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.

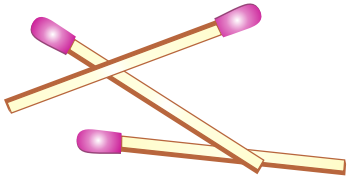
Forests are living ecosystems with many social, economic and environmental values.

What Is A System?

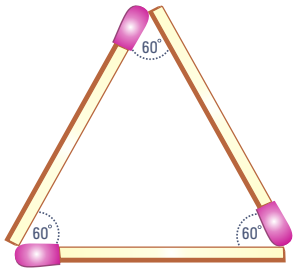
A system is a group of interacting parts functioning as a whole that is distinguishable from its surroundings by recognizable boundaries.

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.

In the following diagram a heap of matches are arranged in a logical system. The matches now form an interrelated structure with new mathematical properties: angles and parameters.

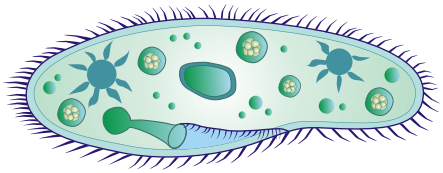


3 matches in a pile = a heap



3 matches in a triangle = a system

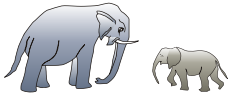
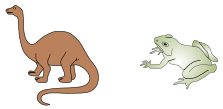
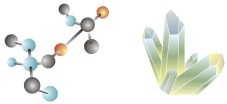
A cell is an example of a living biological system: a whole which functions because of the relationship of its parts (its sub-systems). It has properties that do not exist at the level of its parts, such as the ability to reproduce itself.



Protozoa are living biological systems

The Evolutionary Process

Evolution is a process of increasing complexification. The organic world developed from the inorganic world. Living systems have evolved progressively more complex forms and functions that increase both consciousness and environmental control. This chart outlines some of the major stages (or levels) in the evolution of humans.

Level			System		Properties/Emergent qualities
Open	L7	Animate (Organic)		Humans (symbolic co-ordination of societies)	*Below* + Symbolic thinking; tool-making; culturally organized societal systems; complex emotions; advanced neocortex
Open	L6	Animate (Organic)		Mammals (emotional co-ordination of groups)	*Below* + Emotions and rudimentary feelings; simple social behaviours; limbic brain
Open	L5	Animate (Organic)		Reptiles (complex physiological co-ordination)	*Below* + Impulses and instinctual behaviour; central nervous system
Open	L4	Animate (Organic)		Neuronal organisms (multi-organic)	*Below* + Sensation and perception; neurological codes; locomotion
Open	L3	Animate (Organic)		Cells (multi-molecular)	*Below* + Dynamic equilibration; prehension and irritability; biochemical codes; reproduction
Closed	L2	Inanimate (Inorganic)		Molecules (multi-atomic)	*Below* + Molecular properties and structures; replication
Closed	L1	Inanimate (Inorganic)		Atoms (multi-particle)	*Below* + Chemical and elemental properties; chemical reactivity
Closed	L0	Inanimate		Particles	Forces, positions, velocities interactions

Evolution / complexity

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.

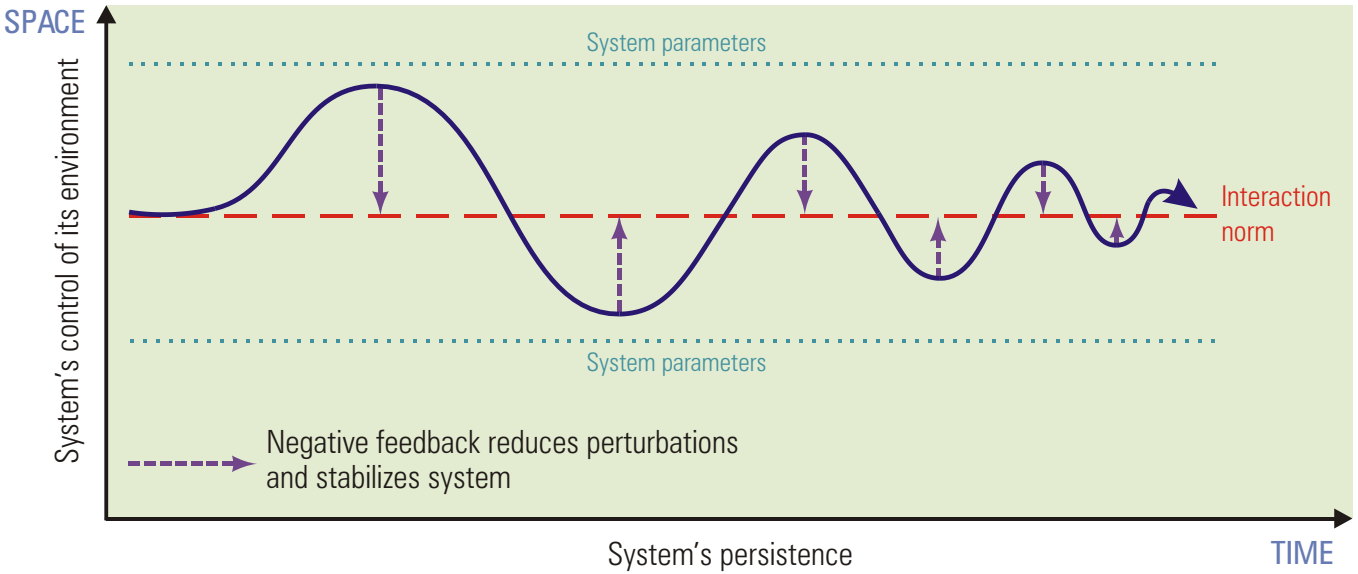
All systems are constantly equilibrating with their environments

Living social systems are continuously regulating their structures and processes

System 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.

