

The theory of "Life's complex systemicity"

THE THEORY OF "LIFE'S COMPLEX SYSTEMICITY", IS SHOWN AS THE LIFE'S META-DYNAMIC OF ITS SUSTAINABILITY:

A "BIOETHISM TRANSDISCIPLINARY APPROACH"¹ RESULT

Jean-Jacques Blanc, Consulting Engineer
Crets de Champel, 9 CH - 1206 - Geneva Switzerland
Tel/fax: +41(22)346 30 48
E-mail: j-j.blanc@bioethismscience.org
Url: www.bioethismscience.org

ABSTRACT

An extensive research on "Systems science", by the author J-J. Blanc, (since 1996) induced to his creating a new systemic² paradigm for a transdisciplinary approach of living systems. Named "The Bioethism", it was developed towards a large understanding of living systems origin, their natural structures, behaviors, bonds and evolution while permanently interacting with environmental events both within their body and their ecosystemic and sociosystemic environments, together with their status and evolution direction.

Beyond the sense given to the noun and the adjective "systemic" as linked to the notion of quite many systems in general, the notion of "systemicity", is, in this new theory, far more suggestive of the global dynamics, as "meta-drivers", that made Life to exist and sustain. To illustrate the dynamical sense of it, it is only to refer to another notion that has a dynamic sense: the "velocity"³.

The survey of the different disciplines concerned with living systems' survival, an analytical methodology and analysis of the above processes, led to the emergence of a new theory the author called "The Life's complex systemicity" that is relying on the entire body of dynamics that made and make life to exist and sustain, thus adapting to the dynamics of changes. A "meta-systemicity" participates in such move in terms of the retroactive physical and cosmic⁴ dynamics world.

At the Asilomar ISSS 48th conference (2004), the author, introducing the notion of "systemicity" and its theory, first described "survival": a circular and regulating set of dynamic moves permanently fed along with a psychophysiological body streaming biochemical matters and information feedback. Those moves are fed from necessary survival interactions and retroaction as they result from the endogenous or exogenous milieu changes. The body of these retroactive phenomena that are fundamental to living system's survival, suggested another and complementary approach in the form of a new paradigm. As central to Life's dynamic, these systemic circular phenomena as the product of interactions with the environment of life's ecosystems and creatures' bodily structures were then named by the author: the "environmental-psycho-somatopsychism", (a neologism and its abbreviation: "e-psop"). A overview upon the entire body of interdependent bio-physicochemical mechanisms, processes and streams, interwoven within "3D networks" shows that systemic survival abilities and performances are epigenetically provided from the convergence of

¹ - **Bioethism** is a universal paradigm that I developed in 1996 and which proposes a transdisciplinary approach of any living system interactions within its environmental spaces, its body and ecosystem's niche, a behavioral representation in terms of "**Biology, Ethology-ecology and Humanism**". The presence of man stresses the necessity to approach survival fundamental values as common to all creatures and for the protection of life on Planet Earth.

² - **Systemic**: dynamic and retroactive forces pertaining to or affecting an entire body or organism.

³ - **Velocity**: "the rate of change of position along a line and/or throughout a 3D network, with respect to time or the derivative of emerged positions with respect to time. It is also a rate of occurrence or action : the differential speed of historical changes.

⁴ - **Cosmic**: the essence of the general relativity is in the space-time that has dynamic properties

The theory of "Life's complex systemicity"

cosmic forces (magnetic, gravitational...) and planetary conditions (geologic, geochemical, geophysical, geo-climatic...) that retroactively sustain individual creatures to exist and survive within a world of inevitable interdependency.

The efficiency of the streams of circular information, stimuli and survival activities require adaptation to the dynamics of these "physicochemical games" and other environmental changes. The energy that is required is provided for by environments and transformed into metabolic results that "fuel" the vitality of life's biological processes. Then, epigenetic and emergent results induced to from the cosmic physicochemical world, together with evolution changes, promote biochemical and physiological processes, that structure, assimilate and form body components, psychic structures and differential metabolic outputs for creatures to survive. The "entirety" of these universal, cosmic forces, planetary mechanisms and processes, as individually and globally dynamic, sustains the notion that such "Systemicity" is the meta-dynamic that was and is Life to be.

As the description of "The Theory of Systemicity" will require several communications, it is here decided to brush up some of the scientific principles that support the whole complexity of "Systemicity". We will nevertheless partly develop the historical and timely aspect of "Systemicity" as part of the meta-systemic dynamics that sustain our Planet as "Gaïa" and Life as the convergence of emergent results.

Keywords: Systemicity, Bioethism, dynamics, meta-drivers, cosmic physics, psycho-chemistry, epigenetic, complexity, survival – retroaction – percolation – feedback – reflexivity – neural brain – emergence

Acknowledgment

Since this "new general theory", as named "The general meta-systemicity" is very much innovative in terms of its being transdisciplinary and bringing up a new mode of describing cosmos and living systems dynamics. It was postulated that developing the theory would require the structure to have many chapters that are complementing previous and future papers issues. The whole description of the "Theory of Complex Systemicity" also requires practicing, step by step, a transdisciplinary approach, which is a very large work in time. The following pages reveal only some of the aspects of the theory in terms of physics, chemistry and biology principles with specific descriptions about "The Life's complex systemicity", and upstream, about the "meta-systemicity" in cosmos. Both are illustrating the implication of numbers of dynamics and mechanisms, which interdependent imbrications that are supporting the final "theory of general meta-systemicity".

THE NOTION OF "SYSTEMICITY"

The notion of "systemicity" is related to the globality of primordial and dynamic phenomena and processes, which mechanisms are confronted with physicochemical moves of matter and energy. These systemic moves emerge from interrelated and interdependent interactions results of atomic and physicochemical components, which are submitted to permanent changes that occur within cosmos and solar system as well as on the terrestrial surface. Those universal physical and chemical forces are constraints to the Planet evolution and to that of other cosmic objects. Further more, the notion of "Systemicity", appreciated in terms of drivers is consubstantial to that of "velocity" as having both a dynamical connotation.

The theory of "Life's complex systemicity"
EMERGENCE OF THE THEORETICAL ISSUE
AT LEVEL OF COSMIC PHENOMENA

The "Systemicity" of dynamic phenomena that occur within the cosmos is a highly complex set of evolutionary phenomena with permanent interactions between physicochemical cosmic objects, the Earth included. Cosmic "climates within specific galactic systems" are every day influencing the Earth and living creatures' behaviors for survival. In order to take inventory of the different sets of dynamics that shape up the "cosmic systemicity", it is then necessary to overlap the quarrel on reductionism, since Life originated out of a complex and long period of heavy and unstoppable chains of physicochemical events that made the Earth to mould from them, becoming the theater of ever changing ecosystems' components under an ever changing climate.

