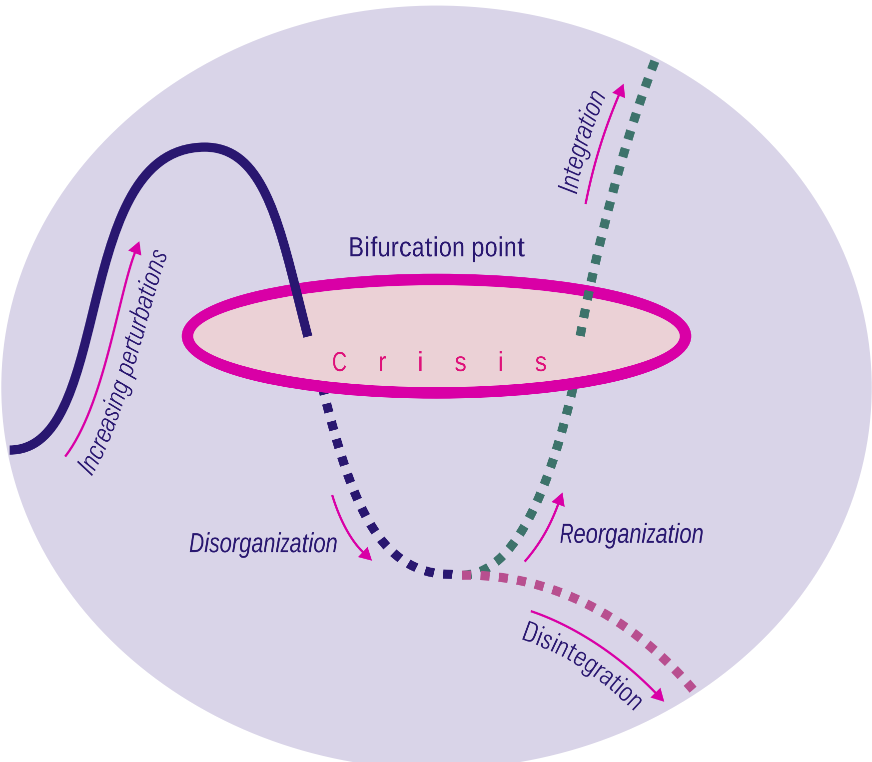
The BEST Model

A BEST Futures graphic presentation



BEST *Biosocial Evolutionary Systems Theory*

Contents

Introduction

The goal of the *BEST Futures* project is to support the transformation to a sustainable global system through developing useful new theoretical tools. Our work builds on evolutionary systems theory, which studies how systems maintain themselves and change in relationship to their environments (see Appendix 1, *The Paradigm Shift in Science*). Evolutionary systems theory is essential for understanding how living biological and social systems (plants, animals and societies) self-organize, reproduce and evolve.

The purpose of the *BEST Model* is to explain societal evolution. New historical "ages" evolve when a new view of reality emerges that is capable of reorganizing social institutions and economic processes in more functional ways. Evolutionary transformations have taken place a number of times in human history: from the hunter-gatherer bands of the Old Stone Age, to the herder-cultivator tribes of the New Stone Age, to the agricultural kingdoms of the Agrarian Age, to the industrial nations of the Industrial Age. We are now in the midst of another evolutionary shift to the holistic planetary civilization of the Information Age.

The BEST Model identifies the paradigm-changing factors that must be present before a complete societal transformation can take place. Because these factors are now present, we know that the evolutionary transformation of the industrial system has already begun. Our model also explains why the world system is now unsustainable, the dynamics of global change and the requirements of a holistic civilization.

This presentation combines the theoretical content of our two full-length graphic presentations, *Time-Space-Technics*, and *Collapse and Transformation.* It explains the evolutionary process, how systems function and change, the historical evolution of societal systems, and the current evolutionary period.

Section 1

A Universe of Systems

organization and regulation govern the evolution of inorganic, organic and societal systems

"The eternal mystery of the world is its comprehensibility."

Albert Einstein

$$E = mc^2$$

A Universe of Systems

When we look around us we see order, not chaos. From micro-cosmos to macro-cosmos, all that exists in the universe is organized energy and matter.

Universal laws create recurring patterns and structures at every level. Even relatively chaotic and unpredictable events are organized by natural laws into patterned systems. Stable systems and structures tend to endure and evolve into progressively complex and conscious forms.

The history of the universe is the history of the continuous self-organization and evolution of both matter and consciousness.

Fish Egg

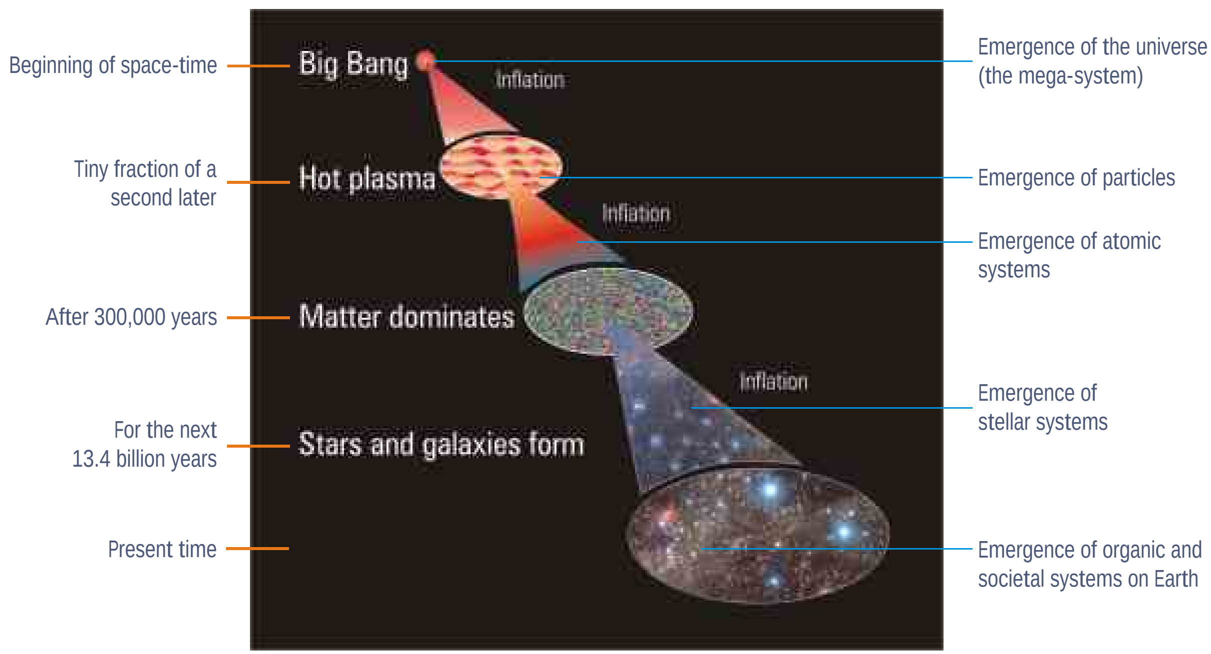
Andromeda galaxy

The Big Bang

Physicists basically agree that our universe began with the "Big Bang" some 13 billion years ago. This cosmic explosion created a unified continuum (a curved-space hypersphere) of time, space, and force fields.

Einstein's theory of invariants (now known as the theory of relativity) states that the laws of physics apply everywhere and at all times. The same laws that organized the dense undifferentiated energy that existed in the early universe are still organizing the universe, causing it to greatly expand and evolve differentiated matter and consciousness.

When we apply general systems theory to the study of inorganic, organic and societal evolution, we see that other integrative principles govern the universe in addition to physical laws. Our theory includes foundational constructs such as space, time, force fields, energy and boundaries, and adds regulatory and organizational principles such as invariance, equilibration, bipolarity, quantization, integrative levels, emergent properties, number mathematics, causality, probability theory, form-function, figure-ground perception and isomorphism.



The expansion of the physical universe from the Big Bang to the present.
Integrative principles organize the evolution of all inorganic, organic and societal systems.

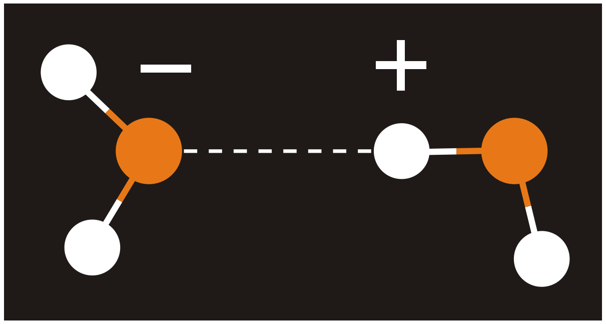
Evolutionary Leaps

On one hand the universe is orderly, with many enduring processes and structures. On the other hand the universe is constantly changing and evolving. While (current) laws of physics are able to accurately explain continuous physical processes, they are not able to adequately explain discontinuous evolutionary processes.

Three key integrative principles help to explain the emergence of new structures and properties. The *principle of invariance under transformation* states that the evolutionary process is one of long periods of continuity (symmetry) interrupted by relatively brief periods of discontinuity (asymmetry). Discontinuity permits quantization (transformation) to take place in a process that both builds on and changes existing structures.

Evolutionary leaps involve *quantization*, the emergence of more complex systems with new functional properties. The *principle of integrative levels* states that new evolutionary levels emerge through processes of structural transformation that both integrate and transcend previous levels of systemic organization. (*The Principles of Organization and Integration* are listed in Appendix 2.)

Water molecules adhere together because positive regions in one molecule attract negative regions in another.



Organic life on Earth is made possible because of the unique properties of water molecules.

Hydrogen and oxygen are atomic systems with chemical properties. When combined into water (H_2O), they form a more complex molecular system with many properties that do not exist at the atomic level (at standard temperature and pressure), e.g. liquidity, cohesiveness, and the ability to act as a solvent.

We Are Made of Stardust

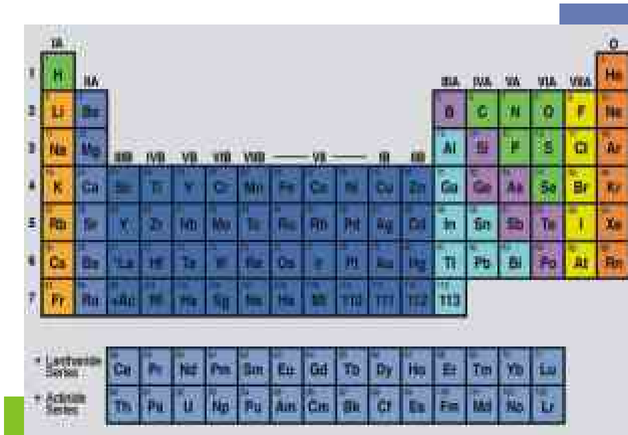
Hydrogen and helium were the first atoms to emerge. These became the raw fuel for the fusion reactions of stars. When large stars die, they become supernovae that create heavier atoms and then explode, sending the new elements into interstellar space. We are the direct products of billions of years of cosmic evolution: the calcium, carbon and iron in our bodies was once stardust.

The periodic table demonstrates how the formation of chemical elements is governed by integrative principles. For example, although every element has a different structure, all elements demonstrate the *invariance* of the basic pattern of atomic systems. Similar entities have similar structures; the more transformation occurs, the more *symmetry* is lost. New elements emerge through a process of *quantization* (discontinuity) in which they evolve autonomous new structures and acquire new properties. Elements are also organized into a sequence of *integrative levels* that start with simple systemic structures and evolve into increasingly complex entities.

Supernova

The heavier chemical elements are formed in dying stars.