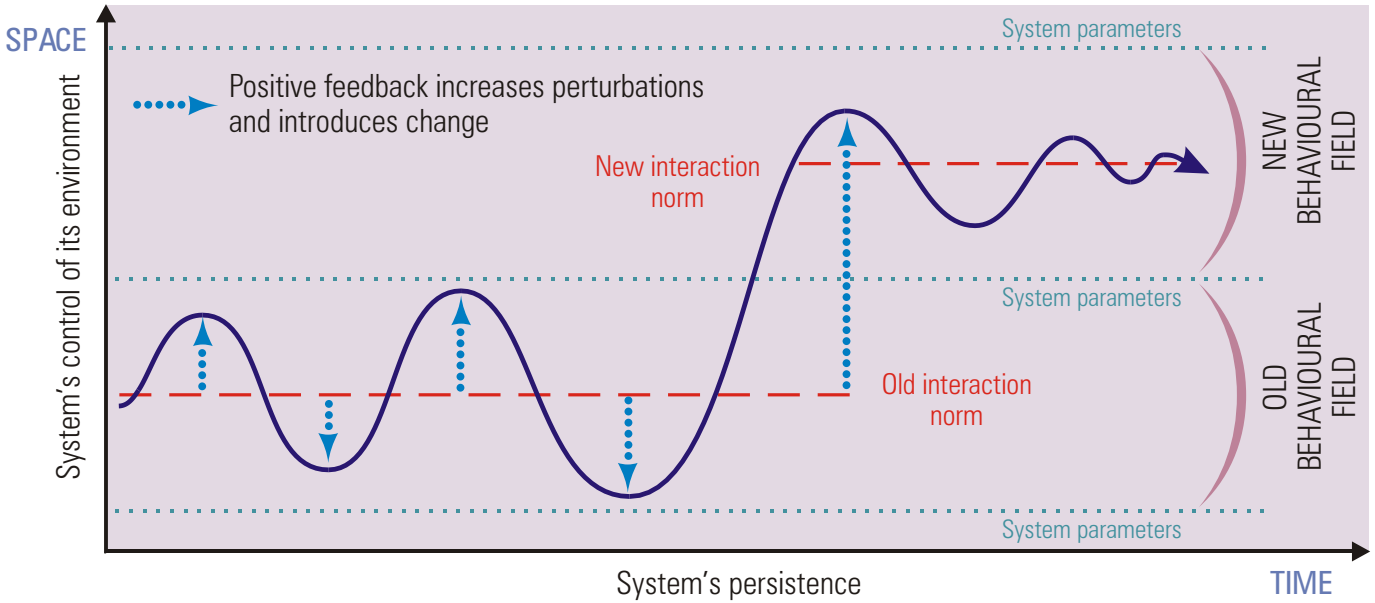


System change

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.

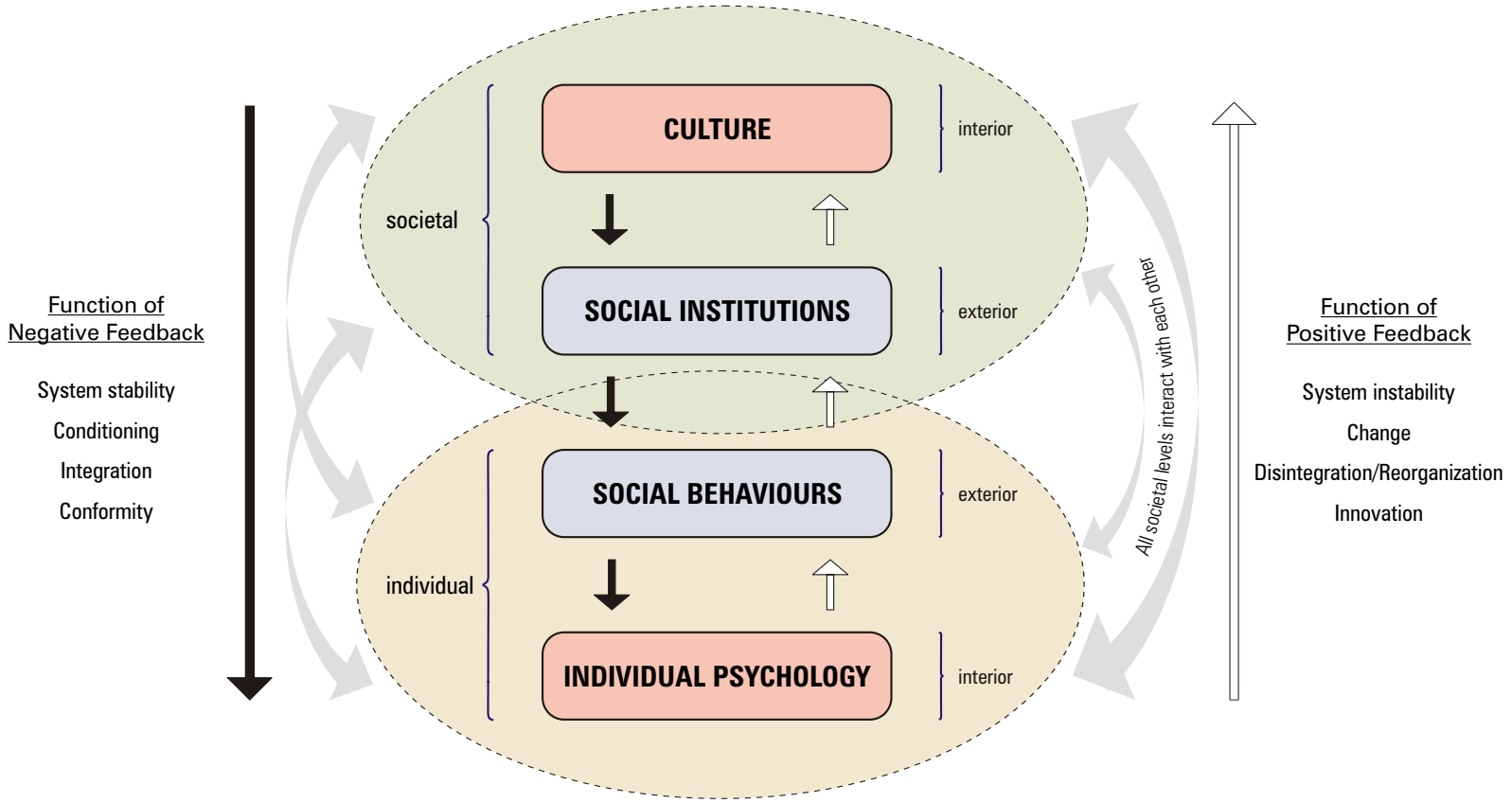
When change forces a societal system to exceed its boundaries, it can move the system to another stable configuration within the existing evolutionary level, cause it to break down to a less complex level of organization, or cause it to break through to a more complex level. New properties, structures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



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.



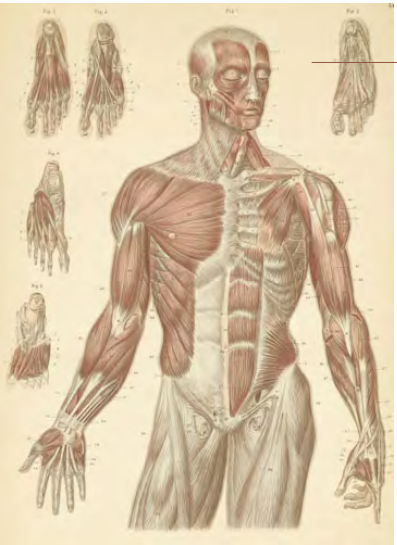
Adapted from Ken Wilber, *A Brief History of Everything* (Boston: Shambhala, 1996), P. 71.

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.



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.