In the time of its youth, the Earth's global climate was heavily influenced by the behaviors of cosmic forces and the solar system as well as the formation of the moon, the bombardment of the Earth by meteorites, asteroids and comets and the apparition of oceans on Earth. An immense network of interrelations between interactive and emergent results of atomic, physical and chemical events is, accordingly, in constant evolution within breathtaking changes. In other words, "the complex systemicity" of these dynamical phenomena changes the cosmos global systemic landscape at each single instant, changes that are few to be visually perceived at a human eye level, considering the lapse of time that is to be reckoned in million and billion years.

History of the Earth Up to the Origin of Life

The history of Earth is an emergent result out of interrelated cosmic events that were induced to diverse cosmic phenomena and forces: it is said to have originated from a Supernova. The Hadean time (4.5 to 3.8 billion years ago) is not geological. During its history, the sun was forming and was the result of gravitation until its undergoing thermonuclear fusion that gave off light and heat.

The Earth, as other planets, formed from the coalescence of particles by gravity into larger objects (*planetesimals*) which continued to aggregate into surrounding planets. "Left-over" material formed asteroids and comets. Because of collisions between large cosmic bodies releasing a lot of heat, the Earth has probably been molten at the beginning of its history.

The Universal Gradual Evolution: a Matter of Primordial Systemicity

The very slow transformation of the Universe over -12 billions of years until the Earth's formation as a planet, and the arrival of Life at an early Archaean period, around -3.8 billions of years is an authentic illustration of "an evolving historicity". It shows four kind of dynamical phenomena:

- The high constraints of thermodynamics over cosmic objects, and its practical implementation
- The retroactive effect that induce to endogenous and exogenous status changes, while sustaining the formation and evolution of planet Earth's actual and temporary integrity,
- The high benefits of dynamical effects, in terms of an endemic balance that maintains planets at distance from an early death,
- The apparition of oceans and an atmosphere as conditions that implemented Life to appear.

The universality of "the general process of systemicity" is represented also by numbers of retroactive processes that produce energy (thermonuclear, physicochemical, solar, kinetic, radiant, gravitational, electromagnetic...) having diverse interrelated effects. For some of them, the chief parts of Albert Einstein's imposing body of work are here quoted:

The theory of "Life's complex systemicity"

"Albert Einstein, between 1905/1915, developed a special theory of relativity: the "electrodynamics of moving bodies" (the speed of light is a physical constant but a cosmic body never rest as continuing to move uniformly) and with the General relativity developed the geometrical theory of gravitation". An act that unifies special relativity and Sir Isaac Newton's law of universal gravitation with an insight that gravitation is not due to a force but rather is a manifestation of curved space and time, this curvature being produced by the mass-energy and momentum content of the space-time".

One names "Restricted Relativity" a first version of the theory of relativity (Albert Einstein, 1905) who did not consider the question of accelerations of a reference frame, nor gravitational interactions of the origin. However, it presented a coherent explanation of the electromagnetic interactions and their transformations by change of reference frame using the transformation of Lorentz. Moreover, it solved paradoxes existing in traditional mechanics relating to the velocity measurements of the light. This theory introduced for the first time the concept of space time and explained phenomena of variation of the duration and measures of length between an observer and another, each one of them being located in a different reference frame. Since then they were experimentally checked and have shown results of retroactivity between these moves" (excerpts from diverse encyclopedic texts).

Paul Dirac (1928), developed a relativistic electron theory and quantized⁵ a field theory, called quantum electrodynamics that unify relativity and quantum theories in reference with the interaction between electrons, positrons, and electromagnetic radiation. Furthermore, it shows the QE situations in which matter is converted to energy and energy converted to matter (*the particle of light, electricity and magnetism*). Electromagnetism is the physics of the electromagnetic field: a field which exerts a force on particles that possess the property of electric charge, and *is in turn affected by the presence and motion of those particles*.

The planet Earth is protected from solar winds (current of plasma flowing from the sun) by "the Van Allen Radiation Belt" held in place by Earth's *magnetic field*", also helping atomic forces and reactions occurring around the Earth to be "rinsed out". The solar wind pressure (magnetic storms pressure) on the magnetosphere increases or decreases depending on the Sun's activity: it changes and modifies the electric currents in the ionosphere (ions and free electrons).

This general analysis shows very clearly the "systemicity" of those interdependent dynamical cosmic processes and forces. I call such global phenomenon a "primordial systemicity" from which emerged several results that participated in the emergence of Life on Earth. Within the body of dynamic processes were (and still are) mechanisms of reactions, retroactions, circularity, reproductions, adaptations to physicochemical moves, changes and apparition of new proprieties, which were all seeds of evolution with emergent results). The moves were (and still are) "drivers" making emerge the different bricks of reactive structures, from which, by synergy⁶, proto-metabolisms and living system's metabolisms were given boosts, and induced to dissipative structures that became and are still adaptive creatures.

Changes of state and transition of phase

Pierre Papon, (2002) describes the change of states together with the dynamic of phase changes as they confuse the boundaries with metastability. He wrote about different classes of phase transitions such as: vaporization, (the passage of the liquid to gas), fusion (the passage of the liquid or solid and its reverse that is solidification), the transition between the ferromagnetic state (the material with a permanent magnetization) and the paramagnetic state (without permanent magnetization), the transition supra conducting (the material becomes a perfect electric conductor, etc. These phenomena between opposite statuses usually pass by an intermediary qualification.

⁵ - **Quantize**: restrict a variable to a specific set of values as forming into quanta (Physics)

⁶ - **Synergy**: "a mutually advantageous conjunction or compatibility of distinct actors or elements (as resources or efforts).

The theory of "Life's complex systemicity"

"The states of the matter are like the countries of a complex geography, separated by borders" he said. The passage from one state to another as named transition phase, corresponds to the crossing of a border. But transition is often fuzzy; in certain conditions, the substance can pass by a state known as *metastable* before changing course towards a stable state. The passage of a state to another is not instantaneous and there are "undecided" states with particular properties, halfway between liquid and solid, such as the Earth's state transformation at the Early Achaean, or /and at the state of permafrost.

Metastability scrambles the thermodynamic borders separating the solid, liquid and gas states. Beyond of a certain range of thermodynamic parameters, the phase considered becomes unstable and one necessarily passes in another state through a transitory state. The complex history of the Earth is a proven event and said to be the fact of an "evolutionary history": it illustrates the results of the dynamics that participate to the cosmic and terrestrial global meta-systemicity that induces to a slow sequence of fuzzy changes of phase within ago-antagonistic results. Phenomena that perpetuate themselves throughout the Earth's and Life's actual conditions show that Earth's evolutionary living conditions and survival sustainability are "governed" with the systemicity of the set of dynamical forces that make it survive far from equilibrium unless a major catastrophe should wipe Life's out.

