

**THE "COSMO-PLANETARY AND TERRESTRIAL META-DYNAMICS  
SYSTEMICITY"  
AND "LIFE'S INTRA-BIODYNAMICS SYSTEMICITY",  
THEORIES RESULTING FROM  
A "BIOETHISM'S TRANSDISCIPLINARY APPROACH"<sup>1</sup>**

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**Abstract**

Ever since 1996, J.-J. Blanc, as the author, made an extensive research on "Systems science", which induced to his developing a new systemic<sup>2</sup> paradigm in terms of a *transdisciplinary* approach to "*Living systems*" that he named "The Bioethism" (see note 1). It is meant to support the acquisition of a large understanding of living systems' origin, of the meaning of their natural structure and their adaptive behaviors, their bonds and evolution trends while permanently interacting with environmental events for survival. These actions-reactions from ago-antagonistic signals and stimuli within their body milieu, their ecosystemic and sociosystemic environments are closely linked with and affected by - a) their specific individual and social status and the diversity of species behavioral evolutionary trends - b) cosmo-planetary and terrestrial meta-dynamic forces.

The survey of the different scientific disciplines development concerned with the actual "Science of Systems", shows that the living systems' knowledge of reality is, for too many scientists, in developing their works in the strict philosophy of human "reason" (logic and metaphysics). Excepted, of course, are those disciplines where individual and societal emotion is a paramount understanding of pragmatic survival rules. An adequate learning for a sustainable development of societies, respecting the required survival diversity needs is here based on new general theories the author called "The general meta-dynamics systemicity" and "Life intra-dynamics systemicity" and "The general systemicity". Because they rely on the entire body of forces and dynamics that made and makes physicochemical moves to exist and sustain, by essence the biological ones, and behavioural processes adapting to the permanency of change. At the Life's level of survival intra-dynamics systemicity, the "cosmic<sup>3</sup> meta-dynamics" of universal forces and moves participate in the physicochemical dynamics of the biological world of which systemicity is based on retroactivity building up a temporal sustainability.

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<sup>1</sup> - **Bioethism** is a general humanistic transdisciplinary approach paradigm that I developed in 1996, which has shown the necessity to work on the knowledge of any living system's structure and behaviors as interacting within its environmental space and on its body milieu and ecosystem's niche levels, taking into account a general representation of species in terms of "**Biology, Ethology-ecology - Humanism**". The presence of man stresses the necessity to approach the living's survival fundamental values as common to all creatures' capacities to sustain and assume the protection of Life on Planet Earth: [www.bioethismscience.org](http://www.bioethismscience.org).

<sup>2</sup> - **Systemic (adj.)**: nature of a dynamic and retroactive process pertaining to or affecting an organ or the body of an organism.

<sup>3</sup> - **Cosmic**: the essence of the general relativity is in the space-time lag that has a dynamic cause and its effect properties,

## Meta-dynamics Systemicity

Consequently, an overview upon the entire body of universal interdependent bio-physicochemical mechanisms, moves, processes and streams interwoven within "3D networks", shows that survival abilities and performances are epigenetically provided from both the convergence of cosmo-planetary forces (magnetic, gravitational...) and terrestrial conditions (geologic, geochemical, geophysical, geo-climatic...), which, retroactively, sustain the Earth and by extension the biological world of individuals and societal systems to exist and survive within a dynamic equilibrium inevitably interdependent of chaotic effects of the thermodynamic entropy.

My work, requiring several communications, it was decided to divide its development into different "scientific principles" chapters that support the complexity of cosmo-planetary and terrestrial meta-dynamics systemicity. Their effects are combining interactive physicochemical forces and moves, as emergent results generally referred to their synergistic, their dynamical<sup>4</sup> coordination supporting the meta-drivers systemicity. A few paragraphs of will prepare another communication about "The Life's intra-bio-dynamics systemicity" and the provisional conclusion assumes the future description of the "Theory of a General Systemicity".

**Keywords:** Systemicity, Bioethism, dynamics, meta-drivers, synergy, cosmic physics, emergence.

### INTRODUCTION

The purpose of the author is to bring up to achievement "new theories" based on dynamic forces and moves: - one about "The cosmo-planetary meta-dynamics and terrestrial systemicity" - the other about the dynamics of biochemical contexts as of Life to exist, developing living systems survival adaptations, named "The Life's intra-biodynamics Systemicity". They are in no ways meant to be "general systems theories", which is an obsolete approach of the so many systems' mechanism and intellectual casts of mind that express sides of human intelligence and creativity. RNA, DNA processes produced and still produce common behavioral abilities for survival to all species including man. The survival dynamics list is long such as feeding, dwelling, communicating, reproducing, escaping, building, reacting... as terrestrial forces and moves forming together with cosmo-planetary meta-dynamics the entirety of "systemicity". A notion that is a much precise and innovative overview of our univers since it is being a transdisciplinary approach meant to foster the realistic description of dynamic results. Emerging from pressures over the *living systems' survival*, those dynamics are interdependent with the actual completeness of the Universe ecosystems and include biophysicochemical structures and processes that induced living creatures to develop sustainability, adaptability and endurableness within cell's membrane and filtering reactors capable to perdure and reproduce for some time.

The "General systemicity", "The cosmo-planetary meta-dynamics and terrestrial systemicity" and "Life's intra-biodynamics systemicity" are "meta-drivers" with systemic specificities that show the complexity of imbricate and interrelated result emergences. They are differencing behavioral moves in one and other physicochemical fields as induced to by synergistic drivers producing one or another chains of specific effects.

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<sup>4</sup> - **Dynamical:** "of/or relating to physical force or energy",

## Meta-dynamics Systemicity

By way of consequence, it is postulated in this work that studying the primordial components of the living origin, and its evolution does require a large transdisciplinary mastership of the "Systemicity of those dynamics" that participated in Life to happen and of sciences of the living beings. The "Bioethism paradigm" was created at it.

This paper will describe only some aspects of "Systemicity" in terms of physics, chemistry and biology principles, given that actual scientific information is to illustrate postulates and realities of cosmo-planetary forces, processes and moves.

### THE NOTION OF "SYSTEMICITY"

The notion of "systemicity" is related to the whole of primordial and dynamic moves, forces, phenomena and processes, which mechanisms are confronted with physicochemical interactions<sup>5</sup> and reactions<sup>6</sup> of elements, matter and energy. These systemic momentums<sup>7</sup> emerge from interconnected, interrelated and interdependent moves within atomic and physicochemical elements that are submitted to the permanency of pressures, fractures and bifurcations occurring within cosmo-planetary environments: the cosmos, gas and dust nebulae, stars, galaxies, the solar system as well as planetary environments exchange their forces effects, named interconnectivity. The universal physical and chemical forces (magnetism, gravity, strong interaction, weak interaction, gas reactions and contextual changes...) are together constraining and beneficial to the Planet morphological and contextual evolution and to that of other cosmic objects. Further more, the notion of "Systemicity", appreciated in terms of the "drivers" it is composed of; is providing impulse or motivations, that show the notion of "cosmic velocity" is consubstantial in dynamics.

"Systemicity" is particularly explicit of the whole of physicochemical processes that have differential outputs, particularly those that have positive ago-antagonistic directions induced to the retroactive connectivity that sustain survival phenomena in general. Such sustainability is in no time a one way move, since successive outputs emerge in a synergistic environment from set of reactions and counteractions<sup>8</sup> toward the permanency of the universality of the thermodynamic law, named entropy<sup>9</sup> as balanced with physicochemical survival moves.

### Living Systems Science And Other Human Creation of Systems

The necessity of a "large clarification of systems science", principally because there cannot be "a general systems science", or a "theory of system science", so much the "Systemics" actually developed apply to so many morphological and intellectual sorts of systems and a large confusion using the noun or the adjective "systemic". On Earth, an undisputed contextual situation is related to permanent changes of living events from feedback "retroaction differential results" that has induced me to search for "new

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<sup>5</sup> - **Interaction:** "action that occurs as two or more objects have an effect upon one another",

<sup>6</sup> - **Reaction:** "resistance or opposition to a force, influence",

<sup>7</sup> - **Momentum:** "force of movement; strength or force gained by motion or through the development of events. Also the product of the mass of a body of matter multiplied by its velocity (Physics, Mechanics)".

<sup>8</sup> - **Counteraction:** "to restrain or neutralize the usually ill effects of by means of an opposite force",

<sup>9</sup> - **Entropy:** "the unavailable energy in a closed thermodynamic system, a disorder status that varies directly with any reversible change in heat in the system and inversely with the temperature",

## Meta-dynamics Systemicity

transdisciplinary fundamentals" so as to build up a scientific and realistic development of Life's systemic dynamics. 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 intra-dynamics systemicity*", that some ones would probably like to read as of the "*Theory of Life's systemic complexity*".

Beyond the sense given to the noun (and adjective) "systemic" that are generally referring to qualify most "systems" in about 30 different meanings others than living systems, the notion of "systemicity" is, in this new theory, far more suggestive. Global and adequately dynamic, the sense of "systemicity", as we said, is only to refer to the dynamic sense of "velocity"<sup>10</sup>. However, these two notions are not to be understood as synonymous but yielding to the same connotation in terms of moving forces that participate in cosmos and Life to exist and sustain.

