TIME-SPACE-TECHNICS

The Evolution of Societal Systems
and World-Views

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Introduction

This presentation is designed to introduce our evolutionary systems theory of history. Time-Space-Technics (TST) is unique because:

1) **TST** affirms that we live in a constantly self-organizing and evolving universe that is monadic in energy, matter and consciousness.

2) **TST** provides the first comprehensive systems perspective on the history of human evolution from the Big Bang to the emerging planetary civilization of tomorrow.

3) **TST** integrates the natural and social sciences, and explains how the systemic evolution of human societies is part of the evolution of the inorganic and organic worlds.

4) **TST** defines universal Principles of Organization and Integration (which apply equally to the physical, biological and societal levels of organization) and explains their presence and significance in the evolution of societal systems.

5) **TST** makes clear why the evolution of societies can be both incremental and quantal, and explains why and how these periodic shifts occur.

6) **TST** explains societal evolution as the emergence of more complex, conscious, open and permeable societal systems with new properties and increased capabilities.

7) **TST** demonstrates the interplay of structure and process (form and function), at all stages of societal history.

Introduction

8) **TST** explains how societal systems are organized (symbolically patterned) by their world-views.

9) **TST** demonstrates that societal world-views and structures must be relevant to social and environmental needs.

10) **TST** makes use of the concept of a Universal Culture Pattern to show one-to-one correspondences among societal systems from the earliest periods to our own. (This device assists in identifying similarities and differences among societies.)

11) **TST** explains how the relationships between societal and material technics (technologies) are fundamental elements in creating and maintaining societies.

12) **TST** identifies the major societal world-views and accounts for their emergence, application and evolutionary significance.

13) **TST** identifies the major factors – environmental, material, societal – responsible for mega-shifts in societies and civilizations from Paleolithic to contemporary times.

14) **TST** applies these factors to explain why modern science and industrial civilization first emerged in Western Europe.

15) **TST** also applies these factors to help explain the present transformation of mores, values and institutional structures and to provide empirical data that all societies are currently in another mega-quantum shift to a new type of societal system (a planetary system).

Caveat

Matthew Melko warns (*The Nature of Civilizations,* 1969, p. 42):

"A deterministic cast of thought, plus the fact that comparative historians have been dealing with the total study of history, have frequently led to the creation of rather rigid, dogmatic, all-embracing systems….
Even more dogmatic are the charts that often accompany the systems of the comparative historians. But these charts must be accepted as models, and as such they must sacrifice accuracy for intelligibility; they must have an element of arbitrariness. It is no less reasonable to make a chart of a civilization cycle than it is to make a chart of a business cycle. And the comparative historian must chart the unknown, even though he is certain to err, just as the sixteenth-century cartographer was justified in making maps, even though they amuse us today."

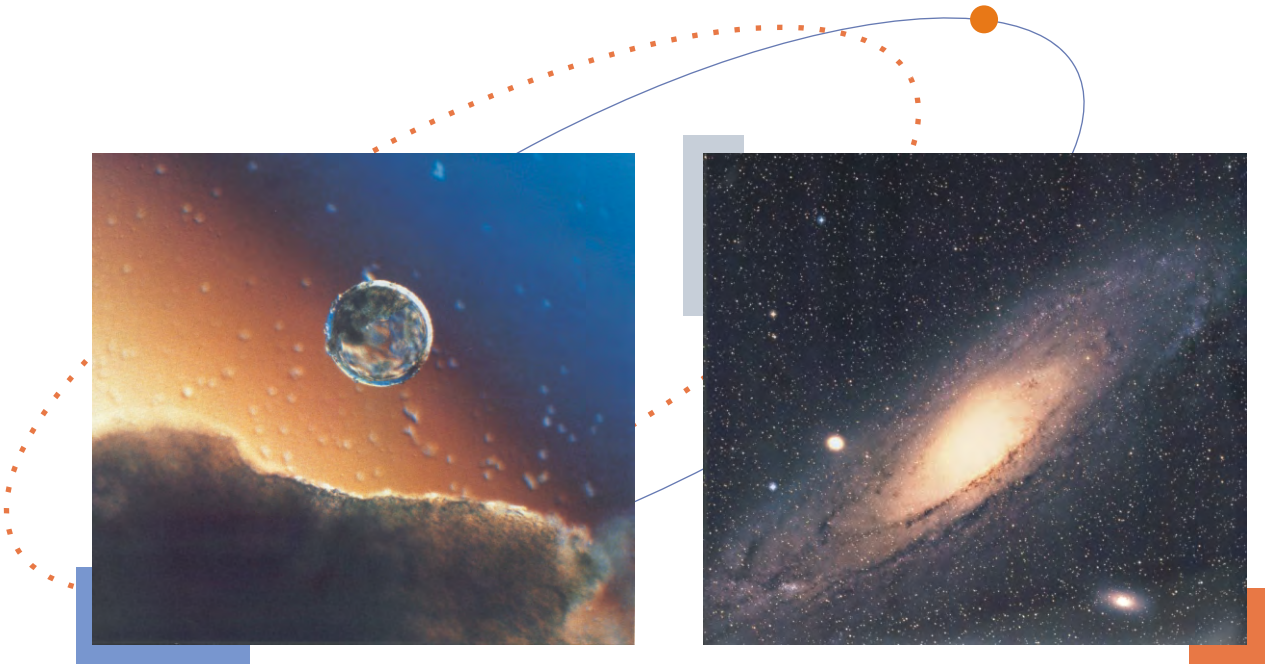
Rumold Mercator, 1587 C.E.

Kaos or Kosmos?

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.



An egg in the fallopian tube

Andromeda galaxy

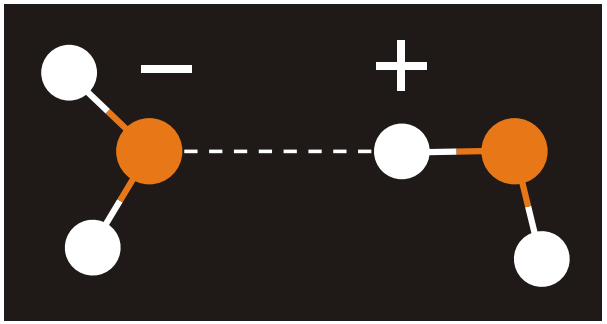
Integrative Principles

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 4.)