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 Social Systems

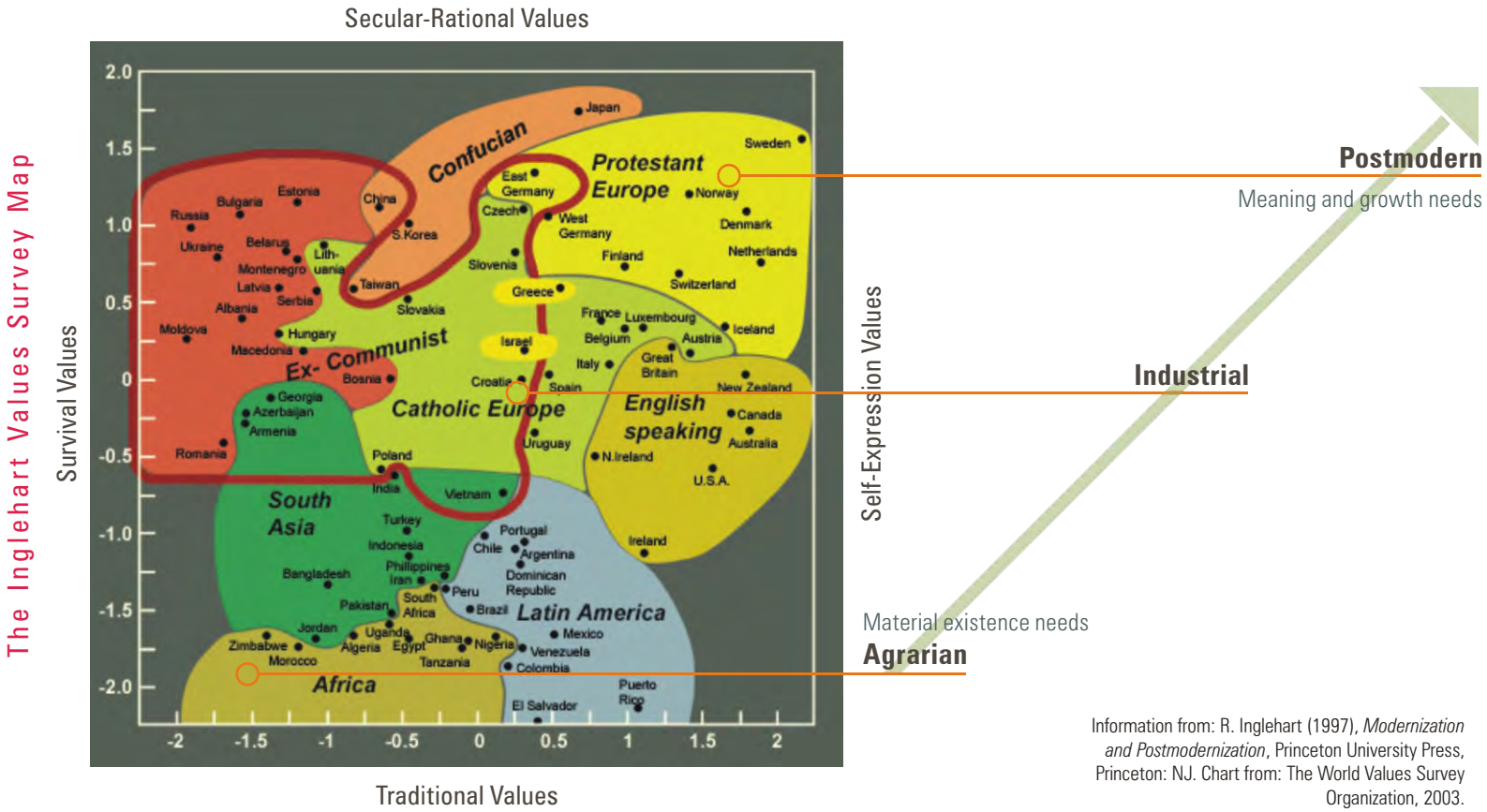
Living social systems are made up of interdependent social sub-systems. The basic structure of all societies is called the Universal Culture Pattern because societal systems require similar basic institutions in order to function.

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.

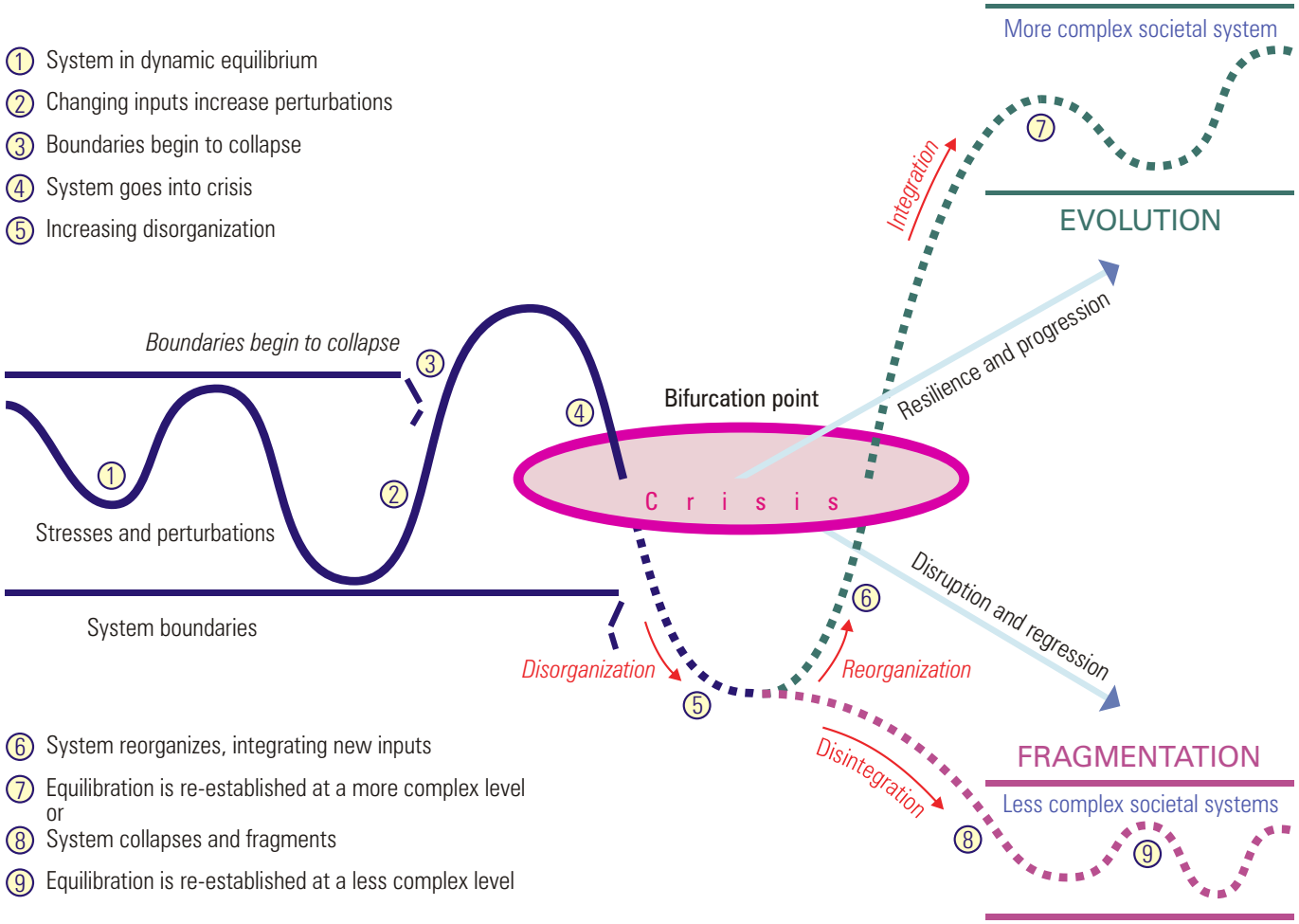
2) Values are also changing in industrial societies. Needs for individual growth become more important as incomes rise and economic survival becomes more assured. Advanced industrial (postmodern) societies experience a shift from survival/materialist values to self-expression/post-materialist values.



