

# COHERENCE vs COMPLEXITY: AN APPLICATION TO WATER

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## ABSTRACT

It is revisited the modern physics of condensed matter, mainly based upon coherence dominion concept, upon dynamic generation (self organization) of order and upon merging of structure and function, for the purpose of proposing a vision of the Nature extremely simple and elementary fully opposite to the complexity approach that appear so enthusiastically accepted and celebrated by the systemic community. Actually at molecular biologic level, it seems that coherence (order and merging of system and function) is becoming one of the most important physic and biologic law that operates the strong effect of ordering molecules by means of electromagnetic field, creating the so called "Coherence Dominions". This appears peculiarly true for water molecules that speech and self organize each other by means of electromagnetic fields giving more support to field theory than classic particles biology approach. So, the kind of bridge between physics and biology proposed by this model appears to be a very simple and elementary body of knowledge that, according to Preparata, creates a vision of the Architecture of the Nature extremely "*coherent and ordered*". So Coherence Equations – that are a generalization of Schrödinger equations – deduced by applying QED (Quantum Electro Dynamic) seem to be in contrast with complexity equations due to their inherent simplicity. Really, the Preparata Architecture approach to the Universe, based upon the "Coherence Equations", appear to assert and propose a quite different vision of the Nature in which the complexity factor, mainly based upon random approach is completely outside. Water behaviour is taken into account as the major example of this kind of organization giving the opportunity to mention the Ruggero M. Santilli model that, being compatible with the Preparata one, is able to explain all inherent and external water properties, peculiarly the long range ones. According to the coherence vision, Nature appears to be simpler than the random based complexity approach tries to show. Clearly it appears spontaneous the necessity to harmonize the two approach: the complexity against the coherence approach. The problem is still open.

## INTRODUCTION TO COHERENCE IN MATTER

In order to compare the order or coherence approach to Nature vs the random complexity one, it is selected only one field for the comparison: living and condensed matter, peculiarly through biology. The complexity is referred to the main known authors approaches (BBS: Ref. N° 1, 2, 8-20 and Appendix). The "order approach to Nature", i.e. the invariant coherence one, used for the comparison is the one postulated by thick known theoretical physicists such as Giuliano Preparata and Ruggero M. Santilli (BBS: Ref. N° 3). Both their models could be used for the purpose but Preparata model of coherence in matter is easier and more intuitive to introduce in terms of physics (BBS: Ref. N° 4, 5, 6, 7) so, in this context, it is presented his model in first instance with some references to the Santilli model too (a sort of mathematical order of the Nature).

Considering the modern physics approach to complex systems, basically governed by random and/or chaos, Giuliano Preparata, a big Italian theoretical physicist dead few years ago, used to say:

*"As a matter of facts, it could appear really paradoxical (but not in the philosophical sense where it is not at all) that the inderteministic physics born from the quantum revolution at the very beginning of the Nineteen Century reveals itself to be much more "deterministic" then the classic physics that recent developments shows dominated by "chaos" and/or random.*

In this frame, the Preparata model of living matter is based upon the following classic molecular biology principles (SA: Ref. N° 1, 2, 3, 4, 5):

1. The biologic dynamics is defined inside the atomistic conception i.e. the dominant science paradigm of the 20<sup>th</sup> century.
2. The matter, peculiarly the biologic one, is made up of molecules built up with atoms.
3. The principle of asymptotic freedom, i.e. any molecule (i.e. of water) is always similar to itself (it is always the same) a part from the physical state in which it is found: gaseous, liquid or solid. Equally in biology a cell is always similar to itself.
4. The locality postulate, i.e. local effect depends only upon local causes since distance actions of every kind are excluded.

Modern but classic biology is based upon molecular biology according to which living matter is basically conceived by a set of molecules that interact each other thorough standard chemical forces having short field of action no more than a couple of molecular radius. Any biologic event is characterized by an ordered sequence of molecular collisions, ruled by biologic catalysers (enzymes and coenzymes) to guarantee the

specificity of the chemical reaction. According to the classical chemistry vision, chemical reactions usually happen due to some kind of code link among molecules (and atoms) that complementarily recognize each other. This kind of programmed property of chemical molecules together with the variety, the evolution, self assembling, self organization, self replication, mutation, hybridization and so on make molecules example of complexity. However, sequence of molecular collisions would happen only inside limited ranges of the external environmental physical parameters (temperature, pressure, pH, dielectric constant, magnetic permittivity and so on). Outside those environmental limits the biologic dynamic degrades its performances till its complete failure. This classic random molecular collisions model producing a biologic events is a little bit rough, off the shelf and obsolete. It seems that exists some sort of collision codes (BBS: Ref. N° 2/Balzani e Venturi) among molecules such that each molecule meets its peculiar correspondent molecule by means of an appropriate mutual information reconnaissance (Fig. N° 1, 2, 3, 4).

