them know whether the direction, and its inherent tradeoffs and implications, is desirable. The irony is that those outside the "West"

are seeking to replicate a vague notion of a capitalist representative democracy as an organizational panacea. Still more vague is the rhetoric of a "new world order," which lacks any guiding foundation or substance.

Despite claims to the contrary, in terms of punctuated evolutionary system transformation, there was no transformation in the demise of the former Soviet Union or the end of the "Cold War." Both events emanate from the convergence of third and fourth stage forces of organizational change: capital (as control over change) and information technology (as cybernetic development). The irony is that without a map for nonlinear transformation, what is now occurring in the former Soviet bloc is a set of imitative, dialectical institutional reforms. However, these reforms only move toward the third stage of the sociopolitical system`s evolution (i.e., capital as control over change). Thus these are epigenetic mutations. More ominous is that these mutations only add to the sociopolitical system`s complexity and turbulence, not to the transformation of the system.

Bifurcation of the Sociopolitical System: Boldly Going Where No One Has Gone Before

It is easy to draw analogies from evolutionary systems theory and nonlinear dynamics that suggest the sociopolitical system will bifurcate in the not too distant future. However, before a bifurcation occurs there is an overarching struggle among systems to influence which new system branch will emerge. As complexity and turbulence accelerate, we see an unconscious struggle over the relationship between the sociopolitical and technological systems to influence the forces and fluctuations to be amplified in the cybernetic dialectic`s next system. Thus it has become common to see clashes between business and environmentalists, for example. Common because weare witnessing an increase in the destabilizing informational fluctuations within and among institutional organizations; fluctuations that produce more heat (i.e., entropy) than light (i.e., wisdom). Consequently, the sociopolitical system becomes more turbulent and chaotic, and thus more vulnerable to small perturbations. The net evolutionary effect is to push the system ever faster toward a nonlinear transformation.

If the entropy producing complexity of an old system prevents access to the energy and resources needed for the new competing organizational subsystems to grow, then the new subsystems will seek out a mechanism to leap into a higher, more autonomous system level. Thus, it should come as no surprise that a new sixth system is emerging in evolution. Whether or not this new system is centered on humans or a new form of life, it will capture available free energy from the sociopolitical and technological systems. Unfortunately, at this point, the only new source of energy being amplified comes from the converging symbiosis of biological and information technologies. It has not accessed sociopolitical system energy. In any event, the emergence of this new, higher system acts as a force creating even more turbulence. This is because competing feedback loops in the emerging system pulls the sociopolitical system toward a nonlinear transformation.

For a system to transform consciously toward a preferred higher level system, means the past luxury of dialectically muddling through via reform (i.e., weak creativity) will not suffice. Nevertheless, it is a human centered hubris that leads many to conclude that the territory quaintly called recorded history can map the future. Critically absent in such a conclusion is the realization that recorded history lacks precedent for exploring a spontaneous, nonlinear sociopolitical system bifurcation. Yet, virtually every planner, economist, bureaucrat and politician is slavishly pursuing linear, dialectical reforms that invariably increase total system complexity and instability. Meanwhile, we are left wanting for the strong creativity or hypercycle-like mechanism that can explore or design a nonlinear future. The only source for such strong creativity was long ago banished to the heretical, albeit entertaining, domain of science fiction.

The Dilemma of Nonlinear Transformation: Are You Experienced?

Unlike lower nested systems, where transformation is an unconscious fact of existence, self-awareness in the

sociopolitical system requires explicit definition of transformational mechanisms and heuristics for end goal states. A reasonable existential angst can demand that, during exploration of a new system, bridge mechanisms do not exacerbate the existing system`s institutional ability to function. This has presented the sociopolitical system with an unprecedented dilemma The dilemma comes from the basic characteristic of punctuated evolution as nonlinear, system transformation. Thus, "[t]he territory no longer precedes the map, nor survives it. Henceforth, it is the map that precedes the territory." [Baudrillard 1983]

Without employing the evolutionary systems paradigm as such a map, our present sociopolitical system resembles a two-dimensional "flatland." The system is unable to conceive or act upon transformation in a new dimension in any proactive or anticipatory manner. Thus, short of consciously evolving our sociopolitical system appropriately (i.e., amplifying fluctuations toward the idiomergent design system branch of the bifurcation), we face big trouble. If this imminent bifurcation defaults to another branch it will, at best, significantly change our notions of freedom and humanity, and at worst, destroy our species.