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

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.

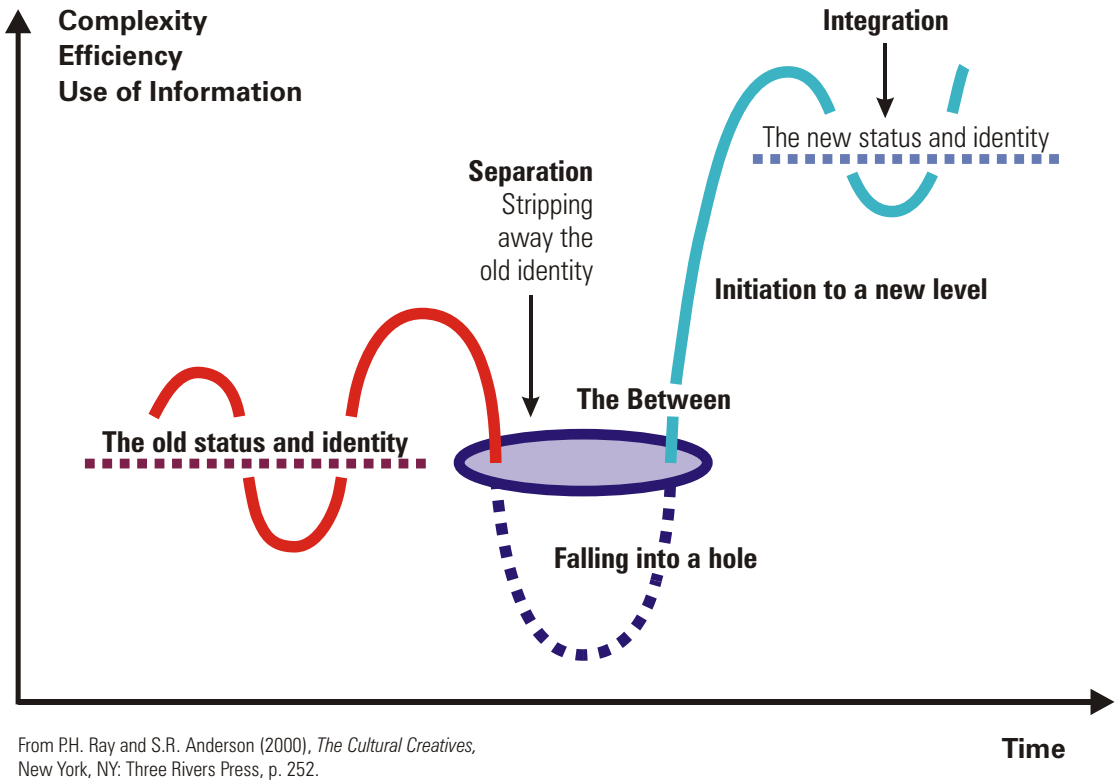


Individual Psychological Growth

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), *The Cultural Creatives,* New York, NY: Three Rivers Press, p. 252.

Societal Quantization

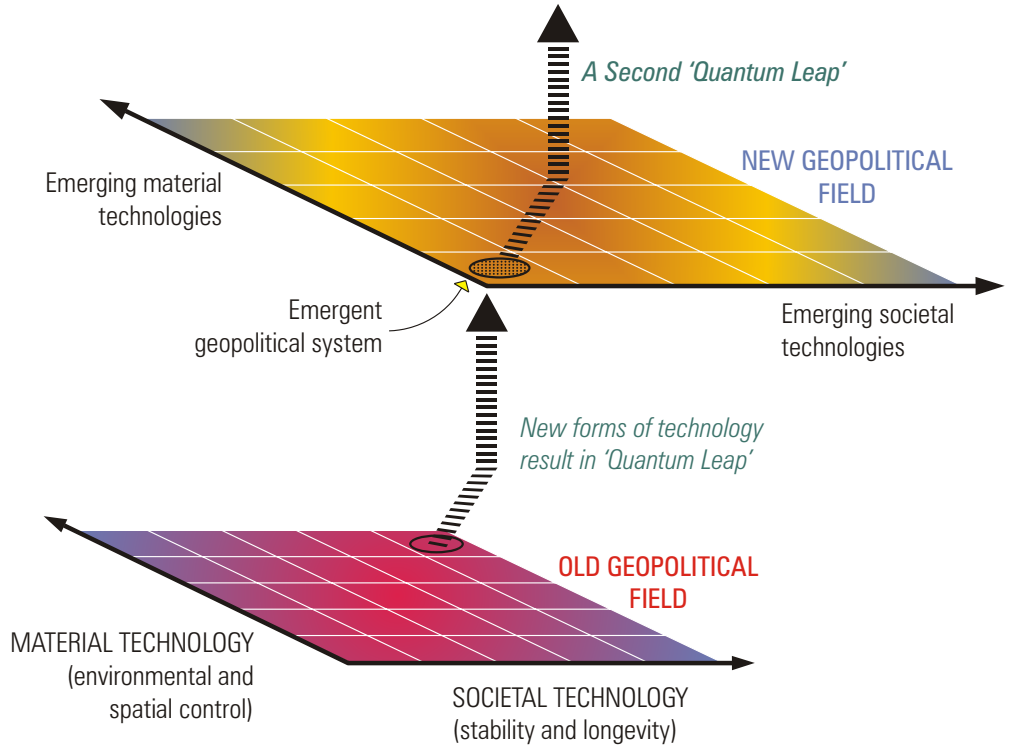
The process of a system evolving to a more complex system state is called quantization. The new system emerges with a new structure and additional properties.

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 agrarian societies share similar worldviews (theocratic), social organizations (feudal), 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:

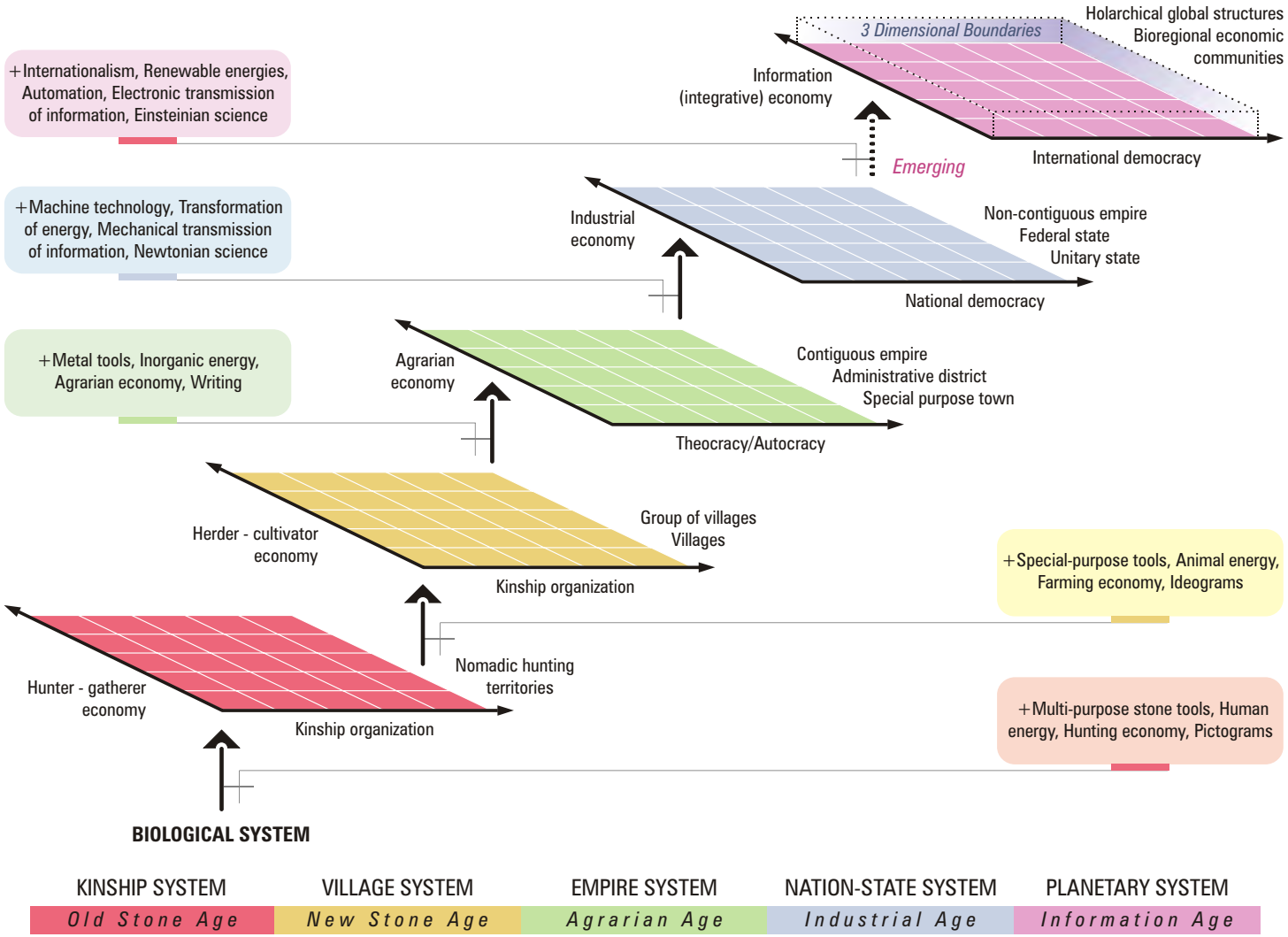
1. Technological/scientific innovations
2. Increased production and consumption of energy
3. Increased environmental control capacity
4. Increased information systems
5. Exponential growth of populations
6. Economic growth and social complexification
7. New aesthetic canons and modes of expression
8.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



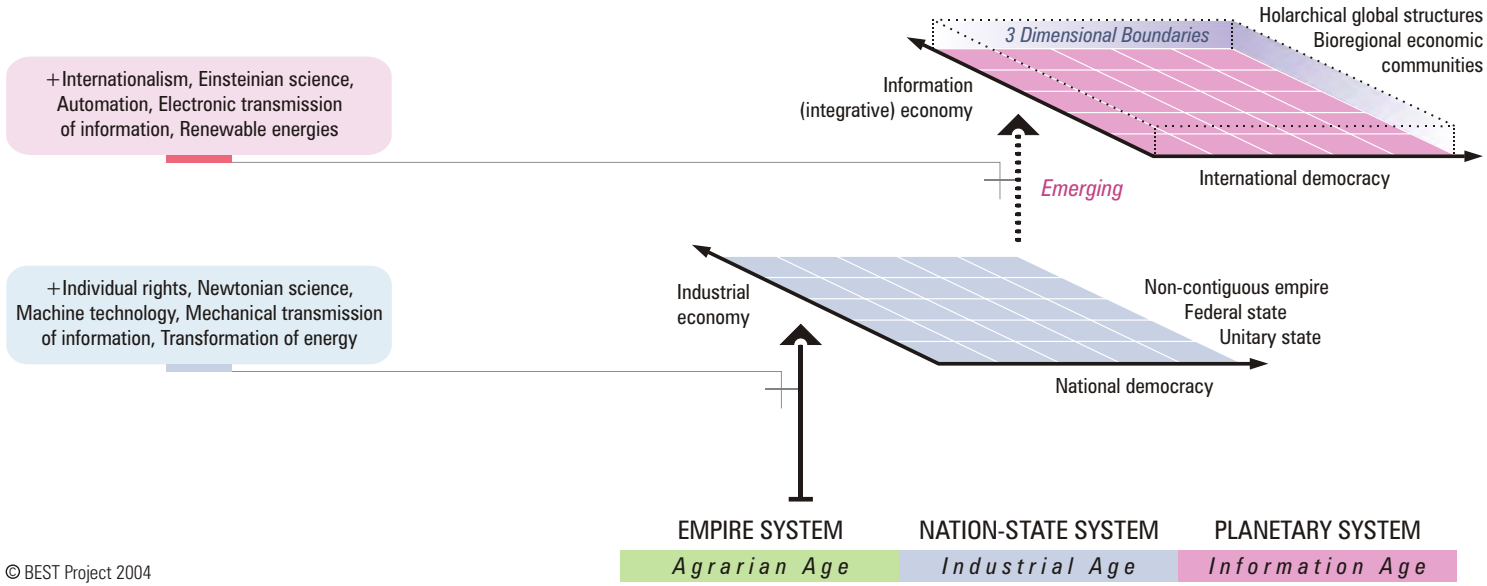
Adapted from: Marney, M.C. & Smith, N.M., "The Domain of Adaptive Systems" General Systems, vol. 9, 1964, pp. 123, 127 and Taylor, A.M. "Integrative Principles in Human Society".

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 human civilization is now emerging in response to human, social and biophysical needs. Although it is not possible to predict its exact design, the Information Age will probably be based on 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. Energy will need to come from renewable technologies.



Looking Ahead

We all need to know how decisions are likely to influence future outcomes.

Like weather systems, societal systems have complex and chaotic dynamics. Although precise forecasts are not possible, the probability of various outcomes can be estimated.

Factors Contributing to Societal Change

Change can be destructive (e.g. resource depletion) or constructive (e.g. more efficient technologies). Both destructive and constructive changes can destabilize a societal system. If a system cannot maintain its stability through assimilating or repressing changes, it must transform to a more complex system state or collapse.

Industrial civilization is entering a period of rapid change. Environmental degradation will be a primary cause of destructive change. Destructive social conflicts are likely to result from global economic crises, growing inequality, and an increasing gap between rising expectations and declining standards of living.

The primary causes of constructive change are rising educational levels and the development of more sustainable and distributed information, energy and productive technologies. Although television and the Internet are spreading unsustainable consumer values, they are also developing a global awareness of democracy, the environment, peace and human rights.