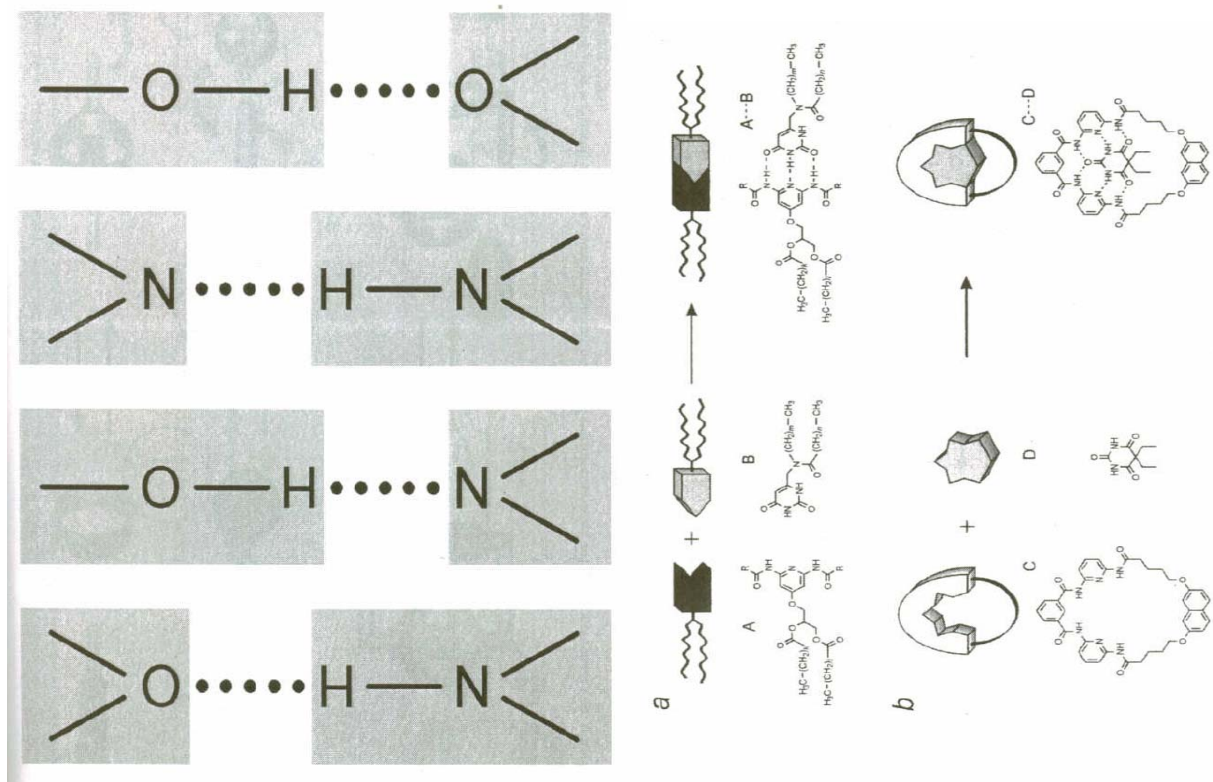


Fig. N° 1 Classic Hydrogen Link, Fig. N° 1a Classic examples of linking codes between molecules (BBS: Ref. N° 2/Balzani, Venturi)

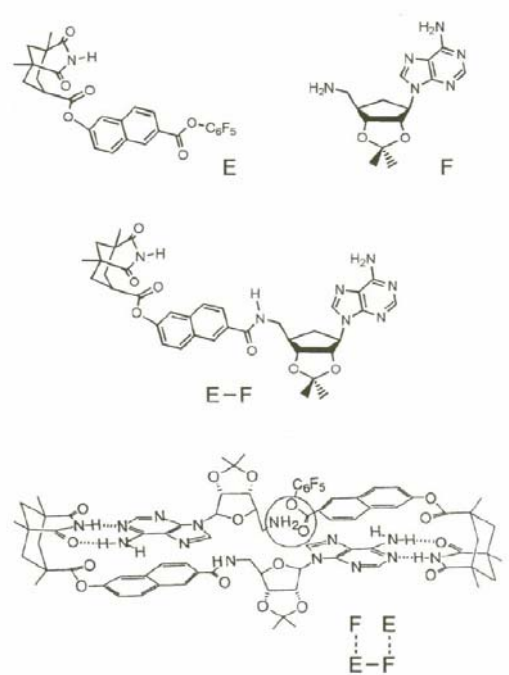
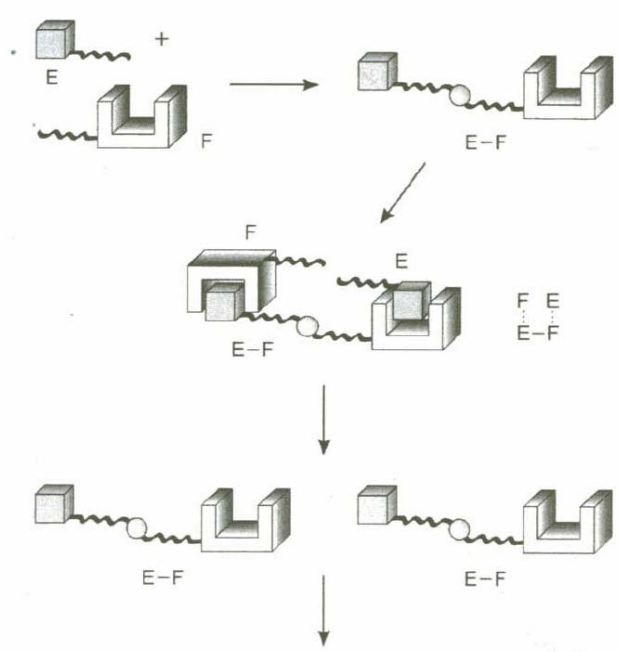


