The Nature of Evolution

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Abstract

Science, and with it our understanding of evolutionary processes, is itself undergoing evolution. The evolutionary framework still most frequently used by the general public to describe and guide processes of societal development is erroneously grounded in Darwinian perspectives or, at the very least, draws facile analogies from biological evolution. The present inquiry incorporates fresh insights on the general systemic nature of developmental dynamics from the most recent advances in the transdisciplinary realm of the sciences of complexity (e.g., general evolution theory, cybernetics, information and communication theory, chaos theory, dynamical systems theory, and nonequilibrium thermodynamics). The description of the evolutionary trajectory of complex dynamical systems as irreversible, periodically chaotic, and strongly nonlinear agrees with certain features of the historical processes of societal development. But there are additional features of the evolutionary dynamic of natural systems that are seldom portrayed as part of human developmental deportment. These features include elements such as the convergence of existing systems at progressively higher levels of organization, the increasingly efficient utilization of environmental energy, and the complexification of system structures in states that are progressively further removed from chemical and thermodynamic equilibria. The sciences of complexity offer insight into the laws and dynamics that govern the evolution of complex systems across a variety of disciplinary areas of investigation. Through a study of the isomorphisms across disciplinary constructs in the theoretical analyses of the principles governing the evolution of human societies, it is possible to enrich the account of developmental dynamics at the socio-civilizational level. Such an account would further our understanding of the phenomenon of societal development and provide the means for the purposeful guidance of this phenomenon in accordance with general evolutionary principles. This paper sets forth the type of considerations, and outlines a general research agenda, for inquiry toward an operational model of the evolutionary development of social systems.

Keywords: Societal development, evolution, systems design, syntony, sustainability.

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INTRODUCTION

The increasing complexity and interrelatedness of human social systems highlights the need for an evolutionary praxis in service of sustainable societal development. A focus on human evolutionary development from the holistic perspective of large-scale diachronic change would provide a natural normative referential context within which to situate social systems design efforts oriented to bringing about desired (and desirable) futures. Sustainable societal development would flow as a natural step from social systems design efforts informed by such an evolutionary praxis.

This praxis is taking form in a variety of practical reorientations of evolution theory, best exemplified by the emerging domain of Evolutionary Systems Design (ESD) (A. Laszlo, 1996). ESD offers a means for the robust design of social systems as legitimate evolutionary responses to the perception of global and individual needs. Conscious human guidance is an ongoing requisite to such a praxis since the ability of societies to evolve, and even to survive, depends in great measure on their ability to adapt with changing realities. ESD recognizes the extent to which a systemic orientation is needed to maintain a holistic, critically self-reflective attitude that seeks to integrate individual satisfaction (including the physical, mental, emotional, and spiritual needs of human beings) within societal and natural environments in consideration of dynamic evolutionary laws and processes.

However, given that they are culturally-conditioned, social systems are embedded in an even more mercurial environment than are biological systems. What the reality is that affects the existence of social institutions, political states, and economic systems depends not only on what the case is, but on what its members and its leadership perceive it to be. Since reality is not an absolute given, evolutionary systems theorists and practitioners should not seek to design absolute solutions to contemporary challenges; solutions should take the form of flexible systems for future creation that help decision-takers select humanistic and sustainable responses to the issues they confront. In *Order Out of Chaos,* Ilya Prigogine and Isabelle Stengers note that individuals can very much play a role in evolutionary processes of change. "The threat lies in the realization that in our universe the security of stable, permanent rules are gone forever. We are living in a dangerous and uncertain world that inspires no blind confidence. Our hope arises from the knowledge that even small fluctuations may grow and change the overall structure. As a result, individual activity is not doomed to insignificance" (as quoted in Banathy, 1996, 313).

Through the tools of systems science and design, it is possible to construct a stable structure of human co-evolution with life and life support systems on earth. No longer is it necessary to shift weight back and forth between reliance on the technological fixes of science and technology and reliance on the culturally idiosyncratic justice of human social institutions. As we all know, two-legged structures are inherently unstable. With the integration of the culture of design, humanity can firmly ground the world of symbols, values, social entities, and cultures that comprise our reality-making competencies. ESD can help us learn to master these competencies through evolutionarily informed acts of inventing, making, assessing, and implementing — and

an understanding of the fact that not only is the future possible, it is up to us. Indeed, "the ideas and visions we now produce could be the butterflies of the [near future]. It is up to each of us to flap our wings — and to make use of the chaos of our times to launch our bifurcating societies along the humanistic path" (E. Laszlo, 1994, 61).

What is needed to launch our bifurcating societies along the humanistic path is some sort of evolutionary compass. Some way of guiding our efforts so that they are in tune with, aligned with, the general evolutionary processes of which we are a part. The challenge is to understand how to read the patterns of change and to learn how to engage in creative opportunity making that is both meaningful and sustainable. This is not a question of the survival of the fittest; it is a quest for fitting survival. Through advances in the scientific understanding of evolutionary processes, it is becoming ever more patently clear that our planet is a nest for life: remove part of the nest and life incubates deficiently. So rather than seek to dominate the planet (as if there were any point in seeking that which has already been attained – at cost), the quest becomes one of dynamic harmonization, of evolutionary consonance, in short, of syntony. The evolutionary compass, then, would be one that points our way toward syntonious pathways for future creation. Is such a compass really needed? Can we not continue with a model of Darwinian gradualism that fosters a biogenic drive toward species supremacy? Well, let's just look at where it has gotten us so far…

DARWIN'S OFFSPRING

Even a cursory survey of the state of syntony of our global society reveals serious disequilibria. It appears that societies all around the world are currently experiencing a period of rapid and extensive transformation. The signs of change are pervasive, and the rate of change is itself changing and accelerating, speeding contemporary societies toward a critical threshold of stability and engulfing the individual in a confusing blur of behavioral choice. One the one hand we are witnessing global flows of information, energy, trade, and technology swept up in massive economic reforms and political reorientations. On the other, and in no small measure due to the magnitude and intensity of these flows, we are experiencing climatological and ecological maelstroms that are altering the physical essence of our planet. The resulting turbulence of these dynamics creates a disorienting and disrupting vortex of social, cultural, and ecological change on both local and global levels.