The periodic table of chemical elements

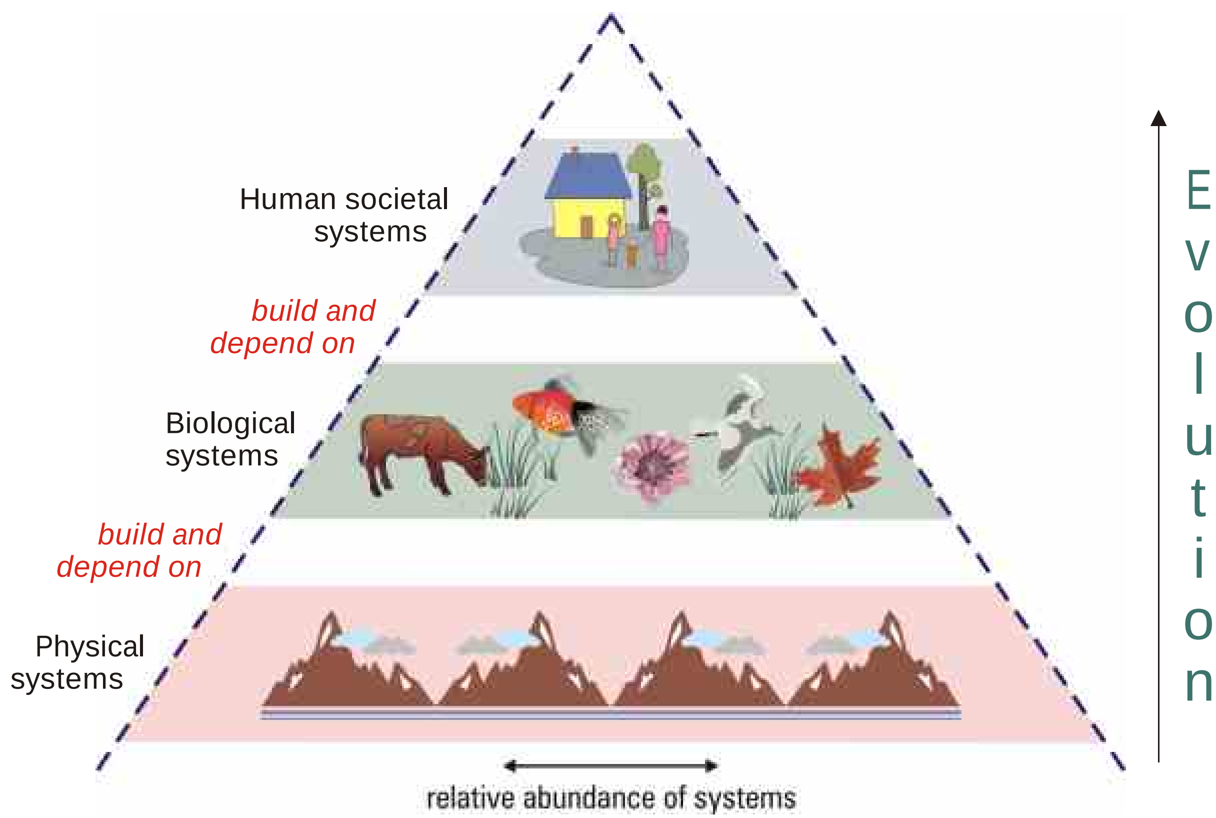


All elements are variations of atomic systems. Although every element is unique and has distinctive properties, elements that have similar structures share similar properties.

The Evolutionary Process

The universe is composed of sub-systems that are constantly obtaining and expending energy. Energy fluctuations force systems to either equilibrate or quantize to a different level of organization: to either reorganize at more complex states or fragment to less complex states.

The process of quantization progressively creates increasingly complex and conscious systems. Evolution is unidirectional because every system level builds upon its predecessors and adds new properties not found at the previous level. Quantization has produced three major evolutionary leaps: all inorganic systems have evolved from the energy of the Big Bang; all organic systems have evolved from inorganic systems; and all human societies (societal systems) have evolved from organic systems.



New systems evolve through including and transcending previous system levels.

Adapted from Ervin Laszlo, *Evolution: The Grand Synthesis* (Boston: Shambhala, 1987), P. 55.

Diagram not to scale

The Emergence of Life

Systems comprise two organizational types: *allopoietic* (externally created) and *autopoietic* (self-created). The evolution of self-reproducing systems marked a quantum leap in evolution as it permitted the emergence of new properties such as motility and consciousness. Self-creation characterizes all living organisms from the cell of an organism to plants, animals and human societies.

Organic life may have begun with self-reinforcing autocatalytic networks forming in primeval chemical soups. Autopoiesis occurs when a closed system of production processes evolves that is capable of regenerating itself.

Allopoietic systems (e.g. crystals) are inorganic and non-autonomous because their structures are not concerned with their maintenance or reproduction. Autopoietic systems (e.g. plants) are organic and autonomous because their structures are self-renewing, self-repairing, and capable of interactive linkages with their environments.

Allopoietic

Minerals endure because their structures support symmetry, static balance, and immobility.

Autopoietic

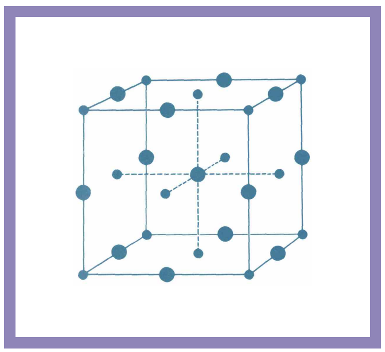
Animals survive because their structures support dynamic equilibration, mobility and the other functions they need to maintain and reproduce themselves in their environments.

Form and Function

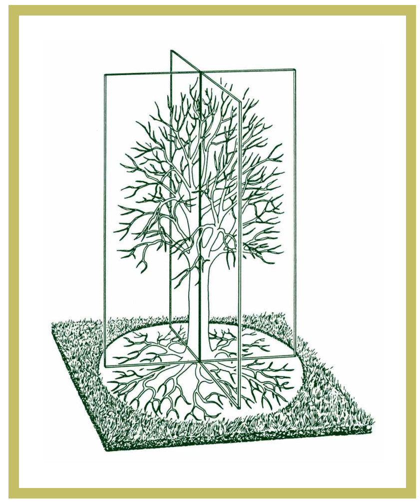
In order to exist, inorganic and organic systems must have structures that enable them to maintain themselves in relationship to their environments. Because open (dynamic) systems have a continual flow-through of matter-energy and information from their surroundings, they have self-regulating structures that are continuously equilibrating.

The external environment biases every open system to move to a configuration (attractor) that optimizes its relationship with its surroundings. This process is called natural selection when applied to living systems.

Living systems emerge and endure because they have functional and environmentally relevant structures. The evolutionary process continually creates new forms with new environmental capabilities.



The symmetrical structure of a salt crystal

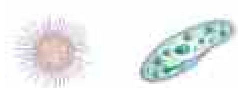
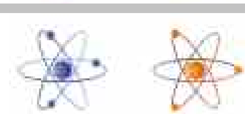


Trees have radial symmetry

Forms must be functional to endure. Qualities found in the inorganic world such as polarity, symmetry and spirality, provide the physical basis for the development of three-dimensional organic structures.

The Evolution of Humans

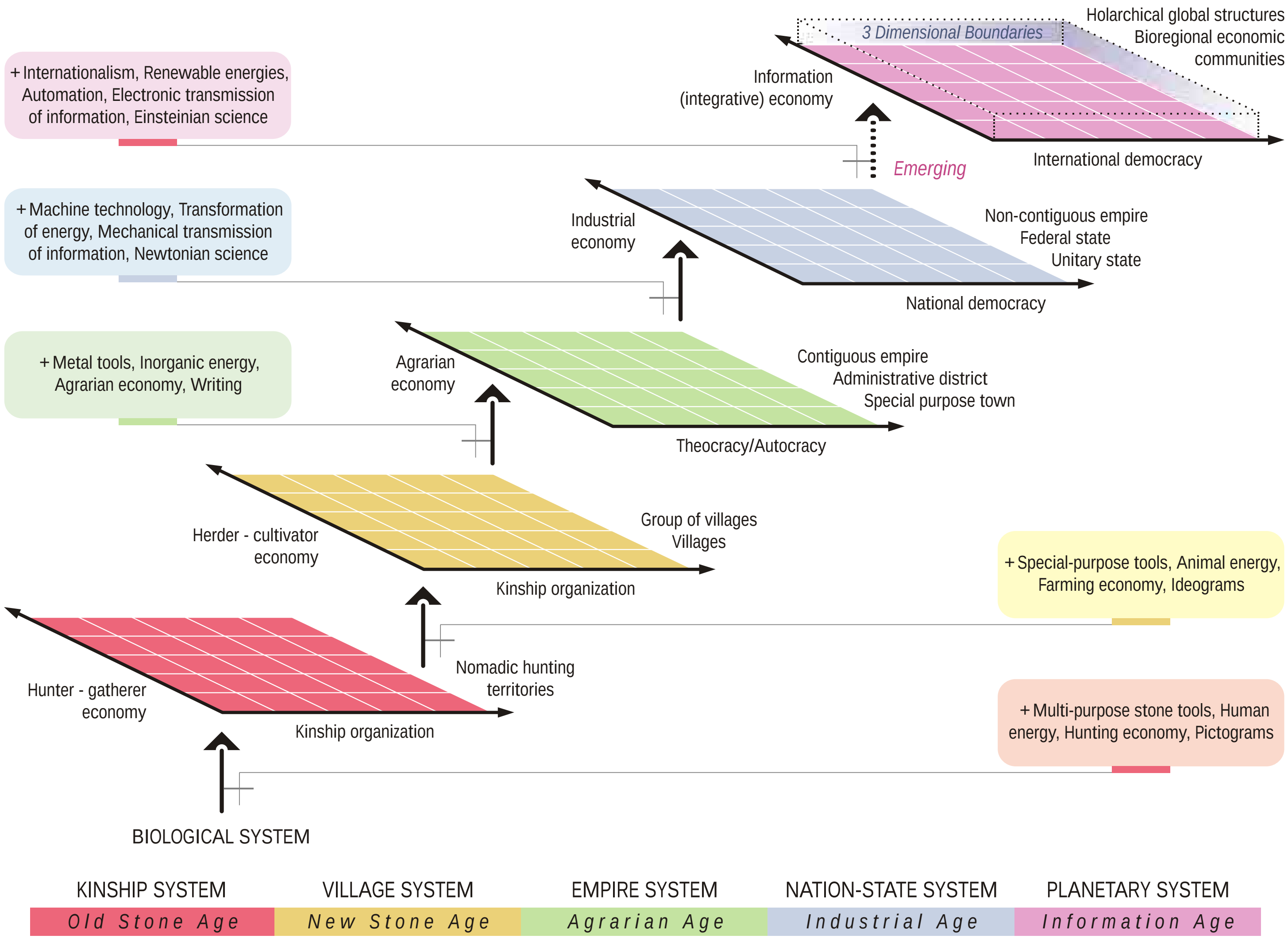
Living systems have evolved progressively more complex forms and functions that increase both consciousness and environmental control. This chart outlines some of the major integrative levels in the evolution of humans.

Level			System		Properties/Emergent qualities
Open	L 8 (S)	Animate (Organic)		Humans (symbolic co-ordination of societies)	*Below* + Symbolic thinking; tool-making; culturally organized societal systems; complex emotions; advanced neocortex
Open	L 7	Animate (Organic)		Mammals (emotional co-ordination of groups)	*Below* + Emotions and rudimentary feelings; simple social behaviours; limbic brain
Open	L 6	Animate (Organic)		Reptiles (complex physiological co-ordination)	*Below* + Impulses and instinctual behaviour; central nervous system
Open	L 5	Animate (Organic)		Neuronal organisms (multi-organic)	*Below* + Sensation and perception; neurological codes; locomotion
Open	L 4	Animate (Organic)		Cells (multi-molecular)	*Below* + Dynamic equilibration; prehension and irritability; biochemical codes; reproduction
Closed	L 3	Inanimate (Inorganic)		Molecules (multi-atomic)	*Below* + Molecular properties and structures; replication
Closed	L 2	Inanimate (Inorganic)		Atoms (multi-particle)	*Below* + Chemical and elemental properties; chemical reactivity
Closed	L 1	Inanimate		Particles	Forces, positions, velocities interactions

Evolution/complexity

The Evolution of Complex Societal Systems

New material and societal technologies develop in response to human needs for increased meaning and improved living standards as well as to societal needs for increased environmental and spatial control. These developments eventually lead to the emergence of more complex societal systems (new historical "ages"). Societal evolution involves the congruent transformation of societal worldviews, social structures and economic processes.