Fig. N° 1b Molecular replication process; Fig. N° 4 Molecular self replication process  
 (BBS: Ref. N° 2/balzani, Venturi)

Classically, this chemical approach explains the linking with topological codes and mechanical codes. However, this explanation seems unsatisfactory. Paradoxically, the long range interactions appear to be characterized by a much sophisticated molecular hidden dynamics able to change an independent molecule set (e.g. of water) in a kind of only one holistic ordered organism tidy endowed of homeostasis. In the meantime, it was observed that each molecule radiates classic and/or quantistic electromagnetic fields able of interacting each other by linking together electric charges and current along distance hundred times superior to the distance to which normally act the chemical actions. According to this observation, Preparata and Del Giudice (SA: Ref. N° 1) created their model making the hypothesis that the above described molecular behaviour is defined by the quantum electromagnetic field radiated by each molecule interfering each other with long range (hundred times chemical ranges) interactions. Many other hypothesis and theories have been created to explain the long range order such as that of R. M. Santilli based upon the Hadronic Mechanics (BBS: Ref. N° 3) and his Hadronic Chemistry. In this analysis, the above mentioned Preparata and Del Giudice model is followed. According to this model, it is the electromagnetic field that operates the management action of putting together a set of molecules letting them to have closed chemical meetings according to the classic known biochemistry. In other words, according to the new condensed matter physics, electromagnetic field occupies a very special position having a peculiar role in the behaviour of molecular sets.

Already during the first half of the 20th-century, Tesla, Marconi and Lakhovski proposed a "electromagnetic biology". In this kind of biology, the molecule has to be considered just as "electric harmonic oscillator" that, in homeostatic conditions, resonate in phase. From this point of view, the therapy consisted in granting and harmonically according the system of oscillators in such a way to bring all together in phase resonance increasing the internal coherence of the entire system. Unfortunately, this approach failed due to the well known and famous energetic inconsistency. Actually, at that time, there was unknown or it was not understandable what was the energetic source that created the electromagnetic field. As a matter of fact, the calculus showed that the human organism would be only able to produce sufficient energy to make an oscillation of the human body molecule just once a day.

Nowadays, according to the above mentioned basic four hypothesis, *big limits* are placed to the analysis of the biological dynamics that seem to be steered by the peculiar electromagnetic fields radiated, peculiarly, by water molecules internal to the human body and peculiarly to biologic skin. In other words, water assumes in biological systems a primary role. The molecular radiations would produce the so called "Coherence Dominium" (CD) of water molecules in biological systems, in which the intermolecular interactions appear to be fully different from that of short range chemical type but mainly due to long range electromagnetic-quantistic nature.

During almost the past three decades, it has been developed the extension of the quantistic electro-dynamics, mainly the all merit is due to Giuliano Preparata for his explanation of the formation of the condensed matter from the "gas" matter and the brand new Hadronic Mechanics and the fundamental Hadronic Chemistry mainly due to Ruggero M. Santilli [BBS: N° 3].

Many parts of Preparata theory are outside of the Standard Model in the same way as Ruggero M. Santilli Hadronic Mechanics and his fundamental approach to Hadronic Chemistry are fully outside of the Standard Models. Both the theories are generalisation of the Standard Model of the knowledge of the Universe.

Actually, according to Preparata theory it becomes feasible what the classic electro-dynamics doesn't foresee: *the formation of "Coherence Dominium" that explains the existence of a certain quantistic biological dynamics and of the ions circulation in the alive organism.* In other words, in the quantistic physics it happens that the parameters changes that determines the object can really happen not only due to applied external force (such as an applied electric field) but also due to spontaneous enliven action from the inside, such as internal fluctuations. In fact, the fluctuation is the most important performance thing of the quantum object just beginning with "void" space (vacuum). In classic physics, the void is the nothing, so it implies the total darkness. In quantum physics, the void is all the fluctuations of all the conceivable fields by starting with the electromagnetic fields. So quantum darkness implies some random on-off lights having very short life. During these fluctuations, the electromagnetic field interacts with electric currents produced by nucleus and electrons rotating around atoms and molecules and produces an attractive energy that modifies slightly the total energy of each single molecule or atom. This phenomenon, known as Lamb shift, constitutes the test of the reality of the void electromagnetic fluctuations. It is also very well known that molecules and atoms can take many configurations each one having different energy. To pass from a configuration to another, it is necessary that the molecule (or atoms) modifies its energy. This transition could be properly implemented by applying an external electromagnetic field of appropriate frequency corresponding to the relative desired energy gap. This transition is really a resonance of the molecules (at relative wave length) of a specified kind with the applied electromagnetic field. So when, in the void, the number of resonating molecules subjected to electromagnetic fluctuations is properly increasing to such a number to reach a critical value of density, then the attractive energy produced by the interaction fields fluctuating with the intra-molecular currents become sufficiently great to impose to the molecular set to prefer a different regime corresponding to energy saving. So the molecules change their status from gaseous to liquid, where each molecule oscillates between two

configurations at the same frequency of the applied electromagnetic field. In physics this property is known as "coherence". The region of the space having the dimension of the wavelength of the electromagnetic field is named "Coherence Dominion". At the inner part of the Coherence Dominion the molecules tend to assume maximum density due to the tendency to the minimum energy. So at liquid level, the coherence corresponds to that of electrons regime, whilst at solid level the coherence implies electrons and nucleus regimes.