Economic and cultural integration in North America and Western Europe; social and political transformation in Eastern Europe, The Middle East, Africa, India, Pakistan, and China; human caused global climate change; declining levels of biodiversity and ecosystem viability; changes in the migration patterns of both human and animal populations — these are not isolated phenomena: they are organic elements in the dominant pattern of our times. Now, this pattern also manifests countervailing dynamics, such as social innovations that focus on quality of life and local community initiatives that emphasize self-directed sustainable development on the one hand, and breakthroughs in technologies that promise increased efficiencies and means of harnessing renewable energy sources on the other, but the common feature is the transition that virtually every part of the world is going through. Some of the more visible effects of this transition include indebtedness and financial crisis in the Third

World, geo-political and instability associated with international initiatives stemming from the First World, and urban, food, and environmental crises in all three "worlds."

Are all these changes part of a normal course of societal evolution, or are we in a fundamentally different phase of development as we round out the first decade of a new millennium? I don't think this is normal. Humanity is transiting into a new kind of society, one that is as different from the society we leave behind as the grasslands were from the caves, and the settled villages of antiquity were from life in nomadic tribes. The society we are leaving is the nationally based industrial society created at the dawn of the first industrial revolution — the society toward which we are heading is an interconnected socio-economic system created by the growing impact of information, the globalization of business and government, and the ever greater demands on an increasingly over-burdened and fragile terrome.

The evolution of far-reaching social structures with powerful technologies has changed the surface of the earth. But such advance has also tended to reinforce social inequities, political stresses, and unreflective uses of technology in ways that polarize humanity and degrade nature, creating problems of global dimension. Global warming, the attenuation of the ozone shield, the menace of deforestation and desertification, the destruction of many species of flora and fauna, the extensive pollution of air, water and soil, and the poisoning of the food chain are threats that all societies now share in common. These are the characteristics of our current problematique — they represent the dangers to be averted and the opportunities to be seized upon in the global transition in which we find ourselves at the dawn of the new millennium. To act in syntony with sustainable evolutionary dynamics, we need to have recourse to a better compass by which to guide societal development.

Evolutionary inquiry needs to be dedicated to the exploration of evolutionary dynamics across disciplinary boundaries. This calls for the intensive and extensive exploration of manifest isomorphisms in evolution theory from a variety of disciplinary perspectives. As such, the new inquiry needs be both informed by, and in service to, a transcendent evolutionary paradigm (i.e., not one bound by any disciplinarily derived axiology of evolution, nor by any one theoretician or theory of evolution). The objective of such inquiry is to foment the emergence of a meta-evolutionary paradigm, and to cultivate conscious evolution toward the betterment of our collective chances for evolution with distinction – rather than risk unwitting devolution to extinction. The result of such a transdisciplinary orientation to evolutionary inquiry would be an actionable theory of evolution; one able to guide human societal change efforts through an evolutionary praxis that places human affairs in the context of planetary sustainability. This is the shape of the compass that is being wrought of Evolutionary Systems Design.

BEYOND DARWIN

For most people, evolution simply means Darwin. Unmistakably, he is important as a historical figure who legitimized a theory of evolution both scientifically and popularly. However, scientific understanding has advanced beyond even neo-Darwinian interpretations, and yet popular conceptions of evolution remain strongly associated

with classical Darwinism. This is seriously problematic if we wish to be effective stewards of evolutionarily sustainable societal development…

Classical Darwinism is founded on the notion of the complete and entire separation of the germline (the genetic information handed down from parent to offspring) and the soma (the organism that expresses the genetic information). Jean Baptiste Pierre Antoine de Monet, Chevalier de Lamarck, did not make this separation, of course, but his theory, known as Lamarckian evolution, was less appealing to the zeitgeist of the Industrial Revolution, and so found broad based appeal only in the former Soviet Union. With the addition of mutation theory proposed by Hugo de Vries, Darwinian evolution came to describe a process of biological change that proceeds by selection of those randomly created genetic variants that have the best "fit" with particular environments. This means that a Darwinian appreciation of biological evolution is based on a double chance: the chance variation of the germline, and the chance that this random mutation will result in an organism that has an increased "goodness of fit" with it's environment. In short, evolution is based on trial and error, and this implies, that it is something like the work of a blind watchmaker, as Richard Dawkins called it. This view still holds firm, despite the fact that modern science tells us otherwise. Indeed, some researchers maintain that Darwin's theory is fundamentally mistaken (*Cf.* Hoyle,. 1983; Lorenz, 1987; Senapathy, 1994). The problem, it seems, relates to the improbabilities of double-blind chance processes as the driver of the manifest complexity we observe in life and living ecosystems.

This problem with Darwinian explanations of evolution eventually boils down to that of complexity and time. Random rearrangements within the genome are unlikely to produce new species from old anywhere else than in the space of theory formulation. The time that was actually available for the current myriad species and their manifest levels of complexity to arise seems to fall way short of that required by a Darwinian explanation. The most ancient rocks on earth are about four billion years old, and evidence suggests that the earliest forms of already highly complex life, the prokaryotic cyanobacteria known as blue-green algae, are over 3.5 billion years old. That means that this form of life is likely to have emerged within the short geological space of about 500 million years. Of course, this can only be said to be likely if one does not adhere to the Darwinian belief in evolution relying on chance variation of the genome, coupled with chance environmental fitness of the phenome. The level of complexity of a eukaryotic cell is not likely to have emerged within that relatively short period of time. As renown mathematician and physicist Fred Hoyle put it, the probability of such a process occurring purely by chance is about as likely as a hurricane blowing through a scrap yard assembling a working airplane.