Adapted from: Marney, M.C. & Smith, N.M., "The Domain of Adaptive Systems" General Systems, vol. 9, 1964, pp. 123, 127 and Taylor, A.M. "Integrative Principles in Human Society".

An Integral Systems Approach

will enable us to see issues in their totality

The industrial worldview is a dualistic *either/or* approach.
It emphasizes parts over wholes and quantities over qualities.

It often can't see the forest for the trees.

Trees only have value as lumber.

The integral worldview is a multirelational *both/and* approach. A systems perspective enables us to understand dynamic processes as well as the interrelationships between parts and wholes and between quantities and qualities.

It sees both the trees and the forest.

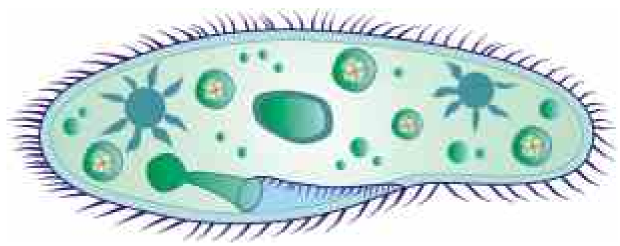
Forests are living ecosystems with many social, economic and environmental values.

What Is A System?

A system is a group of interacting parts functioning as a whole that is distinguishable from its surroundings by recognizable boundaries.

A system is more than the sum of its parts. When a system is formed, qualitatively distinctive properties emerge. When hydrogen atoms are joined with oxygen atoms, the water molecules have additional properties that do not exist at the atomic level.

A cell is an example of a living biological system: a whole which functions because of the relationship of its parts (its sub-systems).
It has properties that do not exist at the level of its parts, such as the ability to reproduce itself.

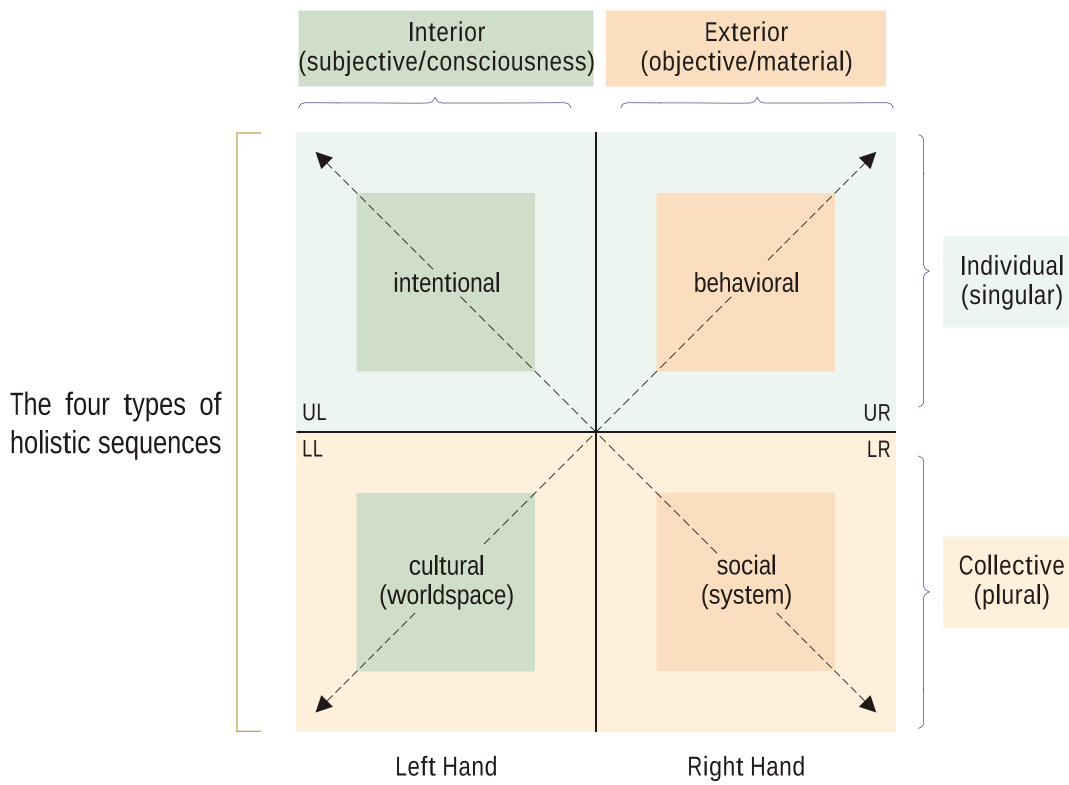


Protozoa are living biological systems

The All-Quadrant Perspective

The Age of Reason replaced subjective faith with scientific inquiry. The brilliance of Western science is its ability to understand reality through measuring and quantifying the material world. However, the modern world now values objectivity and devalues subjectivity. Because qualities such as love, truth, faith and beauty cannot be measured, they are not given much weight by decision makers. As a result industrial civilization knows more about destructive weapons than constructive relationships, more about wealth than happiness, and more about illness than wellness.

An all-quadrant perspective recognizes that the subjective is as important as the objective. Because systems exist within other systems, everything has both an inside and an outside. Also, since things never exist alone everything is both individual and part of a collective. As a result there are four equally valid (and interconnected) ways of interpreting reality: the interior (or subjective) individual; the subjective collective; the exterior (or objective) individual; and the objective collective.



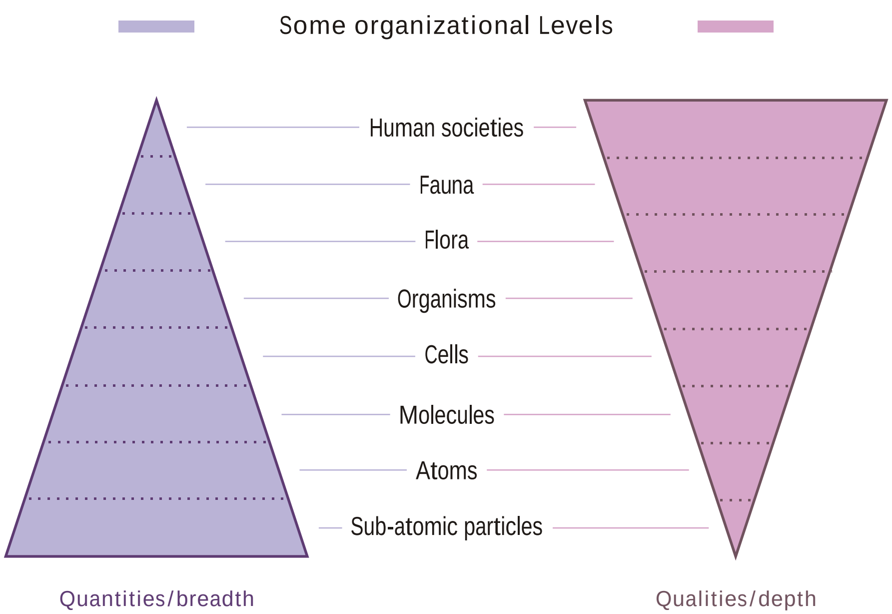
Adapted from Ken Wilber,
A Brief History of Everything (Boston: Shambhala, 1996), P. 71.

The All Level-Perspective

The universe is a system composed of other systems. Because every system is both a whole composed of parts and a part of a larger whole, systems are hierarchically nested within each other. Hierarchies of nested systems (wholes or holons) are called holarchies.

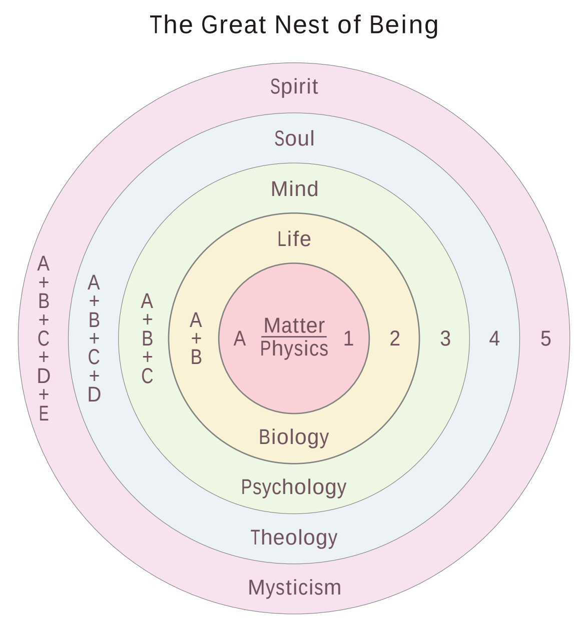
In order to understand something fully we need to understand not only the system level at which it exists but also its relationship to subordinate and superordinate levels. An all-level perspective helps us to understand contexts and interrelationships.

Different holarchies describe different perspectives.



An example of an evolutionary holarchy

Diagram not to scale



An example of a subjective holarchy

From: Ken Wilber (1998), *The Marriage of Sense and Soul*, Random House, New York: NY

Thinking Systemically

A systems approach would say that a grizzly bear is 5% fur, claws and teeth and 95% forests, meadows and salmon streams.

Grizzly bear
Forests
Salmon streams
Meadows

Photo courtesy of Ian McAllister

System Equilibration

Open (dynamic) systems have a continual flow-through of matter-energy and information from their surroundings. They are constantly adjusting (equilibrating) to changing conditions.

A system cannot maintain a congruent and functional structure if its boundaries are exceeded. At that point it must either collapse or establish a new structure with new parameters. For example, if water is heated past its boiling point, it must change its structure from a liquid to a gas in order to re-establish equilibrium at a higher energy state.

When the parameters of societal systems are exceeded they must also change their structures or collapse. For example, herder-cultivator societies are limited in their abilities to utilize resources. They must evolve into agrarian societies in order to process more energy, resources and information.

All systems are constantly equilibrating with their environments

Living social systems are continuously regulating their structures and processes

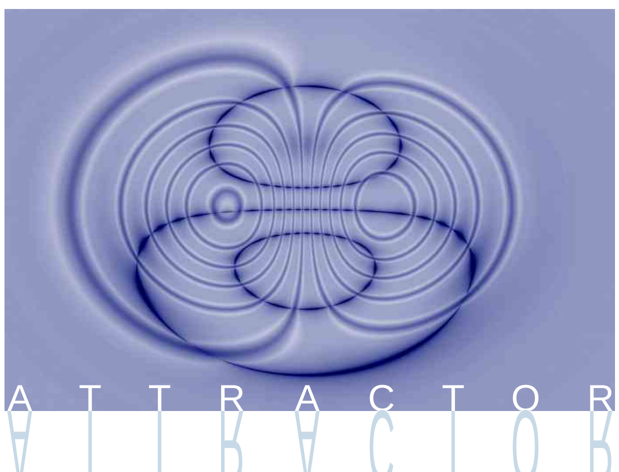
System Attractors

An attractor is a preferred or stable position for a system. A system will evolve until it arrives at an attractor and will stay there unless changed by other factors. Complex systems can have many attractors.

Weather is an example of a complex system with many preferred positions. The recurring conditions of a spinning earth and changing seasons causes the weather to self-organize in predictable patterns.

Human societies evolved through distinct historical stages (”ages”). Societal systems with similar worldviews and structures emerge and endure in each age because they have environmentally relevant configurations. Their congruent and stable patterns constitute system attractors. For example, similar conditions and stages of development created the long-lasting agrarian kingdoms of Egypt, China, and Central America.

