PHOSPHATE - WATER – MOLECULAR OXYGEN SYSTEM BIOLOGICAL LASER ACTIVE SUBSTANCE AND ITS IMPLICATION IN THE LIVING MATTER THERMODYNAMIC BIOPHOTONIC TESTS

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Summary

The paper deals with some biophotonic tests on the unknown properties of every component of the molecular biological laser system, phosphate –water – molecular oxygen: high and low temperature semiconductor type; photon absorption and emission; light power amplification by amplitude and frequency modifying, some nonlinear properties that explains the living matter thermodynamic. Some graphics illustrate the laser nature of bioluminescence

Keywords: phosphate, water, oxygen, bioluminescence, laser, biological laser system and phenomena, thermodynamics

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Introduction

The purposes of the paper are: to reveal a part of my fundamental multidiscipline studies and biophotonic tests that I done at International Institute of Biophysics Neuss Germany (2003), to confirm the existence of the biological laser active substances BLAS inside the human, animals and plants systems, substances that are emitting the bioluminescence BL, to confirm the laser properties of the BL (as holographic, thermal, plasma laser or Kervran effect), and which has implications in BEMPh cicles (or biochemical, electric, magnetic, photonic or laser effects) as thermodynamic cycles and its specificity for every type of the living matter systems.

For that I improved both methods, theoretic and experimental method, to verify the point of view of a new theory - the *Biological Laser Theory* (BLT) 1993-2006 (Manu M D, 2003; 2007). It treat with the human, animal and plants laser holographic principles of structure and functioning, the interference of light and bioluminescence with the living matter systems, the bioluminescence properties for every type of BLS. The complex biophysics' mechanism of human, plants and animals' functioning begins with the molecular level of semiconductor diode

type, phosphate – water - molecular oxygen. This hypothesis is sustained by new theoretical and experimental bio-photonic studies, and it is validate from a thermodynamic point of view. For theoretical studies, it was necessary to introduce in biology new knowledge from laser, liquid crystals, nonlinear optic, and holography, electronic and to do connections with biochemistry, physiology, ophthalmology etc. What types of substance are emitted BL, I have to establish by biochemistry and biophotonic tests, delayed luminescence DL and spontaneous emission SE tests. I done theoretical and experimental studies upon KH_2PO_4 or KDP, a *nonlinear medium (Nemeş G,1972)*, whose structure is based on $[H_2PO_4]^-$ or $[PO_4]^{-3}$ group and K ion, P atom which has *properties of optical radiation emission, not "spontaneous" way but* after optical stimulus action, and which disappears in long time, but appear again after new optical stimulus, as a natural laser phenomenon, or a biological laser phenomenon.

Theoretical approach

KH_2PO_4 or KDP is a nonlinear medium in nonlinear optics and is too a well known

tampon system of inside cell medium, whose properties were limited t*o biochemical reaction*, but I found that *it is a nonlinear medium* too. In *nonlinear optics* KDP it is used as *parameter generator system*, which *double the optic frequency*, so that step by step the visible spectrum becomes ultraviolet. It seems that its optic activity is due to molecular system. In 2 H_3PO_4 acids, whose property is the light emission or phosphorescence, or bioluminescence at basic level, in natural conditions a luminescent activity. A lot of cell macro energetic compounds imply $[PO_4]^{-3}$, $[PO_4]^{-2}$ or $[PO_4]^{-}$, able to absorb n electrons as a nonlinear medium, and determine n photochemical reaction.

The material for study was phosphate – water –molecular oxygen group as molecular semiconductor biological laser system or the *biological laser active substance* of all other types or biological system: *membrane, nucleus, cell, organ, and organism.* This is valid for animals and plants too, for the Earth planet. I suppose that on the Earth exists another molecular group as H_3SO_4 - CO_2 to UV sensitive or other combinations to X ray sensitive. Theoretically *the semiconductor diode* is a mixture of two or three chemical elements or substances, whose atoms and molecules have the property to emit electricity when it is lighted from a source of light, very quickly in special condition of temperature, in general for low T. Because the biochemistry attempts us about the energetic property of 2 H_3PO_4 acids, I consider *phosphate group* is one of basic molecular group for the *laser active substance*. The phosphate group works together water and molecular oxygen to do it and is initiated by the light action, under optical stimulus as a nonlinear medium. The metastabil π electron of phosphorus atom is able to absorb 1,2,.. n photons in a photon trap (one of *nonlinear optics rule*) (Nemeş G,1972), that explain the validity of *Weber - Fechner* and *Bunser- Roscoe physiology rule, both in human and plants physiology*.