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



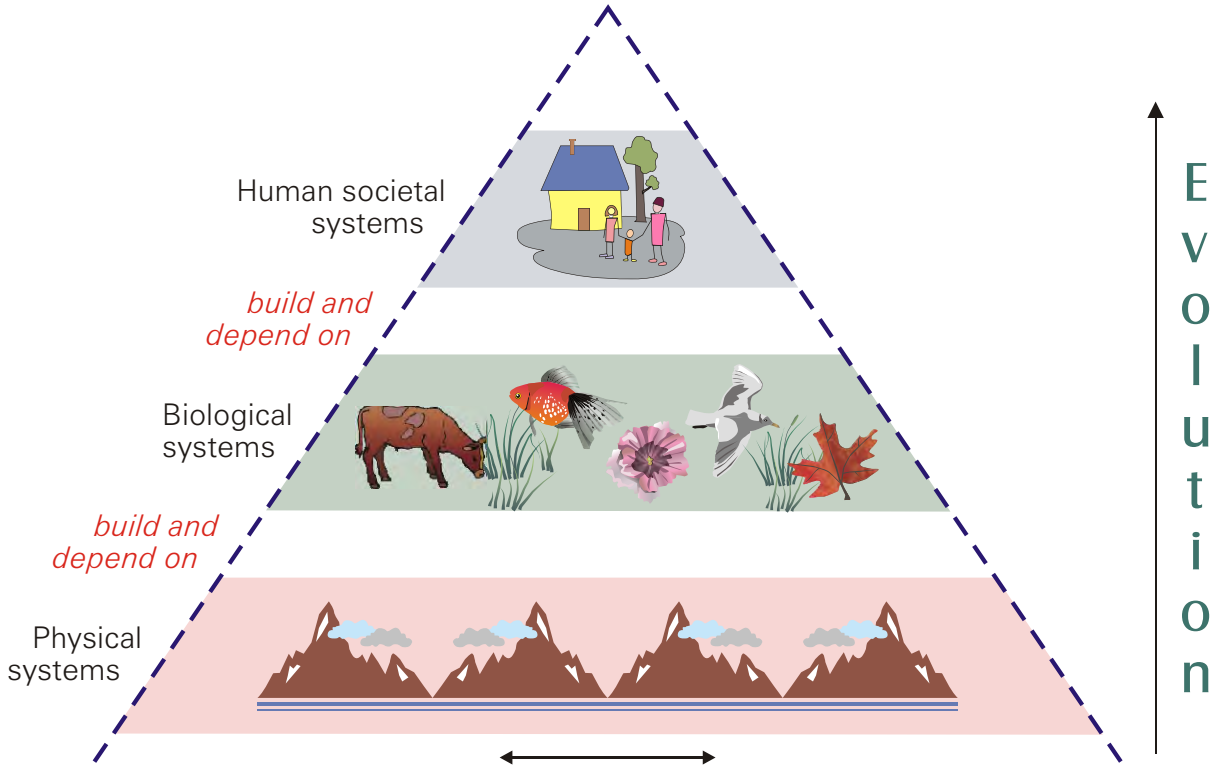
Organic life on Earth is made possible because of the unique properties of water molecules.

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.

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.

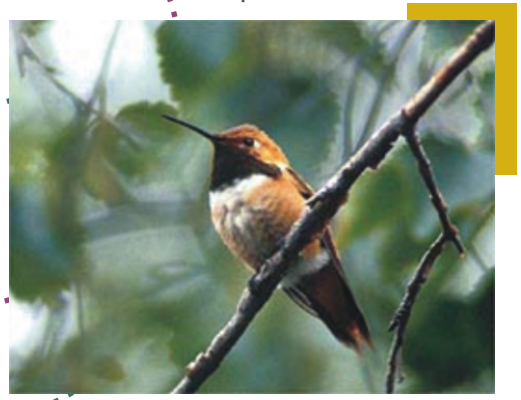
Organic life may have begun with self-reinforcing autocatalytic networks forming in primeval chemical soups. Autopoiesis occurs when a closed system of production processes evolves that is capable of regenerating itself.

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



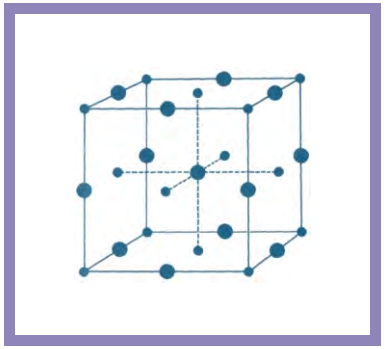
Animals survive because their structures support dynamic equilibration, mobility and the other functions they need to maintain and reproduce themselves in their environments.

Form and Function

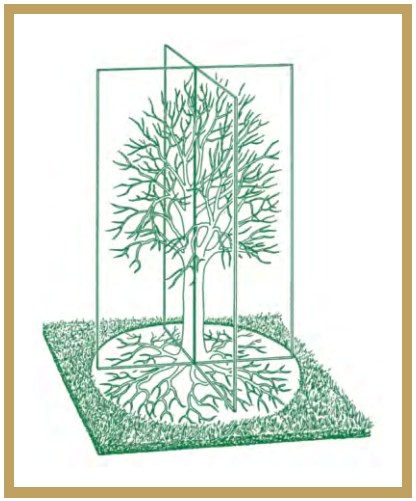
In order to exist, inorganic and organic systems must have structures that enable them to maintain themselves in relationship to their environments. Because open (dynamic) systems have a continual flow-through of matter-energy and information from their surroundings, they have self-regulating structures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

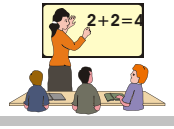
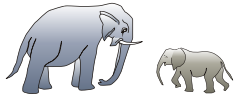
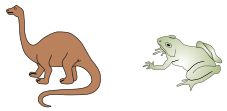
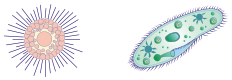
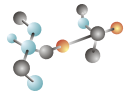


Trees have radial symmetry

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	L7	Animate (Organic)		Humans (complex 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

World-Views

While living biological systems are genetically patterned to maintain and reproduce themselves, living social systems are symbolically patterned to maintain and reproduce themselves. This is because human societies have co-evolved with the emergence of the human capacity to use complex symbols and tools.

Societal systems are unified and organized around world-views, which are overarching conceptions of reality that explain the place of human beings in the world. World-views and cultures (learned traditions of thought and behaviour) provide meanings and symbolic tools for organizing the social institutions that in turn organize and regulate group and individual behaviours.

Societal evolution involves the emergence of new world-views (new symbolic interpretations of reality) with the capacity to organize more complex structures and processes. Different cultures at the same level of evolutionary development will have a similar world-view, social structures and economic processes.

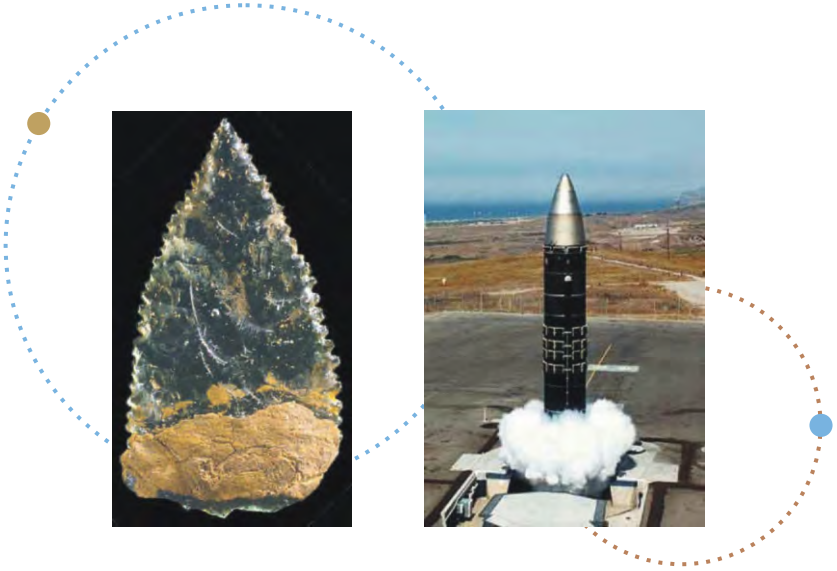
Priests supported the religious world-view of agrarian civilizations.
Scientists supported the rationalist world-view of industrial civilizations.