A chaotic attractor is the limit set of a bounded, aperiodic trajectory
From: gaianxaos.com



A Lorenz attractor

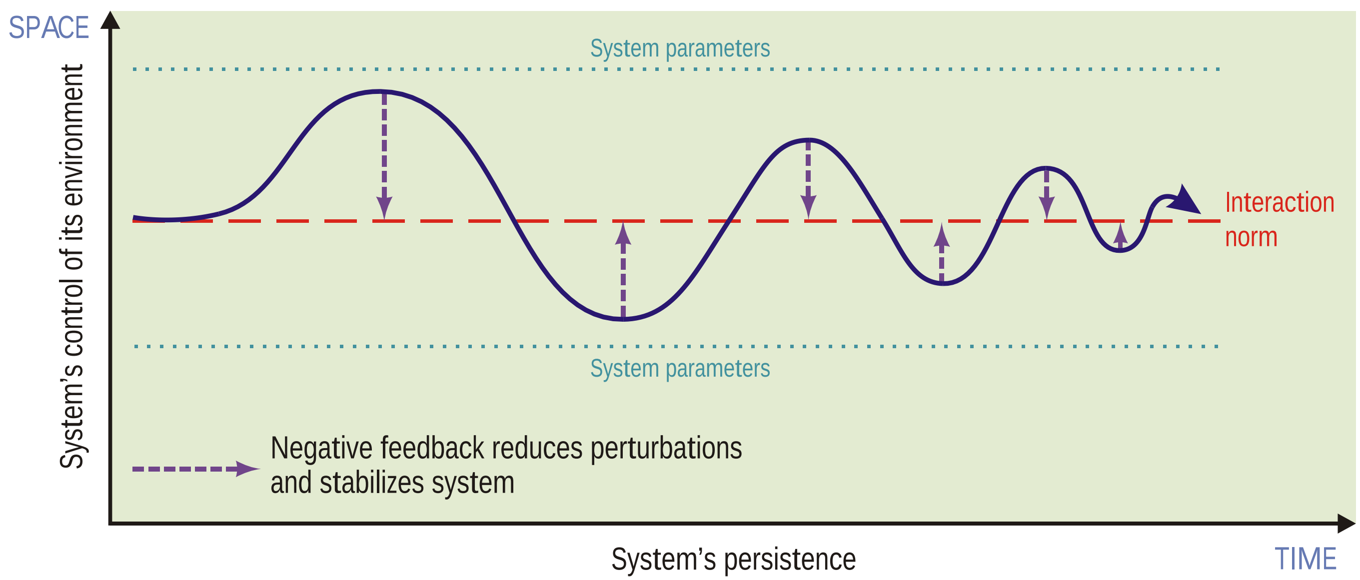
Chinese agrarian civilizations were socially and environmentally stable

The Forbidden City

System Maintenance

Dynamic (open) systems such as living biological or societal systems are constantly re-equilibrating in response to internal and external developments. They use negative feedback to reduce perturbations (fluctuations) and maintain their systems within functional parameters. For example, humans sweat when too hot and shiver when too cold.

Societies are stabilized through system components such as cultural values and social institutions. An example of negative feedback is the use of social and economic rewards and punishments to reinforce a societal system and minimize deviations.

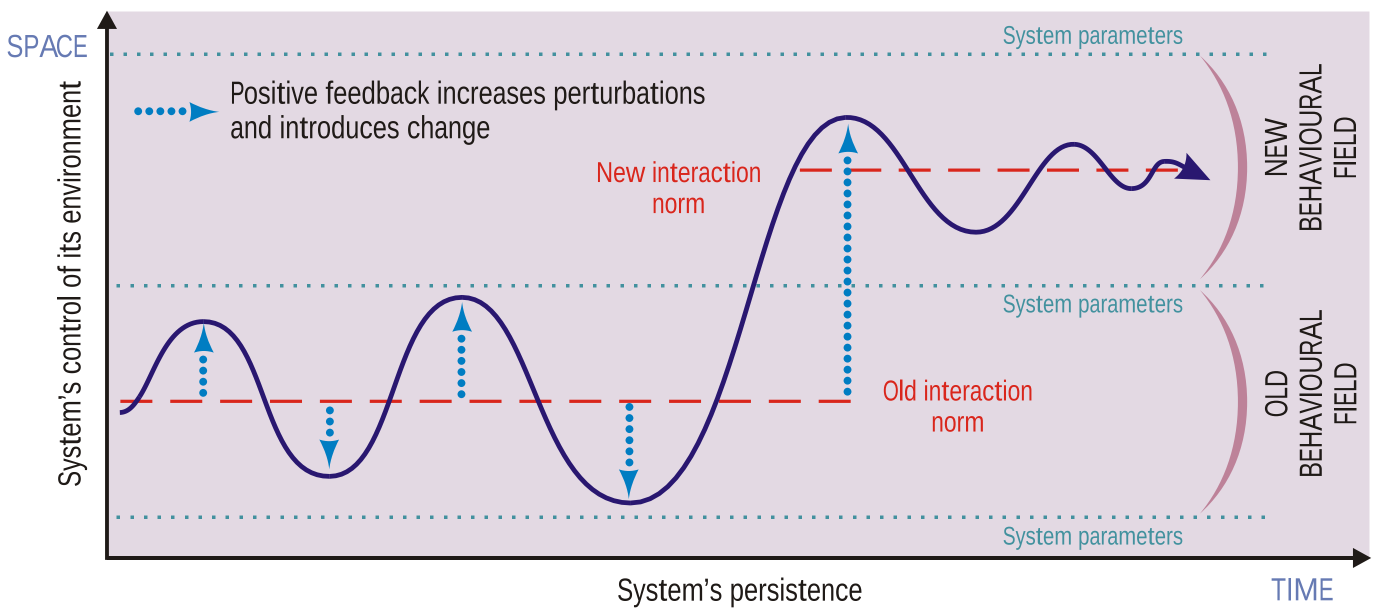


System change

Positive feedback causes systems to change. For example, our physical growth is stimulated by positive feedback from hormones. Societies change due to positive feedback coming from internal developments in societal and material technologies (e.g. new philosophies or economic processes) or by changes in their external environments.

The external environment biases a system to move to a configuration (attractor) that optimizes its relationship with its surroundings. This process is called natural selection with living systems.

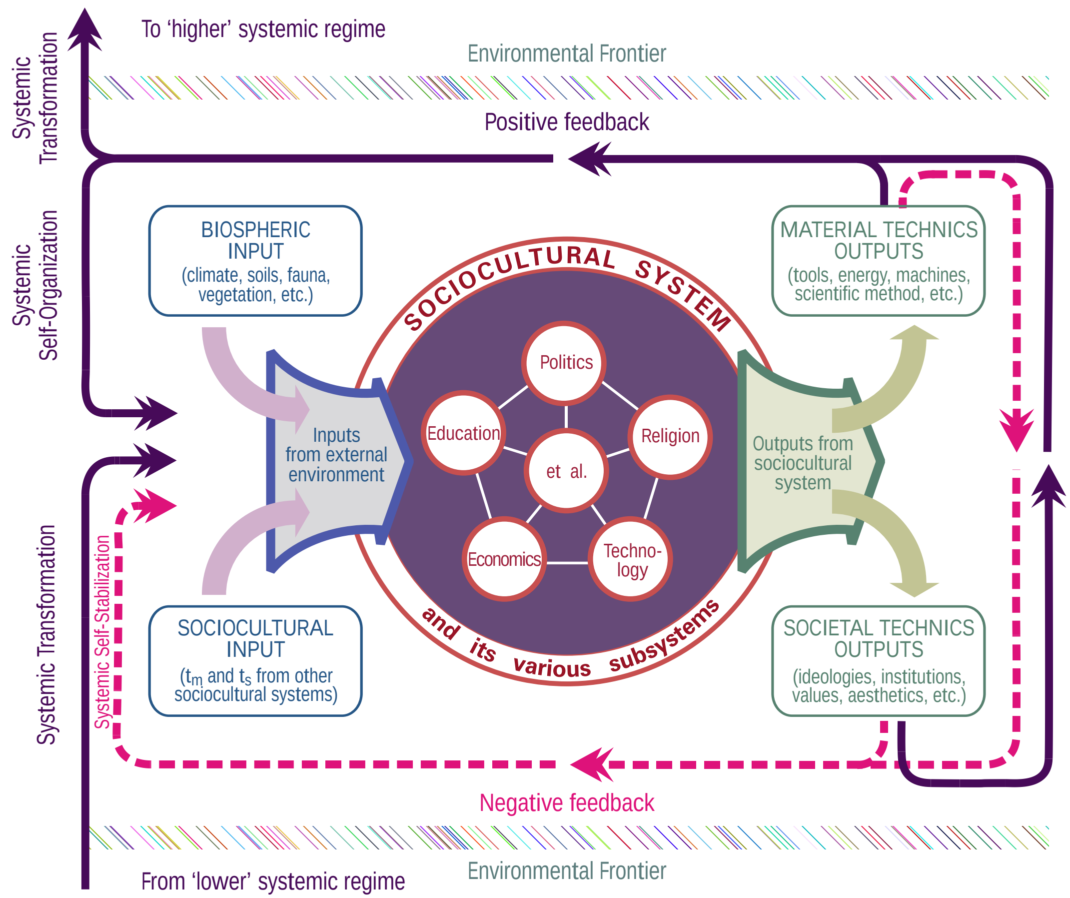
When change forces a societal system to exceed its boundaries, it can move the system to another stable configuration within the existing evolutionary level, cause it to break down to a less complex level of organization, or cause it to break through to a more complex level. New properties, structures and environmental relationships emerge at more complex levels.



System Inputs and Outputs

Human societies maintain and reproduce themselves through processing and converting information, resources and energy from their environments. They are complex cybernetic systems with feedback loops that take in inputs from the biosphere and from other societal systems, and convert these inputs into the material and societal outputs necessary for the system's maintenance, self-stabilization and reproduction.

The diagram shows how material technics (t_m) and societal technics (t_s) interact upon a societal system in relationship to its environment. They normally combine to promote systemic self-stabilization: increasing imbalances between positive feedback and negative feedback result in either systemic transformation or collapse.