ENVIRONMENT CONDITIONS IN WHICH LIFE ORIGINATED ON EARTH

The Oxygen clue

The most primitive organisms in existence today include bacteria that live in terrestrial hot springs and in deep-ocean hot water vents created by volcanic activity. The evolutionary significance of these organisms was found from ancient sedimentary rocks that are far more abundant in iron than are modern marine sediments. The waters that deposited modern sediments are rich in dissolved oxygen, and iron in the presence of oxygen quickly turns to rust, in a process called oxidation showing rust does not dissolve in water.

In contrast, non oxidized iron dissolves, moving into the oceans in waters flowing down rivers. Traces of oxygen could cause this iron to precipitate out of the water and fall to the ocean bottom, without turning it to rust. The abundance of iron in primordial sedimentary rocks therefore suggests that there was very little free oxygen on the early earth, either in the atmosphere or dissolved in the oceans.

Atmospheres

At the time of its completion as a solid body, the Earth's atmosphere was of water vapor, nitrogen (N₂), methane, some hydrogen and small amounts of other gases: some carbon dioxide (CO₂), very little breathable oxygen (O₂)...

J. H. J. Poole, University of Dublin (~1947) postulated that the escape of hydrogen from the earth led to its oxidizing atmosphere. The hydrogen of methane (CH₄) and ammonia (NH₃) might slowly have escaped ("rinsed out" by the Van Allen belts moves?⁷), leaving nitrogen, carbon dioxide, water and free oxygen. At the Earth's surface, warmth was of a temperature over 49° C (120°F) as a result from volcanic and tectonic activity still going on with less intensity and frequency.

⁷ - **Relativistic electrons:** "populations of relativistic electrons (relation between energy and velocity) and ions in space form or change in response to changes in solar activity and the solar wind".

The theory of "Life's complex systemicity"

Cosmic and Earth's body dynamics: major systemic influences

Then, largely produced by the moon tidal forces, combined with laws of physics: e.g.: gravitation slowly reduced the earth spins at one revolution in its axis: days became longer. Abundant volcanic activities were found from radioactive material in the early earth, giving off heat produced by volcanoes. Rocks appeared as the Earth cooled and the oldest ones are known to be 3.8 billion years old.

A new period of time began known as the Archaean⁸. The Earth's rock crust slowly formed continental plates with small embryonic surfaces called "cratons", which are the stable part of continents "excreted" from the Earth's mantle systemicity: the internal moves from the core up to the surface of the continents and oceans, in other words the convecting system of the mantle away from hot mantle zones toward cooler ones. This process known as continental drift, together with the subduction of plates into the mantle is a systemic drift move (Plate tectonics) that produces earthquakes and volcanic eruptions and major changes of continents geography along hundred millions years like the surge of mountain chains and the apparition or *disappearance* of oceans and seas.

OCEANS AND THE APPARITION OF LIFE

Water and oceans

The geological history of the Earth began in a lapse of time of around 800 million years, while it changed from liquid to solid.

To day, the origin of water on Earth has *not* been clarified; even so the world's oceans were described to have formed over the past 4.6 billion years. From a systemic point of view, and under the effect of the "meta-systemicity" of cosmic and terrestrial dynamics, contributing factors to the origin of the Earth's oceans are described such as:

- The cooling of hot gases released: as "outgassing" and/or sublimation and evaporation which are "phase transitions" of a substance into a gas, potentially bringing water to Earth.
- Comets, trans-Neptunian objects or water-rich asteroids (protoplanets) from the outer reaches of the asteroid belt colliding with a pre-historic Earth may have brought water to the world's *oceans*.
- Liquid or wapor, water "locked" in the Earth's rocks leaked out over a few million of years.
- Photolysis: The direct process is defined as the interaction of one or more photons interacting with one target molecule. Radiation can break down chemical bonds separating liquid from hard mass.
- Rain and sandstorms may have pooled.

While it is said that "*more than one of these factors contributed to the vast oceans*", it is also likely to postulate that the first living creatures capable to increase the oxygen rate in the atmosphere were algae and some bacteria structuring stromatolites⁹ rocks. Algae chloroplasts with chlorophyll use sunlight to assimilate carbon dioxide and produce glucides, while releasing from oxygen. A chemical component of water that, over long billions of years, was

⁸ - **Archaean**: "pertaining to the earliest known forms of rocks; of or belonging to the earlier of the two divisions of Precambrian time".

⁹ - **Stromatolite**: "a fossil rock with a structure worked out by a community of microscopic organizations, primarily various types of bacteria and algae" (photosynthesis).

The theory of "Life's complex systemicity"

produced in such volume that it progressively changed the atmosphere composition¹⁰ so as to be breathable but also capable to activate the amount of water vapor that induces to different paleoclimatic changes, precipitation into rains, runoff waters and recycling with evaporation..

The hydrologic cycle and winds: a transdisciplinary approach

The circulation and conservation of earth's water is in a frequent state of change (surface water evaporates, cloud water precipitates, and rainfall infiltrates the ground...). It is most probable that the whole volumes of water contained on land, in oceans, and in the atmosphere was progressively attained to in balance with the increasing volume of oxygen in the atmosphere. The formation of the Earth crust within a changing atmosphere, changing land and ocean environments was changing temperatures. The hydrologic cycle that could be considered as a closed system has a reactivity towards the cosmic behavior of the planet, which is under the influence of the presently described "meta-systemicity". Participating in it, the sun dynamics, and gravitation are only two of the components of the set of the "Systemicity" dynamics.

As for winds, one has to consider other dynamics that influence the systemicity of moves: air masses and circulation fronts. Cold fronts and warm fronts and different type of advection are collectively forming global and local climates according to temperature, moisture and vortex advection conditions. Global winds result from solar heating of the Earth and the differential heating between the equator and the poles, the rotation of the planet (Coriolis effect) and the magnetic fields are major influences on the atmospheric circulation of air and clouds masses.

There again appears the complexity of both "meta" and life's dynamical systemicity where cosmic and terrestrial forces interact. The complexity and interconnectedness of each of every physicochemical and bio-geological cycle within the 3 dimensions of ecosystems produces differential opportunities for matter, energy and organisms to adapt themselves to their temporal conditions and reactive behaviors.

APPARITION OF LIFE AND DYNAMICAL SYSTEMICITY

It was early in the Archaean that life first appeared on Earth around -3,8 billion years ago. Oldest fossils date to roughly 3.5 billion years ago, and consist of bacteria microfossils. They grew along ancient seacoasts and endured harsh sunlight as well as episodic wetting and drying by tides. Environmental conditions like subaquatic volcano emergences with significative temperature and gas effects induced some living creatures (Archaeobacteria) to develop, finding energy and metabolic nutriments from chemical reactions within the water and matter milieu. They constitute a taxon of the living characterized by cells without core and distinguished from the eubacteria¹¹ by certain biochemical characters, like the constitution of the cellular membrane or the mechanism of replication of the ADN.

