Introduction to

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.

Universal Integrative Principles

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

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

Albert Einstein

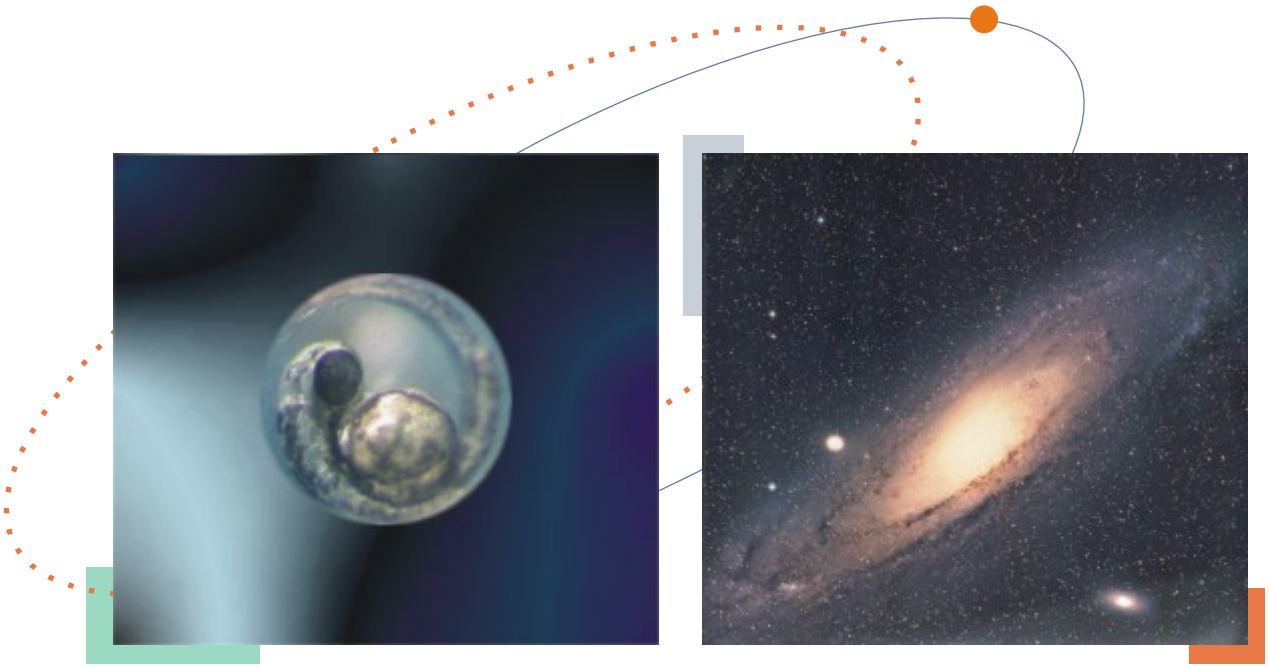
$E = mc^2$

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.