All the molecules belonging to the Coherence Dominion resound together to the unison when they are invested by an electromagnetic field of appropriate wavelength. In terms of Haken synergetics (BBS: Ref. N° 8-11), there is the emergence of a self-organisation of molecules electrons dominated by the same phase: they resonate in phase, that appears a sort of order parameter, that submits all the molecule electrons in the CD to the same resonant regime. According to synergetic theory, the overall number of degrees of freedom is completely reduced to basically only one: *the order parameter*.

However, the coherent set of molecules are subjected to external random collisions of other molecules whose intensity increases with the temperature. If the external applied collisions energy becomes equal to the energy gap gained by ordering the coherent dominion, then a fraction of coherent set of molecules lose its coherence, i.e. the phase accord with and within the collective mode. So, for a given temperature, the condensed matter is made up of a mixture of two homogenous systems: a coherent fraction grouped in coherent dominions oscillating at the same frequency with a minimum energy and a non-coherent set of (out of phase) molecules forming a dense gas filling the interstices among the coherence dominions. From the theoretical analysis, it is deduced that the electromagnetic field inside the coherent dominion cannot radiate outside the coherent dominion itself. The electromagnetic field remains trapped inside the coherent dominion presenting at the frontier an evanescent cue, that quickly decreases outside the coherent dominion surface. It is just this field cue that arrests the external molecules from entering the coherent dominion where the phase resonant molecules are filled at minimum distance each other. The relative coherent and non-coherent fractions of molecules are quite different each other. Every molecule fluctuates between two configurations of different magnitude at a frequency (rhythm) of the electromagnetic field, changing its dimensions in time and negating the principle of asymptotic freedom.

Summarizing, in the model, it is assumed that each molecule present in the matter (i.e. water of each skin layer) behaves as a standard liquid, then it is also assumed that each molecule oscillates consistently in a Coherence Domain of the diameter of 100 Angstrom with the peculiarity of having the higher energy configuration less than the so-called "ionization threshold". This particular value of energy is the energy gap to which a molecular electron starts to be free out of the same molecule of liquid (water). In other words at every instant, in a (really a free one) Coherence Dominion of condensed matter there is a portion of electrons nearly *free* that are then available to implement the following two phenomena:

1. The *electron transfer*, i.e. a molecule outside the Coherent Dominion moving along the CD surface captures a nearly free electron without spending appreciable energy.
2. *The magnetization of the water*: this long time very well-known phenomenon usually considered inexplicable according to the conventional classic physics, otherwise finds a simple explanation with the quantum electrodynamics of the condensed matter (water). Little energetic stress, such as the mechanics agitation, or an electromagnetic wave or a chemical reaction, can induce a coherent collective motion of nearly free electrons; every electron can really leave the original molecule and jump on to another contiguous molecule (generating the so-called "hopping conduction"). The acquired energy by these nearly free electrons is always lesser than the "energy gap" of the coherent set of molecules but sufficient to let rise a coherent excitation of the set of nearly free electrons, that, consequently, starts rotating inside the Coherence Dominion, producing a circular electric current that, in turn, produces a static orthogonal magnetic field proportional to the rotation speed of the nearly free electron cloud. In other words, every energetic excitation in free or under skin water produced by a hydrodynamics, chemical or electromagnetic perturbation (of entity less than the "energy gap" that determines the Coherence Dominion) leaves a trace in the network of the water Dominion of Coherence in the form of a permanent magnetization.

## **Quantistic Electrodynamics Coherence and Chemical Dynamic**

According to the above explained theory, it is supposed possible to apply the properties of the free liquid (water) consonant matter Coherence Dominion to biologic matter such as "water in the human skin". Actually, at room temperature, liquid water is formed of a coherent fraction of the order of the 40% and a non-coherent of the order of the 60%. Due to the erosion produced by thermal collisions, it is possible to reduce the dimensions of the dominions of coherence of the water internal to the skin to an order of 700 Angstrom. Each Coherence Dominion is spherical and its surface is a well-curb and really frontier where coexist coherent and non-coherent molecules of water and where the electromagnetic field suddenly decreases. This frontier region is thick 30 Angstrom and its interstitial space between the coherence dominions of the water is filled of non-coherent molecules and, in some cases, of solute molecules including ions. In this manner, it is

created and maintained a coherence dominions network of skin water in the various layered of skin due to the effect of the overlapping of the evanescent tails of the electromagnetic fields outside to the same coherence dominions. That the way, the manner and the mode with which the dominions oscillate in phase coherence among themselves producing a network of dominions, i.e. a kind of cage that keeps in the interstices between a domain and the other, inside the network, the not coherent fraction of water molecules and of the relative solutes.