Bacteria cells and viruses built interactive and interdependent communities, which, along extended period of time of evolution and natural selection, structured the first plankton creatures. Phytoplankton (algae as autotrophic¹²) and zooplankton (protozoa as eukaryotic¹³, usually single-celled) are micro-organisms that became the primordial apparition of food chains constitutive of all extinct or actual species. In that respect, the major "survival

¹⁰ - **Atmosphere:** actual components are nitrogen (78 percent) and oxygen (21 percent). In the remaining 1 percent are argon (0.9 percent), carbon dioxide (0.03 percent), variable water vapor, and trace amounts of hydrogen, ozone, methane, carbon monoxide, helium, neon, krypton, and xenon.

¹¹ - **Eubacteria:** type of spherical or rod-shaped bacteria.

¹² - **Autotrophic:** light (photosynthesis) or of chemical links (chimosynthesis).

¹³ - **Eukaryotic:** having cell organelles and nuclei with chromosomes.

The theory of "Life's complex systemicity"

dynamic principle" is a consequence of the predator-prey process which emerged while the RNA structured. Many of them learned how to extract oxygen from water or produced it.

In perspective of a molecular phylogenesis approach of primordial biological matters as corresponding to genes producing ancestral proteins, Joseph Thornton, (2006) developed and tested primordial proteins as big molecules intervening in most functions of organisms. Primordial proteins that had not participated to organisms' metabolism for billions or hundred million years are coded from gene sequences and discovered together with mixed software model of phylogenetic methods for evolutionarily heterogeneous data and lab tests.

The planet Earth called "Gaïa": a living system

The "Systemicity outputs" are illustrated with some of J.E.Lovelock's (1979) developments over the planet Earth existence as being a living system he called "Gaïa". Lovelock's theoretical approach is based on:

- The thermodynamics second principle: matter tends towards an increasing entropy, or disorder, in terms of physicochemical balance, thus its degradation and extinction.
- The "survival principle" opposes itself against disorder since Life constantly renews its molecules from biological retroactivity and adaptation (also see later the molecules of emotion)

The environmental conditions on Earth, at the time Life gradually came out of the limbo, were strongly radioactive and the atmosphere, with very little oxygen and no ozone. It was above all exposed to UV radiations. The pressure of Earth mass and accumulated energy of its radioactive components heated its interior to the point gases and vapour expelled from it, participating to the formation of air and oceans. Among these gases was enough hydrogen for life's elements - organic components – to form and survive: hydrogen is present in the universe and is essential to life's components (carbon, nitrogen, oxygen, phosphorus, iron, zinc and calcium. Hydrogen is also the fuel of sun that provides, together with water, the flux of energy essential to the physiology of organisms.

The presence of free oxygen induces to the development of oxydo-reduction in environments: oxide components reject oxygen – rust become iron - and "hydrogen +" induces to balance acids and alkaline. If these condition have enough potential, then environmental milieu are prepared for the physicochemical development of the components that will develop Life. Further more, the temperature of the Earth surface was constant, actually in favour of Life to develop.

The abundance of organic chemicals together with side waters and solar energy provoked reactions in favour of the production of Life's components (acids, reactors...) that were progressively interacting and reproducing while they were tossed around within bubbles in shallow and tidal waters. We arrive at the point of this description, where bacteria and viruses appear as single cells, which mean that DNA had completed their assembly capacities (nucleotides, genes, chromosomes) and that two main functions were at the origin of cells: the membrane for integrity and reproduction with the coding of proteins, then molecules. At that time probably emerged the predator-prey dynamics. In an ecosystem, the ecological dynamics are illustrated by the field of oscillations, within which predator-prey populations occupy a resource, or several,

Without going further into Lovelock approach, the back office of this description is again understandable in terms of "systemicity" and dynamics that were participating to such moves, particularly the function of *feedback positive and ago-antagonistic biochemical reactions*. And also a wide set of functions: autocatalytic chemical reactions, reaction diffusion, morphogenesis, instability dynamics and pattern surge: activator/inhibitor.

The theory of "Life's complex systemicity"

Physics and Biology Worlds: Life cannot be described to Universal Laws

Evelyn Fox Keller, MIT, wrote in *Nature* 2007 that: "Biological *phenomena are permanently contingent upon evolution*". These general phenomena and events cannot be theorized but may be considered such as to rely upon provisional rules or "generalizations". Though submitted to physical systems, mechanisms and their universal laws, biological facts are ever changing and adapting differently from environmental events according to the world areas. The "Living" being reducible to the dynamic of physical and chemical materials, as well as "biops" ones (see the abstract) includes biological emotional reactors to the molecular emotion world for survival.

The hypothesis in biology having but only an intrinsic value of given explanations will never become "theoretical principles, nor "laws" as Life is an ever changing phenomenon. Moreover Life appeared within specific combinations of those cosmic and terrestrial dynamics where water and temperature were also specific, and different of today ones. It is quite right and understandable to observe the massive quantity of information contained within emergent nucleotides results as constantly interacting in an ago-antagonistic manner, of which one is only capable to bring about fragments of life's complexity. Further more the biological phenomena cannot be reduced to a specific molecule: DNA segments are "associated" to genes confronted with an ever changing environmental milieu.

Biology and Modelling: a Possible Description of Primordial and Fractional Mechanisms and Interactions

The science of the "Living" has made immense progresses in the understanding of its mechanisms, particularly since the genome was globally and chemically deciphered. From such base and from computerized data, many biological tests in laboratories enable scientists to reproduce and describe some of the Darwin natural selection and evolution mechanisms. The "paleomolecular biology" is a method applicable to genes sequencing, DNA synthesis¹⁴ and computerized models. By sequencing gene fragments models and tests have succeeded the reproduction (revival) of proteins that went silent for billions and/or hundred million years.

However these tests cannot be but fractional since it will never be possible to biologically restructure the whole RNA/DNA of past species since the building up of genes should individually take into account the impact of the environmental conditions of the moment, in other words, to reproduce the "dynamical systemicity" of the surroundings they lived in.

"Primordial organic functions" have surged along a very slow evolution of physical reactions confronted with worlds of entropy: processes issued from thermodynamic moves "work" with the specific ecosystems fluxes of the moment. Prior to the apparition of gene segments coding proteins, organic functions have induced to physicochemical reactions from which emerged "RNA reproduction capacities". Life was in limbo until unicells developed (bacteria, archaebacteria and eukaryote): "*cells are the atoms of the living world*". *A single cell is often a complete organism in itself, such as a bacterium or yeast*". However, virus¹⁵ types of organism raise the question of "egg or hen" metaphor, so anyone here may propose questions: "*when appeared the predator-prey chain mechanism*"? *Is the answer within the sole physicochemical milieu that developed this essential function to life? Would energetic results and effects be the clue?* Biochemistry, biophysics and molecular biology would certainly provide important information on the subject, even though Lovelock had his own arguments for them to answer.

¹⁴ - **Polymerase chain reaction (PCR)**: a molecular biology technique for enzymatically replicating DNA without using a living organism.

¹⁵ - **Virus**: "microorganism without a cell wall, able to reproduce only by inserting itself into a host cell and hijacking the reproduction mechanism for its own ends".