This theoretic hypothesis is the result of a long time analysis and synthesis of interdisciplinary fundamental studies. It is one of the new biophotonic (energetic and informational) model of biological systems - "the biological laser system"(BLS) and "biological laser phenomenon"(BLP) and implies enabled agreement of some obligatory conditions, matching some well-known physics theories (already verified):

— Caloric theory of the mechanical work (thermodynamics);

— Lasers theory (Lengyel B, 1968) and non-linear optics (Nemeş G,1972);

— Information theory (cybernetics);

— Finite time thermodynamics or generalized thermodynamics theory (V. Radcenco,2001).

According to BLT, there are some common points between the 4 theories presented above and the assertion of the importance of natural light and bioluminescence in the thermodynamics of the living matter systems. So is the role of supplying power in: the thermodynamics of the living matter systems, the energetic and informational role of the light, the transformation of the light into laser type radiation (bioluminescence), laser type nature of the bioluminescence, specific types of biological laser systems (BLS) and phenomena.   All these are realized after a proper course of the thermodynamic cycle.

The *technique laser principles* of *structure and functioning* (Lengyel B, 1968) are the same for "the biological lasers systems". They are the followings:

1. The *principles of a laser structure,* common to all types of biological laser systems BLS (laser resonator, laser active substance as phosphate-water-molecular oxygen, radiation source, shutter system, cooling system, system of amortization of the mechanical shocks etc).

2. The *principles of laser functioning*, the interference light- living-matter systems and the amplification of light power by frequencies, amplitude and phase, specific to all types of biological lasers systems BLS **(figure 1).**

3. The *secondary laser effects* are necessary to be present in all types of BLS, but they begin at mol sem. BLS level.
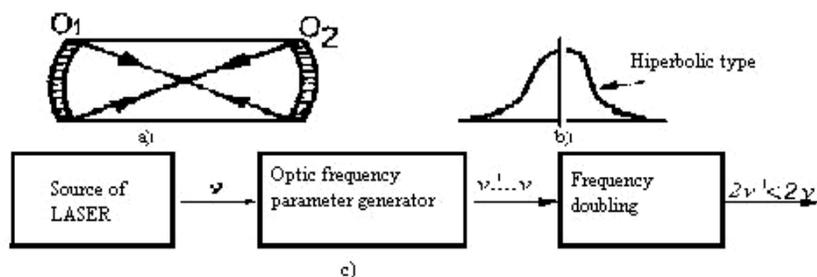
Fig.1. Different types of technique models for the biological laser systems. According to Biological Laser Theory the correspondence between the two types is: a) cell or the eye - bifocal or confocal laser resonator with two focuses in the same point or different position on the optical axle of resonator; (b) the light electromagnetic field distribution inside a confocal laser resonator; c) the molecular semiconductor biological laser system – optic frequency parameter generator as KH_2PO_4 or KDP system (Tarasov L.V., 1990)

— The *holographic effect* as *information* represents the *optic biologic signal* that is supporting the *modulation (frequency, amplitude and phase)* as *a nonlinear optic phenomenon*. The *thermo-tropic and lio-tropic liquid crystal* (Muşcutariu I., 1981) are joined to sem mol BLS and are the base of holographic matrix, but they go in redox reaction. More, it takes place the transforming / conversion of any kind of external form of energy in bioluminescence, as an unique form of energy proper to living-beings. The bioluminescence may be converted in other proper forms of energies, as bio- chemical, electric, magnetic and (bio) photonic form. Every cell of an organism (human, animal or plant) receives and sent these four forms of energies to any depth of the living-body (A.T.Winfree, 1987).

—The *laser thermal effect* generates specific heats characteristic to the animal organisms with cold or warm blood, as well as for vegetables.

— The *laser plasma effect* (as a possible Kervran effect) explains the appearance of the inside crystals in plants or animal organs (in fruits, internal hear etc.)