The bottom line is that "a series of random genetic mutations is not likely to have produced all the complex species indicated by observation and the fossil record within the time that was available for biological evolution on this planet. … In any case, if random mutation and natural selection require more time to produce viable species than the fossil record indicates, then Darwin's theory, if not quite mistaken, is at least incomplete" (E. Laszlo, 2000). Indeed, most scientists have come to recognize just how mistaken contemporary popular interpretations of Darwin's theories actually are (Loye, 1999).

A NICER NATURE

Additional insights into the cooperative dynamics of animals and plants alter the classical image of nature as a drama of ruthless competition in a violent struggle for survival and domination. Biologist Lewis Thomas expresses his views on the subject as follows:

> One major question needing to be examined is the general attitude of nature. A century ago there was a consensus about this; nature was 'red in tooth and claw,' evolution was a record of open warfare among competing species, the fittest were the strongest aggressors, and so forth. Now it begins to look different. ... The urge to form partnerships, to link up in collaborative arrangements, is perhaps the oldest, strongest, and most fundamental force in nature. There are no solitary, free-living creatures, every form of life is dependent on other forms. (Thomas, 1980, 1)

The pattern of association and interdependence found in nature forms a type of relationship that, in the words of Lynn Margulis, "is far more than the sum of its parts" (Margulis, 1981, 167). What emerges can be called community. In essence, community implies a cooperative venture, and what is life if not a cooperative venture? (N.B. Only non-Darwinians need answer.) Margulis explains this vital mutualism like this:

> All organisms are dependent on others for the completion of their life cycles. Never, even in spaces as small as a cubic meter, is a living community of organisms restricted to members of only a single species. Diversity, both morphological and metabolic, is the rule. Most organisms depend directly on others for nutrients and gases. Only photo- and chemo-autotrophic bacteria produce all their organic requirements from inorganic constituents; even they require food, gases such as oxygen, carbon dioxide, and ammonia, which although inorganic, are end products of the metabolism of other organisms. Heterotrophic organisms require organic compounds as food; except in rare cases of cannibalism, this food comprises organisms of other species or their remains. (Margulis, 1981, 163)

In nature, community means that "every species ... directly or indirectly, supplies essential materials or services to one or more of its associates" (Dice, 1962, 290). Such a conception of community brings with it deeper insights, such as "... the notion of life as self-directed movement. Nature is not at war, one organism with another. Nature is an alliance founded on cooperation" (Augros & Stanciu, 1987, 129.).

Community in nature occurs at many different scales and scopes. Just as we may think of the populations of various species living in a given geographic area within a broader biotic ecosystem as forming a community, so can we think of an organism itself as a highly integrated, differentiated, and coordinated form of community. In discussing the nature of the living organism, biophysicist Mae-Wan Ho presents a fascinating

account of the syntony involved in creating that unity which you and I call an individual human being out of the myriad atoms, molecules, and cells of our body:

> To give an idea of the coordination of activities involved, imagine an immensely huge superorchestra playing with instruments spanning an incredible spectrum of sizes from a piccolo of 10^{-9} meter up to a bassoon or bass viol of a meter or more, and a musical range of *72 octaves.* The amazing thing about this superorchestra is that it never ceases to play out our individual songlines, with a certain recurring rhythm and beat, but in endless variations that never repeat exactly. Always, there is something new, something made up as it goes along. It can change key, change tempo, change tune perfectly, as it feels like it, or as the situation demands, spontaneously and without hesitation. Furthermore, each and every player, however small, can enjoy maximum freedom of expression, improvising from moment to moment, while remaining in step and in tune with the whole. (Ho, 1998, 55)

This is the very essence of syntony — of evolutionary consonance. It describes a system of dynamic harmonies in terms of musical harmonization and improvisational co-creation. It suggests, as Augros and Stanciu put it, that "every living thing is beautifully attuned to its environment" (Ho, 1998, 138), and that no living thing is out of step with its habitat. Brian Goodwin calls this the "sacred dance," where life moves in dynamic harmony with its environment. Through such an appreciation we can come to recognize how "even the study of a whole organism can be reductionistic if it ignores habitat, niche, and relation to other living things. ... No organism makes sense in abstraction from its natural living condition" (Ho, 1998, 230). This sort of embeddedness and entanglement, of necessary context, means that thinking of things in nature in terms of their individual 'thinginess' is like reading a sentence out of context: both necessarily yield only partial results. The key point to recognize here is that no part of a complex system is what it is in and by itself. In fact, it is what it is only in the context of its relations to the rest of the system.

It also means that all beings are defined by their contexts at least as much as they define their contexts. And what is more, it suggests that the process of creating the patterns of our existence is itself a pattern — one that informs and is informed by the very processes of life. Alfred North Whitehead, in the development of his process philosophy (centered on man and society, though founded on the natural scientific world picture), provides one of the strongest roots for contemporary systems thinkers wishing to transcend the quicksands of analytical reductionistism.

Reductionistic approaches to the dynamics of change ignores there are two, not just one, type of causal relationship betwen parts and wholes. In the Western world, and the tradition of the classical sciences that define its analyses, "upward causation" is standard fare. This process describes the dynamics of parts in interaction with each other creating forces that produce the substances which manifest at the level the whole. Reasoning along these lines leads to the supposition that by working on the parts we can affect healthy change in the whole. Of course, it is not always wrong to reason this way – in fact, it works perfectly well in the case of relatively simple and straightforward situations associated with particular individual problems and concerns. But in the case

of complex and dynamic problems, such as are involved in evolutionary processes, it is too simplistic. Here the concept of "downward causation" suggested by Nobel-laureate neurophysiologist Roger Sperry is called for. Downward causation describes the process by which the whole exercises what biologists refer to as determinant influence on the parts. As Sperry's work demonstrates, this is the kind of influence that happens in the higher nervous system where the consciousness exhibited by the whole brain governs the behavior of the brain's neuronal networks and subassemblies.