Environmental Control

All living and open systems are maintained by a continuous flow of energy. The evolution of more complex human societies has been marked by the appropriation of increasing amounts of energy from the environment. More complex societies require more energy per person than simpler ones because they have more networks, more information processing, more specialists and more regulatory hierarchies.

Historically, every society takes more energy out of its environment than it creates. Societies collapse when the energy flow is no longer available in sufficient quantities to sustain increased populations, defend the state from attack and maintain internal infrastructures.

Societal evolution involves the emergence of world-views with progressively increasing environmental and spatial control capabilities.

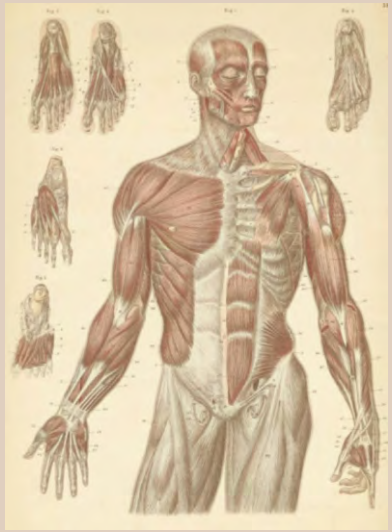


From spears to ICBMs: societal evolution involves the utilization of more energy per person and the emergence of superior environmental control capabilities.

The Universal Culture Pattern

Living systems can only survive if they have functional structures that enable them to maintain and reproduce themselves in their environments. The structures of all societies are isomorphic because they must all meet similar individual and societal needs. Although every society is culturally distinct, all societies are organized around the same set of key social institutions. This basic structure is called the Universal Culture Pattern (UCP). Individuals learn their fundamental views of reality and standards of conduct from their society's UCP.

All of the institutional sub-systems that make up a societal system's UCP are interconnected and interacting. Although there is a systemic tendency towards congruence, some of the segments of the UCP may change more rapidly than others. If not rebalanced, disequilibria may lead to conceptual and societal revolution.



Living Biological Systems

Human biological systems are composed of interdependent organic sub-systems.

Individual needs
Meaning/religious expression
Communication/self-expression
Order/safety
Knowledge/learning
Belonging/esteem
Material security
Environmental control

Universal Culture Pattern

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

Living Social Systems

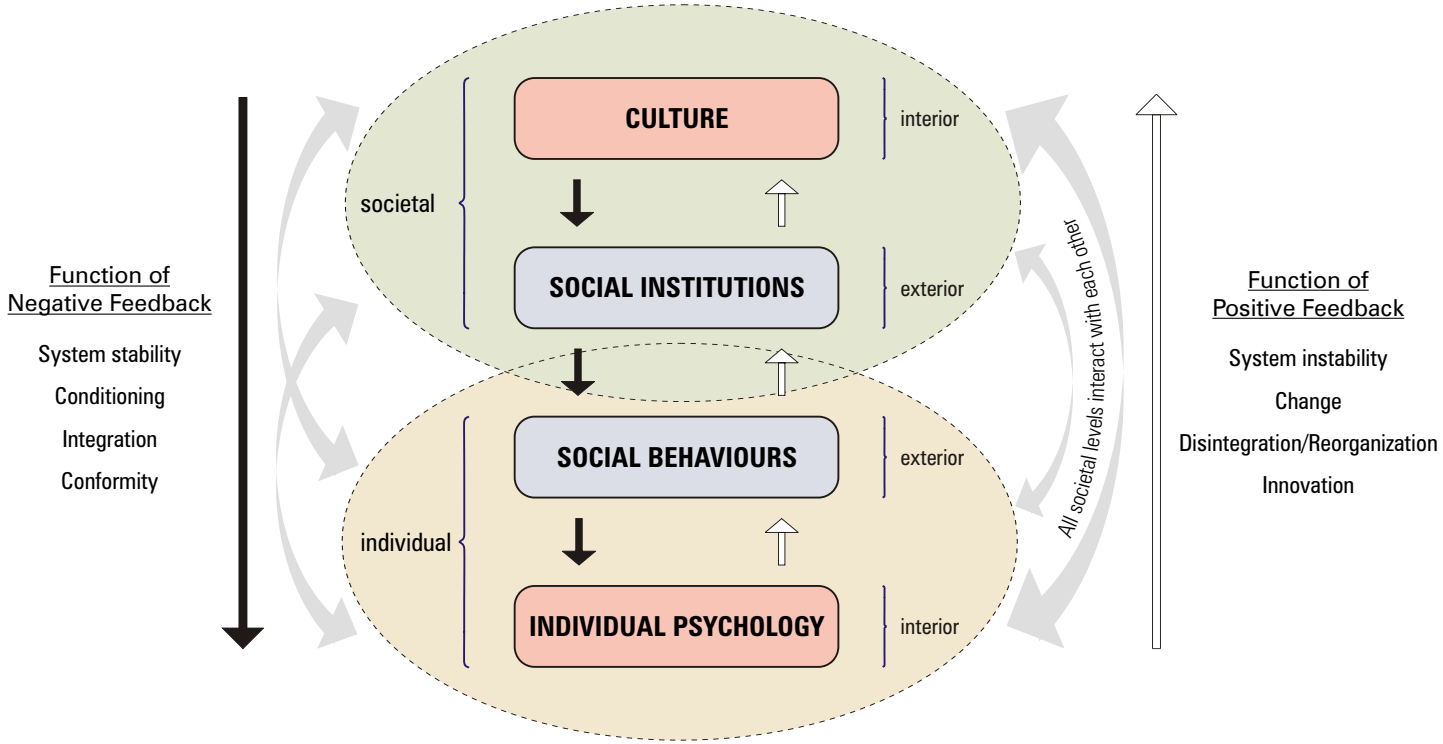
Societal systems are composed of interdependent institutional sub-systems.

Individual and Societal Interaction

Historians have debated whether great people make history, or whether great people are made by history. Systems theory argues that interactive societal processes cause individuals, societies and environments to change each other and co-evolve. However, not all processes are equal: societies depend on natural environments – and not the other way around – and individuals depend on societies.

Societal systems are organized through worldviews. Congruent cultures provide meanings and symbolic tools for organizing social institutions. Institutions organize and regulate group and individual behaviours. These 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 develop autonomy and reciprocal abilities to influence social behaviours, institutions and their wider culture.



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

Material and Societal Technics

Sociocultural systems use two types of interrelated technics (methods of applied learning) to equilibrate with their environments. Material technics (t_m) are primarily concerned with attaining environmental control: the processing of energy and natural resources. Societal technics (t_s) are primarily concerned with maintaining social control: the processing of information and the organization, regulation and reproduction of the societal system's world-view and social structures.

Societies are viable to the extent that their material technics enable them to physically manipulate and spatially organize their environments. Societies have longevity to the extent that their societal technics enable them to preserve internal and external equilibrium. Material technics tend to be connected to positive feedback processes (growth and change), while societal technics tend to be connected to negative feedback processes (equilibration).