The neologism "systemicity" I have *launched* (Monterey CA, 2004), is also referring to "Life's driver dynamics" understood with "The Bioethism transdisciplinary approach paradigm" (**Biology-Ethology, ecology - Humanism**). It fostered universal specificities relative to the complexity of Life's processing as it appeared 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 serving survival to reproduce. Understood as a global terrestrial move, its "tick tock" induce intermediate ago-antagonistic circular swings from birth to death: the Life's pendulum sways throughout the interconnected living system web and ecosystem networks. Thus, the determinant survival<sup>11</sup> dynamics are transactions that are permanently confronted with physicochemical and cosmic periodical forces, pressures and opposite changes in environments and milieu metabolisms.

The Yin-Yang<sup>12</sup> philosophy of two complementary forces, or "the principle of duality" as "opposing extremes", that represents everyday 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 dedicated to behavioural action. "*The everlasting rustle sound of the planet, the "Gaia'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).

### The Cosmo-Planetary Dynamic Systemicity

The Universe gradual evolution is a matter of primordial "neguentropic"<sup>13</sup> systemicity" due to the very slow transformation of the Universe. Over -12 billions years elapsed until the Earth was formed 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 the much diverse type of dynamical phenomena:

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<sup>10</sup> - **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.

<sup>11</sup> - **Survival**: "the continuation of life or existence".

<sup>12</sup> - **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)

<sup>13</sup> - **Negentropy**: "negentropy is an organization factor in physical, biological and sociological systems that counteract the natural disorganization tendency" of elements, matter and energy.

## Meta-dynamics Systemicity

- The high constraints of thermodynamics over cosmic objects, and its practical implementation,
- The universal force of gravitation that governs the motion of cosmic objects, all forms of matter, and energy,
- The retroactive effect that induce endogenous and exogenous status changes, while sustaining the formation and evolution of galaxies, star-systems planets and the effects on Earth's original, actual and temporal integrity,
- The high benefits of dynamical effects, in terms of an endemic balance, that maintain planets at distance from an early death,
- The high interrelations of the cosmo-planetary and terrestrial meta-dynamics, and their effect over Life's intra-dynamic systemicity,
- The evolution of gas composition of space and atmosphere that induced to the apparition of water, oceans,
- The retroactive moves due to atmospheric conditions that implemented a physicochemical medium and a synergistic context for Life to appear.

The universality of "the general meta-dynamics systemicity" notion is represented by numbers of retroactive processes that produce energy (thermonuclear, thermodynamic, physicochemical, solar, kinetics, radiant, gravitational, electromagnetic...). Their interrelated cosmo-planetary meta-dynamics effects, like stars and planets existence, are consubstantial with the terrestrial physicochemical circular ones on Earth. For a short example, let's mention the "climatic recycling" of vapour to water. For some of them, the chief part of Albert Einstein's imposing body of work is here quoted:

*"Albert Einstein, between 1905-1915, developed a 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".*

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, was named "Restricted Relativity". 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 "measurements of the light velocity".

This theory introduced, then the concept of space-time and explained phenomena of the duration and distance variation measured by two observers, each one being located in a different reference frame. Experimentally checked, it has shown "results of retroactivity between these moves". The static Universe model developed by Einstein and the cosmological constant, lying at the crossroads of quantum mechanics and gravity is controversial since the Universe is on the move with gravitation attraction as assumed by Edmond Hubble (1929) discovering that galaxies move away from each others at a speed proportional to their distance (Hubble constant) and cosmology with the physics of astro-particles becomes quantitative. The particles study becomes differentiated while using other messengers than photons (neutrons, neutrinos, gamma rays and gravitational waves)

## Meta-dynamics Systemicity

and the battle about quantum mechanics is particularly sharp observing the factual reality of particles as photons position and their wave duality. At the same time, Paul Dirac (1928), developed a relativistic electron theory and quantized<sup>14</sup> a field theory, called *quantum\_electrodynamics* that unify relativity and quantum theories in reference with the interaction between electrons, positrons, and electromagnetic radiation. Furthermore, he shows quantum electrodynamics situations in which matter is converted to energy and energy converted to matter (*the particle of light, electricity and magnetism*). Together with such fact, *electromagnetism* is the physics of the electromagnetic field: a field which exerts a force on particles that have electric charge properties, and are *retroactively affected by the presence and motion of those particles*.

Atomic forces and reactions occurring around the planet are "rinsed out" by "the Van Allen Radiation Belt" that is a protection from solar winds (current of plasma flowing from the sun) held in place by the Earth's *magnetic field*". The solar wind pressure (magnetic storms pressure) on the magnetosphere increases or decreases depends on the Sun's activity, changing the electric currents in the ionosphere<sup>15</sup> (ions and free electrons).

This is a short general analysis that shows very clearly the "cosmo-planetary dynamic systemicity" of those interdependent processes and forces: it is first a "primordial meta-dynamic systemicity" from which several cosmo-planetary moves participated in the emergence of Life on Earth. Within the body of those dynamic processes were (and still are) mechanisms of reactions, retroactions, circularity, reproductions, adaptations to physicochemical moves, changes and apparition of new proprieties that are all interrelated seeding systemicity dynamics in consequence of evolutionary moves. These moves were (and still are) "meta-drivers" making emerge the different bricks of reactive structures, from which, by synergy<sup>16</sup>, proto-metabolisms and living system's metabolisms were given birth, boosts, evolutionary capacities that induced to dissipative structures to be motivated as living creatures to adapt for survival to perdure.

Chemical interactions, physics of the particles, astrophysics and cosmology, matter, the vacuum, time and its arrow study, led Y. Prigogine (1977) to develop the notion of such "dissipative structures", as showing open systems operating far from a thermodynamic balance in an environment of matter, energy exchange and entropic equilibrium pressure.

### "SYSTEMICITY" AT LEVELS OF COSMO-PLANETARY META-DYNAMICS

The "Systemicity" of dynamic phenomena within the Universe is a highly complex set of evolutionary phenomena within permanent interactive environments that occur between physicochemical reactions and cosmic objects dynamics: gas clouds, stars, asteroids, comets and planets like Earth. Attested by cosmic "contextual climates within galactic systems and gas clouds", their dynamic systemicity is permanently influencing the spatial milieu. The solar system, its planets, the Earth and Living creatures' behaviors for existing illustrate how each is confronted with specific dynamics. The sustaining of Life on Earth is a consequence of the set of cosmo-planetary dynamics", of which characteristics are induced by a general and universal meta-dynamic systemicity. The inventory of the

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<sup>14</sup> - **Quantize**: restrict a variable to a specific set of values as forming into quanta (Physics)

<sup>15</sup> - **Ionosphere**: "the part of the Earth's atmosphere in which ionization of atmospheric gases affects the propagation of radio waves, a part close to mesosphere and thermosphere"

<sup>16</sup> - **Synergy**: "also, a mutually advantageous conjunction or compatibility of distinct actors or elements (as resources or efforts).

## Meta-dynamics Systemicity

different sets of dynamics that shape up the "cosmic systemicity", requires to overlap quarrels on reductionism, since Life originated out of a complex and long period of heavy and unstoppable chains of atomic and physicochemical events. The Earth was molded from them, becoming the theatre of ever changing ecosystemic components under ever changing geographical structures and atmospheric climates. By remembering the entire set of long circular and retroactive phenomena occurring in the outer space, one then understands the very slow and progressive thermodynamic recycling of baryonic<sup>17</sup> and other heavy elements within the dark matter. Gas spheres shape up into star embryos from gas and dust nodules, contract, then collapse under the pressure of gravitation within the core of frantic moves of energy (gamma, infrared, ultraviolet and X rays). The interstellar medium is filled with hydrogen gas, some helium and substances like calcium, sodium, water, ammonia, formaldehyde and other dust particles. Such mass is fed back to the interstellar medium, where it mixes with matter that has not yet formed stars.

At a galaxy level, the entire star milieu is not absorbed in by its black hole, since a part of star envelopes either rebounds from the temporary formation of a spinning neutron core or misses passing through the very centre of the core and is spun off instead. This circulation of interstellar matter through stars, and the entire retroactive cycle determines the amount of heavy elements throughout cosmic clouds and shows that the constituent elements abundance is a matter of dynamic systemicity. When part of the star, in terms of interstellar matter and gas is passing through the black hole, it is firstly pragmatic to consider that such medium is simply "washed away" into the intergalactic space. Recycling going on with other elements, the "medium", together with the meta-dynamics of space systemicity, participate in the seeding of new stars around or in neighbouring galaxies.

The universe has reached to a structure, which evokes that of a 3D graph network whose nodes correspond to large gatherings of dark matter in great quantity and super clusters of galaxies, which contain several thousands of galaxies themselves containing each hundred of billion stars and orbiting objects like planets, meteorites... Here is the actual situation since the big-bang, 13,7 billion years ago. Galaxies form galactic clusters due to dynamical forces which are the gravity and the expansion of the universe as well as the intergalactic and interstellar interactions. Galaxies content of stars is largely variable as their number depends on the proportion of stars and their temporal collapse, as well as their capacity re-feeding space with gas and matter "ready" to become new star embryos.