In the case of water, the self oscillation created by the distribution of electromagnetic fields happens to a well determined frequency located in the infrared to an value equal to 62400 GHz, that corresponded to an energy of 0,26 eV. Due to the gradients present at the frontier of the of coherence dominions, forces are developed that act on locally present molecules and atoms. Two kinds of forces are really present:

- a. *Massive forces*: that are repulsive and tend to remove the particles from the dominion being inversely proportional to the mass. Since electron mass is time thousand less than that of the molecule, in the frontier region these forces tend to stretch and deform locally present molecules in such a way to drive the electrons out of the frontier while the nucleus remain within it. In this way, a series of electric dipoles are produced on the surface of the dominion that constitute a positive and negative charged double layer producing an voltage potential difference of the order of 100 mVolt. The figure are related to standard water at room temperature. If the coherent regime increases the frontier thickness is reduced and the voltage potential difference of the double layers decreases too.
- b. *Dispersive force*: suppose that, in a coherence domain, a molecule vibrates at frequency  $f$ , it will interfere with the electromagnetic field frequency having  $f_0$  and is subjected to a force:  
 $F = k/(f^2 - f_0^2)$  inversely proportional to the difference of the squared frequencies. If there are two molecules, one oscillating at  $f$  frequency and the other to  $g$  frequency, when they interfere with the above-mentioned electromagnetic field oscillating to  $f_0$  frequency then they are subjected to a force with an in inverse proportional to  $(f-f_0) \times (g-f_0)$ . This interaction is attractive or repulsive to downstream of the sign of the difference and it assumes very large values when the frequencies are quite close each other.

The spatial distribution of electromagnetic fields in water oscillating at the above mentioned frequency ( $E = 0,26$  eV) generate at the water coherence dominions surface a set of forces depending upon the frequencies distributed in along all the network of the coherence dominions frontier regions covering all the volume of the liquid. This also explains how bio-molecules assembling each other along their appropriate coherence dominions frontier regions produce, universally, cellular membranes.

At this point, it is possible to repeal the explanation of the specificity of the molecular collisions based upon their mutual reconnaissance but not due to some kind of random meetings. *This is a main point of difference of the Preparata approach to the knowledge of Nature and its Architecture vs the random complexity one.* Actually, based upon the behaviour of these dispersive forces, only molecules oscillating on the same frequency are able to mutually recognize and attract each other at long distance, even in the middle of numerous other molecular species that however oscillate to different frequencies. So it is generate a sort of "intelligent behaviour" of the molecular biology, in which, somehow, some molecules chase each other and do not collide by chance each other as used to happen in the classic and conventional molecular biology.

Obviously, water cannot be the lonely means of the living matter to follow this coherent behaviour, otherwise it would exist only one frequency solution: 0,26 eV. Actually, water is one of the simplest means, other molecules usually with the mediation of water, are able to aggregate other molecule sets by oscillating at different specific frequencies, however producing other set of molecules, in other words, other coherence dominions. Normally from the conventional biochemical point of view, these coherence dominions are interpreted as "polymers" whist from the present point of view they have to be considered being "monomers". In this frame, an advanced hypothesis is that those "monomers coherence dominions" are really enzymes that usually have dimensions of hundred of Angstroms. There are similarities among water coherence dominions and enzymes coherence dominions. So, due to specific oscillation enzymes could present energy configuration closer to the ionizing threshold much more than the water configuration itself. The present approach on enzymes is able to explain also the possible energy creation due to electron transfer for many biochemical cycles, such as the (9 stages) Krebs one, that the classic theory is unable to explain. According to the coherence theory, the electromagnetic field, that originates the coherent oscillation of electrons, solves the task of extract the electrons from the double layer substrate breaking the relative links. Since enzyme electrons are extremely close to the freedom, a huge amount of electron transfer take place depriving the enzyme itself of the necessary electrons to maintain the coherent oscillation with consequent loss of coherence. To rebuilt coherence enzyme has to recover its electrons. To this purpose, it becomes spontaneous to think that the electrons are provided by the metal molecules that often are linked to the coenzymes. Thus, the union of enzyme and coenzyme is essential for maintaining the coherence, and then the catalytic action in the chemical reaction.

In this frame, chemical reactions get a energy regime fully different from that of the classic biochemical models. As a matter of fact, exothermic chemical reaction free energy released in a non coherent environment becomes heat and produce an increase of temperature. On the contrary in a coherent environment, the same reaction releases its energy content to a coherent réseau as an electric polarization

wave that produces, in turn, a coherent excitation of the entire coherent dominion able of attracting other molecular species. Summarizing, the interaction cycle is reported in the Fig. n° 2