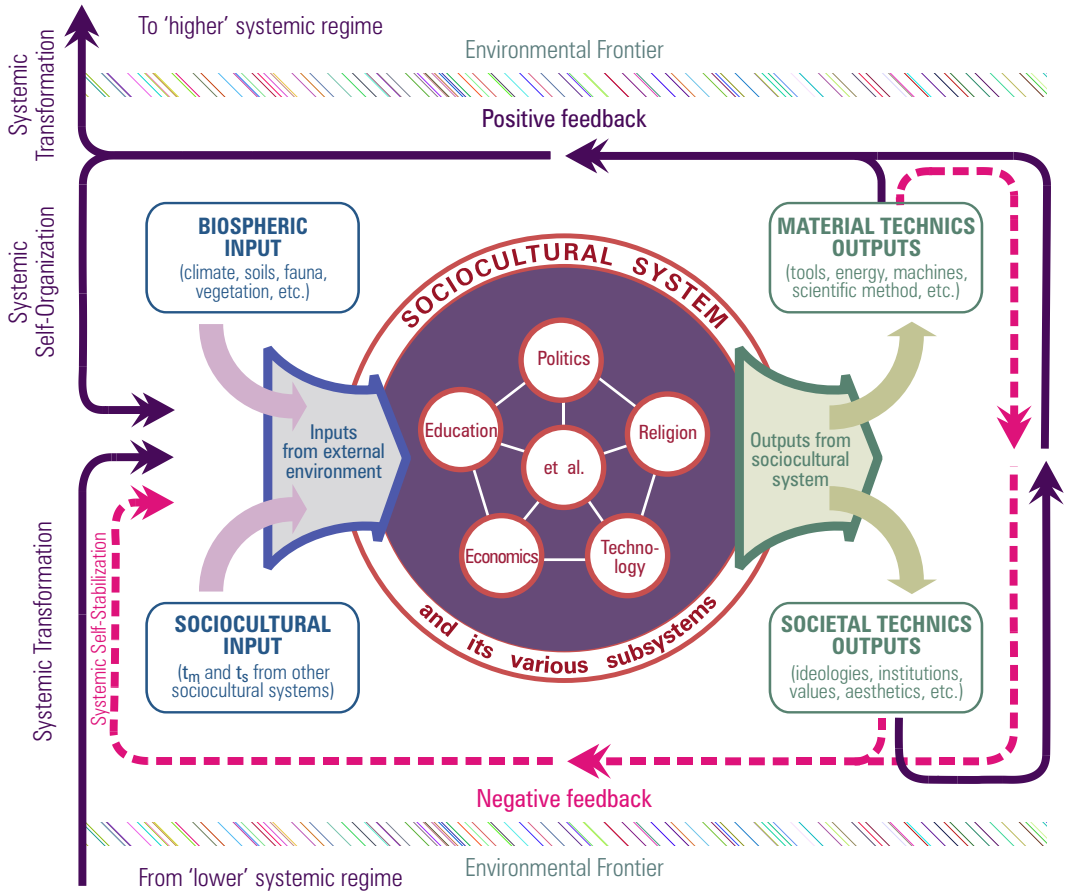
t_m agricultural technologies increase food production

t_s dress codes reinforce social structures

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 is bifurcated to show how (t_m) and (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 will result in either systemic transformation or collapse.

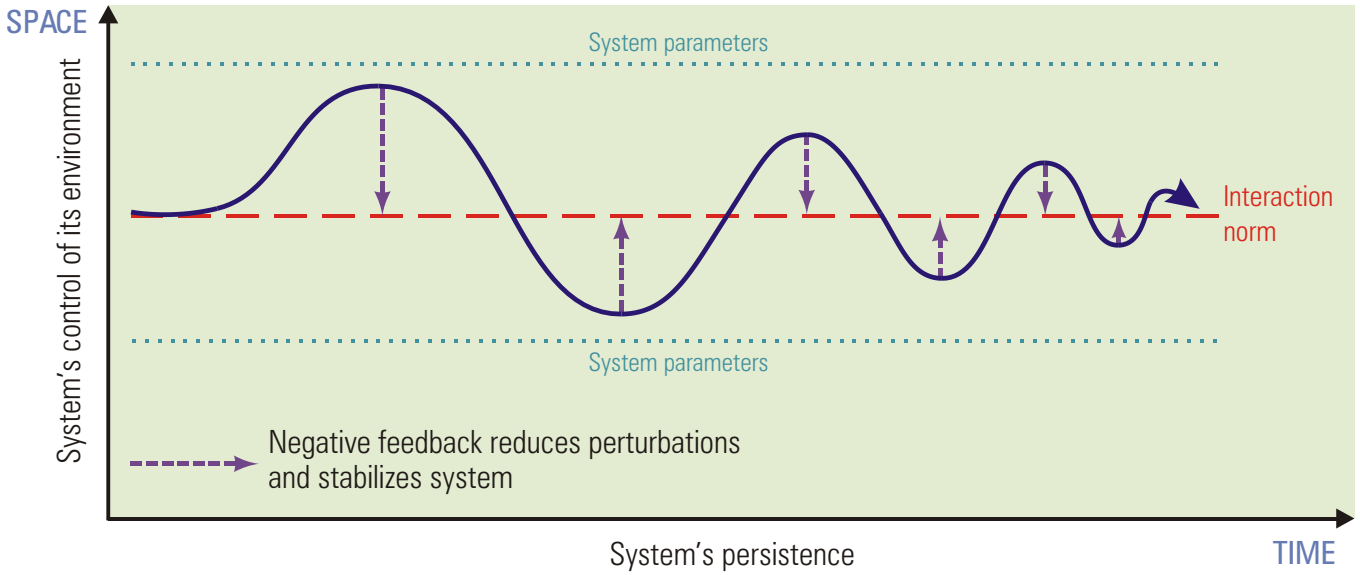


TST Metamodel Diagram

System Equilibration

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 Boundaries

All systems (whether stars, plants or societies) have boundaries. Boundaries are structures that manifest a system's underlying organization in a particular environment. In physical environments boundaries can be topological (e.g. the surface of the ocean); in social environments boundaries can be behavioural (i.e. ethnic membership).

Living systems have boundaries that are solid enough to preserve autonomy while being permeable enough to allow information and energy to be exchanged with the exterior. These boundaries enable systems to communicate and equilibrate with their environments. A system cannot maintain a congruent structure if its boundaries are exceeded – it must either collapse or establish a new structure with new parameters.

Societal systems and their sub-systems (e.g. families, schools, and businesses) are continually creating, maintaining and changing boundaries. A major function of specialized regulatory institutions such as legislatures, courts and the military is to control and integrate external and internal societal boundaries.