All these effects have to be in terms of classic thermodynamics requirements, as well as those of the laser systems in nonlinear optics. This model takes into account the laser power amplification (modulation in frequency and modulation in amplitude) from the living matter systems. How are these principles applied in the BLS? We won't study the thermodynamic effect for a low temperature

semiconductor, because it is easy, but we shall study the high temperature semiconductor type, as it seams to be mol. sem. BLS. For that I consider the existence of "non-linear adiabatic phenomena", as it seems to be the reality and help us to simplify somehow this analysis. Some bio-physic/ bio-chemical mechanisms maintain a constant temperature of the systems. This is the main condition of a non-linear adiabatic system are assured only by an organisms, organs and cells level (as cellular biological laser systems BLS). On a more thorough analysis, we can notice some intermediary phases that are necessary in the course of the biological laser processes.

The cell subordinate systems, starting with Sem. Mol. BLS (that can be found in the BLS of the membrane, nuclear BLS – intricate systems in the cellular *BLS*) do not meet the requirements of an adiabatic system.

Why does the living matter systems entropy decrease, why the temperature is constant at the finish of a thermodynamic cycle? According to the *Biological Laser Theory* the actual decrease of entropy in the living matter systems is due to *the basic biologic laser active substance, sem mol. BLS or phosphate-water-oxygen system*. This microscopic, molecular system is *an intermediary between the energy and the matter, between light and living matter, between light and life*. *KDP* (probably and the phosphate-water-molecular oxygen system) is a well known *non-linear medium*, but I found by multi- discipline studies some properties of a semiconductor for high and low temperature.
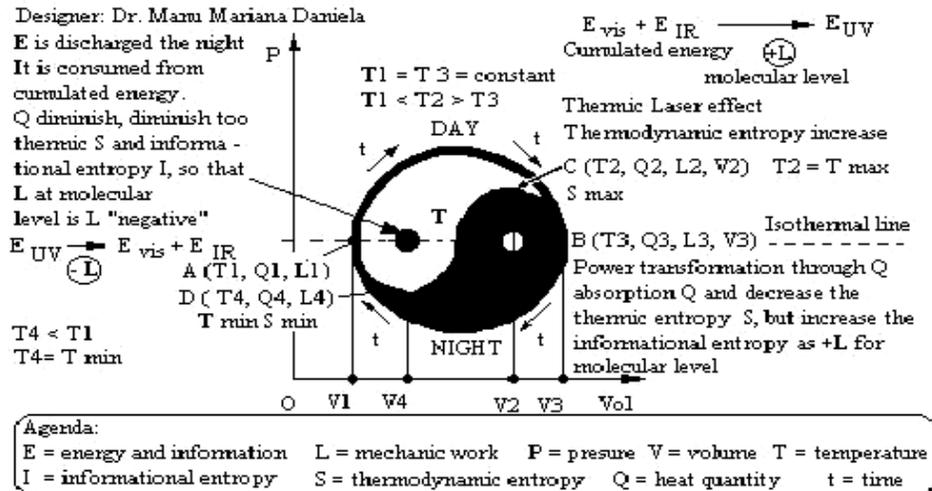
(Original design Dr Manu M.D.)

Fig.2. The living matter' systems thermodynamics. The isotherm and adiabatic transformation in homeoe- thermal cell biologic laser system .The representation of thermodynamic Carnot cycle of a homeoe-thermal laser biologic system BLS is according to Manu - Stănciulescu Lasers Biologic Theory, BLT. Finite Time Thermodynamics is applied to the level of a biologic laser system. Cumulated energy of the day is discharged by night. Thermal and informational entropy is transformed from one in another due to nonlinear mediums of living cell.

We shall characterize each of the points A, B, C through the temperature parameters T, heat Q, mechanical work L:

$$A(T_1, Q_1, L_1) C(T_2, Q_2, L_2) B(T_3, Q_3, L_3)$$

Agenda:

• White zone = daytime or light exposed:

— The accumulation of optic energy (visible spectrum energy) and caloric energy (infrared energy = E_{IR});

— The thermal amplification, thermal entropy;

— The power qualitative transformation, through the heat absorption, which is produced by system as the calorific laser effect, drives to the diminution thermal entropy through the consumption of Q and breeds the informational entropy (in the white point).