The Basic Challenge of Our Time: To Be Or Not To Be?

At the present there is an absence of any widespread understanding in the implications of the impending bifurcation, and the necessity to design hypercycle-like bridge mechanisms that explore new, viable sociopolitical structures. It is implicit in evolutionary soft-determinism that bridge mechanisms use aspects of both lower and higher systems. Thus to avert an unwanted transformation will require a deliberate integration of the major systems, especially the psychoneurobiological, sociopolitical and technological systems.

Also implicit is that, after the bifurcation, the new system will reconfigure the design of its subsystems. There are two prerequisites to exploring plausible configurations of higher level, sociopolitical organization. First, there must be an effort to demystify and popularize the new paradigm quickly. There must be adequate time for widespread discussion and understanding of evolutionary systems theory before we are much farther down our turbulent road. Second, to design a future will require cybernetic/ hypercycle-like bridge mechanisms that facilitate discussing and exploring heuristic goals in the context of available choices in soft-determinism.

It must be stressed that any successful effort to explore and steer a course toward a desirable higher level sociopolitical system will require popularizing the evolutionary systems paradigm. It is up to those involved with evolutionary systems theory, and confident of its basic validity and reliability, who must simplify and facilitate access to this knowledge. This explicitly means bottom-up awareness in society-at-large, not just an institutional awareness. Ideas, as sociopolitical memes, have consequences!

Attaining A Design System: Can`t Always Get What You Want, But If You Try Sometime, You`ll Get What You Need

Near-term, popular awareness of this paradigm probably will produce additional system perturbations from both ends of the sociopolitical spectrum. Vested special interests dominating the system will feel threatened by the unknown. In thinly veiled, self-serving efforts, they will be expected to extol the virtues of consistency (i.e., linearity). They also will deny the existence of any absolute causal evidence in the theory. This allows them to say the theory does not warrant funding bridge mechanisms and the exploration into such a nonlinear system and the corresponding new organizational structures. At the other extreme, it is certain that pop culture will often distort evolutionary systems theory in grotesque and unimaginable ways. Moreover, Luddite fundamentalist groups and demagogues will make many bizarre claims and accusations.

Long-term, despite those earlier perturbations, events will overtake any debate. Thus, the creation of any bridge mechanisms will depend on dissemination of the knowledge in the evolutionary systems paradigm. There are two probable scenarios.

1. Bottom up: If there is a broad awareness of the paradigm, the system should access a new source of free energy from innovative thinkers. That is, thinkers who can create analogies to the hypercycle bridge

mechanisms transforming other systems as competing feedback loops. Nonetheless, we can only hope that the creation of a new cybernetic design system and the attendant collective support materializes before the present system becomes totally unmanageable.

2. Top down: If primarily institutional parties are aware of the paradigm they will lack sufficient energy, support and will to transform the system. Moreover, with increased chaos near the nonlinear break, limited awareness of evolutionary systems theory could negatively impact democratic governance. At that point, evolutionary systems theory provides the rasion d`etre for psychotic institutional behavior. And, there are numerous precedents of sociopolitical organizations employing evolutionary systems theory for dark objectives (e.g., Social Darwinism and eugenics). Characteristically, such organizations appeal to primal emotions and patience with offers of so-called interim measures. However, such measures tend to be mere camouflage for perverse dialectical reform, and thus a lateral system mutation.

The First Bridge: The Medium is the Message

In the context of the sociopolitical system, many of the theoretical challenges above are also priorities for practical application. In particular, there is the challenge of widespread awareness of the evolutionary systems paradigm. This will require:

1. An agreed-upon metaphorical map with a common, transdisciplinary language applicable to the five major systems. 2. Any presentation of the evolutionary systems map must be clear and simple enough to resonate intuitively with persons from all walks of life. Moreover, the presentation must avoid abstractions that miss the intuitive and rich world we all see and touch. Further, it might be useful to highlight the popular values of the ecology movement as a core meme nested within the evolutionary systems paradigm.