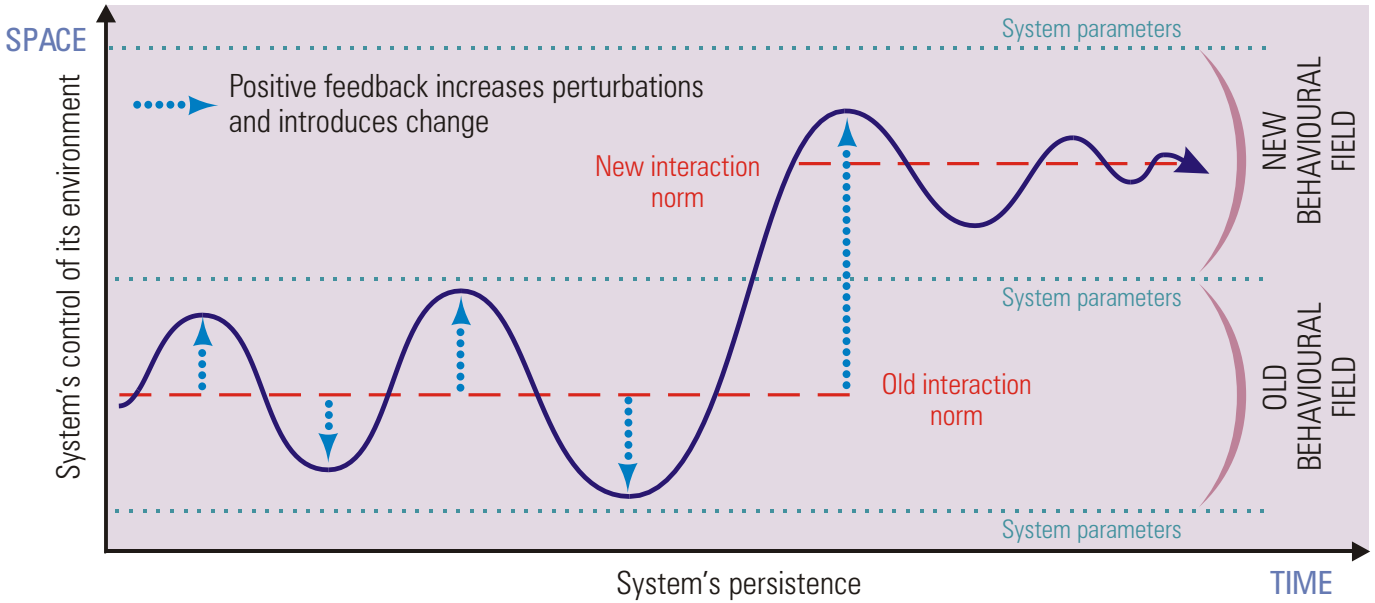
Legal institutions help to regulate societal boundaries

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.

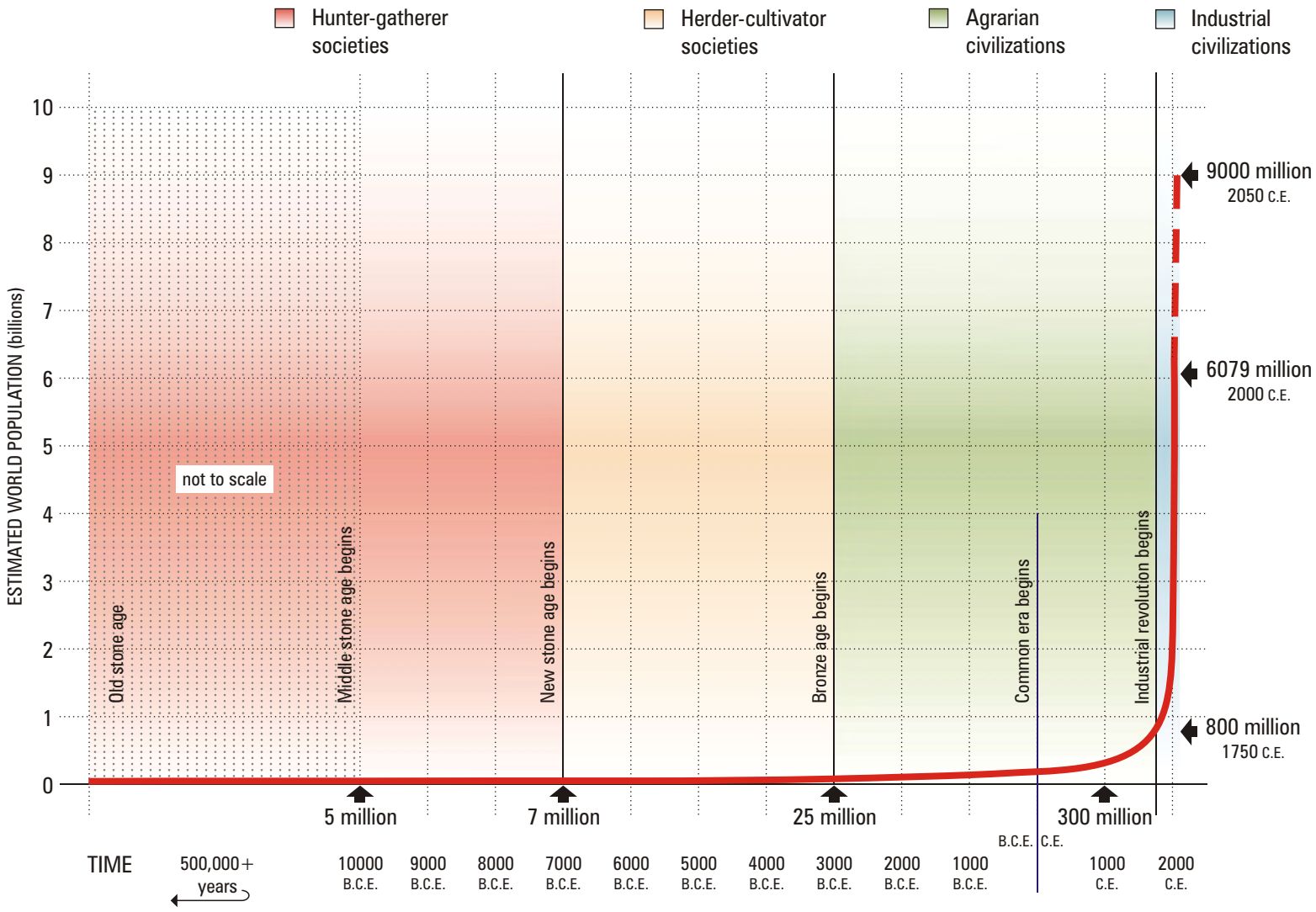
The external environment biases a system to move to a configuration (attractor) that optimizes its relationship with its surroundings. This process is called natural selection with living systems.

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.