In this light, we have cause to reinterpret the Darwinian evolutionary theory of random mutations and the supposed struggle for existence that ensures their fitness: "Mutations, it appears, are flexible responses on the part of the genetic network of a living species to the chemical, climatic, and other successive generations of organisms experience in their milieu" (E. Laszlo, 1999, 29). In other words, there is a mutual tuning in — a sympathetic resonance — that occurs among those who dance this sacred dance of being and becoming.

Over a century ago, T. H. Huxley noticed that the life-affirming values behind this sort of syntony just don't square with Darwin's image of nature: "The practice of that which is ethically best — what we call goodness or virtue — involves a course of conduct which, in all respects, is opposed to that which leads to success in the cosmic struggle for existence. In place of ruthless self-assertion it demands self-restraint; in place of thrusting aside, or treading down, all competitors, it requires that the individual shall not merely respect, but shall help his fellows; its influence is directed, not so much to the survival of the fittest, as to the fitting of as many as possible to survive. It repudiates the gladiatorial theory of existence" (Huxley, 1925, 81-82).

GENERAL EVOLUTION THEORY AND CONSCIOUS EVOLUTION

In recent years, an action-oriented systems approach to the development of human and natural systems has emerged from the study of evolutionary processes in nature and society. It is known as General Evolutionary Systems Theory (or General Evolution Theory (GET), for short). It postulates that the evolutionary trend in the universe constitutes a 'cosmic process' specified by a fundamental universal flow toward ever increasing *complexity*. It is now understood that this dynamic of complexification manifests itself through particular events and sequences of events that are not limited to the domain of biological phenomenon but extend to include **all** aspects of change in open dynamic systems with a throughput of information and energy. In other words, evolution relates to the formation of stars from atoms, of *Homo sapiens* from the anthropoid apes, as much as to the formation of complex societies from rudimentary social systems.

The promise of general evolution theory is captured succinctly by Ervin Laszlo, Ignazio Masulli, Robert Artigiani, and Vilmos Csányi as follows:

> General evolution theory … can convey a sound understanding of the laws and dynamics that govern the evolution of complex systems in the

> various realms of investigation. ..... The basic notions of this new discipline can be developed to give an adequate account of the dynamical evolution of human societies as well. Such an account could furnish the basis of a system of knowledge better able to orient human beings and societies in their rapidly changing milieu. (Laszlo, Masulli, Artigiani, & Csányi, 1993, xvii, xix)

By applying GET to societal phenomena, human social systems can be understood to evolve through a process of convergence to progressively higher organizational levels. When flows of people, information, energy, and goods intensify, they transcend the formal boundaries of the social system. Thus neighboring tribes and villages converge into ethnic communities or integrated states, these in turn become the colonies, provinces, states, cantons, or regions of larger empires and eventually of nation-states. Today, we are witnessing yet a further level of convergence and integration as nation-states are joining together in the creation of various regional and functional economic and political communities and blocs, in Europe as well as in North America and elsewhere in the world.

Through the notion of 'bifurcations' (nonlinear and often indeterminate transitions between system states), General Evolution Theory can be applied to conditions that prevail when societies are destabilized in their particular time and place. Societal bifurcations can be smooth and continuous, explosive and catastrophic, or abrupt and entirely unforeseeable. However, they always describe the point at which a social system traverses a period of indeterminacy by exploring and selecting alternative responses to destabilizing perturbations. Bifurcations are revolutionary transformations in the development of society. The reins of power change hands, systems of law and order are overthrown, and new movements and ideas surface and gain momentum. When order is re-established, the chaos of transformation gives way to a new era of comparative stability. GET explains how bifurcating societies either reorganize their structures to establish a new dynamic regime that can cope with the original perturbations, or disaggregate to their individually stable components.

In relation to sustainable societal development, GET provides a conceptual foundation for theories and tenets of evolutionary governance, evolutionary management, and evolutionary ethics. It suggests that human destiny can be placed in human hands, since it is possible to move toward conscious evolutionary strategies by which to guide the sustainable development of our societies. When this theory is combined with an emancipatory systems approach (Jackson, 1991), a normative imperative emerges for the proactive design — or redesign — of the human future. It accents the empowerment of individuals and groups through the envisioning and subsequent creation of co-evolutionary pathways to desired future states of multiperson evolutionary systems. In other words, it presents a true test of our evolutionary resourcefulness in the demanding but vivifying undertaking of collective self-organization. The skills and sensitivities required for the conscious creation of such systems of syntony cannot derive from a conception of evolution as a purely biological phenomenon, nor from one that pits human against nature, and nature against itself.

We have much to learn from nature with regard to self-organization and evolutionary governance, among many other things. As Augros and Stanciu point out, “her

attributes of simplicity, economy, beauty, purpose, and harmony make her a model for ethics and politics" (Augros & Stanciu, 1987, 231). This model is one with which our species would do well to acquaint itself... It involves learning or re-learning what it means to be part of a natural community that is itself a system of syntony. Fritjof Capra points to this as "the greatest challenge of our time: to create sustainable communities — that is to say, social and cultural environments in which we can satisfy our needs and aspirations without diminishing the chances of future generations" (Capra, 1996, 4). In terms of syntony, it is less a matter of creating these communities than of co-creating the conditions for their emergence. That is, co-creating Goodwin's sacred dance of being and becoming with the other members of the ecosystems with whom we share our earth. Of course, this means focusing not only on the social and cultural environments that Capra mentions, but on the other embedding contexts that define us and give meaning to the life music we make which, in turn, creates the rhythms by which we continuously flow into existence.