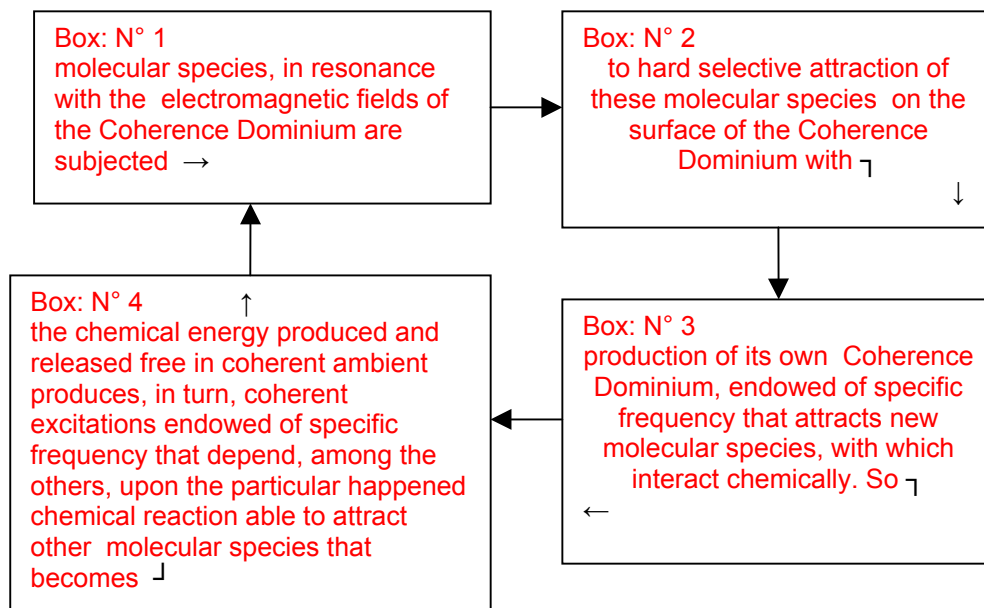


Fig. N° 2 Interaction cycle between chemical and electromagnetic level of the living matter.

This cycle set forth that the chemical level and the electromagnetic level of the living matter in Nature appear to be interlinked, entangled and mutually sustainable each other. This entanglement guarantees the homeostasis and the observed temperature stability in the living matter since produced energy is given away in the form of coherent excitations of coherent structure and not totally dispersed in the form of heat and heat energy that would produce temperature variations. To be sustainable the chemical and electromagnetic entanglement, it must be verified the fundamental condition that the frontier regions of the coherent dominions must have a thickness sufficient to guarantee the enough development of the dispersive forces. If the electromagnetic coherence of the dominions of the media (water and enzymes) would increase to an extent to reduce or, at the limit, nullify the thickness of the coherence dominions, then the attractive selection regime of forces would diminish whilst the random collision regime would increase with consequence that the biologic system would lose its chemical coherence due to excess of electromagnetic coherence.

#### *Electrodynamics cell model*

The above explained coherent electrodynamic mode is really valid for human body cells and consequently for the human tissue, that is really a homogenous set of identical cells. Shortly, every single cell has a set of oscillating electrons on their surface. As demonstrated by an experiment published on "Nature" in 1997, the set of oscillating electrons on the surface of the cells should repulse each other because of the negativity of their charges, on the contrary they attract each other. Actually the attraction depend upon the density of the negative charges located on the surface of the cells. According to the quantistic electrodynamic this phenomenon is interpreted as due to the event that the cell surface electrons set oscillate coherently together in phase. This ensemble oscillation known in physics as electron plasma is coherent but, under a threshold value of the electron density, shows a weak coherence. This means that electromagnetic field of electrons coherence dominion can still maintain its resonance with external fields. However, the intensity of this coherent electromagnetic field is very small and is not able to shield the other external coherent fields. The extent of deepness or penetrability of this coherence dominion electromagnetic field depends upon the surface electron density. If the electron density is under a critical threshold, the set of all cells (i.e. of any one of the layer of the skin) form a tidy, ordered and correlated system, the human tissue, whose density is maintained constant by the coherent regime. In this frame, inner tissue cells cannot produce filiations and, duplication because new born cells would modify the average distance among cells braking the coherence regime, implying, among the others, an relevant energetic price. Constant average distance among cells due to coherence necessity inhibits the cell filiations and/or duplication. Peculiarly, the uncontrolled filiations and/or duplication would place the tissue in a cancer situation. External assault agents, in other words the most important factors of degeneration condition of the human tissue, would produce damage effects. However those aspects are outside the scope of this research.

The circulation of molecules having electrical charges inside the superior biologic organisms are mainly electrolytes and poli-electrolytes, that as ions move along the connective tissue paths, disseminated of cells. Ions movement happened in two steps:

1. An extra cells movement along the connective tissue.
2. The crossing of cells membranes to reach the specialized sites inside the cells itself.

The move of those charges constitutes a electric currents to be studied under the electrodynamic theory. Various ionic species move independently each other without any heat production (loss of Joule effect). In other words the ions charge propagation in the superior biologic organisms happens without a very limited energy loss. Actually, it appears that the relative physics is governed by two know effects:

1. *Josephson effect*. Let suppose to have two regions in which electric charges underlay to coherent regime with exception of a thin not coherent layer in such a way that the tails of the evanescent coherent electromagnetic fields existing in the two regions touch each other, then across this junction passes a super electric current i.e. a current that does not dissipate heat because the Joule effect is null, and having its intensity proportional to the gradient of the phase across to the junction. Actually, it has been experimentally demonstrated within ferment cultivation that in the alive matter there exist Josephson types of super currents.
2. *Blackman-Liboff-Zhadin effect (BLZ)*. If two parallel magnetic fields, the first is static and the other alternating one, are applied perpendicularly to the flow of ionic current, the when the frequency of the alternating field becomes equal to one that is characteristic of the used ionic specie, i.e. the cyclotron frequency of the specified ( $f_c = e/m_i H_0$ ), then the ion flow receives a strong transitory thrust pulse that is transformed in a peak of short duration of the electric current of the specified ionic species. Recently, this BLZ effect has found an satisfactory explanation within the coherent quantum electrodynamics.