The theory of "Life's complex systemicity"

Joseph Thornton develops his researches with methods issued from molecular phylogenesis that uses software capable to compare actual genes in order to rebuild an evolutionary history of molecules together with paleomolecular biology. He studies how genes develop new functions by introducing ancestral genes into diverse environments (hot, cold, acids...) and observes the way evolution is adapting to these milieu conditions. However, rebuilding ancestral milieu is very much probabilistic and would be partial (fragmentary).

By way of consequence, it is postulated here that studying the primordial components of the living, and their evolution requires a good and transdisciplinary mastership of "Systemicity dynamics" and of sciences of the livings. The "Bioethism paradigm" was created at it.

Emergence of the Theoretical Issue on "Survival Principles"

At the Asilomar ISSS 48th conference (2004), I, as the author, described "Living systems' survival" as a circular and regulating set of dynamic moves permanently fed along with bio-physicochemical ("biops") matters and information from feedback that emerge from necessary interactions with the exterior. Such "glocal" retroactive phenomenon, which is fundamental to survival, suggested another and complementary approach in form of a new paradigm. As central to Life's dynamics, this systemic circular phenomenon is the product of interactions with the environments of life: ecosystems, brains, bodies" named by J.-J. Blanc: the "environmental-psycho-somatopsychic", (a neologism and its abbreviation: "e-psop"). The whole body of interdependent bio-physicochemical mechanisms, processes and streams, interwoven in a 3D milieu, is of many interdependent networks showing that systemic abilities and performances for any individual creature to survive come from dynamical forces. Because of permanent changes in behavioral statuses, one understands that "survival" is the result of many principles as constitutive elements like for example: eating, reproducing, self-defence... Evolution principles that goes from genetic inheritance to adaptiveness and education.

"Life's Complex Systemicity" As a Specific Systems' Science

The necessity of a "large clarification of systems science" history has induced me to refer to the emergence of "new fundamentals" so as to build up scientific and realistic developments of Life's processes. In order to comfort the specificity of the "Living systems Science", a global theory, I have called these new fundamentals the "*Theory of Life's complex systemicity*", that certain would probably like to read as of the "*Theory of Life's systemic complexity*".

The neologism "systemicity" I have *launched* (2004), as the way I felt "the dynamics of Life's drivers" came from approaching the phenomenon by mean of "The Bioethism transdisciplinary paradigm". It fostered universal specificities relative to their complex apparition on Earth. Primordial systemic and dynamic phenomena were physicochemical moves of matter and energy, all of them being interdependent, interrelated and interactive with solar system forces and planet cosmic constraints. Understood as a global terrestrial "tick tock", that processes ago-antagonist circular swings from birth to death, the Life's pendulum sways throughout the whole of the interconnected living systems networks in their ecosystems. Thus, the determinant survival¹⁶ dynamics are transactions that are permanently confronted with physicochemical and cosmic periodical forces, pressures and opposite changes in environments.

¹⁶ - **Survival**: "the continuation of life or existence".

The theory of "Life's complex systemicity"

The Yin-Yang¹⁷ philosophy of two complementary forces, or “the principle of opposites”, that represents every Life's phenomena as ago-antagonistic rejoins my feeling about Life's systemicity, particularly while relating it to the role of space-time in the history of unconscious and conscious natural and cultural retroactions for behavioural action. *The everlasting rustle sound of the planet, the “Gaïa's clock” echoes with creatures’ behaviors for survival, and the permanent change of things builds up their genesis and environments evolution* (J.-J Blanc, 2004).

ORIGIN, MECHANISMS AND COMPONENTS OF THE “SYSTEMICITY”

The “primordial systemicity”, within which the body of dynamics were (and still are) mechanisms of reactions, retroactions, circularity, reproductions, adaptations to physicochemical moves, changes and apparition of new proprieties, can be considered as evolution seeds (emerging results). The moves were (and still are) “drivers” making emerge the diverse bricks of reactive structures, from which, by synergy¹⁸, proto-metabolisms and living system's metabolisms were boosted up, and induced to dissipative structures that became (and still are) adaptive individuals and societies.

Percolation, Interactivity, Amplification of Disturbance, and Phase Transition

The percolation is a process of communication in an extended environment where quite a number of "sites" are locally likely to relay information (physical, biological or of a fluid property (J. M. Hamersley, 1957). They communicate with links whose effectiveness is random. According to whether the proportion of active connections is, or not, higher than that a threshold value, the information to long distance is transmitted. Percolation relies upon the critical phenomenon that is phase transition¹⁹: below the threshold, information remains confined in the spot where it originated; beyond the threshold, "percolated" information is then found far from its starting point.

The particular situation of transitions from phase is one out of many physical or chemical move phenomena occurring to number of systems. Therefore, the appearances of highly sensitive behavioral conditions are also observed in biological and social life organizations. Disturbances permanently modify living creatures' behaviors while they interact with environmental events and stimuli from their internal milieu. Alike the butterfly effect, a small fact can induce to important and perverse effect in attitudes. Societies of creatures are meta-organizations, functioning at the verge of a lethal equilibrium that is a compromise between contradictory constraints, which are not predictable and controllable. However, from feedback effects, it may be severe.

Feedback: Definition and Characteristics

A "feedback" is the process that enables loop controls to participate in the management of systems' regulations processes. In a closed-loop system, a feedback dynamic device has the property permitting to an output (or some other controlled variable of the system) to be compared with an input to the system (or an input to some other internally situated component or subsystem of the system) so that the appropriate control action may be formed as some function of the output and input.

¹⁷ - **Yin-Yang**: between those two complementary forces, there are "in-betweens", e.g., there is a certain gap giving some distance in between the two opposites. In fuzzy logic, it means that at a point in between, one can evaluate the value that separate the point to one or the other opposite. It induced to the development of fuzzy-mathematics by Zadeh (note by JJ. Blanc 1997)

¹⁸ - **Synergy**: "a mutually advantageous conjunction or compatibility of distinct actors or elements (as resources or efforts).

¹⁹ - **Transition phase**: "a movement, development, or evolution from one form, stage, or style to another.

The theory of "Life's complex systemicity"

More generally, feedback is said to happen in a system when a closed sequence of cause-and-effect relationships exists between the system's survival variables. In parallel, an open-loop control function has a distinctive control action since it is independent of the output. (J. Distefano, 1967).

The most important feature a feedback imparts to a living system is in its comparison function that continuously detects differences existing between inputs and outputs effects from stimuli and provides appropriate signals or information to manage the input-output difference. What one can call the driver of systemicity dynamics.

In a biological example, such as reaching an object requires some chemical outfit reactions that interpret and decide what to reach, positioning a "body" within reach. At the different levels of action, variable signals are piloted through from the sensitivity of chemical substances, cell's receptors or organs (e.g., eyes) and from their reactivity to "biops" drives. (e.g.: unicell's "brain"²⁰, bar receptors regulating blood pressure by inhibition drives...)