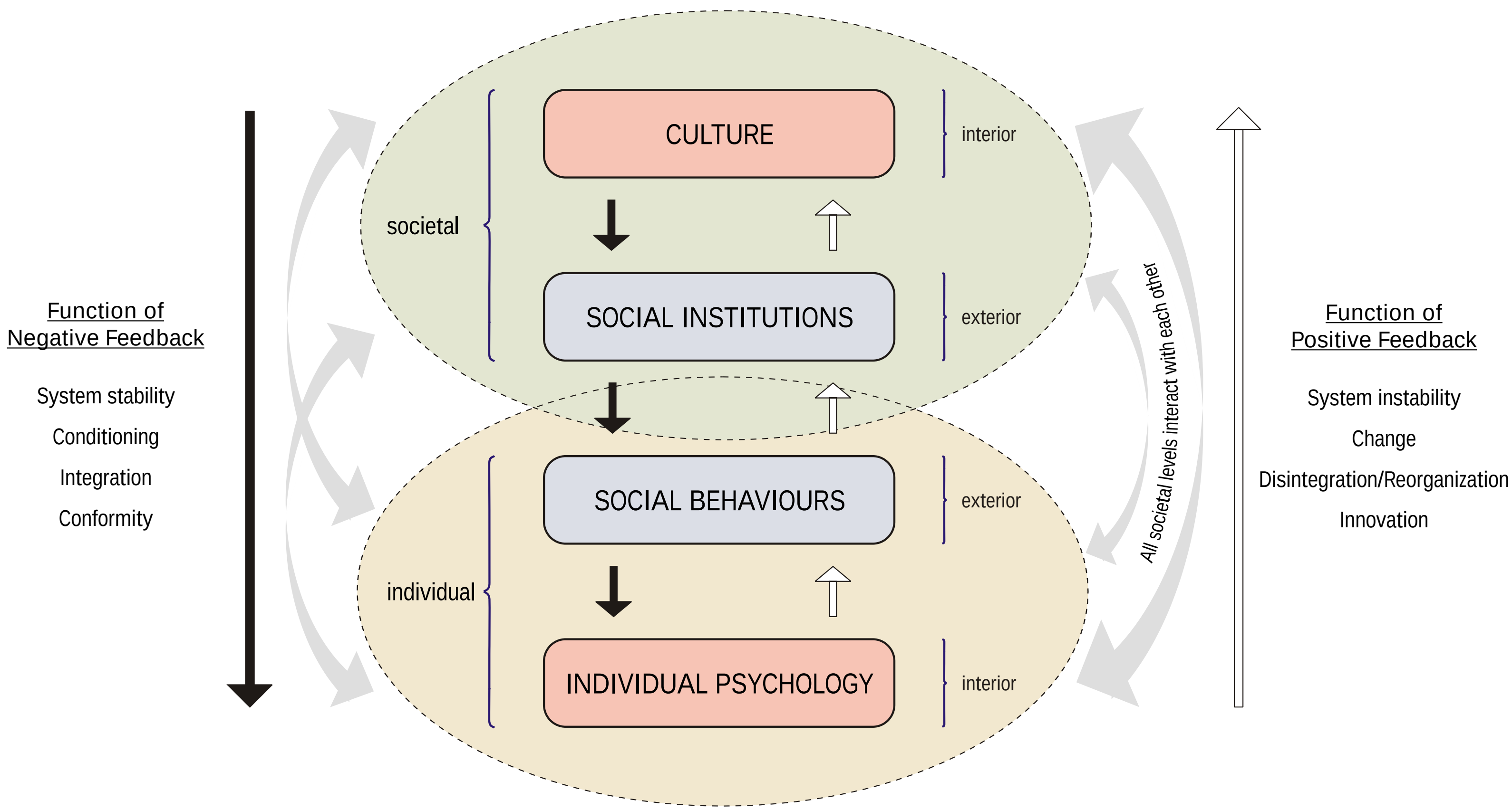


TST Metamodel Diagram

Individual and Societal Interaction

Societal systems are organized through culture. Culture provides meanings and symbolic tools for organizing social institutions. Institutions organize and regulate group and individual behaviours. Social behaviours in turn condition individual psychological structures.

Children are socially integrated (conditioned) through learning language, values and skills from their families and peers. As they mature they become more autonomous and develop the reciprocal ability to influence social behaviours, institutions and the wider culture.



Adapted from Ken Wilber, *A Brief History of Everything* (Boston: Shambhala, 1996), P. 71.

Individual Needs and Societal Structures

Human bodies are living biological systems that are organized through genetic patterns. Societies are living social systems that are organized through symbolic patterns (culture).

In order to survive, biological systems as well as social systems must have functional patterns, structures and processes. All living systems must be able to interact with their external environments and acquire energy and other inputs if they are to maintain and reproduce themselves.

Because living social systems are human organizations, social structures serve individual needs as well as societal needs.

Human needs for

meaning and growth
social existence
material existence

relate to social structures

Institutions	Functions	
Religion/worldview	Meaning and direction	meaning
Culture/aesthetics	Symbolic communication	
Government	Boundaries/regulation	continuity
Education	Transmission/reproduction	
Family	Organization	basic structures and processes
Economy	Production	
Science/technology	Environmental control	

Universal Culture Pattern

Living Biological Systems

Human biological systems are composed of interdependent organic sub-systems such as the skeletal system, the digestive system, the nervous system, the reproductive system, etc.

Living Social Systems

Living social systems are made up of interdependent social sub-systems. The basic structure of all societies is called the Universal Culture Pattern because societal systems require similar basic institutions in order to function.

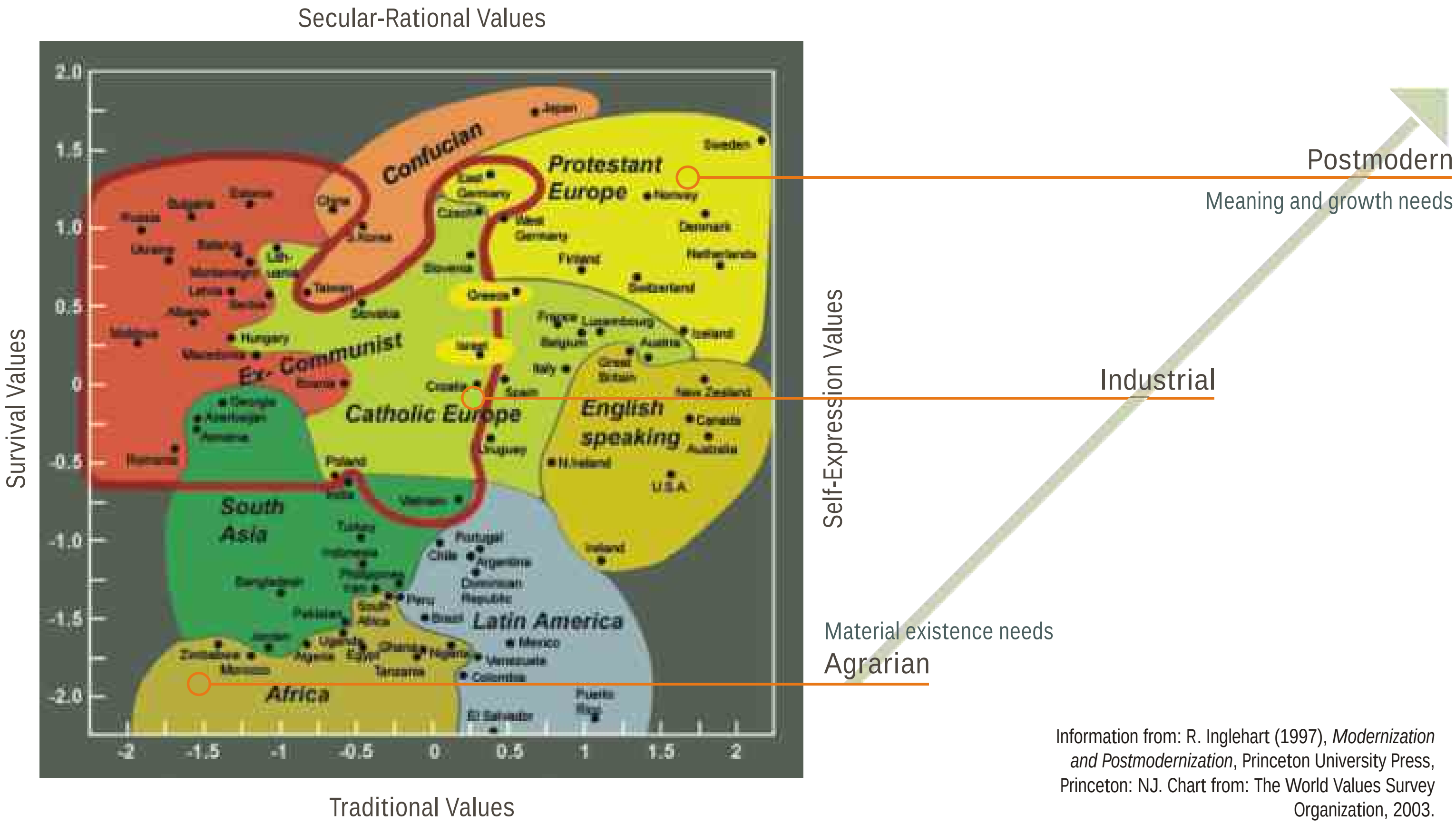
Changing Global Values

World values surveys indicate that economic, political and cultural changes are reciprocal and follow coherent patterns. Modernization is changing global values in two predictable phases:

1) The populations of agrarian and pre-agrarian societies are attracted to modernization because it offers the chance to escape poverty. With exposure to the global industrial economy, their traditional/religious values increasingly change to rational/legal values.

2) Values are also changing in industrial societies. Needs for individual growth become more important as incomes rise and economic survival becomes more assured. Advanced industrial (postmodern) societies experience a shift from survival/materialist values to self-expression/post-materialist values.

The Inglehart Values Survey Map



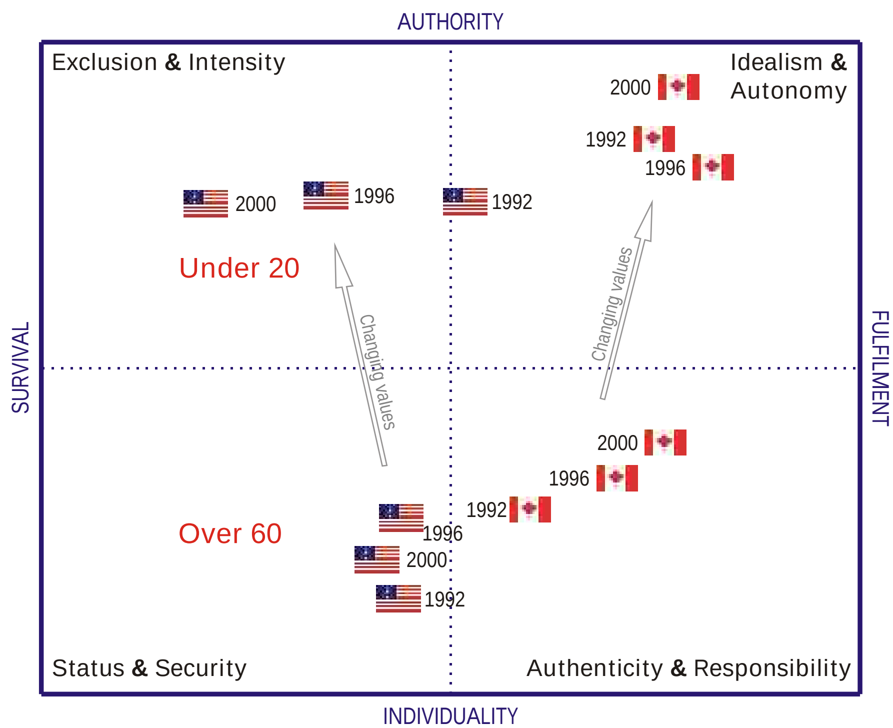
Information from: R. Inglehart (1997), *Modernization and Postmodernization*, Princeton University Press, Princeton: NJ. Chart from: The World Values Survey Organization, 2003.

Structural Congruence

While Marx believed that economic developments drive political and cultural change, Weber believed that culture determines politics and economics. A systems approach integrates both positions: although change can begin anywhere in a societal system, in order for a society to have a congruent and functional structure, reciprocal changes must take place in all of its values, worldview, social structures and economic processes.

For example, the anti-slavery movement was supported by both changing values and by the need of industrial societies for educated, motivated and mobile work forces. This economic requirement is incompatible with the values and social structures of slavery.

Different components of a society can change at different times. This can produce internal conflicts and structural stresses. Values can lag behind technological change (cultural lag), or public opinion can change faster than political structures. Political leadership can also accelerate cultural and economic change.