It is now possible to present a conclusive synthesis of the physical scheme of the ion circulation in the superior biologic organisms. First of all it seems necessary to underline that there is a fundamental dissymmetry in biology between magnetic field and electric field. In fact, the birth of coherence in various zones of the tissue of alive matter produces big variations of the dielectric constant  $\epsilon$  whilst doesn't substantially change values of the magnetic permeability  $\mu$ . So the electric component of the electromagnetic fields undergoes the greater screening in the regimes of strong coherence (as that associated to corrupted and/or cancer tissue). The magnetic component doesn't undergo perturbations in the passage from a coherent region to the other.

Consequently, the magnetic field rises its importance and is proposed as the candidate of some sort of a "universal key" for the study and the management of the alive organisms.

Summarising two current types have to be included: the super current of Josephson that travel along corporeal electric circuit and the pulse currents propagating along the produced nervous network due to the BLZ effect.

## The electric biologic network

Let first analyze the connective tissue physics structure. Basically, this tissue is made up of long molecular chains built with protein parts (amino acid sequences) and glicides parts. These chains can coordinate big quantities of hydrate water (vicinal water). It is possible to demonstrate that this kind of bio-molecular water shows large electric biasing due to the interactions among electric dipoles of the protein sequence and enter a coherent regime completely different from that of the pure water. The actual Coherence Dominions of the vicinal water become tubular muffs coaxial to the molecular chains that are really surrounded by the same CDs. Every single piece of the protein chain, circled by the first tubular muff of hydrate water, produce a second coaxial vicinal water muff having a less coherence grade and so on. Since the electric constant of the means depends upon its internal level of coherence, the vicinal water will be characterized by a dielectric constant  $\epsilon$  decreasing with the increasing of the distance of the backbone of the molecular chain. Consequently, an electromagnetic field born inside the chain remains trapped along the chain due to the presence of the vicinal water in such a way that it could only propagate along the chain itself.

It happen that in some specific sites along the molecular chain, water coherence dominions can be substituted by enzymes whose electrodynamic function is very similar but at a different working frequency. Just at these enzymes sites, it happen the chemical reactions among the molecular species able to resonate to the specific enzyme frequency as previously mentioned. Let suppose that at a specific site of the molecular chain assumed to be long as a glicidic branch, a chemical reaction happens releasing a quantity  $Q$  of energy at the external coherent environment. Consequently, based upon the above described dynamics, it is generated a static magnetic filed trapped in the water muff that forces the local environmental ions to move in a circular mote on the external surface of the muff. Since the coherent portion of the excitation produced by the chemical reaction travels in  $q$  region in which the water electric dipoles (or of the enzyme)



are maintained lined and ordered by the coherent regime, it is generated also a longitudinal force along the muff axis that produces a longitudinal component of the ions flow on the external surface of the vicinal water muff. The composition of this mote with the circular mote induced by the magnetic field produces, in the end of the day, an helicoidally mote, whose energy is extracted from the chemical reaction energy.

In brief, it possible to summarize that the Preparata and Del Giudice bold hypothesis is that the ionic currents along the connective tissue propagate long trajectories that follow sheath motorway aqueous long the molecular chain of the proteoglicani and similar molecule that, with big opportunism, are possible to make coincide with the “meridiani” of the Chinese tradition. Travelling long this “meridiani” circuit the ions go into the lateral cell and they activated chemical reactions that release free energy. During the trip then the ions activated the energy of the body cells and the organism perceives the motion and flow of this electric current as an energy activation flow that is as an emotion.

More precisely, every variation of current ions flow along the “meridiano” involve the passage of the coherent set of ions from a ciclotronic orbit to another one around the tubular muff that wrap the chain longs molecular. This passage or transition should produce also an electromagnetic transition between the two orbits with consequent emission of a field able of provoking the ignition of a current of ions in a similar structure to that existing and present in the near environment. In other word, the ionic motion on the cyclotron orbits must be detectable in the above mentioned environment by means of opportune magnetic fields.

Returning to the similitude with the “Chinese Meridiani” network, it should be underlined that this network has not still been characterized to level of anatomous and physiologic state, while it has been observed numerous bioelectrical correspondence that need other studies for an anatomic and functional formalization equation. At the moment, its is possible to form the hypothesis that the chemical reactions, providing with the circuit network, produce magnetic fields ( Fig. N° 2) what produce, across the BLZ effect, the intensity of the current in the “meridiani” networks.

From the purely electronic point of view, the network of “meridiani” studied by using the SEP techniques is determined, after proper integration of the above mentioned various network effects, from some kind of electrical currents along the various parts of the skin and are also parameterized with resistivity, constant dielectric, PH etc. Applying substantially simple measurement systems (EAV) of the variations of the cutaneous resistance, it appears to be possible to measure some of these parameters and note that they change in degeneration correspondence of the tissue. The response to chemical - physical signals of vary nature is of toxic type (increasing greatly the resistance) being also of therapeutic type by decreasing the resistance and increasing the effective currents in the circuit.