Emerged from thermonuclear reactions in galaxies, the cosmic medium is permanently affected with differential effects that participate in "the cosmos dynamics meta-systemicity" that brings about galaxies, stars, planets and other objects to appear and disappear, giving that gases are "rinsed away" by powerful radiations that come off nuclear reactions. The historical succession of a great contextual diversity of galactic happenings and of star planetary systems birth, include that of the Sun and induced to the Earth planet to become "Life's cradle" from meta-dynamics" of which "systemicity" induced nature to flourish and the humanity species to emerge from "microscopic and light elements" – cells - as contextually constitutive of evolving species structures and behaviors.

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<sup>17</sup> - **Baryon**: "any of a group of subatomic particles that are subject to the strong force: the atomic nucleus, its atoms, neutrons..."

## Meta-dynamics Systemicity

### Geophysics and the Meta-Dynamics Systemicity,

The study of the Earth that applies to physical principles is called Geophysics. Physical phenomena and their relationships with Earth's elements, during short or extra-long term periods of time, include the Earth's magnetic field, heat flow, the propagation of seismic (earthquake) waves, and the force of gravity. It also includes outer-space phenomena: the effects of the sun on the Earth's magnetic field, cosmic radiation and solar wind.

The rotation of the earth in the gravity fields of the moon and sun imposes periodicities in the gravitational potential: tides, marine tides, solid earth tides (deformations of the crust) and climatic statuses changes. These include temperature, humidity, cloudiness, precipitation, wind, and pressure (physics laws of heat and motion). And have well-defined cycles and structural features (monsoons, high and low pressure, thunderstorms and tornadoes) that are the systemic drivers on Earth to make it exist.

### History of the Earth Up to the Origin of Life: the systemicity of cosmos meta-dynamics

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 gave off light and heat in the outer. The planet Earth formed from gas and dust including carbon, oxygen, nitrogen, and iron ejected by ancient stars wherein the Sun's as a young stars formed. As the density of the Sun increased, the surrounding gas and dust slowly condensed, spinning around. The gravitational force of some denser areas attracts more gas and elements as the disk is orbiting the star, and some of them consolidate and grow in size and density, forming the planets of star system. The cosmos meta-dynamics systemicity makes emerge cosmic objects that have a seeding critical point, an evolving "life" and a "death" in terms of matter and energy collapse from nuclear fusion and gravitational pressure. The matter and energy cycle is re-engineering those phenomena thank to the dynamic of the global systemicity.

In the time of its youth, the Earth's global structure and climate was and is heavily influenced by cosmic forces, that of the solar system and its nuclear dynamics, together with the formation and attraction of the moon. The Earth has a history as an emergent result out of interrelated cosmic mechanics and forces that produced its "volume" with the diverse matters originated from a supernova<sup>18</sup> bust. The Earth, as other planets, was formed from the coalescence of particles by gravity into larger objects (*planetesimals*) that continued to aggregate into rounding planets from matter rotation. The solar system has been like a factory space where grew rocky planets such as Mercury, Venus, Earth and Mars. "Left-over" material formed asteroids and comets. At the beginning of its history, and because of collisions between large cosmic bodies releasing a lot of heat, the Earth has probably been molten, progressively getting structured and acquiring properties for its atmosphere to develop. The bombardment of the surface by meteorites, asteroids and comets and the apparition of oceans completed its morphology from fierce pressures of forceful retroaction, fractures and compressions, some because of physical forces, magmatic moves, other chemical reactions, climate aggressions and water erosion.

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<sup>18</sup> - **Supernova:** "extremely bright star that has exploded due to gravitational collapse of the star's core",

## Meta-dynamics Systemicity

Under such dynamics systemicity, cosmic and orbiting convergent forces (ref.: celestial mechanics), and formation of an atmosphere played and plays a major role in shaping its surface. Erosion and transport of soils and rock by cosmic and terrestrial winds create distinctive landforms and patterns, together with water that is the most important sculptor of Earth's landscape. Furthermore, in a permanent circular cycle, water is continuously evaporating from oceans, transported by winds in form of clouds, and "washing over" lands, which it carves into coastlines and river valleys. Because of its geological activity combined with temperatures, water became the "cradle" as an essential milieu for living organisms to physicochemically structure. Water and temperature brought, and are still bringing up to Earth's surfaces an anchoring soil and decreasing erosion while breaking down rock and accumulating matter in one or another place. Wind erosion, wind-driven transport of materials and volcanism also participate in ever changing the planet diverse strata and regional surfaces. Apart radioactivity that was trapped in the mineral-rich rocks that form the mantle, the motion of materials in constant convection moves from deep under the centre, producing a strong magnetic field. The force of the magnetic field said to be issued from the flow of liquid iron in the outer core (under the mantle) is shielding the planet Earth from harmful cosmic rays and the Sun's solar winds because deviating them around.

Throughout that immense network of interrelated meta-dynamics producing interactive and emergent results, these atomic, physical and chemical events participate in restructuring the Earth (and other planets) body, which environmental context is in a permanent evolution from sometimes breathtaking and random changes. In other words, the complex "cosmo-planetary meta-dynamic systemicity" of these phenomena changes the global landscape and contextual cosmo-planetary conditions at each single instant: changes that are few to be visually perceived at a human eye level, considering their size and long lapse of time that are to be reckoned in thousands, million and billion of years. The major example that is a fatal perspective for Life on Earth is in its programmed end when our star, the Sun will have consumed its energy; an event evaluated towards 4 to 5 Bo years ahead. On Earth, one small schedule exception in perceiving day and night light aspects under ever changing climates is however a false impression, given that the orbiting, revolving, contextual conditions are permanently differential<sup>19</sup>. Nonetheless, one may then understand that "systemicity" is the combination and cooperation of all dynamical cosmo-planetary forces, particularly interaction-retroaction dynamics being its main formatting couple that makes things moving about with synergistic differential results.

### Changes of status and phase transition

Matter exists in various forms, or phases. If the temperature and, or pressure of matter is adjusted, the matter may undergo a phase transition. Pierre Papon, (2002) describes the change of status *s* 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 status (the material with a permanent magnetization) and the paramagnetic status (without permanent magnetization), the transition supra conducting (the material becomes a perfect

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<sup>19</sup> - **Differential:** "pertaining to the difference of two or more motions"

## Meta-dynamics Systemicity

electric conductor, etc). These phenomena between opposite statuses usually pass by an intermediary qualification. During a phase transition, matter shifts between its three statuses: solid, liquid, and gas under certain combinations of temperature and pressure, named "critical points", near which the distinction between the two phases is "almost non-existent" and fuzzy. *"The statuses of the matter are like the countries of a complex geography, separated by borders"* he said. The passage from one status to another as named transition phase corresponds to the crossing of a border. But transition is usually fuzzy; in certain conditions, the substance can pass by a status known as *metastable* before changing course towards a stable status (reference to thermodynamics: entropic move). The passage of a status to another is not instantaneous and there are "undecided" statuses with particular properties, halfway between liquid and solid, such as the Earth's status transformation at the Early Achaean, or, and at the status of permafrost.

Metastability scrambles the thermodynamic borders separating the solid, liquid and gas status. Beyond of a certain range of thermodynamic parameters, the phase considered becomes unstable and necessarily passes in another status through a transitory status. The complex history of the Earth has proven successive statuses of an "evolutionary planetary body"; a history that illustrates the results of slow sequences of fuzzy changes of phase within ago-antagonistic dynamics that cosmo-planetary meta-dynamics systemicity engenders. These phenomena, perpetuating themselves throughout the Earth's and Life's actual context, show that Earth's evolutionary living conditions and survival sustainability are "governed" with the systemicity of the cosmo-planetary set of dynamical forces that retroactively sustain them far from equilibrium unless a major thermonuclear catastrophe should wipe both out.

A change of status, as observed at the passage from one status to another, is called the "threshold effect". Nature is permanently confronted with critical point examples, such as natural selection in terms of a population having adaptive responses, inhibited development... They show that the threshold effect is typically sensitive to certain characteristics of individual and group behaviors while confronted to environmental changes within specific contextual conditions. Phase transition critical point is an important phenomenon that participated in a major primordial manner to form, for example, part of atmosphere and oceans volcanic and gaseous contextual milieu at the origin of cells apparition (ref. Archaea, Cyanobacteria or blue algae).

### **Synergy and Emergent Results in the Field in Between Antagonistic Things**

Synergistic<sup>20</sup> moves, as below defined are links in processing chain development of a phenomenon. In reference to some specific works on "Synergy", published by H. Hackermann (1994), or P. Corning (2003), one can observe that the notion of pattern is intimately describing linked phenomena within a "model system of synergistic", as, for example, chemical macroscopic reactions in the form of outgoing concentric waves, spiral waves, chemical oscillations... Or the notion of physical dynamics is said describing a phenomenon of synergy: "a water vortex is the effect produced by the combined actions of several different forces like gravity, water pressure, air pressure, rotational forces as centrifugal (or centripetal) forces, even the initial status of a considered object or move. Examples are numerous, but it is important to stress the fact "synergy" illustrates sets of

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<sup>20</sup> - **Synergy**: "combined action of two or more agents which produces a result stronger than their individual efforts".