• Red zone = nighttime or dark exposition:

— The discharge of optic and caloric energy produces the bioluminescence up keeping, as energy and information

— The caloric consumption adjourns to the diminution gradually thermal entropy S,

— The entropy transformation: during nigh time is diminish Q of the system, that brings about the diminution of thermal entropy; this also diminishes informational I entropy;

• → it is the sense of unfurl the thermodynamic cycle of a biologic laser system as cell, in a day's period, the sense of power and informational accumulation;

• ← It is a invert sense, for the development of nocturnal phases of thermodynamic cycle, in the period of power discharge;

• L = the molecular level of a mechanic work; T = temperature in system; V = system volume; P = pressure from system.

As non-linear medium KDP is *able to absorb and emit radiation with different energetic values from the visible, infrared spectrum (heat) until UV* (DL tests). According to the non- linear optics [9], when we apply the first principle of the thermodynamics in an adiabatic, non-linear system, the sum of the optic energies that went in the cellular system must be equal to the sum of the optic energies that went out of system:

$$\sum W_{inside \atop or \atop absorbed} = \sum W_{outside \atop or \atop emission}$$

Therefore, on the living cell level (homeo-thermal cell), we can extend and apply the well – known *formula of the non – linear optics* for the *non – linear adiabatic systems*, which can be expressed depending on the optic and caloric energies (information) that went in and out, in the following way:

$$\sum W_{inside} = \sum W_{outside}$$

$$\sum W_{inside} = \sum W_{visible} \pm \sum W_{\inf rared}$$

$$\sum W_{outside} = \sum W_{ultraviolet/visible} \pm \sum W_{\inf rared} \pm W_{dispersed}$$

It is also able to emit two kind of radiation:

- High energies radiation, when it is absorbing high temperature ($+\Delta Q$), causing a deviation of the spectrum towards the ultraviolet, up to X; also it is generating power amplification (nonlinear optics, anti-Stokes rule);

-Low energies radiation, when it is losing temperature ($-\Delta Q$), causing a deviation of the spectrum towards the infrared; also it is generating power diminution (nonlinear optics, Stokes rule).

So the moll sem BLS, basic biologic laser active substance may emit radiation with two kinds of frequency as appliqués of anti/Stokes and Stokes rules (non-linear optics).

• When the outside *cell gets warm* exists *a positive biologic laser thermal effect (+ΔQ)*; inside the cell appears a positive biologic laser thermal effect $+\Delta Q$, in the intracellular optic focus and as a consequence it appears the increasing of entropy S inside the cellular BLS. But:

$$+\Delta Q = \Delta Q_1 + \Delta Q_2$$

Where, ΔQ_1 is absorbed by (heavy-) water; ΔQ_2 is absorbed by phosphate, as KDP (potassium di-acid phosphate, as intracellular buffer system), so *that KDP becomes a high temperature semiconductor*. Distillated water, as easy water absorbs less radiation and emits more power than potable water. The initial temperature T_1 is normal in point A ($36{,}5^0$ C), the maximum thermal effect in point B being expressed by the following relation: $T_3 \rangle T_1$. The final temperature T_f is equal to the initial temperature T_1 because it returns to the initial state. It means that there is an intermediary phase in the increase of temperature up to the maximum value T_3 (in point B) and of the heat Q (laser thermal effect), followed by the decrease of the temperature down to the initial value T_1. Actually, the intermediary phase $B-C$ is between the initial phase A and the final phase A. Thus, *the intracellular heat decreases because the water is absorbing the laser thermal effect*. The entropy of the cellular system also decreases, as fact that was noticed

by the biophysicists as the *"energy dissipation" phenomenon*, which characterizes the living matter systems.

b) Contrary, *when the outside system is cold*, *inside the cell appear* a *negative biologic laser thermal effect* $(-\Delta Q)$ and its consequence *the decrease of the cell entropy S*. It means that in an intermediary phase appears a decrease of cell temperature up to the minimum value of T_3 (in point B), *but the water of mol sem BLS is rendering the absorbed radiation from the cell medium*, whose temperature increases up to the initial value T_1. The *KDP* waste it's total absorbed radiation and shifts the visual spectrum to IR zone, and KDP becomes a *low temperature semiconductor type*.

The *phosphate group* has more other roles: *informational role; secondary BEMF effects*.