The skeptic may remark that we flow into existence whether we care about syntony or not. This is true, but I would remind him that it is the quality of the flow, and the degree to which it sustains us and the other processes and patterns that emerge with us in the course of evolution, that is in play here. This matter of quality marks "the difference that makes the difference," as Bateson puts it, and it depends directly on the extent to which syntony is encouraged or neglected. Therefore, it is imperative that we understand evolution in more than just a theoretical way. The challenge is to learn how to work with change, to cope with uncertainty, to dance with evolution. Becoming masters of our own destiny is not a quest of foolish arrogance – it is the survival imperative for sustainable co-existence of humankind with the life support systems of planet earth. The mastery entailed is not one of Darwinian domination but rather one of holistic harmonization. As Eric Chaisson says in *The Life Era* (1987), "An appreciation and understanding of evolution … can provide a map for the future of humanity." With such a map, all that is needed is a reliable compass. Syntony provides such a compass for it involves learning how to sail the currents of evolutionary change. Indeed, with the response-ability and the sense-abilities that come of a well developed syntony sense, it is possible to take to heart and bringing to life the age old adage, *"we can not direct the wind, but we can adjust the sails"* (A. Laszlo, 2001).

Given that syntony can be actuated as an organizing force in societal evolution (A. Laszlo, 1999), the extent to which we inform our actions through a transdisciplinary, universally relevant theory of evolution will mark the extent to which the consequences of our actions and the implications of our thoughts will contribute to developmental pathways that are either more or less sustainable. Mihalyi Csikszentmihalyi (1993) put it quite plainly: "In order to make choices that will lead to a better future, it helps to be aware of the forces at work in evolution." Through an enriched evolutionary awareness, and the embodiment of such awareness in lived consciousness, it is possible to act so as to purposefully promote pathways of increased evolutionary consonance. In doing so, we engage in processes of consciously created syntony, although the flow of the process would be as natural as the dynamics of a healthy and vibrant ecosystem. To be sure, such ecosystems are characterized by communities of beings that interact with each other and with their embedding environment with high degrees of syntony. For human beings, these can be conceived as the 'sustainable communities' of which Capra writes.

SUSTAINABILITY — TOWARD AN EVOLUTIONARY NORMATIVISM

Guided evolution implies normative considerations. The norm, however is nature, not idiosyncratic human proclivity. It is our challenge to foment individual and collective developmental processes that manifest evolutionary consonance. An action-oriented theory of evolution suggests that human beings have the choice consciously to participate in the co-creation of the future. And yet it seeks neither to predict nor to 'socially engineer' the future. Rather, it aims to create the conditions for the emergence of sustainable evolutionary futures.

> In systems such as contemporary society, evolution is always a promise and devolution always a threat. No system comes with a guarantee of ongoing evolution. The challenge is real. To ignore it is to play dice with all we have. To accept it is not to play God — it is to become an instrument of whatever divine purpose infuses the universe. (Laszlo, 1996, 139)

The orientation of proactive evolutionary facilitation is essentially possibilistic. The aphorism of learning to adjust the sails rather than seeking to direct the wind best captures this spirit of evolutionary consonance. Learning to sail the currents of evolution — not just to 'go with the flow' but to become active participants in the journey — is at the heart of any effort to guide societal evolution through such an orientation. Bela Banathy talks about the desired characteristics of desginers in his book, *Designing Social Systems in a Changing World,* and some of them are courage, confidence, willingness to take risks, situational sensitivity, flexibility, tolerance for ambiguity and uncertainty, and the ability to move between synthesis and analysis (Banathy, 1996, 53). Certainly, design is for the bold, the daring, and the caring, although it does not admit hubris, self aggrandizement, or any form of personal or species apotheosis. It is generally an urgent task, and the proactive evolutionary facilitator is usually driven by an empathetic sense of concern for the well-being of earth and all that is in it. This is the sense of response-ability that Evolutionary Systems Designers can neither shirk nor deny. Together with the more-than-human world with which we engage in design, we seek to create a designs that have a "goodness of fit" with the dynamics of our larger society, with our own expectations and the expectations of the systemic environment in which it all is nested.

Once we get a sense of general evolutionary dynamics, we can understand how it is that society is neither directionless nor directed. As a system that incorporates purposeful change agents with conscious intent, society manifests the potential for self-directed conscious evolution. So while society cannot be manufactured or engineered by planning or architecture, the conditions that favor the emergence of healthy, sustainable, and evolutionarily robust environments for its development *can be consciously created.*

Through the evolutionarily informed design of conditions that nurture sustainable communities, a culture of syntony can emerge. It emerges in the flow of general evolutionary processes as several communities create mutually supportive cycles of

value exchange that permit them to organize at a higher level of social coordination. In other words, while a top-down approach to designing society as a whole may be impracticable as well as ethically dubious, the design of conditions that propitiate the arising of individual communities, and through them, the further emergence of a culture, is not. This approach to guided evolution is bottom-up, and as such, it faithfully replicates the strategy of natural evolutionary development in the chemical, physical, biological, societal, and possibly even transpersonal realms.

GROWTH ≠ DEVELOPMENT ≠ EVOLUTION

At this point, it becomes important to distinguish between growth, development, and evolution. *Evolution,* as we have seen, involves a process of directional (but non-directed) change that leads from states closer to thermodynamic and chemical equilibrium (the so called "first state") to those further removed from it (the "third state"). As such, it describes a tendency toward states further removed from thermodynamic and chemical equilibrium. More simply put, it is "a general way of conceptualizing the self-organizing selection process of the universe displayed in … increasing complexity" (Reeves, 1992, 1102). *Development* really relates more to the world of human affairs, and is part of our socially constructed reality in terms of what we consider to be "desirable" objectives for us or others (and hence allows us to make very subjective and relativistic statements about what and who is developed vs. those that are not). *Growth* is something that we can measure through definable units of size or scale, and relates to notions of physical size or numerical quantity. It provides a metric that can be applied to many processes of change, but not to those that are qualitative or conditional in nature.