## Meta-dynamics Systemicity

linked phenomena, indeed combined and cooperative, given that they induce an emergent result. The orientation of the instant-t result is at next instant-t<sup>+1</sup> usually combined with other chain of phenomena and is, at term, having combined synergistic effects, which are differentiated from retroactive effects that add dynamical moves that, from systemicity of the cycle, produce successive changes in the global status of the event. Synergistic is then the "arm" of systemicity meta-dynamics.

In this chapter, among many cosmo-planetary and cosmo-terrestrial dynamics implicated in the systemicity of phenomena, we will describe the essential of natural flows and cycles resulting from the "universal retroactivity", as the "meta-driver" between forces, dynamics and differential emergences. Each dynamic has a imprinting mechanism, at all physicochemical and, or biological character level that produces quantitative and qualitative effects on matter and energy. However, as being interrelated with the complex characteristics of other dynamics, the effective emerging result, at instant-t, which is usually the result of combined ago-antagonism moves, induces the environmental ambient metabolism to be permanently modified: each "ecosystem neighborhood" status evolve by some sort of a "vectorial synergy or momentum". A synergistic move, at short and, or long term in space-time, produces a temporary output effect, which confronted to the permanence of changes, becomes a possible evolutionary factor within the meta-dynamic of the cosmo-planetary and terrestrial systemicity of events.

### The In-between Position of Fuzzy Value

Humans have a propensity for giving sense to an event at one end of ago-antagonist things, contraries or opposites in some sort of Manichaeism reflex. However in between the opposites is a field of intermediate fuzzy values that most often show the realism of the in-between formulation of sense given and of its value. In nature, since emerging effects are permanently oscillating, changing while confronted with the evolution of the environmental conditions, it is admitted that values are "fuzzy", usually considered as not mathematically included within the discrete numbers computation between the 0 and 1 bracket. These intermediate fuzzy values or status point are however definitively derived from the moderation of an action necessary to physical, mental, physiological survival dynamics, and from feedback effects. They constitute the base of an adequate value adjustment regarding an event or the status of a momentum (instant-t) a thing goes through. The contextual evolution of things, as being permanent, the values pass through a status of *transition from phase* that qualifies "thresholds" (critical points), a passage to other differential values or other "given direction", while being maintained in the field of survival intermediaries. It is to some extent the emergence of intermediate statuses as adopting a "*solution of compromise*". Physical, chemical, biological, animal or vegetal, societal and, or cultural, these values nourish these dynamics within permanent retro-cycling moves of systemicity, synergy and emergence differentials as sustaining a temporal momentum of survival.

While living, a creature or a social group is between "life and death": a status of survival qualification within the field of opposite extremes (in fuzzy maths, the field between 0 & 1). The intermediate field area, where the systemicity of meta-dynamics operates (e.g: a few days old instant-t) is where the homeostasis of metabolism is being sustained, playing the primordial role of survival, in terms of being a momentary critical point. The set of intermediates is made of "struggles for life behavioral moves" for an individual to survive

## Meta-dynamics Systemicity

while permanently confronted with alternatives and variabilities on how to position itself by one or another successive status values produced from environment and milieu events. The incommensurable context of the "natural", its variability is, in this manner, constantly changed with endogenous and exogenous evolutionary events. Particularly influenced and, or driven with a certain number of physical and natural laws, the diversity of objects, species, individuals and societies behaviors is the source of information, matters and energy as required from survival dynamics and their epigenetic balance of sustainment.

The regulation of an ecosystem ambient metabolism, homeostasis of its components, also require a large diversity of physico-chemical reactions emerging from an the "intra-systemicity" of matter-energy-information interactions results that induce the metabolism status at instant-t to be dynamically balanced for survival.

### "SYSTEMICITY": A PLANETARY META-DYNAMIC DRIVE

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 retroactively star systems sustain. Within the solar system, natural forces and chemical streams of circular information and stimuli induced to energetic changes that provide for the renewal of vital processes substances and material, structuring and sustaining the metabolism of living organisms (vegetation, animals and micro-organisms) for their survival, at least for a certain time. It is related to the meta-intra-dynamics systemicity for creatures to coexist within ecosystems, and sustain along together from chains of energetic and biochemical nutriment resources for their survival sustenance.

The "systemicity phenomenon" is far beyond the sense given to the noun and the adjective "systemic" as referring to the notion of "systems in general": it is far more suggestive and realistic as understanding "the set of cosmo-planetary and terrestrial dynamics" as the systemicity "meta-drivers" that made life to exist and sustain. Illustrating such dynamical sense, it is simply to refer to another notion that has also a dynamic sense: "velocity": a rate of change of the position of a moving body in relation to its speed and direction of travel.

This illustration of "the notion of systemicity" is only as referring to a few dynamical moves that happened at the level of molecular biology in the early primordial biochemical "soup". The evolution of molecules towards macromolecular compounds emerged from highly complex physical dynamics made of retro-feeding biochemical matters and energy reactions. They produced endemic capacities for enzymatic reactions and regulations from the feedback<sup>21</sup> of emergent "differentials" as cascades of positive results. Among them, proteins, nucleic acids and enzymes were essential macromolecules to have physiological life processes that originated in a "proto-organism's metabolism" within geological and aqueous ecosystems, engendering the first creatures (unicell, then micro virus, virus and bacteria).

The Earth primordial context made them emerge because a new atmosphere, composed of oxygen, hydrogen, nitrogen..., and new terrestrial conditions induced to considerably

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<sup>21</sup> - **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".

## **Meta-dynamics Systemicity**

change the environmental and biological context. Energetic resources, from numerous feedbacks, enabled more complex molecules to evolve towards cellular organisms. Successive new generations evolved as "eukaryote cells" structured with both a nuclear protection of reproduction capacities and an efficient filtering membrane capable to regulate endogenous and exogenous resources and information as perceived from environmental events together with expelling wastes. The complexity of sub-dynamics that pertain to the cosmo-planetary and terrestrial meta-dynamics conservation, in terms of survival, refer to the systemicity of dynamical physicochemical forces, energy pressure and space-time dimension. Environmental conditions in which life originated on Earth have to be remembered here, since its environmental conditions settled down along 800 million years until living organisms emerged out of physicochemical process fluxes within different geographical milieu as between -4,6 and -3,8 bo,years. A very long period of time, difficult to humans' understanding, during which primordial cells, (protocells) emerged and evolved from chemical cooperative reactions.

### **The Terrestrial Force of Gravity**

The terrestrial force of gravity holds back any "object" being on a body surface to be projected out of its "sphere" in rotation (Isaac Newton). The attraction of the Sun prevents planets revolving around him, to fly away in space. The Moon under the influence of the terrestrial attraction remains in the Earth's orbit. From such, pressure from gravity is the main "sub-meta-driver" that sustains things to happen. The air that is basic to survival with breathing (nitrogen, N<sub>2</sub> and oxygen, O<sub>2</sub>) is maintained on terrestrial surface by gravity and is a relatively protective shield against meteors, meteorites and dangerous radiations for living species to survive. It is charged with oxygen, as the paramount molecule to life respiration, which air-water cycle sustains diverse corpuscles and molecules to structure the nature of organisms' diversity. The atmospheric pressure, as a result of gravity, pulls the air downward, giving air molecules enough weight as to exerts a force upon the Earth's surface and everything that is on it. Winds of different forces, caused by horizontal variations in air pressure, carrying air particles and rock dusts, participate in formatting deserts from benthic sedimentation of oceans depths and by drifting coastal beach sands over inducing dunes building up. Moreover, the pressures of terrestrial tectonic moves, forcing crust surface orogeny, shape up mountains of reworked materials such as benthic sedimentary rocks. Many cycles that participate in both cosmo-planetary and terrestrial meta-dynamics sustainability, at length of a human observation, and the evolution of planetary ecosystems are corroborating the notion of dynamics systemicity; therefore, confirming the meta-drivers retroactive "systemicity".

### **The Cycle of Rock**

Tectonic forces, heat and pressure metamorphose, breaking process of weathering and other surface processes (running waters, glaciers, waves, and winds) are transforming bedrocks down into smaller, moveable pieces. The rock cycle begins as rocks are lifted up in the magma, pushed up the planet surface and eroded. The particles, or sediment, are travelling by wind or moving water until they are deposited as a material that settles into layers. Additional sediment may bury these layers, or change the underlying sediment to metamorphic rock. Additional sediment may also compact the layers into sedimentary rocks. Rocks may sink down into the lower layers of the earth by plate tectonic processes. Buried and subducted rocks usually meld and recrystallise into igneous rocks in the

## Meta-dynamics Systemicity

magma. Metamorphic, sedimentary, and igneous rocks are then uplifted, starting the rock cycle again.

### The cycle of 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 (retroactive differential evolution) and under the effect of the "systemicity" of cosmic and terrestrial dynamics, as contributing factors to the origin of the Earth's oceans, principles are described by: 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 vapor, water "locked" in the Earth's rocks leaked out over a few million of years. The release is photolysis, the direct process as defining the interaction of one or more photons interacting with one target molecule and radiation can break down chemical bonds separating liquid from hard mass.