At the moment, a first preliminary electrical model has been developed by Giuseppe Quartieri (SA Ref. N° 27) bit it will be reported in another publication.

### **Insufficiencies of quantum chemistry for biological structures**

Most of the above mentioned arguments support the Santilli approach to Hadronic Chemistry (SA: Ref. N° 6) because of the listed insufficiencies of the quantum chemistry to provide with serious representation of biologic systems. Actually, Quantum Mechanics Theory and QED are notoriously able to explain perfect rigid, conservative, reversible systems (i.e. external systems) such as hydrogen atom or a crystal. Consequently, any theory, such as the Santilli one, that is able to deal with hadronic particles in a new way is really outside the Standard Model.

The introduction of deformable-elastic structures in quantum mechanics brings to catastrophic inconsistencies. To try to cope with the chemistry of biological structures, Santilli has developed the Hadronic Chemistry i.e. chemistry applicable to hadrons that are charged, deformable, high density particles subjected to irreversible and non conservative processes. Hadronic Chemistry generalizes all conventional laws and principles of quantum chemistry in a broader way. Peculiarly, quantum and hadronic chemistry coincide everywhere except for new effects due to the correlation of valence electrons at small distances. After the EPR argument on the lack of completion of quantum mechanics and consequently of quantum chemistry, Santilli conceived the chemical bond of valence electrons wit the representation of deep wave-overlapping of the wavepackets of the same valence electrons. In other words, electrons were not anymore considered point-like charges but hadrons having wavepackets of 1fm dimension. The calculation of the invariant representation of the deep overlapping of the wavepackets of valence electrons was based upon the assumptions that the physical conditions were:

1. Non linear (i.e. dependent on the superior power of the wave functions).
2. Non-local-integral (i.e. dependent on the integral over the volume of wave-overlapping different from a finite set of isolated pointes).
3. Non potential (I.e. consisting of “contact” interactions then with “zero range” and the potential energy has non meaning mathematically and physically).
4. Non Hamiltonian (i.e. non representable via a Hamiltonian but requiring additional terms).

5. Non unitary (i.e. the time evolution violates unitary conditions).

So, in the Hadronic Horizon [a small sphere of radius of the order of 1fm ( $10^{-13}$ cm) in which only the broader theory (Hadronic Mechanics) holds] there are a lot of completions of the Quantum Mechanics, but, for the purpose of this work, the relevant is that a new model of condensed matter and peculiarly of water is obtained. The model comes out of the emergence, in Hadronic Chemistry, of new interactions structurally beyond any hope of the Quantum Mechanics, according to which water molecule correlate-bond themselves into singlet pairs in accordance with Pauli's exclusion principle. Basically, the new interaction is due to the introduction of a basically new, strongly attractive non-Coulomb force among pairs of valence electrons (Hulten term in the hydrogen molecule). This is trivially due to the non Hamiltonian character of the interaction. Anyway, a part from the mathematical difficulties (iso-geno-hyper mathematics) to deal with Hadronic Chemistry, also this approach is really a simple approach to the vision of the matter that really fights against pure complexity, even if, according with Santilli thinking, biology is not at all treatable with Quantum Chemistry but only a little bit with Hadronic Chemistry.

## CLASSIC RANDOM COMPLEXITY IN NATURE

Algorithm complexity in Nature is basically the mathematical approach to complexity (see Appendix). Classic Kolmogorov, Solomonoff and Chaitin concepts of complexity are defined in terms of a succession of digit that must be introduced in the calculus (computer) for obtaining the output succession of data. Complexity is equal to the measure in bit of minimal programs of the succession of digit. Consequentially, a random succession of digits has complexity approximately equal to its measure in bit, as Wolfram approach to the new mathematics tries to demonstrate by facing the behaviour of a software simulation program (cellular automata, mobile automata, substitution systems and genetics algorithms).

In a way or in an other one, let assume validated the notion of complexity, the problem is now changed in finding the measure of the Preparata "Coherence" notion, i.e. "Coherence Dominion" in terms of the relative measure of complexity. In other word it is possible to reduce "coherence" to a random succession of digit? As know by all the theoretical physicists practitioners (by staring with Preparata and Santilli) coherence is not random, but eventually a periodic function irreducible to random, by mathematical definition. This proposition is demonstrable according to Gödel theory. So the coherence vision of Nature is something much more simple and essential that its reducibility to a random computer calculation process. However, Nature inherent complexities born from the biotic evolutionary escalation of sequence of random processes are reducible to basic elementary actions and/or quantum of actions according to Hector Sabelli (SA: Ref. N° 25). This turns to be in perfect agreements with Preparata approach to simplicity of Nature and its Architecture.

## CONCLUSIONS

It has been presented a paramount vision of the complexity and coherence of water model first of all developed by Giuliano Preparata and Del Giudice. The SEP measurements importance have been also presented by noting the existence of the (Quartieri) brand new electric model for the electric current along the skin, completely different form the very well known skin effect, just because they are different phenomena. Later, it has been simply presented the modern and brand new Santilli chemistry and mechanical hadronic approach, that would give, in the future, a better interpretation and representation of the long rang coherence order and presence of long range coherence dominions. For ending, it has been shortly recalled the classical random complexity in Nature.

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