Growth	=	an increase in size or quantity
Development	=	an amelioration of conditions or quality
Evolution	=	a tendency toward greater *structural complexity* and *organizational simplicity*, more efficient modes of operation, and greater dynamic harmony

Building on these distinctions, we can turn to a consideration of evolutionarily sustainable societal development. For the process of global development to be sustainable, it must be able to provide ways of "doing more with less" — by increasing the abilities of individuals to resourcefully adapt with their environments in ways that change as their environment changes — but that remain constant in their maintenance of viable environments in which to operate. As portrayed in Figure 1, below, in order for this concept of sustainable development to be in service to humanity, it must assure that both the products and the processes of change are –

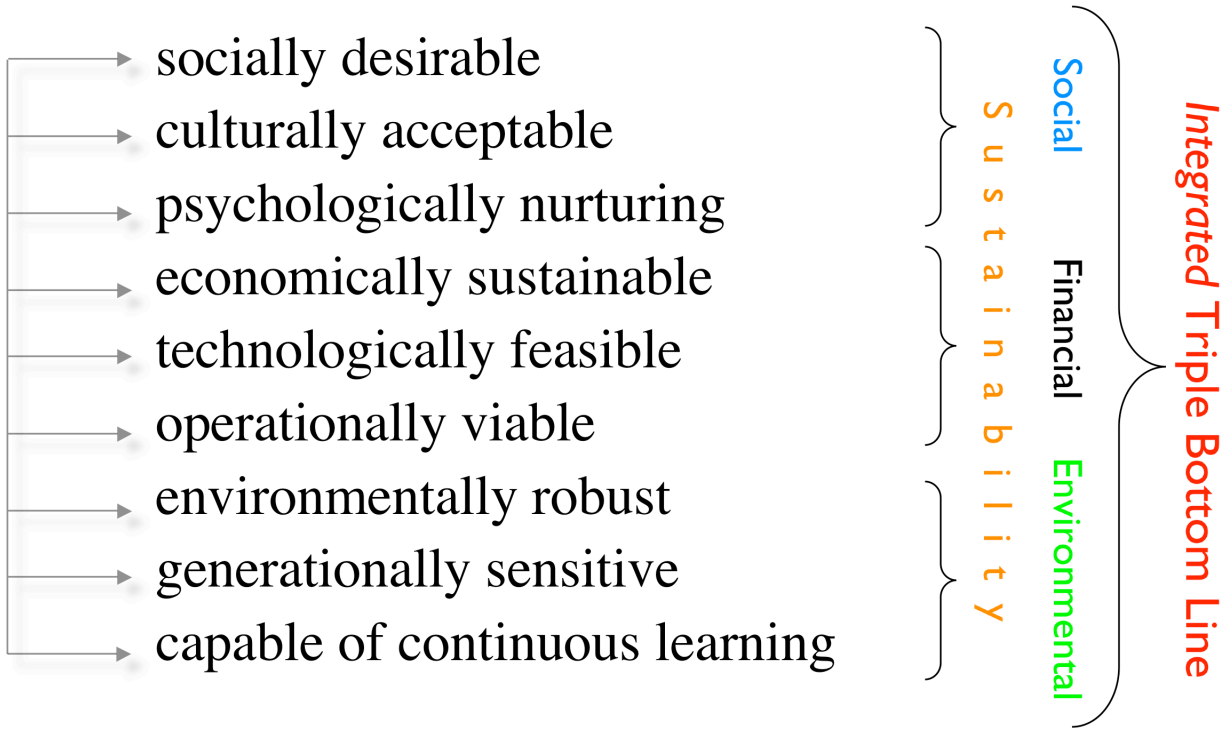

Figure 1. Sustainability Criteria.

By monitoring all these aspects simultaneously, a process of development (individual, societal, or global) can be said to be evolutionarily sustainable if it involves an adaptive strategy that ensures the continual maintenance of an increasingly robust and supportive environment. This is the very essence of evolutionary sustainability. Sustainable development strategies generated through evolutionary systems design seek to identify opportunities for increasing the dynamic stability and self-sufficiency of an individual or group in interaction with the broader set of components of its particular time and place. These strategies always indicate areas of evolutionary potential to be developed to the advantage of the complex dynamic systems involved in ecosystemic interaction now and into the future.

Sustainable societal development, then, is based on a vision that conceives of true progress as that which redresses current needs without placing at risk the needs of future generations. The emergence of energy-accounting and environmental accounting, ecosystem modeling, product life-cycle analysis, entropic laws in economics, self-organizing concepts in cybernetics, artificial intelligence theory and related concepts, demonstrates that the inner logic of science is even now leading toward a transdisciplinary mode of thinking about evolutionary phenomena. The logic of systems science emerges strongly in this endeavor, and it draws upon an impressive array of mathematical and related techniques. Transdisciplinary interventions that aim

to provide the means to build capacity for the continuing provision of benefits employ, either implicitly or explicitly, an evolutionary model of societal change. Those that do so effectively imply a rate of development that is capable of promoting an ongoing process of socio-cultural and politico-economic betterment.

EVOLUTIONARY SYSTEMS DESIGN (ESD)

As indicated in this paper, evolution is a process of emergence — create the right conditions and interesting things happen. That is also the essence of ESD. The best we can do is get involved in the process of fostering the conditions under which sustainable societal development can occur. This would be neither underconceptualizing nor overdetermining our role as proactive evolutionary facilitators.

Choosing to adopt this role requires engaging in the process with purpose and vision, with positive energy and the taking and sharing of response-ability. Only then can one be ready to make syntony. Of course, *making* it happen should not be confused with *forcing* it to happen. One is a creative, constructive, life-affirming act. The other is a restrictive, impositional, life-constraining act. True love, for example, is something we can make but never force. The same holds for peace, harmony, and not least, for syntony.

As a species, our actions and interventions on this planet have been largely driven by chance and, at best, '20/20 hindsight.' However, as Margaret Mead noted, we are at a point where for the first time in human history, we are able to explain what is happening while it is happening (in Montuori, 1989, 27). ESD builds on this relatively new meta-reflective competence by serving as an instrument for the evolution of consciousness and as a means of fostering conscious evolution. It suggests that with the new understanding of evolutionary dynamics and effective approaches to the participatory design of social systems, our species can stop drifting upon the currents of change and begin to adjust its sails in view of sustainable evolutionary futures. "As evolution becomes history, it can become conscious. As Jonas Salk put it: conscious evolution can emerge from the evolution of consciousness — and from the consciousness of evolution" (E. Laszlo, 1996, 139). This is the understanding upon which ESD has been conceived.