•*The informational role* appears when there is a heat absorption, by KDP (nonlinear medium), as a "parametric generator for optic frequencies", which emits *radiation (after anti-Stokes rule)* with *superior energy* and frequency after the incident radiation. This leads to the increasing of the *informational entropy*, *medium information (Shannon)* $I_m = H$. Total information is rendered by n symbols, where n is number of fronts of light/second 1- 10^{13} fronts / sec renders between 1- 10^{13} information / sec. I named it *the monochromatic information of a photon* (of the light front) as:

$$I_t = \sum_{i=1}^{n} I_i = -n \sum_{i=1}^{n} p_i \cdot \log p_i$$

which describes a similar formula to the *thermodynamic entropy (Boltzmann)*.

$$S = -k \cdot \sum_{i=1}^{n} p_i \cdot \log p_i$$

• *The secondary biochemical, electrical, magnetic and photonic reactions or BEMPh effects are develop between the light stimulus absorption and their emission as phosphorescence, luminescence or bioluminescence. KDP* activates the phenomenon of *hydrolysis* (*water photo-lyses)* and it leads to the appearance in the system of

the protons $[H]^+$, of the photo absorbent electrons $(e^-)^*$, of the hydroxyl ions $[OH]^-$, of the active oxygen atoms oxidants $[O]^\bullet$; of the oxygenated water (hydrogen peroxide) extremely active oxidation agent that must be neutralized by intracellular catalyses and peroxide [HO-OH]⁻.

The Complex Thermodynamic Biologic Cycle

During the development of the complex thermodynamic cycle are succeeded two parts: daytime hemi-cycle and nighttime hemi-cycle. The final temperature is:

$$T_{final} = T_{initial} = constant$$

Every hemicycle is formed by three phases. During daytime, the optic stimuli that interfere with the cells are amplified as laser type. This fact is reflected step by step in the cell's growth, the increase of membrane electric potential threshold, of the energetic value in macro energetic compounds (from 2300 cal/ mol till 14800-cal/ mol). The optical amplifications of bioluminescence power are known more by their secondary effects: biochemical, electric, morphological, histology and physiology forms and less by photonic and magnetic effects. The three phases are produces nighttime, but on an inverted sense for the optic process. This optic phenomena of inversion are not proved yet, but theoretically, they are registered both in animals (human too) and plants. Photosynthesis in plant cells is such a complex cycle.

In this paper I deal with the daytime thermodynamic hemi-cycle in a cell of a homeo-thermal organism.

1. Initial phase A — B

Initial phase A-B, consisting in the absorption of the visible and infrared radiation. The internal energy varies according to the first principle of the thermodynamics:

$$\Delta U = \Delta Q + \Delta L = \Delta Q + \frac{Q \cdot (T_1 - T_3)}{T_1}$$

As $T_1 < T_3$, ΔQ increases and it also increases the entropy $\Delta S = \Delta Q / T$; it is a positive entropy S and . ΔL is positive

2. Intermediary phase B – C

$$\Delta U = \Delta Q + \Delta L = \Delta Q + \frac{Q \cdot (T_2 - T_3)}{T_2}$$

As $T_1 \le T_2 \le T_3$, ΔQ decreases (absorbed by water, phosphate etc) and the entropy $\Delta S = \frac{\Delta Q}{T}$ decreases, results negative entropy, ΔL is negative; $(\Delta Q) \downarrow \Rightarrow \left(\frac{\Delta Q}{T}\right) \downarrow \Rightarrow (S) \downarrow$

In exchange, the energy and the frequency of the thermal radiation emitted by the Sem. Mol. BLS increases. It also increases the energy and the frequency of the bioluminescence as a laser type phenomenon, as well as the informational and energetic entropy of the emitted radiation, entering the field of the ultraviolet radiation W_{UV}. Generally, the increase of the temperature can be higher or equal to the decrease of the temperature of the system $\Delta Q \uparrow \ge \Delta Q \downarrow$ and it results that $\frac{\Delta Q}{T} \ge 0$, therefore we have an irreversible system.

3. Final phase C – A

Final phase C – A consists in the emission of radiation energetically amplified by frequency modulation or / and amplitude modulation: when $T_{final} = T_1$, we can say that the system returns to its initial (stationary) and $T = const$.

Mechanical work ∆L in cell biologic laser systems

Mechanical work L positive is realized to molecular level and it is achieved by increasing the temperature in the initial phase – intermediary phase. L negative is achieved by decreasing the temperature in the intermediary phase down to the temperature of the initial phase therefore a mechanical feed – back type mechanism is applicable.