### 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 born from volcanic activity. The evolutionary significance of these organisms was found from ancient sedimentary rocks that are far more abundant in iron than in 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 that 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.

While it is said that "*more than one of these factors contributed to forming 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 stromatolites<sup>22</sup> 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 more than a billion years, was produced in such volume that it progressively changed the atmosphere composition<sup>23</sup> 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..

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<sup>22</sup> - **Stromatolite:** "a fossil rock with a structure worked out by a community of microscopic organizations, primarily various types of bacteria and algae" (photosynthesis).

<sup>23</sup> - **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.

## Meta-dynamics Systemicity

### The Cycle of Air and Atmosphere

At the time of its completion as a solid body, the Earth's atmosphere was of water vapor, nitrogen (N<sub>2</sub>), methane, some hydrogen and small amounts of other gases: some carbon dioxide (CO<sub>2</sub>), very little breathable oxygen (O<sub>2</sub>)...

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 (CH<sub>4</sub>) and ammonia (NH<sub>3</sub>) might slowly have escaped ("rinsed out" by the Van Allen belts moves?<sup>24</sup>), 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. The air composition is primarily described in terms of temperature, pressure, wind speed, wind direction, precipitation, and humidity. Cool air sinks and creates high-pressure air flows. It is drawn back to low pressure near the equator, creating a cycle of air winds. Winds converge there and create a zone of dynamic weather, recycling vapour, air and sunlight heat energy up to the troposphere, then moves toward the North and South poles and gradually cool to sink down again. Waters of the oceans have the same kind of cycle, while heated from solar energy. The winds recycle energy, dissipating more of it in the air process than energy dissipated by the combined ocean currents, tides, continental drift and mantle convection. However, these dynamic cycles, that are permanently interrelated, show how much they participate in the differential of retroactive effects on nature. The long-term fluctuations of the average weather – the climate – together with the fluctuations of ocean waters – currents - make earth historicity an important part of life's dynamic systemicity and evolution of the planet life to sustain.

### The Cycle of Climates

Sun's radiation has long-term climatic seasonal effects (temperature and precipitation) on earth atmospheres and surfaces, while it is rotating and orbiting around it. The Earth's rotation deflects winds circulation: tropical and polar winds and two intermediate belts go east in each hemisphere. The atmospheric structure and composition, the heat currents transported by oceans, the latitude and altitude of plateau, mountains and lakes induce to different climate levels. The average ambient temperature grades from tropical above 20°, subtropical, temperate and cold between 10°-20°, polar below 10° C). Precipitations in each hemisphere are differentiated by their frequency (all seasons summer, winter) and climatic zones (equator, tropics, arid and dry, temperate, polar). For example the zones called: the "selva" for equatorial rain-forest with hot tropical rain much of the year; the "savanna", with warm, strong seasonality; and the "tundra", with cold, strong seasonality. Climate effects on life are significant in all bio-physicochemical processes. Animals, humans and vegetation show their diversities according to the different areas of continents. Humans nowadays alter the Earth's climatic zones, consequently Life's creatures, with pollutants and chemicals on the soils and in waters, and carbon dioxide into the atmosphere.

These processes are all constitutive of the "cosmo-planetary and terrestrial meta-dynamics systemicity" and here, their interrelations are generally described.

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<sup>24</sup> - **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".

## Meta-dynamics Systemicity

### Cosmic, Planetary and Terrestrial Body of Dynamics: cycles retroactivity influence

Largely produced by the Moon's tidal forces, combined with cosmos meta-dynamics (laws of physics e.g.: gravitation), the Earth's spins slowly reduced at one revolution in its axis making days to become longer, a retroactivity that is having an influence over natural terrestrial cycles. In the early of Earth, if abundant volcanic activities emitted off much heat, they diminished, inducing the formation of the first rocks from a crust cooling down together with a great change in the atmosphere composition and its weathering effects. The oldest rocks (cratons) are known to have been in the mechanical coupling between the outermost layer of the mantle and the crust (asthenosphere and lithosphere), as one of the forces that drive plate tectonic and is dated 3.8 billion years old.

Known as the Archaean<sup>25</sup>, this period of time would be 200 million years younger than life's origin also dated at 3,8 billion years, so was raised the problem of its origin at high temperatures. As the Earth's rocky crust slowly formed continental plates (small embryonic surfaces called "cratons" were found) the stable part of continents was "excreted" from the Earth's mantle systemicity (cycle of magma-rocks). The cycle consists in internal moves from the Earth's core up to the surface of the continents and bottom of 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 over hundred millions years like the surge of mountain chains and the apparition or *disappearance* of oceans, seas and crust fractures. Together with the "cycle of rocks", the "cycle of water" participates in the "cycle of air" and the "cycle of climate".

At the same time, as having interrelated effects, they participate in the adaptation of large varieties of physical mechanisms and chemical molecules, later to living creatures to adapt for surviving to environmental conditions. These sets of terrestrial dynamics participate in "Life's Systemicity" where retroactivity is paramount to the survival of living systems a synergistic emergent temporary fact. An evolving climate during billion of years prepared conditions propitious to the apparition and development of Life: the terrestrial aqueous context combined to temperatures of relative heat of different cycles. The set of cycles, as having differential emergent results, at each instant and at different macro-meso-micro levels, permanently change the interrelated dynamical contexts, which demonstrates the "historicity" character of "systemicity" as the meta-driver of evolution.

### The Planet Earth Named "Gaia" as 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 "Gaia". 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,

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<sup>25</sup> - **Archaean**: "pertaining to the earliest known forms of rocks; of or belonging to the earlier of the two divisions of Precambrian time". "The Precambrian is divided into pre-Archaean time (from the formation of the earth to 3.8 billion years ago), the Archaean Eon (3.8 billion to 2.5 billion years ago), and the Proterozoic Eon (2.5 billion to 570 million years ago).

## Meta-dynamics Systemicity

- 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 "cycle principle" is the result of retroactive processes like the cycle of water in an ecosystem.

The process of sending status information back for comparison with previous status information is called feedback, and the whole process of the input, output, error or difference signal, and feedback is called a closed loop; however differences in the status qualification induce the loop to get open the next step. The variations of status qualifications in gains or losses oscillate around a critical point depending upon the type of system and its sensibility to entropy. 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 favor 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 survival metabolic functions were at the origin of cells to exist: the filtering membrane as integrating physicochemical information, energy, expelling wastes, protecting their integrity and capacity to manage a reproduction cycle, coding proteins, producing molecules. At the time probably emerged the predator-prey dynamics from a specific chemical survival consciousness capable to memorize defenses information learnt from the milieu. In ecosystems' metabolism, the ecological dynamics such as cell's circulation and survival communication with the neighborhood are first found in the field of oscillations, within which predator-prey populations occupy a resource, or several as well as managing a balanced sociality, Without going further into James Lovelock work, the back office of this description is again understandable in terms of "systemicity" and dynamics that were and still are participating to the dynamic of moves, particularly the function of *feedback positive and ago-antagonistic biochemical reactions*. Furthermore, it comprises a large set of functions: autocatalytic chemical reactions, reaction diffusion, morphogenesis, instability dynamics and pattern surge, activator-inhibitor drivers, self-replication...

## **Meta-dynamics Systemicity**

Here again, at the Earth's cosmo-planetary dynamic level, the set of cycles having differential emergent results, at each instant, at different macro-meso-micro levels, but permanently changing the interrelated dynamical contexts, demonstrates the "historicity" character of "systemicity", meta-driver of evolution. The history of Earth, a true odyssey, is consubstantial to that of the cosmos, given that the galaxies and stars (matter and energy cycle), , has an evolving history to perdure in a limited long term: such is the Sun.

### **THE APPARITION OF LIFE**

The hydrologic and winds cycles, described as a transdisciplinary approach of contributing dynamics, are in the circulation and conservation of Earth's water that is in a frequent status 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 the atmosphere was progressively attained to in a dynamic 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 and still is. The hydrologic cycle cannot be considered as a closed system since it is reactive with the planet cosmic behaviors, itself under the influence of the presently described "cosmo-planetary meta-dynamics systemicity" and other terrestrial dynamics. Participating in, the sun dynamics, gravitation and orbiting position are some of the components of the set of "the general meta-dynamics Systemicity ".

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 the status of water or air, temperature, moisture and vortex advection conditions. If 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. Analogues are the characteristics of the parameters that participate in the formation of oceans currents.

The complexity of "cosmo-planetary, terrestrial and life's meta-dynamics systemicity" where interrelated cosmo-planetary and terrestrial forces interact is well specified. The interconnectedness of each of every physicochemical and biological cycle within the 3 dimensions of geographical ecosystems produces differential opportunities for matter, energy and organisms to behave, adapting themselves to their temporal conditions and evolve as facing the reactivity of environments. The "cycle of rocks", the "cycle of water", the cycle of winds and temperature"... as well as the "cycle of cells' individual and social survival" even though physicochemically different in their changing and evolving statuses are formed from a certain number of emerging results. Issued from dynamics differential retroactivity they reveal the cycles as participating in cosmo-planetary and terrestrial meta-dynamics systemicity.