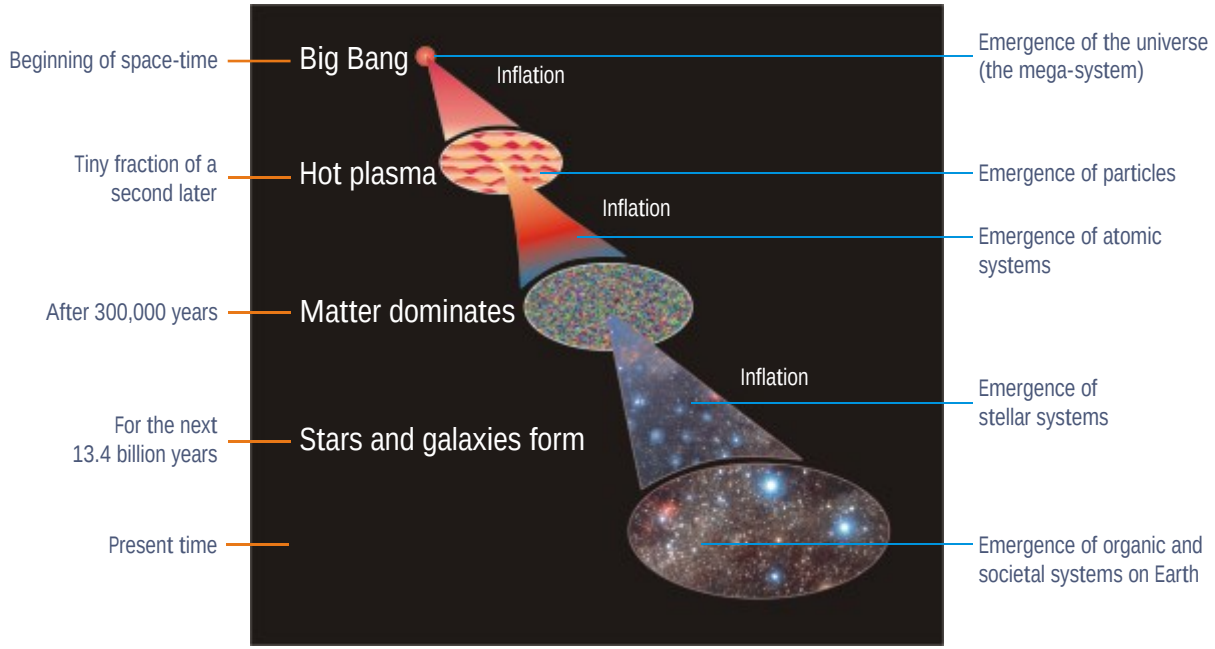
Fish Egg Andromeda galaxy

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.

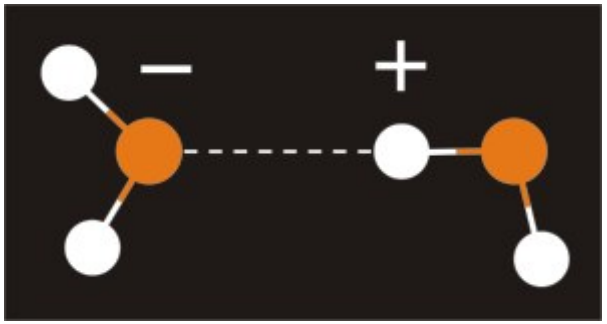
Integrative Principles

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.

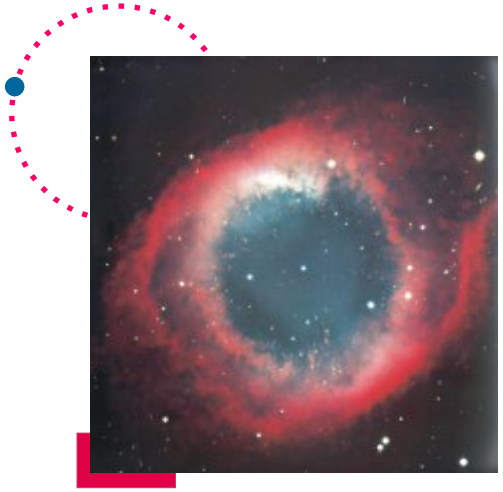
Hydrogen and oxygen are atomic systems with chemical properties. When combined into water (H_2O), they form a more complex molecular system with many properties that do not exist at the atomic level (at standard temperature and pressure), e.g. liquidity, cohesiveness, and the ability to act as a solvent.

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.

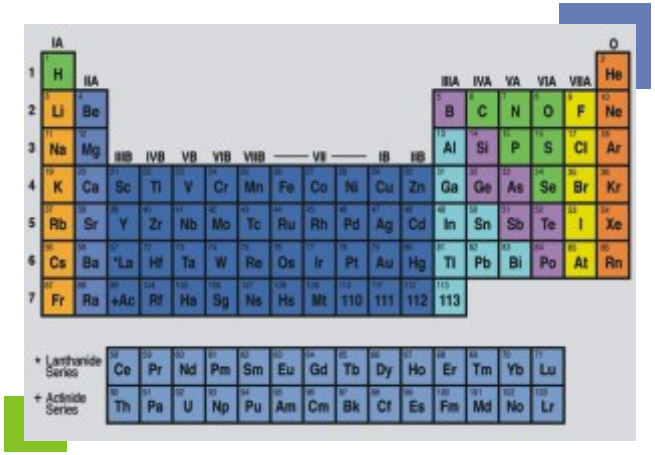
The periodic table demonstrates how the formation of chemical elements is governed by integrative principles. For example, although every element has a different structure, all elements demonstrate the *invariance* of the basic pattern of atomic systems. Similar entities have similar structures; the 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