Accelerating Change

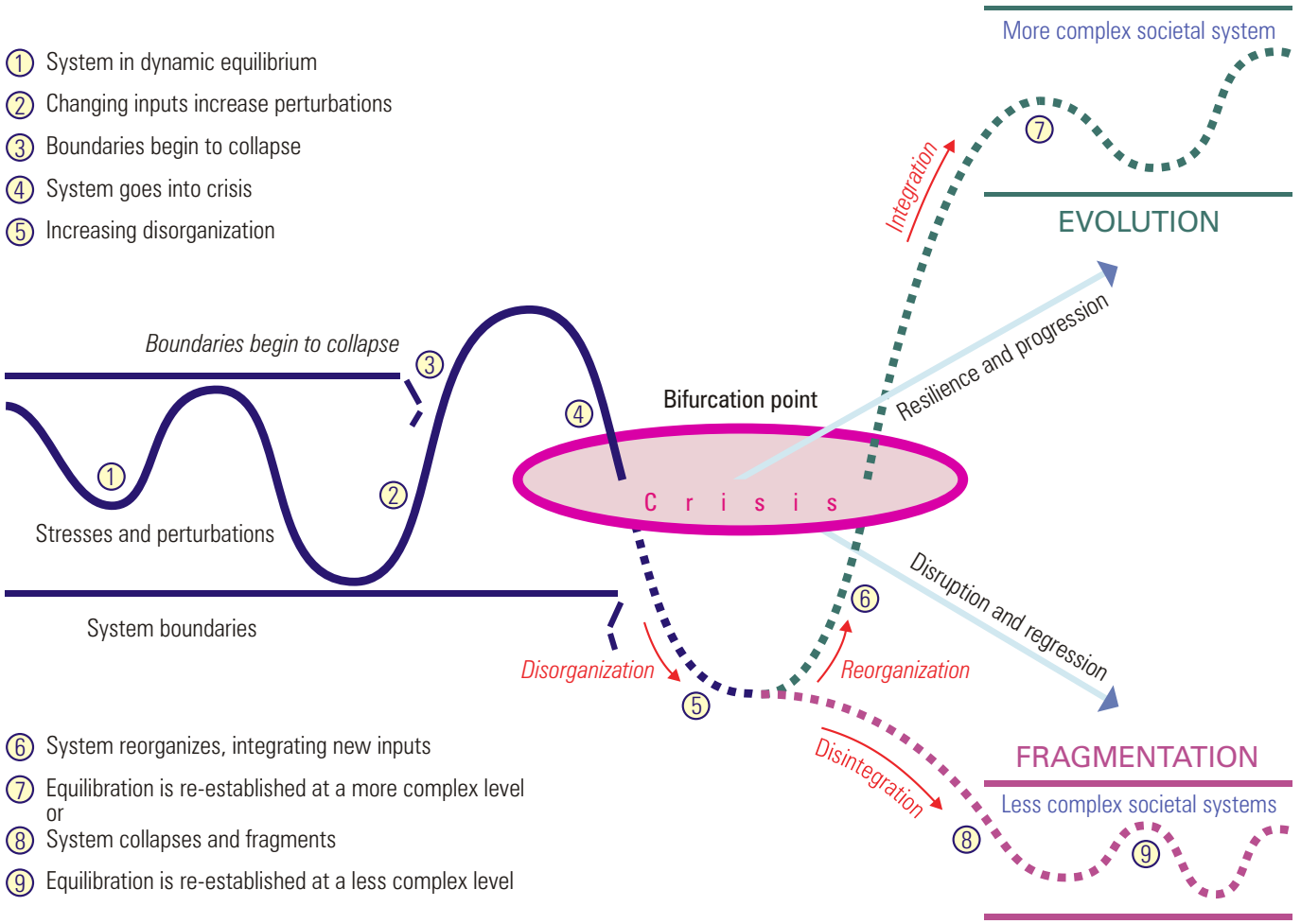
The rate of quantitative and qualitative change tends to accelerate over time. For example, human population growth has accelerated as more complex societal systems have evolved better environmental control capabilities (e.g. more food, less disease, etc.). Increasing populations in turn contribute to accelerating technological and societal change.



World populations are estimated. Based on data from U.S. Bureau of the Census (2003) and UNEP *Geo Year Book 2003*.

Bifurcation Points

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.



Societal Quantization

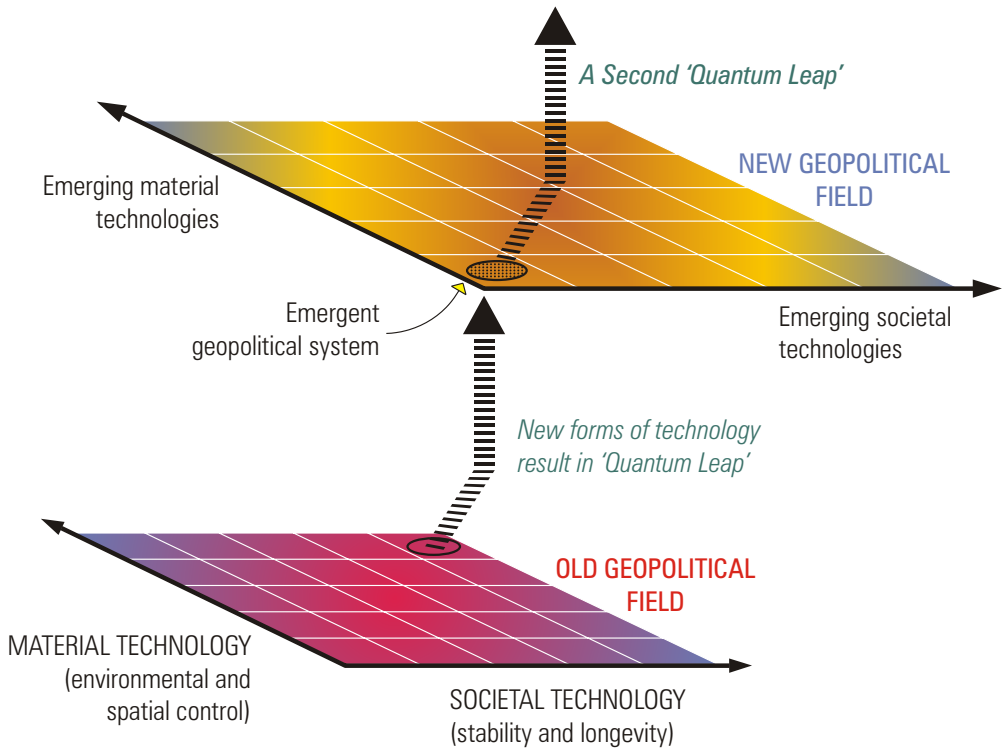
The process of a system evolving to a more complex system state is called quantization. The new system emerges with a new structure and additional properties.

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:

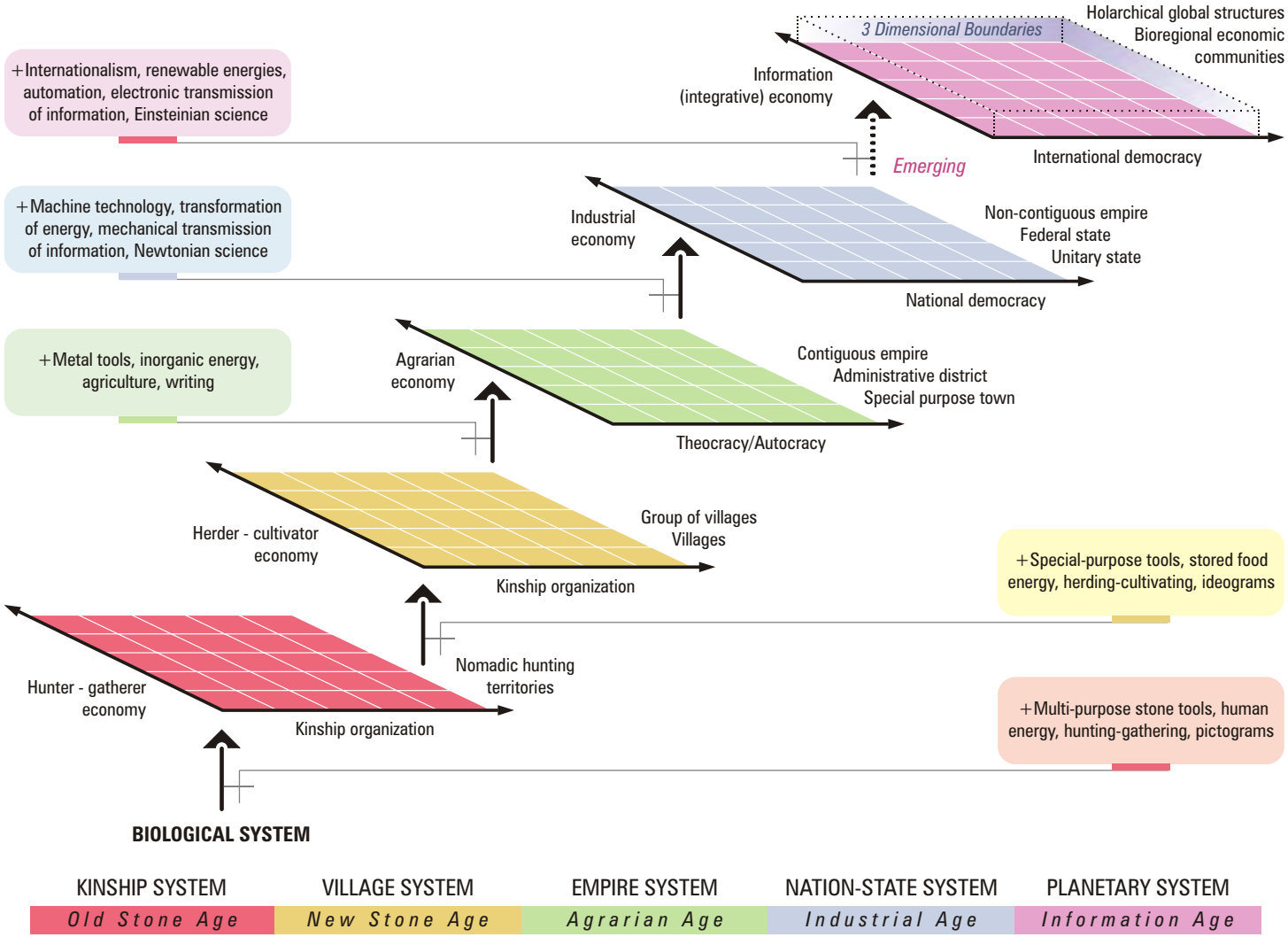
1. Technological/scientific innovations
2. Increased production and consumption of energy
3. Increased environmental control capacity
4. Exponential growth of populations
5. Economic growth and social complexification
6. Increased production/distribution of information
7. Increased societal feedback and control
8. New aesthetic canons and modes of expression
9. 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. *(See Appendices 1-3.)*



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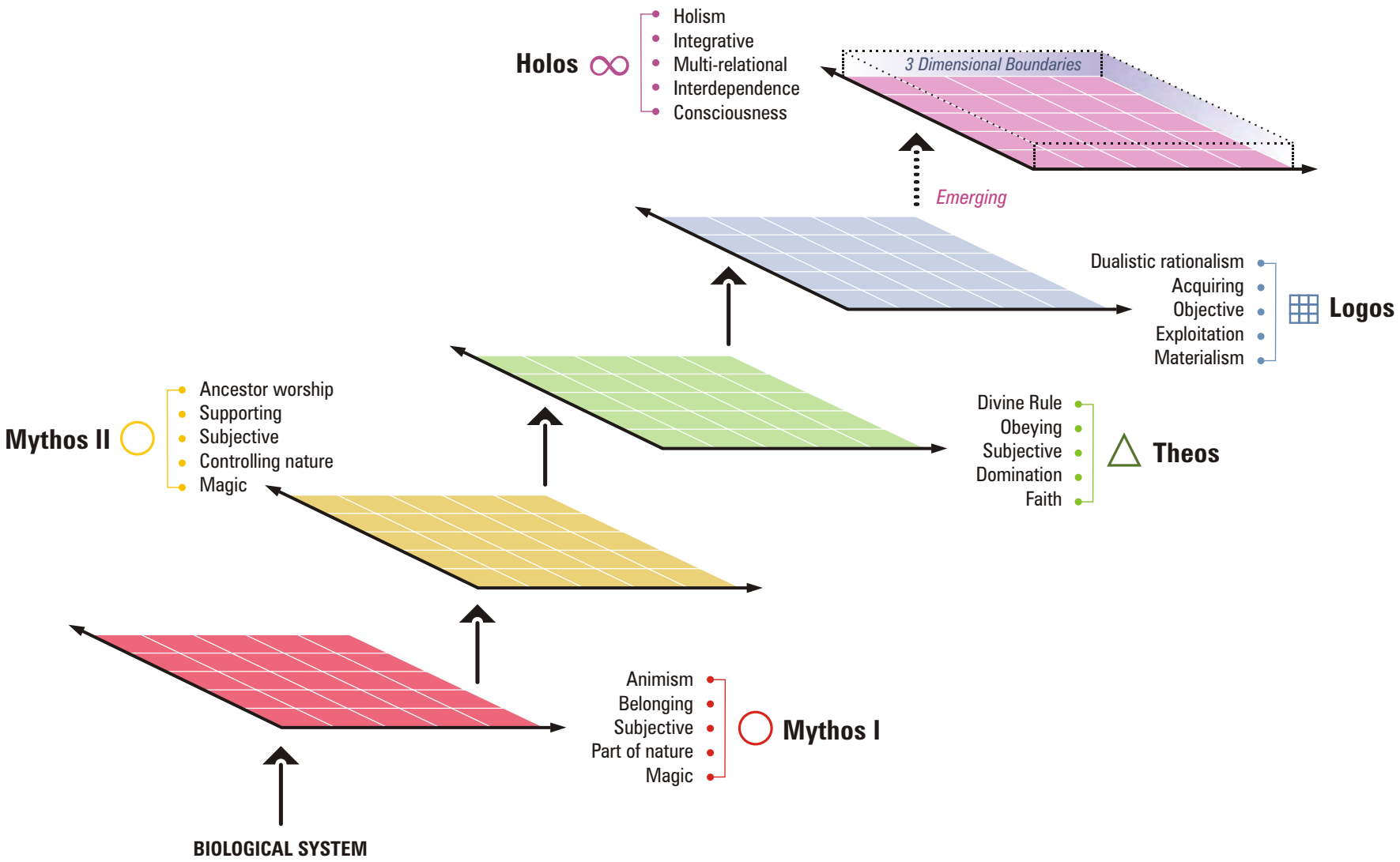
The Historical Evolution of Societal World-views