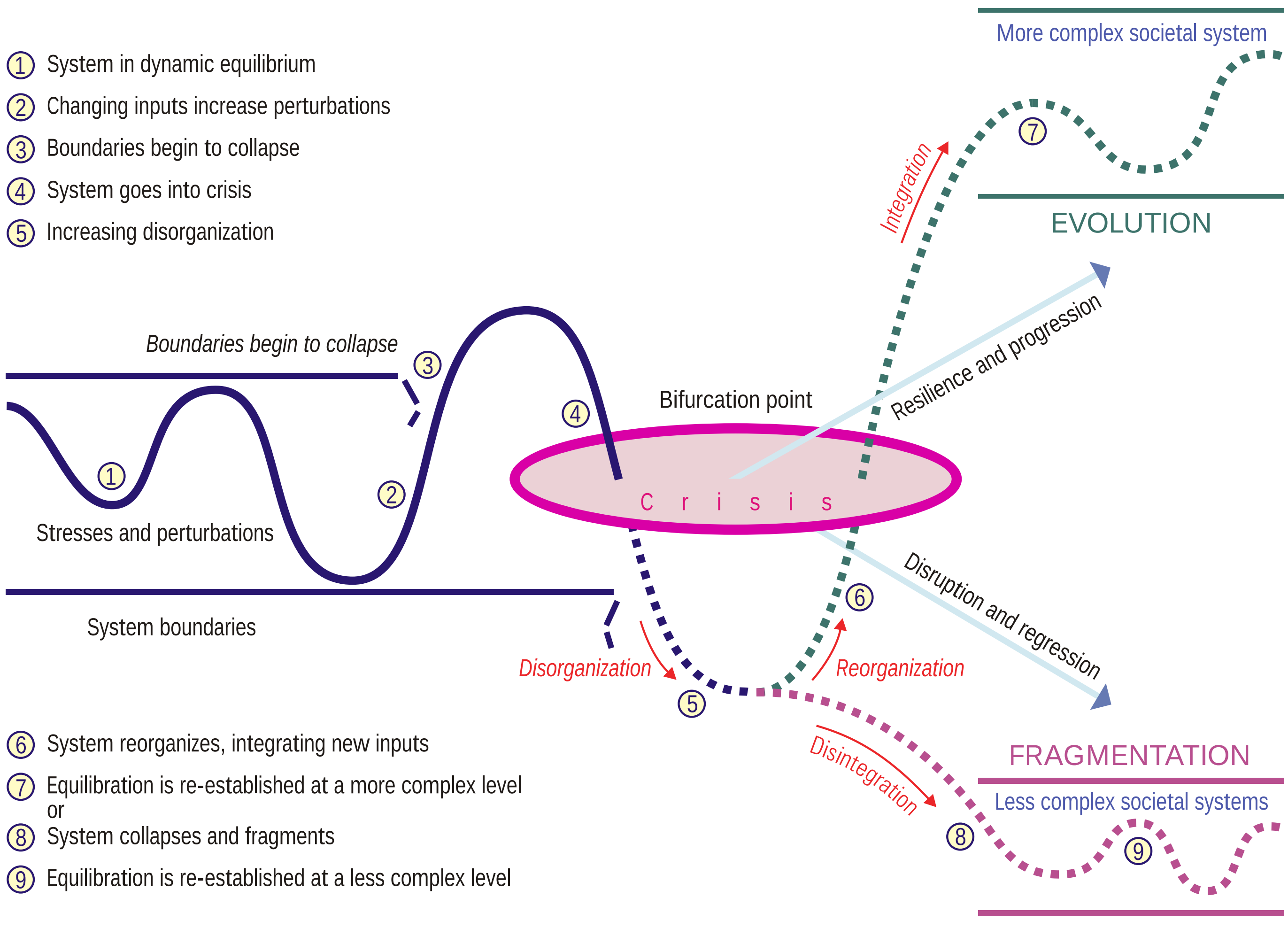


National and generational differences influence changing values: Americans and Canadians over 60 and under 20

Chart adapted from: M. Adams (2003), *Fire and Ice*, Penguin Canada, Toronto: ON

System Transformation

All open systems exist in states of dynamic equilibrium with their environments. If a living system cannot control or adjust to changes in its internal or external environment, it will go into crisis. This is a bifurcation point: coherent pressures for change can cause a system to re-equilibrate at a more complex system state, while dysfunctional stresses can cause a system to break down to a less complex system state.

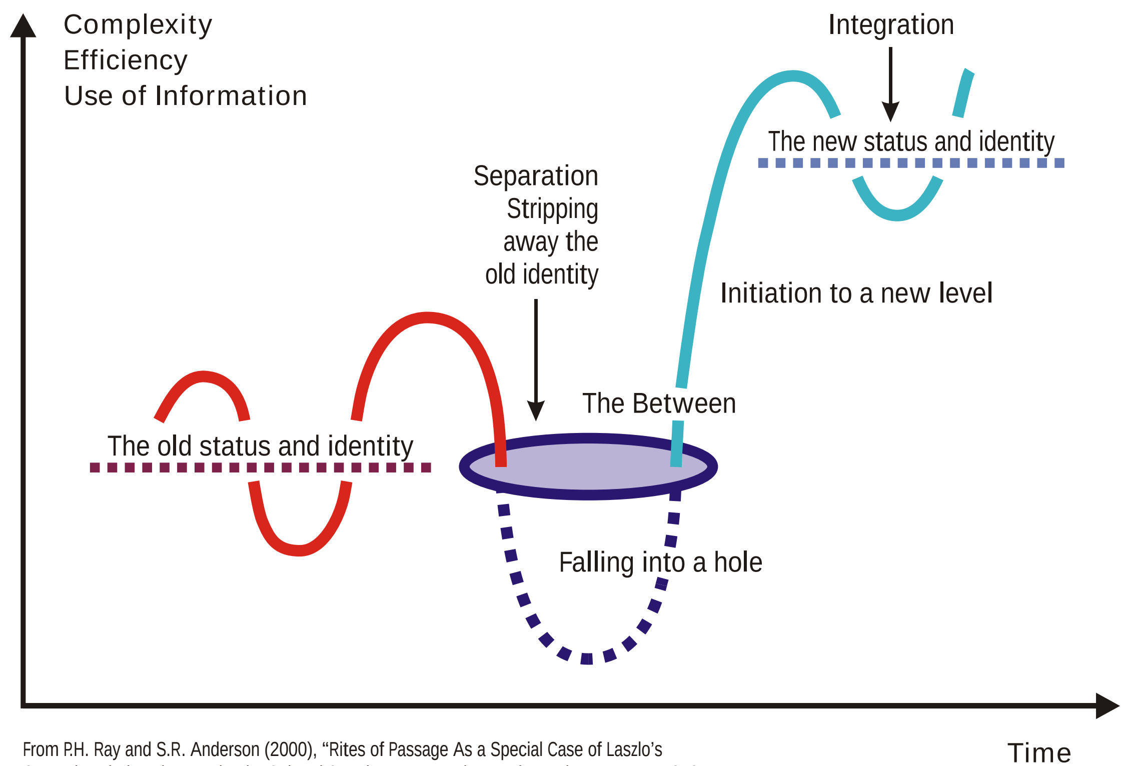


Individual Psychological Growth

System change is illustrated by the process of individual psychological growth. Every transition between developmental stages (from infancy to childhood, from childhood to adolescence, etc.) has similar dynamics.

During every stage identity remains relatively stable (in dynamic equilibrium). However, biological and social growth eventually rupture the identity's boundaries. The individual then enters into a period of crisis in which the old identity breaks down. The identity is normally then reorganized on a more complex (mature) level with increased understandings and competencies.

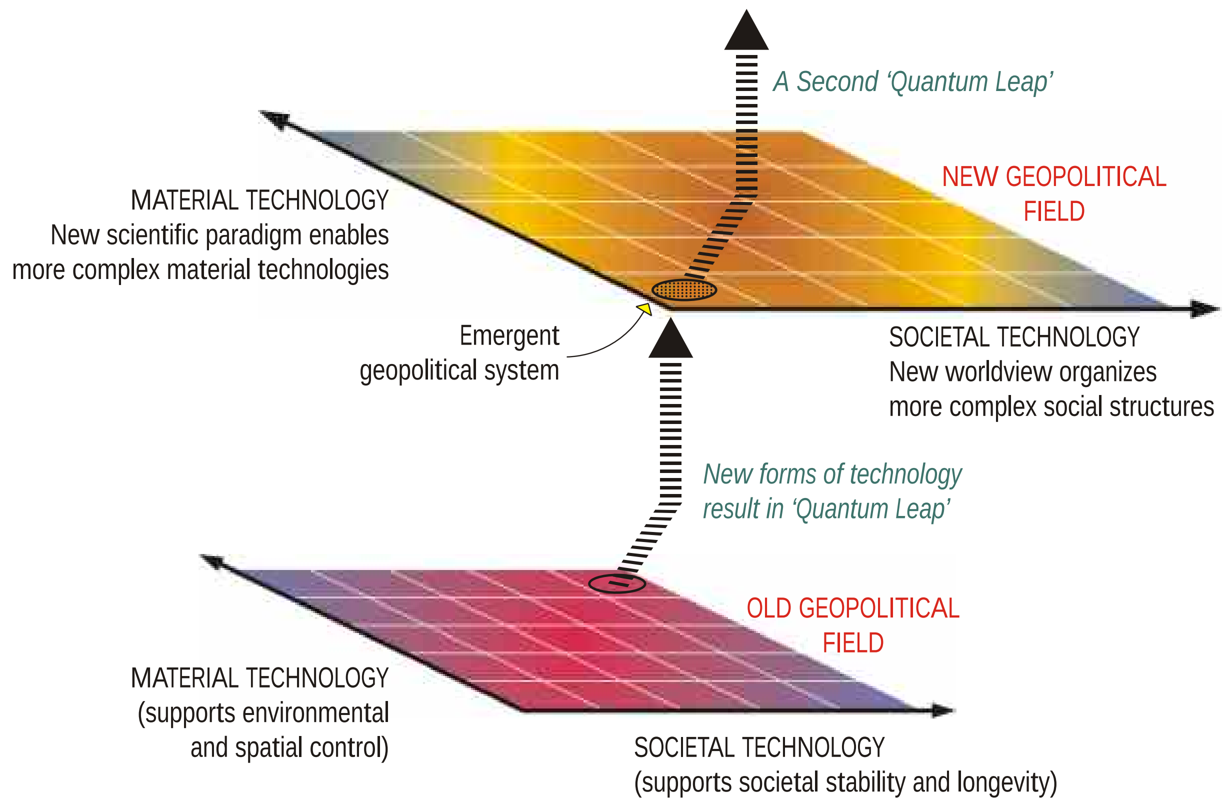
In cases where individuals are insufficiently prepared for a transition or poorly supported, they will enter into crisis but be unable to successfully reorganize their identity. Their identities may then fragment or regress, causing long-term psychological problems.



From P.H. Ray and S.R. Anderson (2000), "Rites of Passage As a Special Case of Laszlo's General Evolution Theory", in *The Cultural Creatives,* New York, NY: Three Rivers Press, p. 252.

Societal Evolution

Involves the emergence of a more open, conscious, and complex system through the congruent transformation of a society's worldview, values, social structures and economic processes



The Process of Quantization

Societal systems quantize (undergo qualitative and quantitative transformation) in three general stages:

1) A paradigm-changing societal or material technic emerges which supports one or more quantizing factor.

2) The presence of a quantizing factor supports the quantization of one or more segments of the Universal Culture Pattern (societal institutions).

3) The quantization of a societal institution supports the quantization of the entire societal system.

The process of quantization can progress or regress:

Emerging — A new paradigm-changing technic is emerging (i.e. one that helps to create a more complex, open and conscious system).

Directing — The new paradigm is directing one or more societal institutions.

Reverting — The emerging or directing technic or institution is quantizing downward (to less complexity, openness and consciousness).

Dominant — The quantized institution is part of a congruent societal system.