3. Any such map requires an audio-visual depiction; preferably in a nonlinear, interactive multimedia format. The specific intent is two-fold:

a. To emphasize information-rich, qualitative images over quantitative relationships; and b. To enhance an associative, self-selecting and self-directed, edutaining experience.

Conclusion: No Place To Hide

In closing, evolutionary systems theorists must recognize the dissemination and use of their knowledge is as precarious as that of the Manhattan Project. The impending bifurcation of our sociopolitical system means it is not only vulnerable from within. For the first time, the sociopolitical system is also simultaneously vulnerable to lower and higher level systems. For example, from the lower level (negentropic dialectic) the biosphere could collapse. This bifurcating branch has gained widespread attention, though not in a punctuated evolutionary context. However, from the higher level (cybernetic dialectic) there is the real threat from an emerging artificial life system. It is what Walter Freeman half-facetiously called, "the machine liberation front." A bifurcation into this system receives very little attention beyond fundamentalist hysteria, and media sensationalism or parody.

Nonetheless, in the soft-determinism of punctuated evolution, the next system bifurcation is capable of moving in either direction: toward higher level or toward lower level system extinction of humanity. Only a conscious, widespread effort to apply the insights of evolutionary systems theory to the sociopolitical system affords humanity an epistemological framework to steer its transformation toward a cybernetic design system. Like it or not, much will depend on what evolutionary systems theorists do with their knowledge in our time.

Glossary attractor - a kind of center of gravity that defines and shapes the organization and development of a structure or system. bifurcation - the transformation point from one system to another. There are generally two branches or directions the system can go. In evolution, the outcome is an election to follow of one branch over another. chaotic processor - an interpretation of the mind as an emergent property whereby the brain acts as a

novelty seeking/generating information processor testing out different constructions of its environment. This is in contrast to neural processors that reflect learning through stimulus/response. [Freeman, 1990] cybernetic - the maintenance of a system`s operational balance through various communication and control mechanisms. edutaining - the blending of education and entertainment such that the learning process can appear as a byproduct of pleasurable activities. emerging system - system that lacks any apparent precursor to its spontaneous appearance. energy flux - the exchange of free energy and the dissipation of heat as entropy production in a system with its environment. epigenesis [epigenetic] - a structural genetic modification or mutation of a species in the course adapting to the environment over time. epistemology - a theory of the nature and grounds for knowledge, especially its limits and validity. dialectic - an advancing spiral that reflects the twists and turns resulting from the relative dominance between competing and opposing forces. idiomergent [idiomergence] - a unification of individual idiosyncratic and collective convergent behaviors as a single both/and perspective rather than an either/or paradox. [Turoff 1975] memes - ideas as a proposed social successor to genes in the course of evolution. [Dawkins 1976] nested systems - the idea is worlds existing within worlds; systems within systems. paradigm - a pattern that organizes; especially knowledge. punctuated evolution - an inversion of Gould`s "punctuated equilibria" model whereby all nested systems in evolution are a single system. Thus organizational change (structuration, dialectical development, dialectical destabilization and nonlinear transformation) in evolution is the norm, punctuated by spontaneously emerging self-organizing system levels. reductionist-vitalist debate - a classic philosophical debate on whether science can find the basic unit that builds everything vs. the idea that something operates within evolution beyond our awareness or ability discover. For example, knowing the quantity of all the elements that comprise a person does not equal an ability to construct a person. Something is missing. self-organizing system - the emergence of a new organizational structure either out of apparent chaos or without prior indication of a coherent form. soft-determinism - the trajectory of processes with parameters causing a finite and preferred set of alternative possibilities at points of evolutionary transformation. strange attractor - the attractor in a turbulent organizational structure that appears chaotic or random yet hides deterministic order revealed in a phase space shape. The trajectory of the attractor in phased space is such that it never repeats itself exactly. structuration - the process of creating a structure. transducer - the conversion of energy from use in one system into a form usable for another system.

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