While Social Systems Design (SSD) can be been characterized as a form of soft systems thinking primarily serving Habermasian practical interests (Jackson, 1991), ESD is conceived as an attempt to evolve SSD into a form of critical systems thinking by also serving an emancipatory interest. This means that ESD draws from wellsprings of soft systems thinking, critical systems thinking, and emancipatory systems thinking in addition to GET and life-long evolutionary learning orientations (A. Laszlo, 2000). The result is a humanistically oriented systems approach comprised of a meta-methodology that facilitates the critical application of various systems perspectives to real-world situations (Laszlo & Krippner, 1998, 59).

Meeting the challenge of sustainable societal development entails learning to co-create with the dynamics of change, neither forcing the process nor being swept away by it. The alternative to forcing the process of change and to being swept away by it has not

really been an option until the last few decades of the 20th century. Historically speaking, humankind has pursued this strategy more or less consciously in order to gain mastery over nature. We can now live on the north pole, in the tropical rain forests, out on the desert or under the sea. We do not need fur to keep us warm; we can fabricate clothing and we can build houses and install heating. We do not need sharp claws or powerful jaws to get the food we need; we can use forks and knives or chopsticks to eat with and we have tools and machines to harvest and process our provisions. And we do not need piercing voices or specialized antennae to communicate among ourselves: we have developed systems of communication to relay information far and wide. In fact, now that we have found evidence of substantial deposits of water hidden away on the moon, NASA engineers are even considering plans to set up a human colony there.

Clearly, the Darwinian principle of species self-promotion has allowed us to change to claim dominion of most of the earth. We have adapted our environment to us, molding and modifying our surroundings however we please in order to be more comfortable. We also have seen fit to do whatever we like with the animals and plants that share our planet. If it entertains us to kill a bull for sport, then we make a glorified spectacle of it, and if we enjoy decorating a Christmas tree in our home, then each year we cut one that has taken years to grow so that it can adorn our house for a few weeks (and often, after that, the tree becomes garbage — stuck in a plastic bag to be carted off as non-recyclable landfill). Those of us who eschew sport hunting may think of ourselves as highly civilized and thoroughly moral planetary citizens, but how often do we act in ways that show we think nothing of taking the life of other living things for our simple pleasure? If we like the smell of wildflowers in our home, aren't we still willing to cut fresh ones every day to please our senses? While each individual act of doing so may not change the world for good or for bad, the attitude that allows us to engage in such acts could.

CONCLUSION

By the start of the third millennium, this Darwinian strategy of adapting the environment to us in accordance with our every whim has brought us to the threshold of sustainability with the life support systems of planet earth. In considering the consequences of this way of being with the world, ESD explores the range of implications of this anthropocentric approach of adapting all to us. It has been the hallmark of the human change agent, but it may not be the legacy we wish to leave.

As we have seen, the rate of evolutionary change is accelerating at the socio-cultural level largely due to the fact that the motors of memetic change rely on information sharing (rather than energy/matter exchange) and thus – provided fidelity of transmission – allow for exponentially faster rates of change than at the bio-physical level of genetic change. Of course, the changes that emerge through socio-cultural evolution then feed back into pressures for bio-physical evolution in the form of changed environments. However, these changes tend to manifest themselves in the short run through decreases in human and social capital (individual health and well-being and collective capacities to cope with epidemics of all kind, respectively). Interestingly enough, on the medium-term bio-phhyical level, we are witnessing the emergence of genetic novelty such as the resistance to malaria though the increased

prevalence of sickle-cell trait among some African populations[†]. With regard to the evolution of human intelligence, the rate of socio-cultural evolution – as determined by the dynamics of memetic change – serves as the driver of change (at least of those aspects of change in human intelligence that can possibly be perceived in the course of change bounded by the temporal parameters of our homocentric frame of history. Of course, astrophysical notions of deep history reach well beyond socio-cultural aspects.). The wonderful thing about this is that the inquiry then moves out of the probabilistic realm of bio-physical evolutionary dynamics and into the possibilistic frames of socio-cultural change. This is where the potential for engaging in the purposeful and intentional evolution of consciousness toward a more fully manifest evolutionary consciousness emerges as a real and meaningful challenge for action-minded scholar-practitioners of evolutionary dynamics. In this sense, concerns one might have about improvements in terms of human intelligence become increasingly a matter of conscious, intentional, purposeful evolutionary systems design.

As we establish a firm foothold in the Twenty-First Century, transiting from one historical period to another across the dividing line of a millennium, we must continue to explore ways of fitting our individual melodies together to create sustaining and enduring harmonies. This is more than just a nice metaphor: it is the essence of syntony. To consciously create syntony, we have to learn certain skills, to develop and practice certain competencies, and to manifest a willingness to think and act interactively. The notion of "will" — of active intention and passionate purpose — is crucial here. In fact, it is what makes the difference between merely *seeking harmony* and *engaging in a syntony quest.*

Our common quest is of stewardship, of ways of being responsible change agents while at the same time learning how to deal with the challenge of playing a meaningful role in a society that is part of a rapidly changing world. This seeking of ways to become stewards of life in partnership with earth, of taking on the mantel of evolutionary co-creator, this is the syntony quest. It employs an evolutionary appreciation that is far removed from the popular conception of the Darwinian struggle for existence. And as with any significant learning adventure, the process of the quest is more critical than any particular outcomes to which it may lead. Through the ways of learning how to read and understanding the consequences of change that both shapes and is shaped by us, Evolutionary Systems Designers may find ways to shape their own response to the challenge of this syntony quest. Sustainable societal development is as much a function of our understanding of evolutionary processes as it is of our ability to engage with the dynamic change processes of which we are a part in a spirit of responsible co-creation. In the final analysis, together with all that with which we interact, we *are* evolution.