The process might not have an accurate ability to reproduce faithfully an input. Also, the reducing effect of non-linearity and distortion might drive to some oscillation or instability tendency. Then, the circularity of moves necessary to the maintenance of dynamics is of an infinite complexity, for chemical receptors exchanges are generating feedback drives or interactive emergent "biops" results affecting the survival streams steadiness.

In order to describe a "systemic process", the specifications or description of the system configuration and of its components must be put into a form compatible to analysis, design, and evaluation of the structure and behaviors of any systemic dynamic or individual creature. For example, a unicell has the chemical functions as like a brain has the proper centers for survival information treatment or a jellyfish with neuronal functions being the simplest organisms has one neuron brain to manage its survival.

SYSTEMIC "INS AND OUTS" OF COMPLEXITY AND NATURAL TRANS-COMMUNICATION

Electrical impulses, biochemical energies and different "biops" matters, sustaining relevant processing of behaviors and actions, contribute to the "dynamic stability" of system's survival. As fitted in with the permanency of changes and the maintenance of the circular moves fluidity, the system's viability is emergent from that percolation²¹ surging along networks and "biops" exchanges, spot to spot, area per area. This vision and approach of survival moves is pertaining to all living system's level, from cells to supra-national societies. It requires a homogenous approach of footbridges and links building up the connectivity of systems' networks for survival needs and dynamics and may proceed from the use of analogy and metaphors (the Maxwell theory origin, the use J.G. Miller's "operator's metaphor"...). Thus, a major example of the above "systemicity" resides in the perfect "reversibility and circularity" of psychosomatic and somatopsychic phenomena while interacting with the milieu and the environments (named "e-psop").

Link (or bonds) and footbridges processes fit in with sensory information. They convey environmental endogenous and exogenous stimuli, from events filtered throughout the "specific individualistic function and networks" (personality of the system) to a central biophysico-chemical treatment center and, from it, outwards influencing the environmental

²⁰ - **Unicell's brain**: close biochemical structure and processing.

²¹ - **Percolation**: " to spread gradually,

The theory of "Life's complex systemicity"

milieu. These phenomena have suggested "the notion of systemicity" as central to understanding living system's survival.

Importance of the "Systemicity" Notion

The "entirety" of the body of mechanisms and processes (cosmic primordial and natural phenomena), and their interwoven dynamics made Life to exist from matter and energy as well as vice versa. The natural forces and chemical streams of circular information and stimuli induce to energetic changes that provide for the renewal of vital processes substances and material, structuring and sustaining the metabolism of creatures for their survival.

The environmental permanent circular "glocal" changes within the complex meta-dynamics and combined natural forces ensure "Life to exist and sustain by adaptation to current situations", at least for a certain time. When such phenomena were named the "Life's complex systemicity", it related to the meta-dynamics required for creatures to coexist within ecosystems, and sustain along together, resources of nutriments helping.

Beyond the sense given to the noun and the adjective "systemic" as referring to the notion of systems in general, the "systemicity phenomenon" is far more suggestive of "meta-drivers" that are a global dynamic that made life to exist and sustain. To illustrate such dynamic sense, it is simple to refer to another notion that has also a dynamic sense: "velocity".

In order to illustrate "the notion of systemicity"; let's refer to a few dynamical moves that happened at the level of molecular biology in the early primordial biochemical "soup". The complex evolution of molecules towards macromolecular compounds emerged from highly complex physical dynamics made of retro-feeding biochemical reactions in matters and energy. They produced endemic capacities for enzymatic reactions and feedback²² of emergent positive results. Among results, the proteins, nucleic acids, and enzymes as the essential macromolecules to physiological life processes, originated in a "proto metabolism" within geological and aqueous ecosystems, engendering the first creatures (unicell, then micro virus, virus and bacteria).

The Earth primordial context made emerge a new atmosphere as composed of oxygen, hydrogen, nitrogen..., and new terrestrial constraints induced to considerably change the environmental and biological conditions. Energetic resources, from numerous feedback, enabled more complex molecules to evolve towards new generations building up the apparition of eukaryote cells structured with an efficient membrane capable to regulate endogenous and exogenous resources and information as perceived from environmental events.

The Emergent Survival Dynamic of Systemicity: Reproduction

The ultimate determinant purpose of survival is evidently the living systems to have "an unconscious and conscious sustainable and adaptable" capacity for reproduction in a limited space-time lapse. All living systems (individual as well as collective) are exposed to: *"a pattern of numerous events, each individual with a certain lethal probability at any moment or in aggregate, causing a total probability of death or survival*. Climatic and other changes in the ecosystem, modify the frequency with which various potentially fatal events occur. Progressive "endo-systemic" changes, inasmuch as growth, reproduction, development, and senescence are intrinsic characteristics in the organism as capable of modifying the effects of various environmental factors".

²² - **Feedback:** "the partial reversion of the effects of a process to its source or to a preceding stage. Also the transmission of evaluative or corrective information to the original or controlling source about an action, event, or process and the information so transmitted".

The theory of "Life's complex systemicity"

The words "survival" and "reproduction" are emergent results of "The Systemicity drivers" and the most important notion of the self-maintenance of a living system identity. Not only surviving is "to overpass a possibly lethal event, leaving survivors as better adapted", but it is also expressing the permanent strive of the physiological structure of a creature while managing the diverse dynamics that maintain its integrity and its "self" for staying alive. It requires the system to have a specific individual degree of consciousness and reproduction features, participating in the circular feeding of Life's survival chains.

Henceforth, since "survival" creates reproductive sociosystems (family, group, local society, national society, human society,) then living systems have to be open-loops with internal and external behavioral processes that are never linear. In contrast, ecosystems (niche, local neighborhood...) are territories where cohabit along interwoven networks of predator-prey food chains. Many creatures species, adapted to sets of niches (as composing a 3D space-time ecosystem's region), are also categorized as highly complex living systems. They, at such level, require the use of pragmatic metaphors that help decipher their complexity.

The study of dynamic systems revealed frequent periodic oscillations. It is probable that, in certain cases, the oscillations are produced by a set of fuzzy phenomena, implying interactions within metabolic processes where the climate and local physicochemical statuses (e.g. volcanism) weighed upon the environment and its entropy status. If a metabolic cycle, for instance, proceeds with the interface of an aqueous medium and of a membrane or a charged wall, the phenomena of electric interaction, which are exerted between the fixed loads of the membrane and the ions present in the medium, are of nonlinear nature and can create dynamic periodical changes. Many periodic phenomena were modeled, and it was shown in labs what a local property could generate within a system in a periodical "processing". These moves are interrelated within the body of dynamical processes that participate in the "Life's Systemicity", and sustain survival motives as well as circular and retroactive processes do.