### **The Cycle of Oceans Salinity**

The oceans get most of their salt from rivers, volcanic gases and hydrothermal vents on the ocean floor. As water is cycling between the oceans, the atmosphere, and the land over hundreds of millions of years, the salts from rivers remained in the oceans, which explain why seawater is saltier than river water. Ancient salt deposits indicate ocean salinity as

## Meta-dynamics Systemicity

having remained relatively constant along 1.5 billion years. Salts are removed from seawater when they bond chemically to clay sediments as they sink to the sea floor in a process called reverse weathering. They are also removed to the profit of marine plants and animals to form body parts and by evaporation forming minerals or blown from waves into the air, leaving a salty aerosol in the air or a salty film on nearby land. The cycle of salinity goes on when uplifted ancient rocky seafloors are weathered releasing ancient sea salts that rivers carry back to the sea. The density of salt participate in the current of the seawaters across the world, together with their temperature, so seeding the systemicity of those dynamics The dynamic is retroactive and participate in Life's to exist: cells, animals, plants, humans, all must retro-regulate their "osmosis" to a certain amount of salts in their tissues in order to provide chemical exchanges within the living organisms for hydration.

### Cycle of Carbon

The cycle of carbon usage by which energy flows through the Earth's ecosystem is basic to cells evolution when photosynthesizing algae used carbon dioxide (CO<sub>2</sub>) found in the atmosphere or dissolved in water. Incorporated in plant tissue as carbohydrates, fats, and protein, the rest is perspired to the atmosphere or water (respiration cycle). Since herbivores eat vegetation, their metabolism uses, rearranges, and degrades the carbon compounds: CO<sub>2</sub> as an aerobic respiration is partially stored in animal tissues and is cycled on to carnivores feeding on herbivores. Wastes and decomposition matters are broken down and their CO<sub>2</sub> is being used again by plants. Continuously circulating in the Earth's ecosystems, it is a carbon dioxide gas in the atmosphere as used by plants in the process of photosynthesis. Animal respiration and photosynthesis balance to keep the amount of atmospheric carbon relatively stable given that a certain amount contributes to underground by-products (petrol...). However, nowadays, the humans with extra carbon dioxide production from industries and fuel usages perturb climates cycle, ecosystems and milieu metabolism.

In conclusion of this chapter, the systemicity of terrestrial dynamics, the different levels of their synergy, retroactivity and convergence of emergent results, at instant-t, explains that, from feedback effect, perturbation, so minimal would they be, induce to amplified moves within the different cycles as illustrated by the "butterfly effect" metaphor. It acknowledges the actual critical situation of the global warming cascade of threats.

### The Dynamics of Systemicity and Apparition of Life

The "primordial systemicity", within which the body of dynamics were (and still are) mechanisms of reactions, retroactions, circularity, recursive production and reproduction, 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 synergy<sup>26</sup>, proto-metabolisms and living system's metabolism were boosted up, and induced to the building up of dissipative structures that became (and still are) adaptive individuals and societies, from cell species to actual humans.

It was early in the Archaean that life first appeared on Earth around -3,8 billion years ago. Oldest bacteria fossils date to roughly 3,55 billion years ago, and consist of early

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<sup>26</sup> - **Synergy**: "a mutually advantageous conjunction or compatibility of distinct actors or elements (as resources or efforts).

## Meta-dynamics Systemicity

autotrophic bacteria. They probably grew both deep under oceans near volcanic gushes and along ancient seacoasts enduring harsh sunlight as well as episodic wetting and semi-drying from tidal cycles. Environmental conditions like subaquatic volcano emergences with significative temperature and gas effects induced some living most primitive creatures (Archaeobacteria) to develop, finding energy and metabolic nutriments from chemical reactions within a rather hot context of water and matter milieu. They constitute a taxon of the livings characterized by cells without core and distinguished from the eubacteria<sup>27</sup>, by certain biochemical characters. Later, eukaryotes cells (2,5 bo.years) have a nucleus enclosing the replication mechanism of DNA and a flexible cellular membrane.

### **Bacterial Populations: structure and metabolism for survival in a contextual milieu**

In order to describe a "systemic process", the specifications and configuration of the system's components must be put into a form compatible to analysis, design, and evaluation of its structure and behaviors, giving that systemic dynamics manage the individual metabolism and morphology of creatures. For example, a unicell has a neural-like chemical function with proper centres (memory chemical basins) for survival information treatment or a jellyfish that is the simplest organisms having neuronal functions in form of a one neuron brain to retroactively manage its survival.

Bacteria are mostly of three groups: *Aerobic bacteria* with survival response to gaseous oxygen for growth and existence. *Anaerobic bacteria* are living in deep underwater sediments. *Facultative anaerobes* grow in the presence of oxygen, and then can grow without it. Bacteria are also classified by the mode to obtain energy: *Heterotroph bacteria* extract energy from breaking down organic compounds of the environment - as in decaying material, fermentation or respiration. *Autotroph bacteria*, fix carbon dioxide as a food source. When fuelled by light energy, they are *photoautotrophic*, or by oxidation of nitrogen, sulfur, or other elements, they are *chemoautotrophic*. Photoautotroph bacteria include the cyanobacteria, as photosynthetic organisms using water and sulphur bacteria that use hydrogen sulphide instead of water. 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 autotrophic<sup>28</sup>) and zooplankton (protozoa as eukaryotic<sup>29</sup>), 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 dynamic principle" is a consequence of the "predator-prey process at quest of energy", a chemical process that emerged while the RNA structured. Many of them learned how to extract oxygen from water or how to produce 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 models of phylogenesis methods that are finding evolutionary moves, were heterogeneous. Both molecules as individual and social entities participate in the

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<sup>27</sup> - **Eubacteria**: type of spherical or rod-shaped bacteria.

<sup>28</sup> - **Autotrophic**: light (photosynthesis) or of chemical links (chimiosynthesis).

<sup>29</sup> - **Eukaryotic**: having cell organelles and nuclei with chromosomes.

## Meta-dynamics Systemicity

formation of macromolecules and organisms given that the survival phenomenon supported by reproduction requires the retroactive differential result of energy consumption. Joseph Thornton developed 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 studied how genes develop new functions by introducing ancestral genes into diverse environments (hot, cold, acids...) and observed the way evolution is adapting to these milieu conditions. However, rebuilding ancestral milieu is of a large probabilistic and would be partial (fragmentary).

### Mechanisms and Components of "Life's Systemicity"

Physicochemical biologic world, in terms of Life cannot be described to Universal Laws as Evelyn Fox Keller, MIT, wrote in *Nature* 2007: "*Biological phenomena are permanently contingent upon evolution*". Planet Earth, the "Gaia" ecosystem, is also subject to evolution dynamics, in a context of homeostasis within a framework of evolutionary long term structural changes that are contingent to terrestrial cycles and the biological ecosystem evolution. These general phenomena and events cannot be theorized but may be considered as relying upon provisional "rules or generalizations" and the development of probabilistic computerized models data. Submitted to cosmo-planetary and terrestrial physicochemical mechanisms in terms of universal laws (for how long?) and geophysical cycles, the biological organisms and their physiological cycles, fluxes and behaviors are ever changing and adapting. Their capabilities usually fit differently according to environmental world areas conditions, climates and seasons, given that orbiting and magnetism are implicated together with solar system winds and the gravity effects. "Living beings behaviors" are reducible to the dynamic of physicochemical reactions, as well as the "biops" fluxes (see chapter 5: "environmental-psychosomatopsychism", its acronym "e-psop"). Cells all possess membrane chemical reactors that behave according to the world of opiates, as molecular emotion participating in managing survival; this is a major discovery made by Dr. Candace Pert, on a biomedical research on emotions opiate receptors, endorphin and peptide that explain how feelings, emotions are connected through our mind with the body. In other terms, how the body-mind functions are set in a single psychosomatic network of information and interrelated molecules that participate in the intra-systemicity of survival dynamics controlling health and physiological statuses. In biology, hypothesis have but "an intrinsic value of given explanations" and will never become more than a tentative to develop "theoretical principles", since "Life survival replication data" permanently emerge from ever changing phenomena on an orbiting planet submitted to the cosmo-planetary and terrestrial meta-dynamics changing effects. Some mechanisms, like the Darwin biological evolution work describing principle, method and mean of species adaptation to environment, are sometimes considered as a theory. However, since a theory implies large data evidence that is a world of "variables", Life's moves are not invariable under the same condition.

Moreover, primordial life appeared within specific combinations of those dynamics effects where water and temperature encountered specific physicochemical statuses and values that have much different oscillations today. As a matter of fact, in terms of evolution, one is now able to describe the massive quantity of information contained within nucleotides emergent results considering their permanent interactions, in an ago-antagonistic manner,

## Meta-dynamics Systemicity

with ago-antagonistic events of the milieu. It is observed that biological values oscillate at a constant evolution rhythm from which one is only capable to bring about one or another fragment of Life's complexity. Furthermore, biological phenomena cannot be reduced to specific molecules: DNA segments are "associated" to genes in ways that also evolve while confronted with an ever changing body milieu metabolism and contextual events that weigh upon organisms behavior, retroactively affecting genes expression while renewing proteins and enzymes sets.