Environmental destruction from mining

Growing environmental degradation and resource shortages will provoke crises

Muslim women in Internet café

Information technologies are changing global values and raising expectations

International volunteers help drill wells

The number of non-governmental organizations increases each year

Some Effects of Energy Crises

It will be an enormous challenge to supply the energy required by a growing global population. At present two billion people have no access to electricity. The Electric Power Research Institute estimates that a new 1,000 megawatt power plant must be built every 48 hours for the next 50 years to achieve global electrification at the level of consumption Americans had in 1950.

Energy prices will rapidly rise when oil and gas supplies begin to decline unless alternative energy sources have been developed. This will not only cause a global depression, but further restrict access to essential products such as electricity, heat, transportation, clean water, sanitation and fertilizers.

The worst effects of rising energy shortages will be felt by the urban poor and middle classes because the urban rich can afford to pay rising prices and the rural poor already lead subsistence lives. It is likely that hunger, disease, crime and social unrest will increase sharply in the world's megacities as services decline and prices and unemployment rise.

Images of Shanghai, Bangkok and Lagos

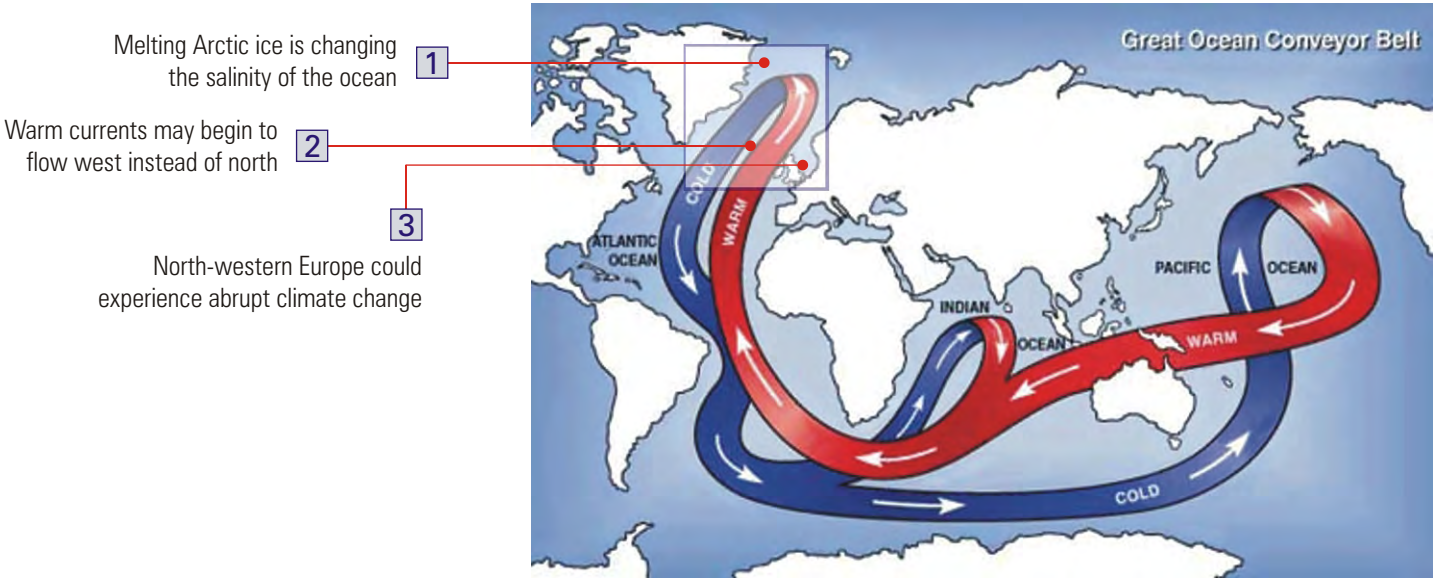
Some Effects of Climate Change

Experts have different opinions on the consequences of climate change. The insurance industry is concerned about the economic costs of increasingly frequent and severe storms, floods and heat waves. Sir David King, the chief scientific advisor to the British Government, predicts that climate change will cause the mass extinction of plants and animal species as well as widespread flooding, drought, hunger and disease.

A Pentagon study warns that climate change is a far greater threat than international terrorism. Abrupt climate changes could sink cities under rising seas and trigger mega-droughts and famines. The result could be widespread social unrest and nuclear conflicts over scarce resources.

The British government is calling on the world's developed economies to cut greenhouse gas emissions by 60% of 1990 levels by 2050.

Global warming may change ocean circulation as early as 2020



Temperatures in north-western Europe may drop sharply at the same time as temperatures increase elsewhere

Information from: BBC News, 1/09/2004; The Observer, 2/22/2004.

Cascading Crises

Because the industrial worldview emphasizes parts over wholes, it tends to view issues in isolation. For example, UN food estimates assume that energy prices will remain relatively stable. But what will happen to agricultural production if the costs of irrigation, fertilizers, and transportation increase rapidly due to declining oil supplies? What will happen if this problem is compounded by other factors (e.g. climate change)?

Societal and biophysical systems have complex and chaotic behaviours. Interacting problems can produce cascading crises (e.g. ecological crises can trigger economic crises which can trigger political crises).The large number of interacting problems facing humanity in the coming decades increases the probability of major crises. Proactive measures will have to be taken to prevent the development of uncontrollable crises which could cause system collapse.

Mayan pyramids

Roman aqueduct

As civilizations expand they require more resources to maintain increasingly complex social structures. Many civilizations have collapsed when the political, economic and military costs of acquiring new resources became unsustainable. Industrial civilization is following the same trajectory.

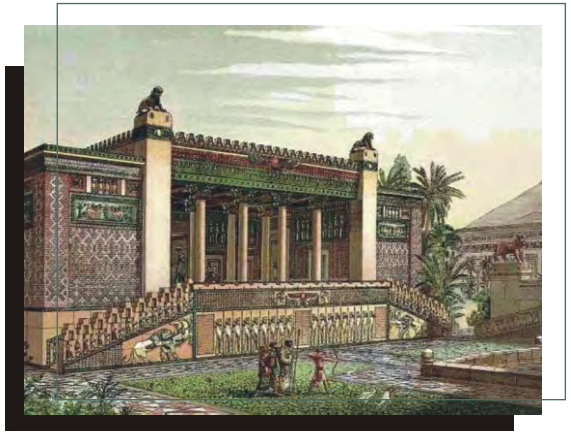
Information from: J.A. Tainter (1988), *The Collapse of Complex Societies,* Cambridge: UK, Cambridge University Press.