Psycho-Somatopsychic Reflexivity

The interconnectedness, interdependency and continuity of "behaviors and reactions for survival" (reproduction) require millions of "biops" interactions from which emerge resulting moves. They percolate in "cascades" throughout the external and internal networks of the "body-milieu-brain-environments-body, as "epsop" circular moves that are part of the "Systemicity dynamics". Behavioural contexts that require of the system those capabilities and qualifications that ensure, or not, the circularity of survival dynamics fluxes. Endogenous and exogenous metabolic processing abilities induce to performing viable interactive moves from treating environmental stimuli signalling internal and external event changes. The dynamic streams of molecules, organizing the connectivity of numerous interdependent mechanisms and processes networks, ensure such continuity participating in the perpetuation of life's sustainability and adaptability, i.e. a metabolism for survival.

The environmental psycho-somatopsychic ("e-psop"²³) processing is to become a "generalized notion as of being the central circular flow procedures"²⁴ that manage any level of fundamental values as major survival principles. Consciousness and awareness, emotions and thinking, intelligence, representation and abilities, are universal living functions, whatever living system is concerned. Considered as, at first, the "protogenes", they are "the

²³ - "e-psop": here a 3D graph metaphor for highly connected networks that represents the interdependent interconnected physiological, sensory and regulatory sets of metabolic processes.

²⁴ - **Procedure**: "a particular way of accomplishing something or of acting and a series of steps followed in a regular definite order (surgical or biological procedure.).

The theory of "Life's complex systemicity"

foundation of a "biops processing substratum" that build up the different survival values under the "meta-driving effect of systemicity".

EVOLUTION

Evolution and Survival Metabolisms

Then on, systemic mechanisms structured the organelles metabolism, which, on to next evolution steps, participated in building up the metabolisms of the first living organisms as single cells. Larger molecular and enzymatic "interaction results" emerged within geospheres and aquaspheres and induced to the apparition of protocells (without nuclei but with functional compartments, or organelles). Among them, some bacteria, from photosynthesizing functions require only water as giving out an electron and producing molecular oxygen. Some organelles became "organs of new organisms" called eukaryote cells that integrates several different organelles as functional entities participating in the metabolism of the cell and its reproduction. There, the ARN induced to form the DNA nuclei, with ATP and nuclear acid...)

Evolution and Dynamics

The biological evolution and development of physicochemical particles (atoms, electrons, molecules...) is governed by the body of those dynamics that structure the "Life's global and complex systemicity". Among these dynamics and beyond physical and chemical forces and energies, are some major impulses and fluxes that participate in, such as: synergy, emergence, evolution (from emergent natural information selection... silent thinking and argumentations) They illustrate the evolution of "biops" processes, facing permanent changes, named "irreversible" since reactions happens far from a state of equilibrium, also named "dynamic balance" (survival) and which opposes a dissipative force against the natural thermodynamic loss of energy named "entropy".

Life is defined as "the state of an organism especially fit and characterized by its capacity for its metabolism to keep sustainable from growth, reaction to stimuli, and reproduction" and, as mentioned above, with a dissipative structure tailored for survival maintenance. However, the first specific organism as capable to exist has a vesicle but no nucleus (the unicell or single cell that is a prokaryote). It slowly emerged from a set of processes from arrays of physicochemical retroactive matters forging mechanisms and processes that have together, as the body of primordial dynamic phenomena, gave access to reproduction from sustaining behaviors. A context of thermodynamic forces, within the natural composition of the two successive atmospheres around the planet Earth, progressively induced to the building up of biological proto-structures that, from assembling, became capable to protect themselves from the ever-changing exogenous events. At such epoch emerged the proto-membrane that became a filtering wall (reactors) for a cell to survive.

The Ever Changing Moves of Biological Conditions and Behaviors

Living creatures, as well an individual as a societal entity, are "functioning wholes" according to the body of survival dynamics phenomena. They are organisms that cannot be understood by means of sole physical and chemical principles. Actually, described physiological networks, metabolic, neuronal, endocrine, humoral and immune processes are understood as globally being biological parts of "a whole set of processing network streams" occurring both inside and outside the "system's skin" and should be called "*regulation networks*" (and not systems). Because of their interdependence and specific localizations, the enormous information volume treated at one instant must be participating in such wholeness, even though it is of much larger volume than that necessary to the synthesis of the elements

The theory of "Life's complex systemicity"

implied in the functioning of percolating moves throughout these networks. Complex biological networks answer general laws postulated as being common to other "processes and their mechanisms", however, often inaccurately called "systems".

Because of the "milieu" (and environment) permanent changes, interactions between the components of a system induce to the evolution of its proprieties: they usually emerge with differential qualifications often showing no exterior events to have intervened. The system becomes irreversibly different. Therefore, a system evolves from one level to another level of organization: thus, and for example, a cellular level would succeed to a molecular one, showing that the "global systemicity drivers" have intervened as dynamics described above.

The Systemic "Required Variety": a "Required Systemicity"

Life's indispensable diversity, said "required variety" is significant of moves circularity, exchanges and the diversity of their qualifications, which, issued from feedback and reflexive actions of ago-antagonist loops, produce emergent and sustaining results. They echo with "Life's systemicity" background and, by inference, shape up the structuring of living systems' behaviors at every (t) instant. Their motivations for survival, in accordance with the circular throughputs of keeping on living, mostly emerge from facing the predator-prey chain game and answering to all environmental events they are concerned with from searching for energetic resources in terms of nutriments. Because of survival significant behaviors, such stimuli induce to a constant adaptation of adequate strategies towards the global entity of their mind-body-external environment and internal milieu metabolism. Indispensable bio-psycho-physiological ("biops") fitness provides for maintenance of their integrity and survival dynamics. Vital are the diversity of their homeostatic²⁵ and functional autonomy and self-organization, as well as their maintaining an "external homeostasis" with other species individuals and the neighborhood wildlife context and/or human fauna, and is particularly significant of the "required systemicity" for living creatures to appear and survive.

THE NEURAL BRAIN

With the apparition of single cells, then neurons structuring brain like survival outfits of species, a biochemical treatment centre of circular information evolved and became complex neural centres made of 3D neurons networks among which, with the "limbic area" and its main components, the amygdala (central to emotions) and the hypothalamus²⁶, manage survival dynamics (nervous and endocrine vital nets) confronted to endogenous and exogenous stimuli.

Among different aspects of "Systemicity", living systems' survival moves are: self-consciousness, thinking (a biochemical information treatment) and other metabolic functions that are emergent from inferred²⁷ representations, sensations and emotional fields of autonomy. They induce to understanding the building up of images (and/or sense given to things) as ending into the permanent systemic mechanisms necessary as to sustain survival behaviors. These bio-psycho-physiological moves ("biops") are individual aptitudes, which, from motivations of the moment, participate in the satisfaction of survival needs. They require the use of memory functions in connection with the information treatment centre so as to fit with environmental conditions.