### Feedback: Differential Retroactivity Results

A "feedback" is the process that enables "loop control" moves participating 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 balance. Most cycles of the cosmo-planetary and terrestrial dynamical materials and energies are retroactively sustained and then evolving, at least within the influence of galaxies gravity on the very long term of their "immense spatial life". 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 "Sun" and its planets, a star system, has an evaluated life length of another 5 billion years ending into a supernova blow out, which matter, chemicals and energy will seed again the interstellar space and neighboring star-systems, in a cascade of retroactive moves. The seeding is historically and retroactively sustained but confronted with the thermodynamic entropy that end with a thermonuclear matter bust feeding the apparition of new star-systems (ref. to supernovae life). On Earth, organisms are confronted with entropy and degradation (breaking down) that feed back new elements for survival of the food and reproduction chains.

The most important feature a feedback imparts to a living system's integrity and behaviors is in its comparison function that continuously detects differences existing between inputs and outputs effects from endogenous and exogenous stimuli that provide appropriate signals or information necessary to manage input-output differences. One may call such retroactive move the "survival capacity driver" submitted to the collective meta-dynamic systemicity (meta-driver) of the cosmo-planetary and terrestrial environments. In a biological movement, such as reaching an object or reacting to endogenous and exogenous events require some chemical outfit reactions that interpret and decide what to reach, positioning a "body", what behavior to have for security or getting a resource within reach. At different levels of action, variable signals are piloted out the sensitivity of chemical substances, cell's receptor filtering and organ functions (e.g., light chemical vision as conversion of information, like eyes one) and from their reactivity to "biops" drives. (e.g.: unicell' "brain"<sup>30</sup> for survival have chemical memory capacities for survival management, bar receptors regulating blood pressure by inhibition drives...) Biological processes might not have an accurate ability to reproduce faithfully an input, then the reducing effect of non-linearity and distortion usually drives to some oscillation or instability. This is why

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<sup>30</sup> - **Unicell's brain**: biochemical processing information close to more elaborate neural function as the one neurone Aplysia.

## Meta-dynamics Systemicity

the circularity of moves is primordial for the maintenance of dynamics, in Life's infinite complexity, for chemical exchanges are generating feedback drives (or biological interactive emergent "biops"<sup>31</sup>) results that affect the survival streams steadiness (dynamical balance) of the object, while confronted to entropy.

### **Biology and Modelling: a Description of Primordial and Fractional Process 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, which is the DNA synthesis<sup>32</sup> applied to computerizing some of its models. By sequencing models of gene fragments and test their capabilities to behave, it was obtained simulations of the reproduction 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 environmental conditions of the moment, in other words, to reproduce the contextual "dynamical systemicity" of the surroundings they happened to emerge from, live in, reproducing and adaptively evolve. "Primordial organic functions" have surged along a very slow evolution of positive physicochemical reactions confronted with the entropic world (during ~ a billion years). The interaction between biological processes produced dynamic results that emerged from their being confronted with the permanency of the thermodynamic "work" within specific ecosystems and fluxes. Prior to the apparition of gene segments coding proteins, organic functions have induced to physicochemical combinations from which emerged the "RNA reproduction capacities" of unicell. Life was in limbo until unicell developed (bacteria, archaebacteria...) and "*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, virus<sup>33</sup> types of organism raise the question of the "egg or hen paradox" used as a 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? Biochemists, biophysicians and molecular biologists certainly provide important information on the subject, even though anyone has his own arguments to answer to such questions as confronted to biological phenomena. A food web is made of "interconnected dynamic food chains by which energy and materials circulate": the emergence of primordial chemical reaction in the form of a biomolecule predated for energy is a dynamic result. The first move that happens is at the level of energetic electrons that absorb and reject energy while transferred from one atom to another during oxydo-reduction reactions. A dynamic that makes biomolecules to exist as they are made of atoms linked with energy, therefore participating in the systemicity of the livings.

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<sup>31</sup> - "Biops": the acronym for a bio-physicochemical event.

<sup>32</sup> - **Polymerase chain reaction (PCR)**: a molecular biology technique for enzymatically replicating DNA without using a living organism.

<sup>33</sup> - **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".

## Meta-dynamics Systemicity

### Percolation, Interactivity, Amplification of Disturbance, and Phase Transition

Life has happened through dynamic percolation of physicochemical phenomena. 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 most of the time random. According to whether the proportion of active connections is, or not, higher than that of a threshold value, the information to long distance may be transmitted since overpassing critical points. Percolation relies upon the critical phenomenon that is constitutive of a phase transition<sup>34</sup>: 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 by passing over a critical point. The particular situation of transitions from phase is one out of many physical or chemical move phenomena occurring to number of cosmic, planetary and biological mechanisms. The appearances of highly sensitive behavioral conditions issued from phase transition are also observed in social life organizations. Disturbances permanently modify living creatures' behaviors and their metabolism while they interact with environmental events and stimuli. Alike the butterfly effect, a small fact can induce to important and perverse effect in attitudes and physiological statuses amplitude. Societies of creatures are meta-organizations functioning at the verge of a lethal equilibrium that is a compromise between contradictory constraints not predictable and controllable, but maintaining a timely and temporal survival. However, from feedback effects, the situation might be severely sensed as depending on their weight on people expectations.

### "Survival Principles", major to intra-biodynamics systemicity

At the Asilomar ISSS 48<sup>th</sup> conference (2004) I, J.-J. Blanc, described "Living systems' survival" as a circular and regulating set of dynamic moves permanently fed along with bio-physicochemical ("biops") matters, energy and information from feedback results emerging from necessary interactions with endo-external milieu. The retroactivity of phenomena, which I call "Meta-dynamics Systemicity" is fundamental to survival and suggested to me another and complementary approach in form of a psycho-physiological new paradigm. As central to Life's dynamics systemicity, the nervous circular system is a network of interactions and retroactions with stimuli in environmental areas of life: ecosystems, brains, internal milieu, bodies". This phenomenon I named: the "environmental-psycho-somatopsychic" cycle, (a neologism and its abbreviation: "e-psop") because survival is a matter of circularities. The whole body of interdependent bio-physicochemical mechanisms, processes and streams, interwoven in a 3D milieu, within interdependent networks shows that systemic abilities and performances for any individual creature to survive come from dynamical forces. Because of permanent changes in behavioral statuses, one understands then "survival principle" as the result of many forces and moves as constitutive and common processes like for example: feeding, reproducing, self-defending... Evolution dynamics, from genetic inheritance to apprenticeship, adaptiveness and education participate in managing the different survival dynamics.

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<sup>34</sup> - **Transition phase**: "a movement, development, or evolution from one form, stage, or style to another.

## Meta-dynamics Systemicity

### LIFE'S INTRA-DYNAMICS AND THEIR SYSTEMICITY

Life's requires in itself an important inventory and argumentation about dynamics as capable to become realistically understood and described: their interactions, in terms of being capable to sustain an endogenous dynamical equilibrium in a milieu that is based on retroaction differential and emergent results and adaptive proprieties, has happen to much complicating along evolutionary trends. This work is then limited to the description of a few aspects of intra-dynamics that introduce our next works since they are at length part of the meta-dynamics systemicity theories presentations.

#### Systemicity “Ins and Outs”

Electrical impulses, biochemical energies and physiological "biops" matter flows, sustaining relevant biological behaviors and actions processing, contribute to the "dynamic stability" of every living system's survival networks. As fitted in with the permanency of changes and the maintenance of the circular moves fluidity, the system's viability sustaining survival is emergent from the percolation<sup>35</sup> of moves surging along the flow of "biops" element exchanges, spot to spot, area per area. This vision and approach of survival moves is pertaining to all living system's physiological, body and societal levels, from cells to supra-national societies. Observing and describing them, requires an homogenous approach of the footbridges and links that build up the connectivity of systems' networks for survival needs and dynamics. To get things able at such level of transdisciplinarity, one must adopt the use of analogies and metaphors, since straight principles or rules are not convenient or disproportionate for a pragmatic understanding of dynamical subjects (the Maxwell origin theory, the use of J.G. Miller's “operator's metaphors”...)

#### Reproduction: the Systemicity of a Paramount Emergent Survival Dynamic

The ultimate determinant destiny 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 communities) are exposed to *"a pattern of numerous events, each individual or in aggregate having a certain lethal probability at any moment, causing a total probability of death or survival.* Climatic and other terrestrial changes in ecosystems modify the frequency of various potentially fatal events that weigh upon chance and physiological specificities of living systems as to become mature. Progressive "endo-systemic" changes, inasmuch as growth, reproduction, development, and senescence are intrinsic characteristics in the organism as capable of modifying the effects of the living creatures upon various environmental factors and moves". The words "survival dynamics" and the notion of "reproduction" are emergent results of "Systemicity drivers" and the most important notion of self-maintenance of a living system. 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 identity and integrity (its "self") for staying alive. It requires all systems to have a specific individual degree of consciousness, memory and reproduction features in order to fully participate in the circular seeding of the energetic survival food chains in ecosystems. Henceforth, since "survival" creates reproductive sociosystems (family, group, local society, national society, human society,)

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<sup>35</sup> - **Percolation:** " to spread gradually,

## Meta-dynamics Systemicity

then living systems have to be open-loops with internal and external behavioral processes that are never linear because of the permanency of changes. in ecosystems (niche, local neighborhood...) where cohabit with, several 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, such as a reef. They, at such level, require the use of pragmatic metaphors that help decipher their complexity.