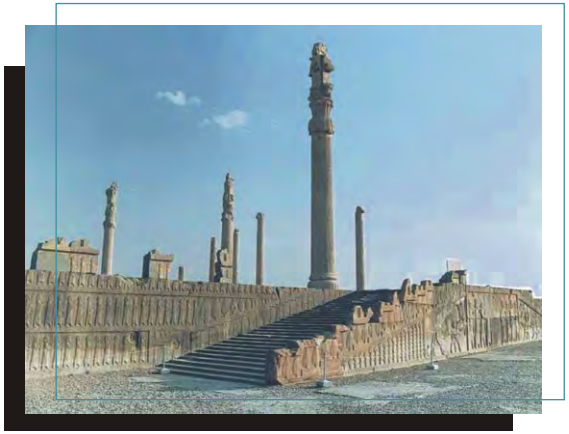
Probable Future Scenarios

(1) Political and business leaders will proactively introduce environmentally friendly technologies, support sustainable development and prevent unrest and conflict. These efforts will slow environmental destruction. However, attempts to improve the system without redesigning its unsustainable structure will fail. Efforts to manage crises will consume more and more scarce resources, eventually resulting in the collapse of the industrial system.

and/or (2) Environmental crises will rapidly escalate, triggering uncontrollable economic and political crises. At some point cascading crises will cause the catastrophic collapse of advanced civilizations. This process may cause irreversible damage to social and biophysical systems.

or (3) As regional and global crises increase and the world economy begins to fail, growing numbers of people will question the values of the industrial system and start to organize alternative structures. At this point a successful transformation to a sustainable civilization will occur if emerging elements of the new societal system are able to organize functional social structures around a coherent worldview.





Persepolis, the ancient capital of the Persian empire: 2500 years ago and now

Almost every civilization that ever existed is now extinct.
Societal systems must adapt, collapse or transform in response to changes.

Modernity vs. Pre-modernity

The traditional economies, values and social institutions of agrarian and tribal societies begin to break down when exposed to the power and wealth of industrial civilization. Development is uneven and rapid urbanization is accompanied by soaring rates of poverty, crime and addiction. The price of increasing incomes and personal freedom is often the loss of community and meaning.

People resist change when they believe that they have more to lose than gain. Identity and resource conflicts occur when people believe that their needs are not being met or are being threatened. People compete and fight over material goods when they fear material scarcity, and people compete and fight over religious, ethnic and national issues when they fear the loss of cultural identities.

A successful transformation to a sustainable civilization must include and transcend the positive aspects of older societal systems while meeting a wider range of human and biophysical needs.

Rating Osama bin Laden

	Fav %	Unfav %	DK %
Britain	3	92	4
France	4	93	3
Germany	2	96	2
Russia	3	87	10
Turkey	11	75	14
Pakistan	65	9	26
Jordan	55	39	7
Morocco	45	42	13

Jihad ↔ vs. ↔ McWorld

Bin Laden supports the feudal values of a pre-modern Islam

Bush supports the consumer values of 20th century industrial society

Rating George W. Bush

	Fav %	Unfav %	DK %
U.S.	61	36	3
Britain	39	57	4
France	15	85	1
Germany	14	85	1
Russia	28	60	12
Turkey	21	67	12
Pakistan	7	67	25
Jordan	3	96	1
Morocco	8	90	2

Neither side understands the values of the other, nor does either side support the post-modern values of diversity, equality, transnational democracy or sustainability. Ending the “war on terror” will not solve the real issues of the 21st century.

Illustration based on: B.R. Barber (2001), *Jihad vs. McWorld*, New York, NY: Ballantine Books.
Data from: The Pew Research Center, 2004.

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: diversity decreases and vulnerability increases as a few species dominate a mature 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.

Modeling Societal Change

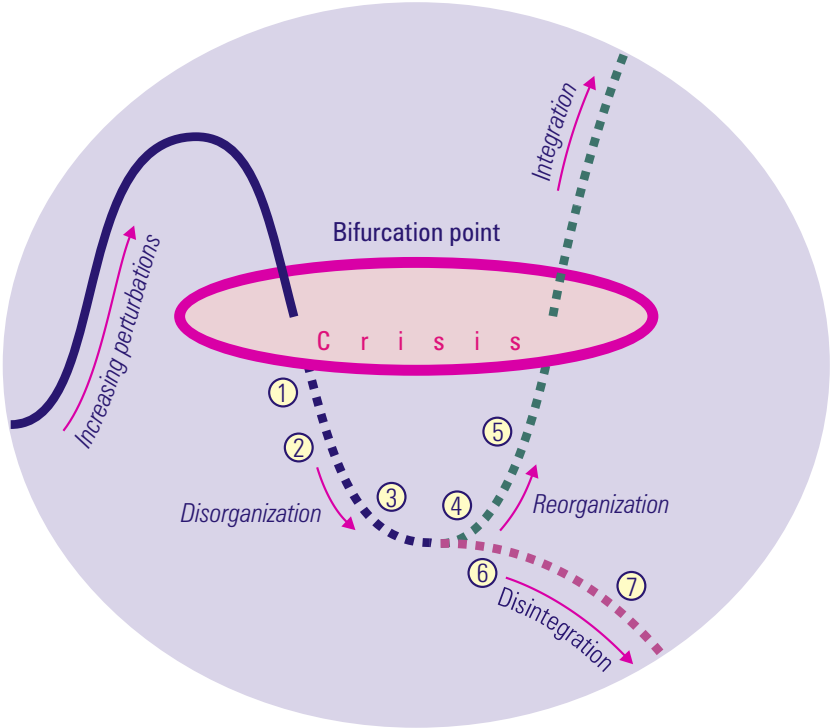
The adaptive cycles of societies are similar to those of ecological systems.
1) Exploitation: the new societal system is able to use its superior social and material technologies to expand throughout its environmental niche. 2) Conservation: diversity decreases and vulnerability increases as populations 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