The cell entropy

The cell entropy is differentiated in two kinds of entropy: thermo-dynamic cell entropy and informational cell entropy, which caused a lot of talks about the real facts and the unknown mechanism, as biophysics and biochemical aspects. A complete

thermodynamic cycle is related to the process of absorption – emission of light radiation, by energetic entropy increase and then by energetic decrease.

The increase of informational entropy

At the same time with the decrease of the cellular energetic entropy, the cellular information entropy increases. Respectively, it increases the energy and the frequency of the secondary emission of radiation, of bioluminescence, as explained by the non-linear media, by the laser phenomenon of energetic amplification by *frequency modulation*

$$\nu_{emtted} = \nu_{visible} + \nu_{inf\ rared}$$

and amplitude modulation. The increased energy of the emitted radiation is also amplified by the following cells that are penetrated by bioluminescence, leading to the increase in the degree of energetic and informational cellular differentiation, the structural and functional complexity, the appearance of some secondary BEMF effects, specific to each energetic level. According to BLS the living matter systems have been functioning for millions of years on the principles of thermodynamics, especially on those of the finite time thermodynamics [9]. They have been following the energy preservation rule, the increase of the entropy rule, the principles of the information theory, the laser structure and functioning principles.

The cell energy "dissipation" phenomenon

The maintenance of the constant temperature of the homoeo-thermal organisms and the energy "dissipation" phenomenon has constituted for a lot of time a subject of controversy between physicists and biophysicists (Popp F.A., Ho M.W., 1993). None of them could foresee the possibility that the decrease of the thermodynamic entropy in the living matter systems might be explained by a biophotonic science, as *BLS* model (as nonlinear optics model), as a creasing of informational entropy. This implies the intermediary phase of secondary absorption of part of radiation by the *laser active substances (Sem. Mol. BLS)*, which means negative entropy ("neg-entropy"). In the same time, this

fact confers to the emitted energy a new characteristic feature, an amplified power and information of the light, as natural origin (Macarovici D. et al, 1985) of phosphate, respectively as a laser type radiation (bioluminescence), rendered as experiment. "Redundant" of light signals information is entertained by successive fronts of light, which are reflected by the real objects that surround us during the day-time and appear as an "on" signal type. The absence of the light signal is an "off" signal type in informational system. The biophotonic model proposed by the BLT offers multidisciplinary theoretical and practical applications, opening new horizons for scientific research and teaching: biological models for bionics, new types of laser systems, nano-technologies, bio-technologies, in the field of biology. It gives a new scientific conception upon the organization of the living matter, embryogenesis, and onco-genesis; there are new therapeutic applications for diseases caused by light both for animals and plants too (cancer).

Biophotonic tests. Material and methods

The experimental methods I performed at the International Institute of Biophysics Neuss, Germany was necessary to be improved so that I introduce a protractor to measure the angles of the light and the optical axle of the sample in the *PMS-1 photo-multiplier*, so that Dem. Prof. F. Albert Popp has done a good impression about my ideas (Manu Mariana-Daniela, 2003, 2007). There are two kinds of devices: *photo-multiplier PMS-1 for stimulated emission of radiation DL (delayed luminescence) and PMS-2 for spontaneous emission* of the samples. So it was verified the main hypothesis of BLT, the thermodynamic properties of KDP (basis of mol sem BLS) as *nonlinear medium*: *anti-Stokes and Stokes rules.* For that there *are two devices, a photo-multiplier PMS-1 for stimulated emission of radiation or "delayed luminescence" or DL tests* and a photo-multiplier PMS –2 for "*self emission"or SE tests*. For DL tests the device has a white light source (200 nm - 800 nm), as a 150 w bulb and there are possibilities to

range a few parameters in the dark chamber of the device: the temperature, color (by filter) time exposure and pressure, concentration. There also are an electronic, a balance, a voltmeter, an electronic thermometer, etc. The dark chamber is a sphere with a 23-cm diameter, and permit inside a small sample to be put in a quartz recipient. It has two windows that are open and shut alternatively: one is directed to the light stimulus, the second is for counting the photons that are emitted by the sample. I was doing tests with samples of different origin (mineral, vegetal and animal type), but in this study I present only mineral samples and their results and conclusions. Self-emission (SE) of PMS -2 devices shows a great emission in the dark chamber of the device **(fig. 3),** because of all day light accumulation.