Societal Quantization

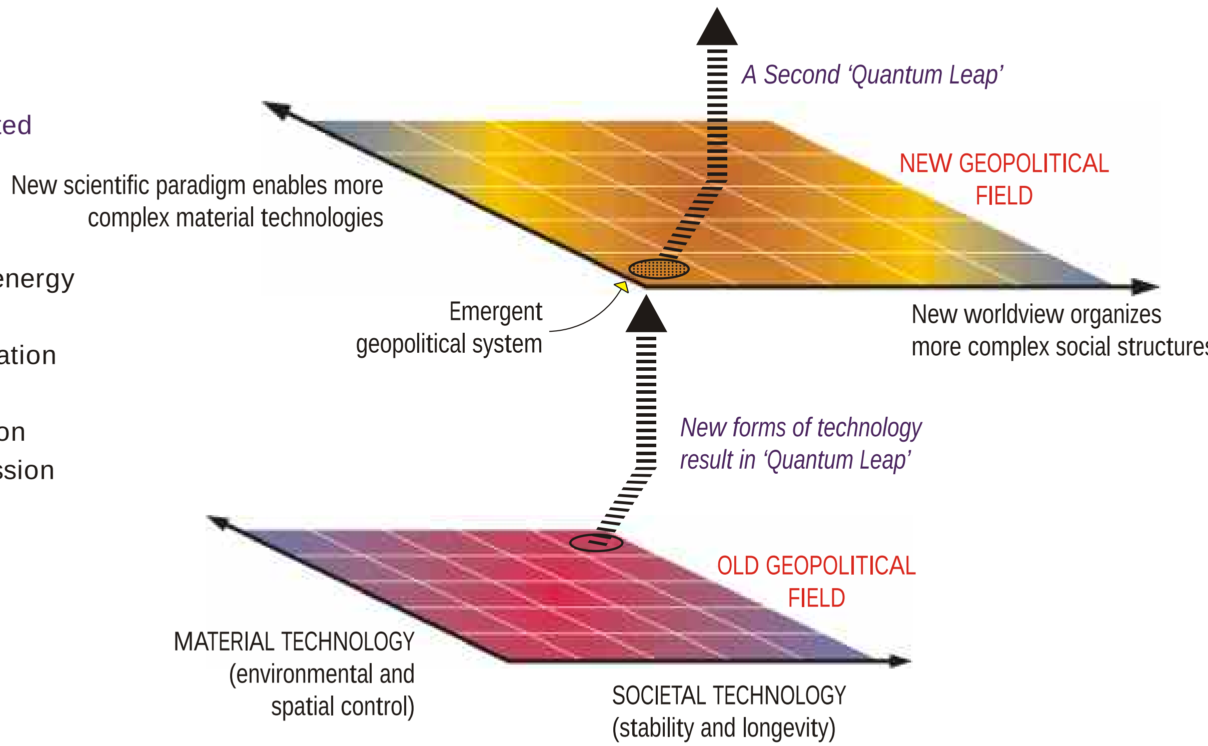
The process of a system evolving to a more complex system state is called quantization. The new system emerges with a new structure and additional properties.

Societal systems have evolved from simple societies to complex civilizations. Although every society is unique, societal systems can be broadly classified according to their level of development. For example, all archaic civilizations share similar worldviews (theocratic), social organizations (hierarchical), and economic processes (agrarian).

When a system cannot control or adjust to internal or external changes, it must change its structure and either re-organize to more complex level or fragment to a less complex level.

Societal quantum transformations are generated when a number of factors are present:

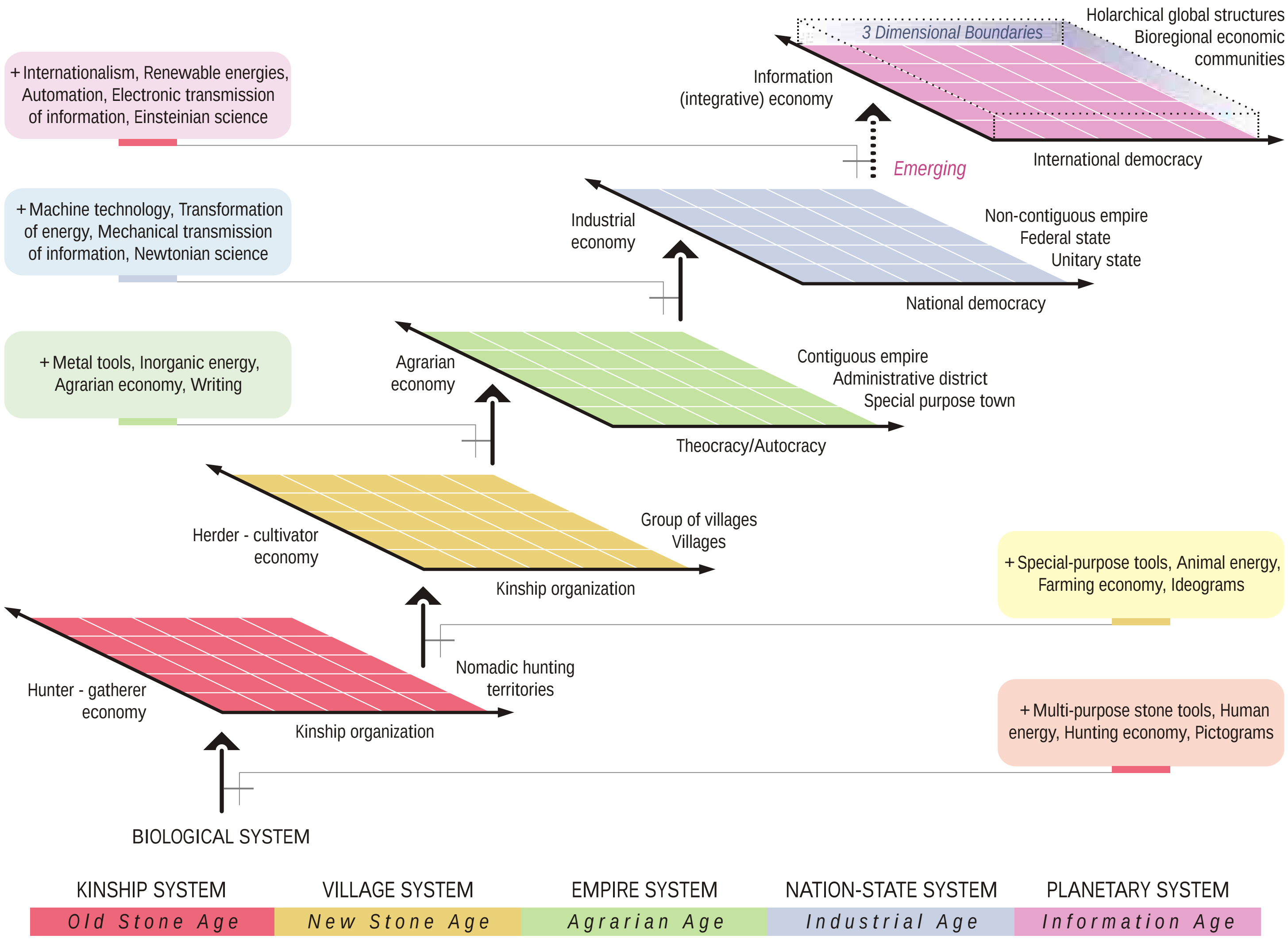
1. Technological/scientific innovations
2. Increased production and consumption of energy
3. Increased environmental control capacity
4. Increased production/distribution of information
5. Exponential growth of populations
6. Economic growth and social complexification
7. New aesthetic canons and modes of expression
8. New cultural world view



Adapted from: Marney, M.C. & Smith, N.M., "The Domain of Adaptive Systems" General Systems, vol. 9, 1964, p. 123, Fig. 7 and Taylor, A.M. "Integrative Principles in Human Society".

The Historical Evolution of Societal Systems

New material and societal technologies develop in response to human needs for increased meaning and improved living standards as well as to societal needs for increased environmental and spatial control. These developments eventually lead to the emergence of more complex societal systems (new historical "ages"). Societal evolution involves the congruent transformation of societal worldviews, social structures and economic processes.



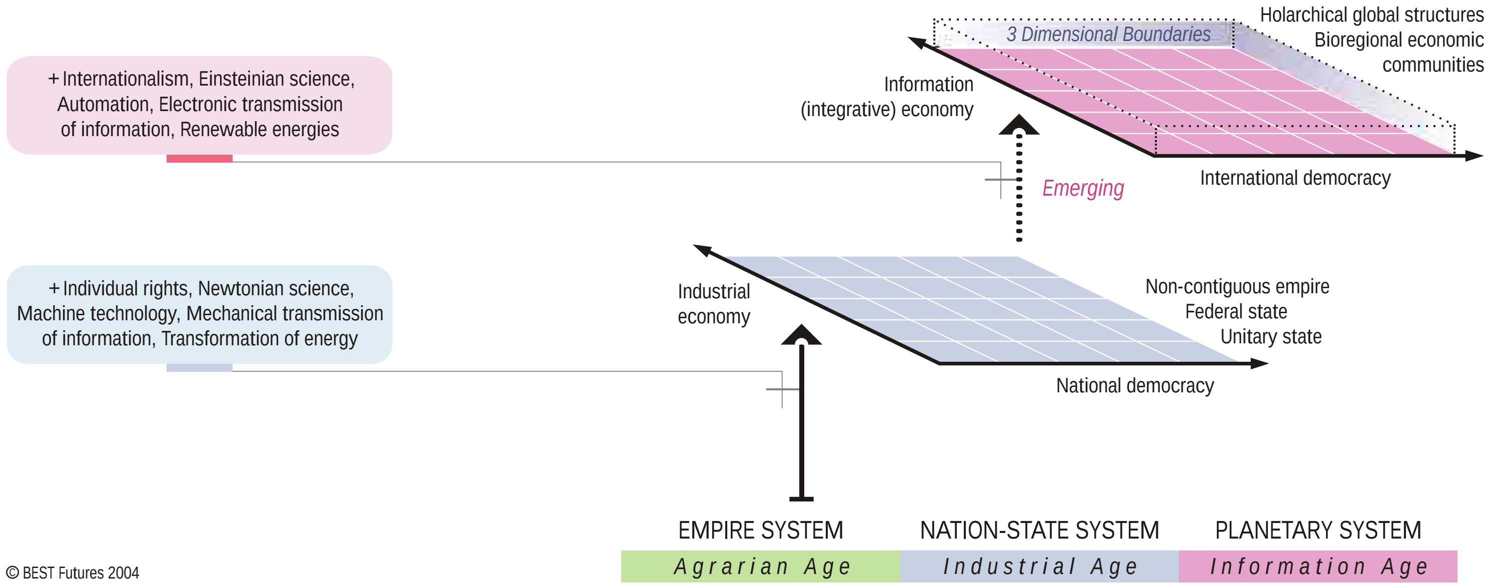
Adapted from: Marney, M.C. & Smith, N.M., "The Domain of Adaptive Systems" General Systems, vol. 9, 1964, pp. 123, 127 and Taylor, A.M. "Integrative Principles in Human Society".

The Emerging Planetary System

The Age of Enlightenment and Newtonian science produced the secular, dualistic and mechanistic worldview of the Industrial Age. This worldview enabled the organization of nation-states with expanding industrial economies that are constantly utilizing additional human and natural inputs.

The Industrial Age has produced enormous benefits including rising living standards, increased longevity, mass literacy, the spread of democratic values, the emancipation of slaves and the enfranchisement of women. At the same time it has come with enormous costs, including environmental and cultural destruction, mass warfare and the breakdown of families and communities. The industrial system is now unsustainable.

The next level of civilization is now emerging in response to individual, social and biophysical needs. Although it is not possible to predict its exact design, the Information Age will be based on post-Einsteinian science and an integral systems worldview. In order to be sustainable it will need to have a culture based on ecological values with congruent social organizations and economic processes. These will need to be holarchically organized as a networked global democracy based on economic bioregions that maintain the constructive knowledge and values of earlier cultures. Energy will come from renewable technologies.



Modelling Ecological Change

The panarchy model helps explain the dynamics of societal change and evolution. Ecosystems and societal systems are panarchies that are composed of hierarchically organized levels. While higher levels are larger and more stable, lower levels change more quickly and are more innovative.

A system's adaptive cycle is shaped by three properties: its wealth determines its potential for change; its internal connectedness determines its sensitivity to perturbations; and its adaptive capacity determines its ability to manage unexpected shocks.