the symbolic patterns that organize societal systems

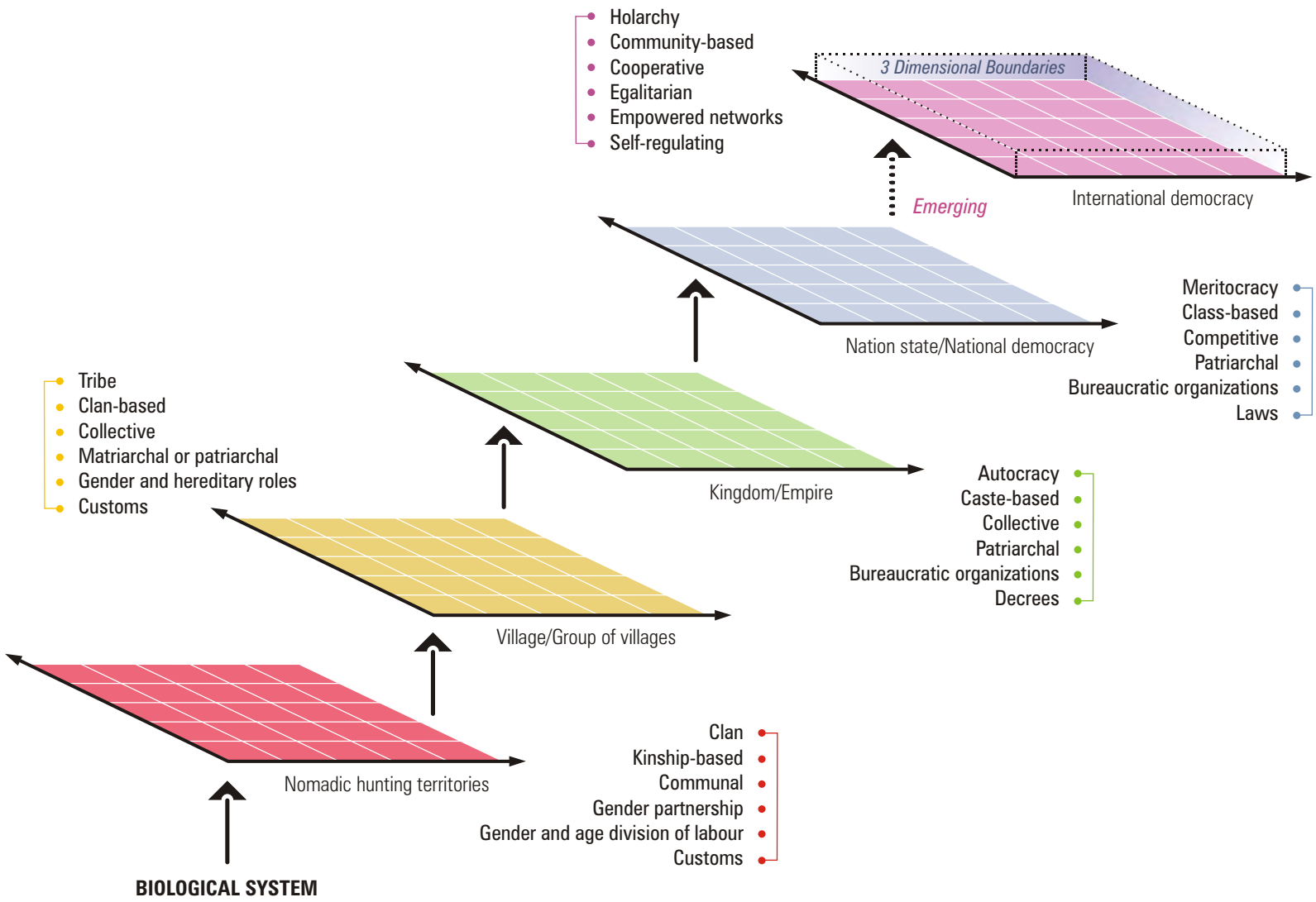


Old Stone Age	New Stone Age	Agrarian Age	Industrial Age	Information Age
KINSHIP SYSTEM	VILLAGE SYSTEM	EMPIRE SYSTEM	NATION-STATE SYSTEM	PLANETARY SYSTEM

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 Historical Evolution of Societal Structures

the organizational forms of societal systems



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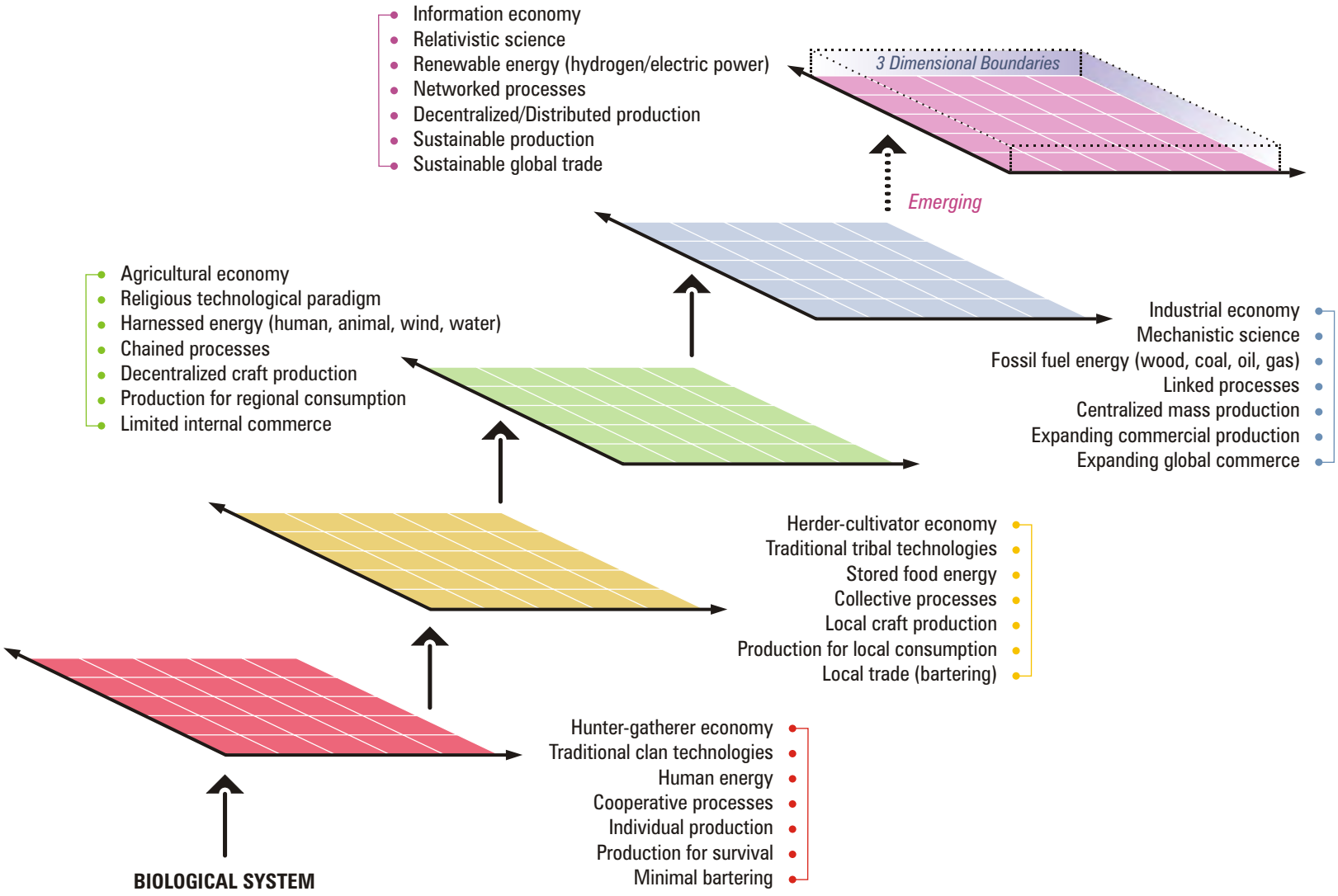
The Historical Evolution of Societal Processes

the material technics and economic operations of societal systems



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