[†] The protozoan parasite that causes maralia cannot reside in sickle-cells, and while individuals with this trait are hypersusceptible to asphyxiation in oxygen poor environments, advantage is conferred upon them in malaria infested ones.

GLOSSARY

Community	A group of two or more individuals with a shared identity and a common purpose committed to the joint creation of meaning.
Complexity	A systemic characteristic that stands for a large number of densely connected parts and multiple levels of embeddedness and entanglement. Not to be confused with complicatedness, which denotes a situation or event that is not easy to understand, regardless of its degree of complexity.
Embeddedness	A state in which one system is nested in another system.
Emergence	The appearance of novel characteristics exhibited on the level of the whole ensemble, but not by the components in isolation.
Entanglement	A state in which the manner of being, or form of existence, of one system is inextricably tied to that of another system or set of systems.
Environment	The context within which a system exists. It is composed of all things that are external to the system, and it includes everything that may affect the system and may be affected by it at any given time.
Evolution	A cosmic process specified by a fundamental universal flow toward ever increasing *complexity* that manifests itself through particular events and sequences of events that are not limited to the domain of biological phenomenon but extend to include **all** aspects of change in open dynamic systems with a throughput of information and energy. In other words, evolution relates to the formation of stars from atoms, of *Homo sapiens* from the anthropoid apes, as much as to the formation of complex societies from rudimentary social systems.
Evolutionary Systems Design (ESD)	A form of *social systems design* that responds to the need for a future-creating design praxis that embraces not only human interests and life-spans but those on planetary and evolutionary planes as well. The primary vehicle for the implementation of ESD is the Evolutionary Learning Community (ELC).
Syntony	In evolutionary systems thinking; evolutionary consonance; the occurrence and persistence of an evolutionarily tuned dynamic regime. More loosely, the embodiment and manifestation of conscious evolution; a purposeful creative aligning and tuning with the evolutionary flows of one's milieu. In traditional radio engineering; resonance.
Social Systems Design	A decision-oriented disciplined inquiry that aims at the construction of a model that is an abstract representation of a future system.

REFERENCES

Augros, R., and Stanciu, G. (1987). *The New Biology: Discovering the Wisdom in Nature,* Shambhala, Boston, Mass.

Banathy, B. (1996). *Designing Social Systems in a Changing World,* Plenum, New York.

Capra, F. (1996). *The Web of Life: A New Scientific Understanding of Living Systems,* Anchor Books, New York.

Chaisson, E. (1987). *The Life Era: Cosmic Selection and Conscious Evolution,* W.W. Norton, New York.

Csikszentmihalyi, M. (1993). *The Evolving Self: A psychology for the third millennium,* HarperCollins, New York.

Dice, L. (1962). *Natural Communities,* University of Michigan Press, Ann Arbor.

Ho, M. (1998). "Organism and Psyche in a Participatory Universe," in *The Evolutionary Outrider: The Impact of the Human Agent on Evolution — Essays honouring Ervin Laszlo* (D. Loye, ed.), Adamantine Press, Twickenham, UK.

Hoyle, F. (1983). *The Intelligent Universe,* Michael Joseph, London.

Huxley, T. (1925). "The Struggle for Existence in Human Society," in *Evolution and Ethics and Other Essays,* (T. Huxley, ed.), Appleton, New York & London.

Jackson, M. (1991). *Systems Methodologies for the Management Sciences*, Plenum, New York.

Laszlo, A. (2001). *The Syntony Quest: Evolutionary Vision for Changing Your World,* manuscript version.

Laszlo, A. (2000). "The Epistemological Foundations of Evolutionary Systems Design," Proceedings of the 44th Annual Meeting of the International Society for the Systems Sciences, Toronto, Canada, 16 - 21 July 2000.

Laszlo, A. (1999). "Syntony as an Organizing Force in Societal Evolution," Proceedings of the 43rd Meeting of the ISSS, Asilomar (USA), 27 June - 2 July 1999.

Laszlo, A. (1996). "Evolutionary Systems Design: Way Beyond the Two Cultures," Proceedings of the Annual Conversation Event of the International Systems Institute, Asilomar (USA).

Laszlo, A. and Krippner, S. (1998). "Systems Theories: Their origins, foundations, and development," in *Systems Theories and A Priori Aspects of Perception,* (J.S. Jordan, ed.) Elsevier, Amsterdam.

Laszlo, E. (2000). *Holos — The Fabulous World of The New Sciences: Explorations at the leading edge of contemporary knowledge,* Trade Book Version, October 1.

Laszlo, E. (1999). *Holos — The Fabulous World of The New Sciences: Explorations at the leading edge of contemporary knowledge,* manuscript version.

Laszlo, E, (1994). *The Choice: Evolution or Extinction?* Tarcher/Putnam, New York.

Laszlo, E. (1996). *Evolution: The general theory,* Hampton Press, New Jersey.

Laszlo E., Masulli, I., Artigiani, R., and Csányi V. (1993), *The Evolution of Cognitive Maps*, Gordon & Breach, New York.

Lorenz, K. (1987). *The Waning of Humaneness*, Little, Brown & Co., Boston

Loye D. (1999). *Darwin's Lost Theory of Love,* iUniverse, New York.

Margulis, L. (1981). *Symbiosis in Cell Evolution,* Freeman, San Francisco.

Montuori, A. (1989). *Evolutionary Competence: Creating the Future,* J.C. Gieben, Amsterdam.

Reeves, W. (1992). "Meta-cognition and complexity," Proceedings of the ISSS Meeting, Denver.
Senapathy, P. (1994). *Independent Birth of Organisms*, Genome Press, Madison.
Thomas, L. (1980). "On the Uncertainty of Science," in the Phi Beta Kappa *Key Reporter,* (6): 1.