The diagram illustrates the phases of an ecological adaptive cycle. 1) Exploitation: a young and diverse forest increases capital, connectedness and stability. 2) Conservation: connectedness and vulnerability increases in a mature climax forest. 3) Release: a crisis (e.g. fire, wind, drought or disease) overwhelms the system, returning nutrients and seeds to the soil. 4) Reorganization: a new ecosystem emerges, starting the cycle again. During adaptive cycles systems can add new abilities or lose abilities (at point ”x” on the diagram).

Information and diagram from:
L.H. Gunderson and C.S. Holling (2002),
Panarchy, Island Press, Washington: DC.

Modelling Societal Change

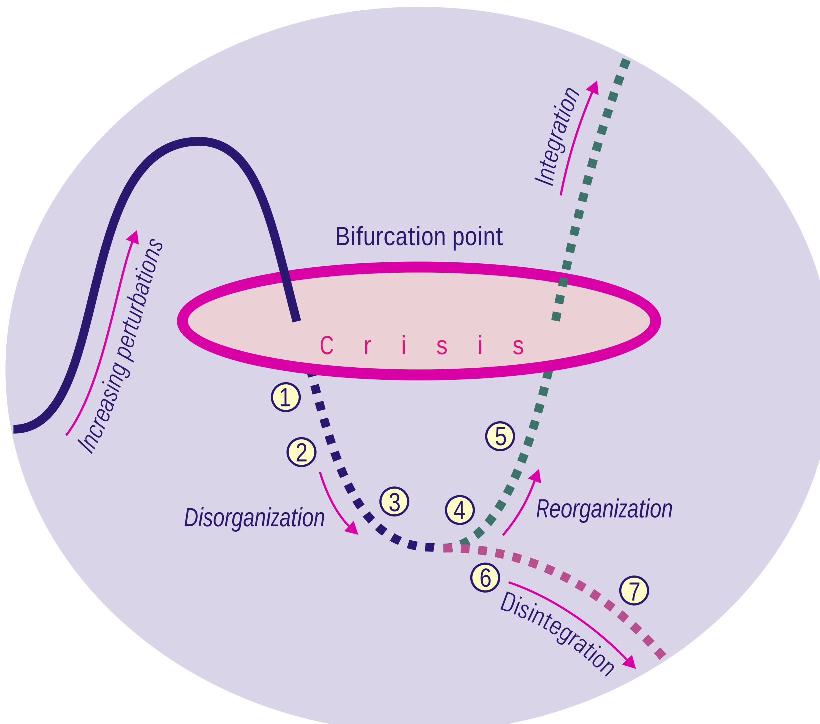
The adaptive cycles of societies are similar to those of ecological systems.
1) Exploitation: the new societal system is able to use its superior social and material technologies to expand throughout its environmental niche. 2) Conservation: rigidity and vulnerability increase as populations rise, the system becomes more complex and bureaucratic, and resources become scarcer. 3) Release: internal and/or external crises (ecological, economic and/or political) overwhelm the system, both destroying and releasing social and economic resources. 4. Reorganization: a new societal system emerges and the cycle starts over.

For example, populations declined and technologies were forgotten after the fall of the Western Roman Empire. Although parts of Europe regressed to the Stone Age, all knowledge was not lost. In the Middle Ages civilization in Europe was reorganized on Greco-Roman foundations. The ability of ecosystems and societal systems to use past genetic and cultural memories to recover from a collapse and adapt to new conditions is termed the springboard effect.

1. People lose faith in the industrial system as crises worsen
2. Human and economic resources are released from the system
3. Support increases for both inclusive (sustainable) and exclusive (ethnocentric) solutions
4. If sustainable solutions are supported, constructive reorganization begins
5. The reorganization of the global system accelerates

or

6. If ethnocentric values and structures dominate, conflicts over scarce resources intensify
7. Global civilization disintegrates



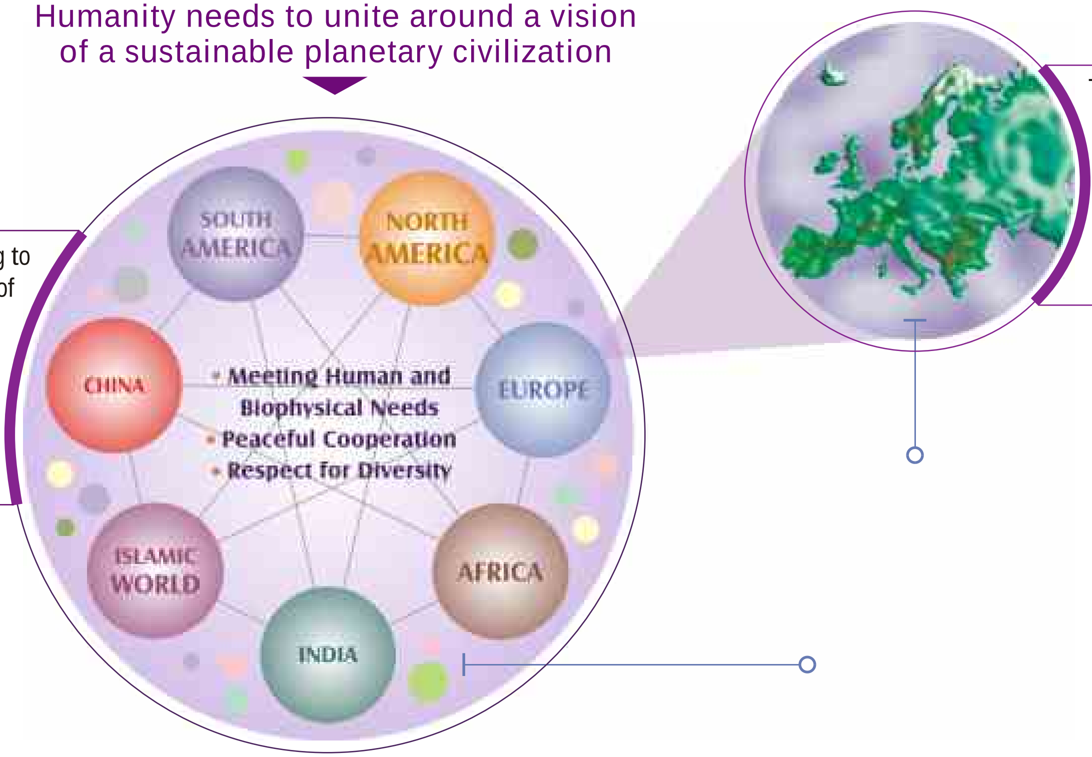
The springboard effect helps systems reorganize

Values and Visions

Sustainability is not just a good idea, but an ecological law. Human societies will only survive if the industrial vision of limitless growth is replaced by an integral vision of sustainable development, and if values that support greeds are replaced by values that support needs.

Key elements of a sustainable vision are: (1) our collective survival depends on human economies becoming sustainable; (2) a peaceful and co-operative world is possible and necessary; (3) power and resources must be redistributed to meet essential human and biophysical needs; and (4) cultural and genetic diversity is essential for health and wholeness.

Humanity needs to unite around a vision of a sustainable planetary civilization



Humans belong to thousands of different cultures. Every large geopolitical and cultural formation is ethnopolitically diverse.

The experience of the European Union shows that increased transnational co-operation can improve cultural diversity and minority rights.

Values based on *The Earth Charter (2000)*

The Structure of a Sustainable Society

More complex societal systems (new historical ages) evolve in response to human needs (for increased meaning and improved living standards) and societal needs (for increased environmental and spatial control). Their increasingly complex structures enable societies to process more and better energy, resources and information.

A new societal system is beginning to emerge. Because the information age will only survive if it is sustainable, it must have values and structures that prevent waste and war while promoting conservation, cooperation, equality, diversity, democracy and conflict resolution.

The information age is emerging because of the development of system-based theories, values and technologies. A sustainable society will need holistic, co-intelligent, empowered and decentralized structures to provide improved awareness, flexibility and efficiency. An integral worldview will permit the development of a planetary system composed of appropriately self-regulating networks.

As societal systems become more complex they require more energy

	kcal/person/day
Early hominids	2,000
Hunter-gatherer societies	4,000
Herder-cultivator societies	12,000
Agricultural societies	24,000
Early industrial England (ca. 1850)	70,000
Modern industrial U.S. (ca. 1970)	230,000
Information societies (ca. 2050?)	?

In order to be sustainable, the information age must utilize energy more efficiently

Industrial age = constant expansion / big and bureaucratic

Information age = increasing efficiency / small and smart

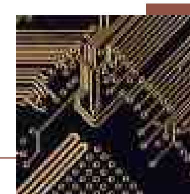
Data from E. Cook (1971), "*The Flow of Energy in Industrial Society*", Scientific American 224.
Graphic from *Architectural Digest,* June 2001.

A Sustainable Culture Pattern

Every societal system is organized around its worldview. The rationalist worldview of the industrial age is analytical, objective, individualist and hierarchical. Its goal is to understand and control the human and natural environment. It organizes centralized bureaucratic structures which provide limited feedback.

The worldview of the emerging information age is integral: multirelational, all-quadrant, co-operative and holarchical. Its goal will be to deepen awareness and integration with the environment. It will be able to organize decentralized networks with continuous feedback.

A new property of the information age is system self-awareness. This means that each individual and sub-system within the societal system will have the consciousness and tools to appropriately interact with the global network and regulate their own activities.



Institutions	Industrial age		Information age
Religion / worldview	Rational / analytical		Holistic / integrative
Culture / aesthetics	Individual achievement		Interdependence
Government	Constitutional / bureaucratic		Consensual / self-regulating
Education	Separate facts / rote learning	Changes to →	Integrative principles / self-directed
Family / social organizations	Nuclear family / corporate		Community / holarchical
Economy	Industrial / centralized		Information / decentralized
Science / technology	Mechanistic		Systemic

The Universal Culture Pattern

The Evolving Culture Pattern

The Paradigm Shift in Science

The following is from *Causality, Emergence, Self-Organization*, edited by Vladimir Arshinov and Christian Fuchs (2000), at
http://www.self-organization.org/results/book/EmergenceCausalitySelf-Organisation.pdf

Since the sixties a scientific paradigm shift has been underway towards a Theory of Evolutionary Systems. During the last two decades an increasing body of scientific literature on topics of self-organization has emerged that taken together represents a huge shift of focus in science:

- from structures and states to processes and functions
- from self-correcting to self-organizing systems
- from hierarchical steering to participation
- from conditions of equilibrium to dynamic balances of non equilibrium
- from single trajectories to bundles of trajectories
- from linear causality to circular causality
- from predictability to relative chance
- from order and stability to instability, chaos and dynamics
- from certainty and determination to a larger degree of risk, ambiguity and uncertainty
- from reductionism to emergentism
- from being to becoming

Principles of Organization and Integration

Fundamental Constructs

These came into existence with the Big Bang. These can also be described as cosmological principles which, as a branch of metaphysics, deal with the cosmos as an orderly mega-system, and as a branch of astronomy, focus on the universe's origin, structure, and space-time relationships.

1) Time
2) Space
3) Motion/Energy
4) Force Fields
5) Boundaries

Principles of Regulation

These Principles collectively regulate, or govern, the structure and behaviour of the phenomenal world at successive levels of systemic organization and integration.

6) Binary Principle (Duality)
7) Symmetry-Asymmetry (Invariance under Transformation)
8) Equilibration (Balance-Imbalance)
9) Quantization (Continuity-Discontinuity)
10) Levels of Organization (Complexification)
11) Numbers (Role of Mathematics)
12) Statistical Regularities (Probability Theory)
13) Action-Reaction (Cause-Effect)

Credits

1-1: Andromeda galaxy courtesy David Malin Images

1-4: Helix Nebula courtesy David Malin Images

1-4: Periodic table courtesy Los Alamos National Laboratory

2-10: Map of medieval Paris courtesy of Historic Cities