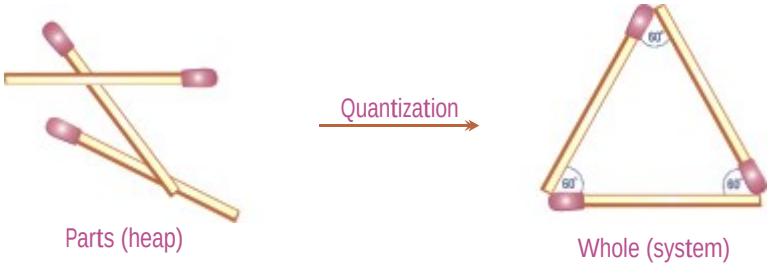


All elements are variations of atomic systems. Although every element is unique and has distinctive properties, elements that have similar structures share similar properties.

A Universe of Systems

A system can be defined as a whole functioning as such by the relationship of its parts. A system is more – and other – than the sum of its parts. When a system is formed, new properties emerge that are qualitatively distinct from the attributes of the system's components.

In the diagram a heap of matches is arranged to form an interrelated system. This system has additional properties: mathematically calculable angles and parameters.



The universe is a mega-system that includes all 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. Different holarchies describe different perspectives. For example, a chemical holarchy is different than a societal holarchy.