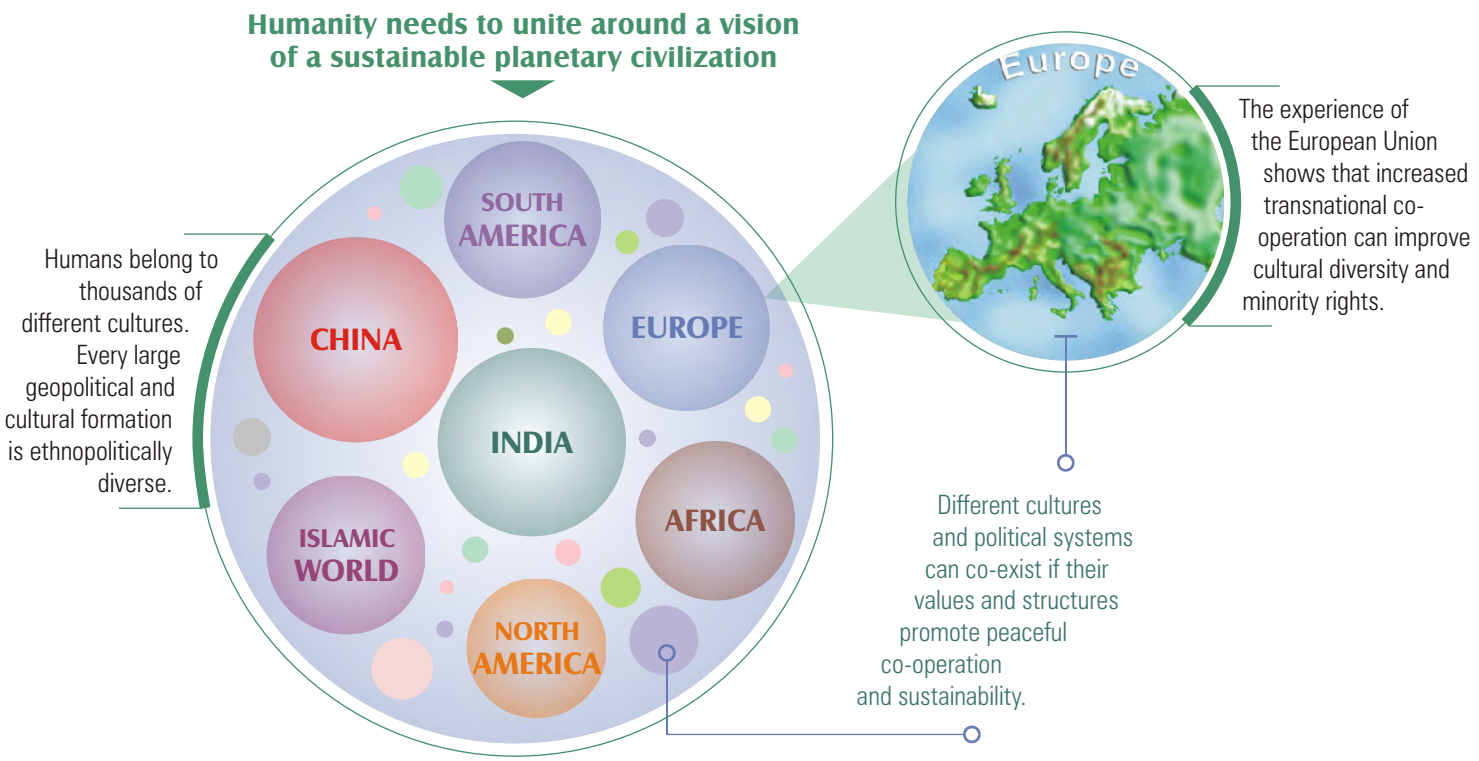


The springboard effect helps systems reorganize

Values and Visions

Sustainability is not just a good idea, but an ecological law. Advanced civilizations 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) a peaceful and co-operative world is possible and necessary; (2) our collective survival depends on human economies becoming sustainable; (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.



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

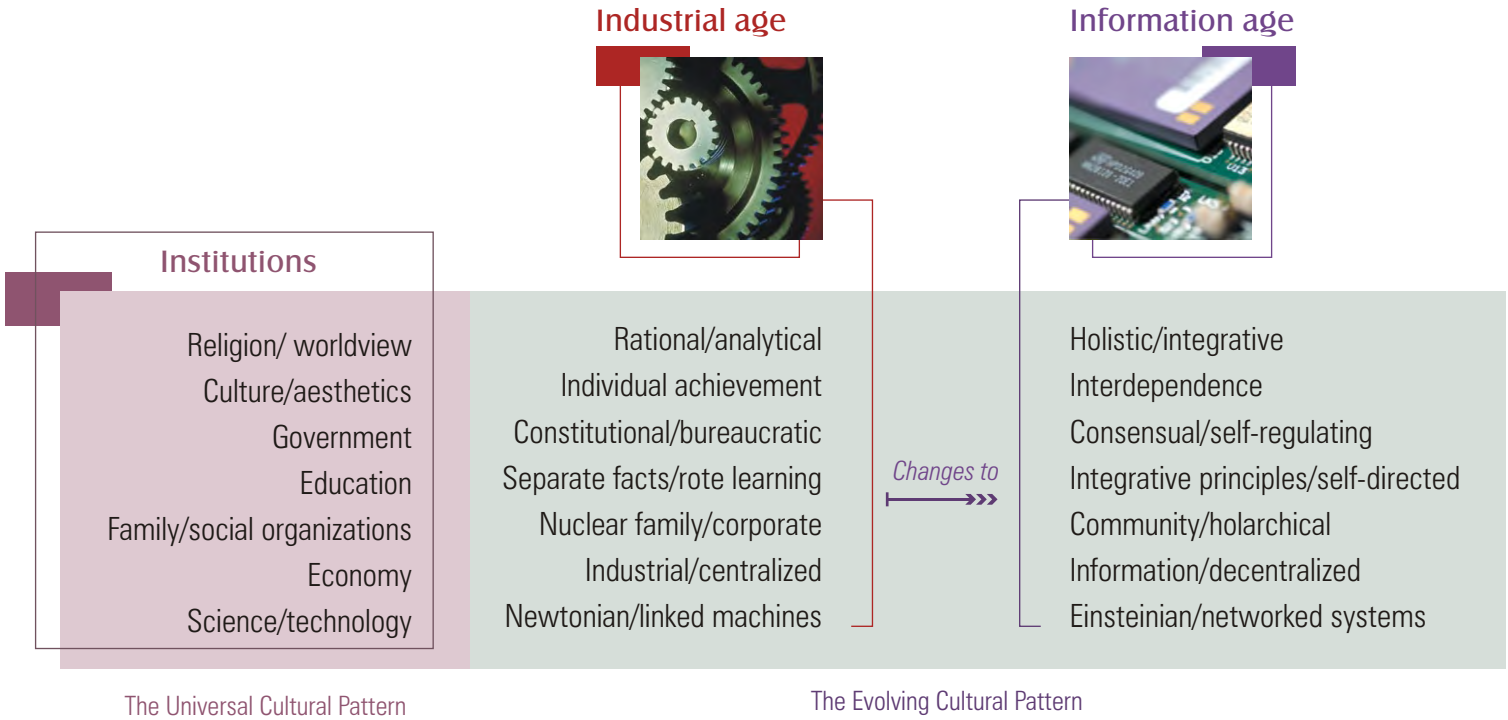
Data from E. Cook (1971), "*The Flow of Energy in Industrial Society*", Scientific American 224.
Graphic from *Architectural Digest,* June 2001.

A Sustainable Cultural Pattern

Every societal system is organized around its worldview. The rational 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, self-regulate and self-replicate.



Supporting Constructive Change

In 1950 few people could imagine how electronics would change the world. In 1985 few people could imagine the rapid and relatively non-violent collapse of the Soviet Union. Few people can now imagine that industrial civilization will either collapse or be transformed within 50 years.

Two trends show that changes are unavoidable: the industrial system is increasingly unsustainable, and transformative new ideas, values and technologies are emerging. These interacting global trends are too powerful, complex and chaotic to be controlled by any government, ideology or ethnic group. However, we can increase the probability of positive outcomes through helping to develop sustainable values, theories, technologies and structures.

Although ruling elites and societal inertia will inevitably resist change, there will be less resistance if diversity and inclusiveness are promoted and if the constructive values of older societies are supported. We can also reduce resistance to change by educating people to our common need: if we wish to survive, civilization must change and evolve.

The Allies united in WWII to defeat fascism. Now humanity must unite to create a sustainable world.

Building B-24 bombers. US aircraft production increased from 24,000 in 1940 to 96,000 in 1944.

After Pearl Harbor, American industry was changed over from consumer to military production within a few months. The entire country was mobilized, enormous quantities of war goods were produced and scientific breakthroughs occurred in many areas including radar, jet aircraft and nuclear energy.