The study of dynamic systems reveals frequent periodic oscillations and it is probable that, in certain cases, these oscillations are produced by a set of fuzzy phenomena, implying cascades of interactions within metabolic processes. Where the climate and local physicochemical statuses (e.g. volcanism) weigh heavily upon the environmental status, the systems' metabolism has to cope with an endemic acute and entropic pressure. 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 and, or fuzzy changes. Many periodic phenomena were modelled, showing in labs what effect a local property could generate within a system's metabolism homeostasis from a single periodic "processing value". The induced new property might strongly disturb the metabolism at an instant-t or for longer: a phenomenon that is analogue to the "butterfly effect" notion.

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 flow.

### The Neural Brain and systemicity

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 hypothalamus<sup>36</sup>, 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 inferred<sup>37</sup> 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-psychophysiological 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.

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

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<sup>36</sup> - **Hypothalamus**: "the hypothalamus contains a control center for functions of the nervous system, and has important links with the endocrine system".

<sup>37</sup> - **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.

## Meta-dynamics Systemicity

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.

### Psycho-Somatopsychic Reflexivity

At the Asilomar ISSS 48<sup>th</sup> conference (2004), the author, introducing the notion of "systemicity" and the theory, first described "survival". Survival is a circular and regulating set of dynamic moves permanently fed along with a psychophysiological body of streaming biochemical matters and information within the emergence of feedback results that are "retroactive positive differentials" when referred to as survival dynamics. Moves that are fed from survival interactions and retroactions result as emerging from endogenous and, or exogenous effects of milieu changes. The body of these retroactive phenomena is fundamental to living system's survival, then suggesting another and complementary approach in the form of a new paradigm as central to Life's dynamics. At a first level, survival is systemic, made of circular phenomena as the emerging products of interactions within ecosystems and body structures milieu. They yield to the notion of the "environmental-psycho-somatopsychism", a neologism and its abbreviation: "e-psop", which the author postulates as being fundamental to Life's sustainability because of its circularity effect within a living body physiology. 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"). Links (or bonds) and footbridges processes fit in with sensory information networks. They convey environmental endogenous and exogenous dynamical stimuli, from events filtered throughout the "specific individualistic function and networks" (personality of the system) to a central bio-physico-chemical treatment center and, from it, outwards influencing the environmental milieu. These phenomena have suggested "the notion of systemicity" as central to understanding living system's survival.

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 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"<sup>38</sup>) processing is to become a "generalized notion as of being central to circular flow procedures"<sup>39</sup> that participate in managing any level of fundamental values as being major survival principles.

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<sup>38</sup> - "e-psop": here a 3D graph metaphor for highly connected networks that represents the interdependent interconnected physiological, sensory and regulatory sets of metabolic processes.

<sup>39</sup> - **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.).

## Meta-dynamics Systemicity

Consciousness and awareness, emotions and thinking, intelligence, representation and abilities to behave, are universal survival functions, whatever living system is concerned. Considered as, at first, the "protogenes" of Life, they are "the foundation of a "biops processing substratum" that build up the different survival values according to the "meta-driving effect of systemicity" as required for diversity sustaining retrosurvival.

### **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 homeostatic<sup>40</sup> 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.

### **Evolution**

In order to approach the evolutionary Universe and the systemicity of objects and living system's behaviors, let's recall the whole of cosmic phenomena as not unscathed from evolutionary historicity. The very slow transformations of the universe (astromathematic extrapolations) emerge out of a great number of dynamic phenomena, gathering in three categories:

- those that are physical and chemical constraints towards cosmic objects in terms of physical laws: thermonuclear energy, gravitation, cosmic radiation energy...
- those that are "beneficial" within the time of a dynamic balance of forces effects, which, being endemic, maintain the cosmic object far from a lethal thermodynamic balance (balance of statuses) during a physicochemical phase transition at a certain lapse of space-time,
- those that are retroactive effects generating changes of status on the surface and, or within the object, while maintaining a momentary integrity of its components.

Therefore, the analysis of the historicity of an evolving cosmos, it is judicious to assume that the systemic theory of the planet Earth, named "Gaia, a living system" by James Lovelock, shows that its evolution is subject to analogous convergent effects relative to:

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<sup>40</sup> - **Homeostatic**: "a relatively stable status of equilibrium or a tendency toward such a status between the different but interdependent elements or groups of elements of an organism, population, or group"

## Meta-dynamics Systemicity

- those dynamic phenomena that are constraints towards its evolution (cosmic forces, entropy, energies...)
- those endemic phenomena that balance the surface qualities of the planet Earth's and of its internal milieu (environmental cosmic and terrestrial forces influence)
- those biological endemic retroactive phenomena that are beneficial with the perpetuation of life.

Mechanics shows the fundamentally relative character of balance and the movement, which well define evolution as a synergistic differential result emerging from the systemicity of a set of meta-dynamics: mass, force, displacement over a distance, time, velocity, acceleration, interaction, retroaction, phase transfer over a critical point... Thus, one can postulate without concern, nor anthropomorphism, that the "systemicity" such as before defined is exactly a meta-dynamic set of universal forces and processes that are interdependent and doubtless conditioning the differentiation of surface and milieu statuses evolution and retroactive effects mostly interrelated at endo - exo - endogenous differentiated levels of any cosmic objects metabolism. However, the planet Earth actual status of a living system, as per James Lovelock's Gaia description, is the result of both the "cosmo-planetary meta-dynamics" and "Life's dynamics" systemicity that together influences the whole Earth system evolution, affecting both the physical and chemical environments and living organisms evolution.

### Survival Metabolism and Evolution from Systemicity

Biological mechanisms and chemical processes moved from energetic resources are being systemic. The retroactive positively differential physicochemical results were first to structure organelles metabolism, which, on to next evolving steps, participated in the building up of the living organisms' metabolism as single cells. Larger molecular and enzymatic "interaction and interrelated 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 systemicity

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...as contextual perception, silent thinking and argumentations...). They illustrate the evolution of "biops" processes, facing permanent changes, named "irreversible" since reactions happens far from a status 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 status of an organism especially fit and characterized by*

## Meta-dynamics Systemicity

*its capacity for its metabolism to keep up its sustainability 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.*

### **Living Systems: an Ever Changing Move of Physiological 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 instant-t must be participating in such wholeness, even though it is of much larger volume than that necessary to the synthesis of the elements implied in the functioning of percolating moves throughout the biological networks. Complex, biological networks answer general laws for living organisms survival often postulated as being common to other "processes and their mechanisms", however then inaccurately called "systems". Because of organisms "milieu" and environments permanent changes, interactions between the components of a living system induce to 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 living 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 dynamically intervened as described above.

### **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 to emerge, suggesting to me the development of the "Theory of general dynamics systemicity ". It was postulated that a further development of these new theories will require its transdisciplinary structure to be composed of many other chapters for complementing previous papers and future issues. The description of "A General meta-dynamics systemicity" and "The Life's intra-biodynamics Systemicity" are, step after step, the result of developing a very large work in volume and time.

## Meta-dynamics Systemicity

The "Theory of Life's intra-biodynamics Systemicity" is here an "abridged description of some of the 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 Life's apparition.

Furthermore, this work strongly suggests that any species and its societal organization 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. Permanently emerging from the world of physicochemical and biological processes studies, vital survival behaviors should result from a sustainable, adaptable and endurable Life's context and human new strategies. The survival of the livings is in danger because mankind produces aggravating degradations implicating the global society intelligence, actual human cultures, socioeconomic attitudes and human systems as fruits of thinking, creativity, warlike competition and obsolete political attitudes.

I am now observing that my intimate conviction there could not be a "general system(s) theory", assuming Ludwig von Bertalanffy biologist's theory was superseded, as I expressed it as from 2000. It is here confirmed since I have inventoried and linked most of the physicochemical events issued from "cosmo-planetary and terrestrial meta-dynamics systemicity" mechanisms, drivers and processes. They bring up the strong evidence of "Systemicity, as a general universal move" within the reality of differential result retroaction.

Since the apparition of Life, every individual living organism and communities, from unicell to the actual living creatures (humans included) is submitted to a universal contextual "meta-dynamic systemicity" that shows cosmic objects and living beings having a diversity of specific and common survival dynamics while submitted to the evolutionary effect of the cosmo-planetary and terrestrial forces. Microgravity at the subatomic level is probably behind a general systemicity.

In conclusion, it is here also postulated that "Systemicity" is the mechanism of retroactivity, a feedback result linked to synergistic and emergence. "The general systemicity" of cosmic objects is part of the entire physical universe metabolism, its dynamics equilibrium since it includes gravitational effects and retrofeeding capacities. The theory of "A primordial general systemicity" will be the 5<sup>th</sup> stage of my works, and hope not being the last.

## 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.

## Meta-dynamics Systemicity

- 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
- 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 Europ-ean 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.
- Corning, Peter (2003): *Nature's Magic, Synergy in Evolution*, Cambridge University Press, UK
- 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.

## Meta-dynamics Systemicity

- 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.
- 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. (much abridged list)