²⁵ - **Homeostatic**: "a relatively stable state of equilibrium or a tendency toward such a state between the different but interdependent elements or groups of elements of an organism, population, or group"

²⁶ - **Hypothalamus**: "the hypothalamus contains a control center for functions of the nervous system, and has important links with the endocrine system"

²⁷ - **Inference**: by extension, an inferred representation, and/or an emotion, is the result of interpreting sensorial information that once treated is being stored in memories.

The theory of "Life's complex systemicity"

Located in the primary brain areas, the cortical levels (specially the cerebellum and the limbic ones are common functions to many species) as memory basins (or their equivalence). There, information and emotions stimuli are inferred and treated unconsciously and/or consciously, inducing to a "primary thinking" and a silent speech, which, in physiological terms, participates in sustaining life's metabolic processes.

PROVISIONAL CONCLUSION

“Systemicity and its dynamics as “Life’s drivers” are consubstantial to the cosmic origin of planet Earth's drivers, suggesting that glocal phenomena are also tuned with the “ticktock” of the biological clock that sustains life against entropy. Maxwell predicted with metaphors that they are producing the "compost" for theories as to emerge, suggesting to me the development of the "Theory of Life's Complex Systemicity ".

This stage of works from after "The Bioethism new paradigm", as a transdisciplinary approach, but not the last one, in developing the theory, shows that major moves within the body of “Life's meta-drivers” are issued from "systemic circularities" at different levels and different statuses of any biological structure.

The set of such dynamics is consubstantial with the physicochemical circular mechanisms of the first and second atmospheres and of the physics of the Earth. For a short example, let's mention the “climatic recycling” of vapour to water in provision of solar energy.

The "Theory of Life's Complex Systemicity” is yielding up to an "abridged description of life's mechanisms and phenomena historicity", and shows the presence of those sets of dynamics that have, level after level of the physicochemical cosmic evolution, structured up the emergence of “Life’s meta-drivers”, their development and the forces and sub-dynamics that compose its body apparition.

It also suggested a more global and universal "Systemicity" in the cosmos as regulating the entire physical universe, which I call "The primordial systemicity" and is here the 4th stage of my works but not the last. Furthermore, it strongly suggests that any species and its societal organization can be scrutinized, better understood and described within the principle of "meta-systemicity drivers" sustaining survival behaviors as emerging results. A large approach on the surroundings and actual dynamics variations confronted to entropy status would enlarge the quality of the expertise.

PARTICIPATION REFERENCES and BIBLIOGRAPHY

- Allman, J.M. (1999): *Evolving brains*, Scientific American Library, HPHL div., New York.
- Auger, P. (1986): *Dynamics in Hierarchically Organized Systems: a General Modeling Adapted to Ecology, Biology and Economics*, Systems Res. 3. Paris.
- Berger P., Pomeau Y. & Vidal (1997): *Espaces chaotiques*, Hermann, Paris.
- Bernard-Weil, Elie (1992): Role played by vasopressin (and of an adrenal-postpituitary imbalance) in the develop-ment of cancerous diseases, *Med. Hypotheses*, 37, 127-136
- Blanc, J.-J. (Sept. 1996): *Systems Science for a Sustainable Planet*, for the 14th *Wacra Congress*, Madrid, Spain

The theory of "Life's complex systemicity"

- Blanc, J.-J. (Sept. 1997): "The Bioethism" as a systemic transdisciplinary paradigm", *14th Wacra Congress*, Madrid, Spain
- Blanc, J.-J. (July 1998): "The Bioethism" as a transdisciplinary approach towards fundamental survival values, ISA, *14th World Congress of Sociology*, Montreal, Canada
- Blanc, J.-J. (Sept. 1999): "The Bioethism" as a transdisciplinary approach of Living Systems science, *4th European Congress of Systems Science*, Valencia, Spain
- Blanc, J.-J. (Jul. 2000): The Bioethism paradigm with collective and consciousness of local sociosystems, Millenium World Congress of Systems Science, Toronto, Canada,
- Blanc, J.-J. (Oct. 2002): 5th Congress of Systems Science and "The Bioethism" approach on "Environmental-psycho-somatopsychism" phenomena *5th European Congress of Systems Science*, Hersonissos, Crete
- Blanc, J.-J. (July 2004): ISSS 48th Conference of Systems Science and "The Bioethism" approach on "Environmental-psycho-somatopsychic" phenomena and the "Systemicity of life". Asilomar Center, Monterey, CA., USA
- Deléage, J.-P. (1994): *Une histoire de l'écologie*, Ed. Seuil, Paris.
- Distefano, Joseph J. (1967): *Feedback & Control Systems*, Schaum Publ., New York.
- Frontier, S., and Viale, D. (1991): *Ecosystèmes, structures, fonctionnement, évolution*, Ed. Masson, Paris.
- Georgescu-Roegen, N. (1995): *La Décroissance, l'Entropie, l'Ecologie et l'Economie*, Edition Sang de la Terre, Paris.
- Golmann, D. (1995): *Emotional Intelligence*, Bloomsbury Publishing Plc, London.
- Griffin, D. (1984): *Animal Thinking*, Harvard University Press, Harvard.
- Hinde, R., and Stevenson J. (1979): *Survival motivations of animals and man*, La Recherche en Ethologie, Ed. Seuil, Sciences, Paris.
- Haken, H. (1996): *Synergetic in Systems Theory*, *3rd European Congress of Systems Science*, and (1983) *Synergetic, an introduction*, Ed. Springer, Berlin
- Lesourne, J. (1978): *Les Systèmes du Destin*, Edition Dalloz Economie, Paris.
- Levy, P. (1994): *L'intelligence collective*, Ed. La Découverte. Paris
- Novak, M., and May R. (1992): *Evolutionary game and spatial chaos*, Ed. Nature, New York.
- Pert, C. (1998): *Molecules of emotions*, Simon & Schuster ltd., London.
- Reicholf, J. (1996): *L'Emancipation de la Vie*, Editions Flammarion, Paris.
- Ruelle D. (1991): *Hasard et chaos*, Odile Jacob, Paris.
- Ruffie, J. (1983): *De la Biologie à la Culture*, Edition Flammarion, Paris.
- Systems Theories: Le Moigne J.-L., Miller J., Rapoport A., von Bertalanffy,
- Thornton, Joseph (2006): Mixed model phylogenetic methods for evolutionarily heterogeneous data, DEB-0516530, October 1, 2005
- Thom R. (1980): *Modèles mathématiques de la morphogenèse*, Bourgeois, 2è. éd., Paris, (1977) *Stabilité structurelle et morphogenèse*, Inter Editions, Paris.

The theory of "Life's complex systemicity"

Vallée, R. (1995): *Cognition et Systèmes*, L'Interdisciplinaire, Limonest, France

Watson James D. with Alberts, B. Bray D., Lewis J., Raff M. and Roberts K., (1983):
Molecular Biology of the Cell, , Garland Publishing Inc., New York.

Zwang, G. (1992): *Ethologie humaine*, Ed. Simep, Paris.