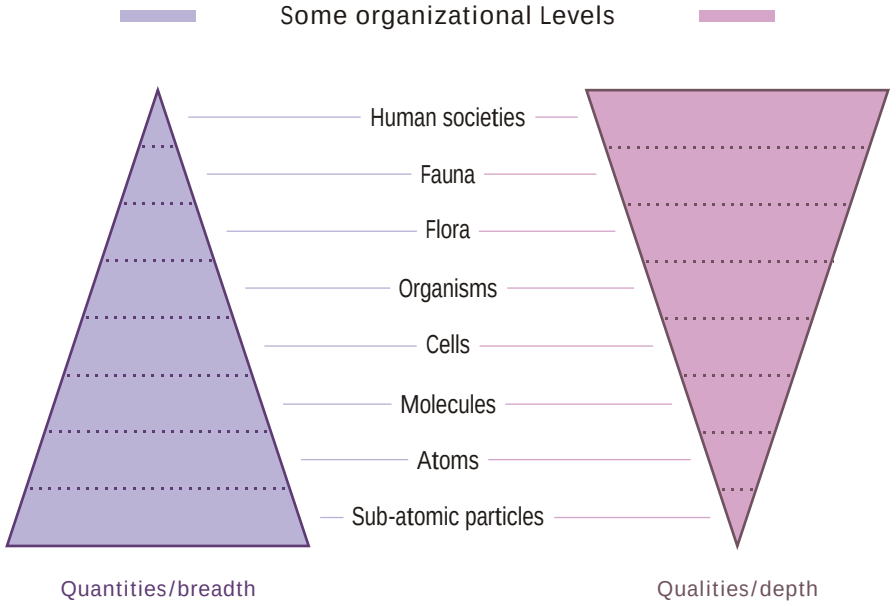


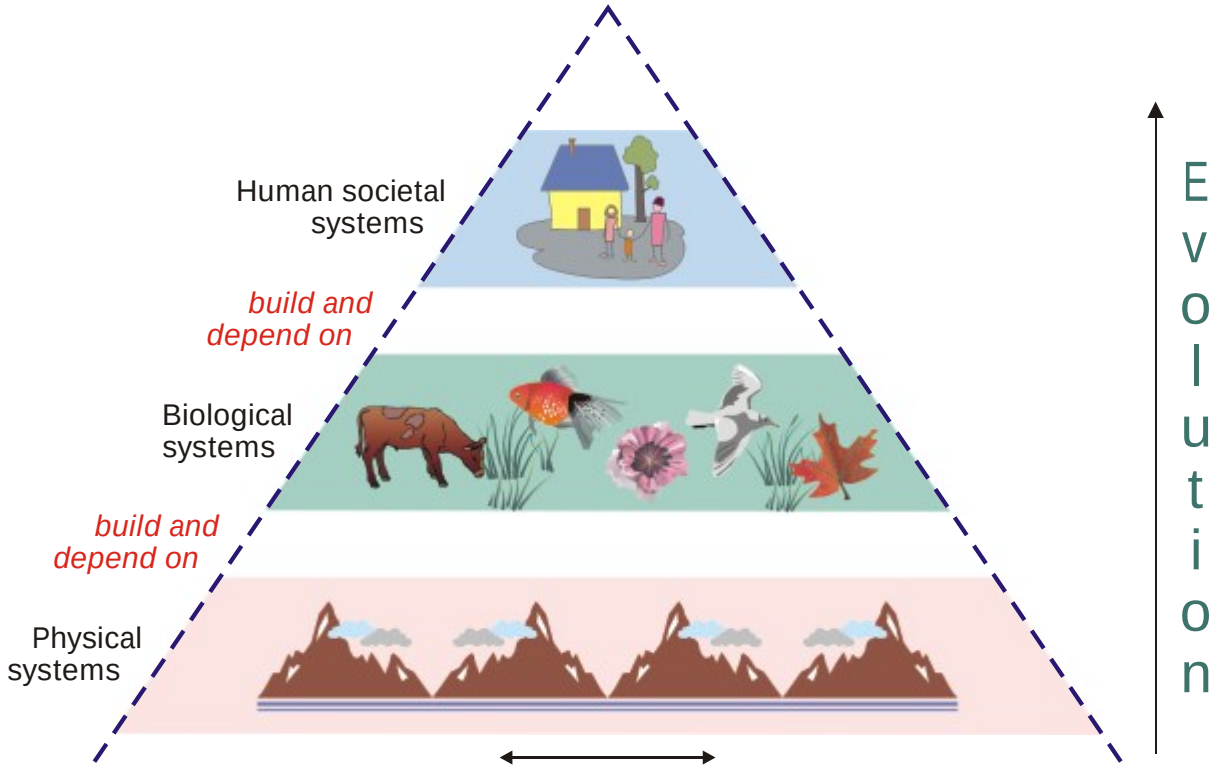
Diagram not to scale

An example of an evolutionary holarchy

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.

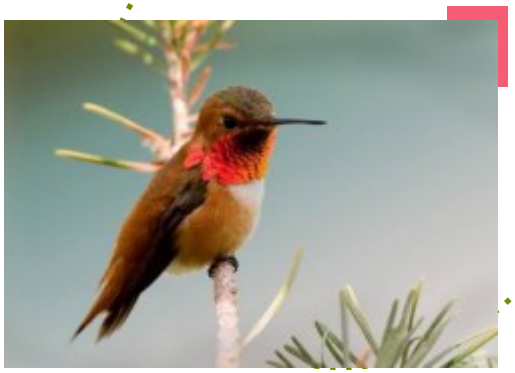
Organic life may have begun with self-reinforcing autocatalytic networks forming in primeval chemical soups. Autopoiesis occurs when a closed system of production processes evolves that is capable of regenerating itself.

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



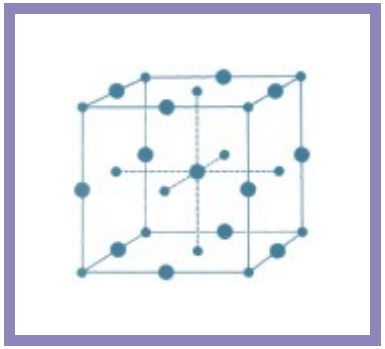
Animals survive because their structures support dynamic equilibration, mobility and the other functions they need to maintain and reproduce themselves in their environments.

Form and Function

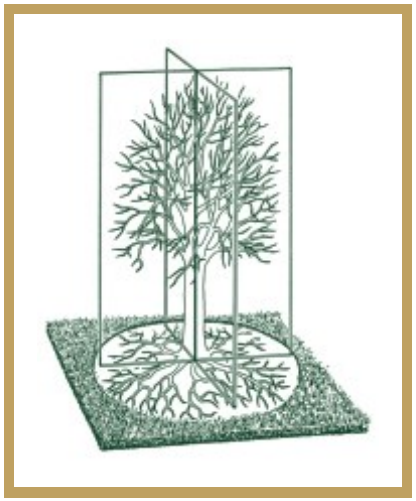
In order to exist, inorganic and organic systems must have structures that enable them to maintain themselves in relationship to their environments. Because open (dynamic) systems have a continual flow-through of matter-energy and information from their surroundings, they have self-regulating structures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