Results
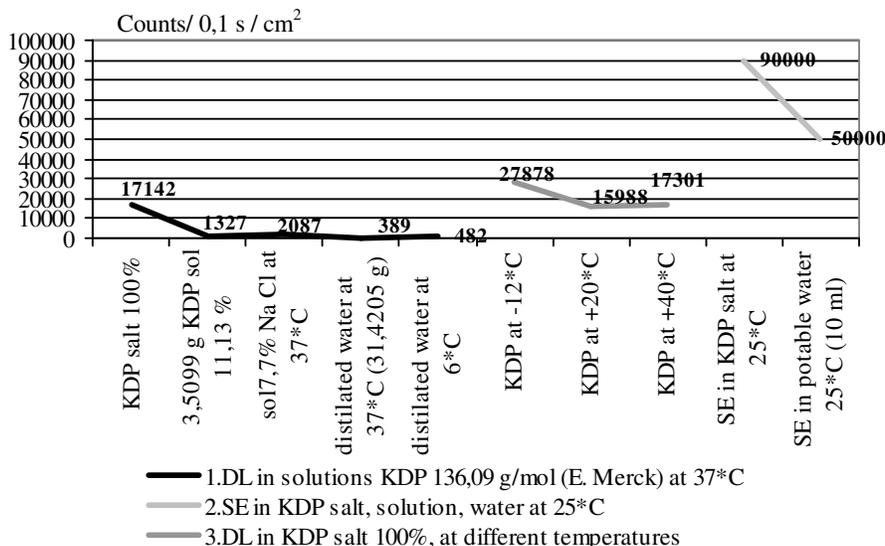
Figure 3. The DL tests in water, KDP salt and solutions, at different temperatures indicate. (original graphic Dr. Manu D. M.)

The DL tests renders the number of photons (or counts) emitted in a time unit and cm2 or counts/ 0,1 s / cm2, on the ordinate axle of the DL and SE (tests) graphic. I took in consideration all components of semiconductor molecular BLS: water, phosphate and less molecular oxygen, O2 which is supposed to exist in normal concentration in air and water. I select for this study only results that are relevant for our hypothesis about water and phosphate role in bioluminescence emission. So, The distillate water is emitted both in visible (389 counts / 0,1s/cm2) and UV spectrum (222 counts /0,1s/cm2), at the same temperature. At low degree (6ºC) distillated water is emitting more (482 counts /0,1s/cm2) than at high (37º C) temperature (389 counts / 0,1s/ cm2). The

phosphate is emitting stimulated emission of radiation DL. At a constant temperature (37 C) the phosphate is emitting more as a salt (17142 counts / 0,1s/ cm2) than a solution (1327 counts / 0,1s/ cm2). At 20ºC the KDP salt has the lowest level of DL (*white light delayed luminescence) as 15988 counts / 0,1s/ cm2. It is registered a high level both for low temperature (27878 counts / 0,1s/ cm2 at –12ºC) and high temperature (17301 counts/ 0,1s/ cm2 at 40ºC).

Discussion

This may explain three real facts:

— The first is a physical fact: a great photon emission up and down $20\,^{\circ}$C explains KDP's properties as a semiconductor type both for high and low temperature;

— The second is the possibility of life existence in extreme conditions of cold (north and south poles) and heat (the equator desert);

— The third is the correlation between the mechanism of temperature increasing and phosphorescence and bioluminescence intensity at all level of other type of BLS (membrane, nucleus, cell), that determine the acceleration or inhibition of BEMF effects at the liquid crystal level [11] (chemical, electric, magnetic, photonic processes). A lot of them are initiated by the light presence, and activate light dependence enzyme (with PO_4) group for: polymerize, hydrolysis, photolysis. For example, DNA and RNA forms long chains that include phosphate group in different concentration, in a medium of water. The molecular oxygen determines the speed of reaction too. NaCl is emitting luminescence both as salt and solution 7,5 % NaCl - 2087 counts / 0,1s /cm^2, more than sol 11,13% KDP (1327 counts / 0,1s /cm^2). This explains: *the activator role of Na and Cl ions* and the power competition between the Na^+ and K^+ ions in the membrane Donnan equilibrium. I found [12] the order of first potential level of some elements as: K (4, 339 eV), Na (5,138 eV), S (10,357 eV), P (10,55 eV). That means that some atoms as P, S, K, Na etc. may be first activated by the light energy. On the other side P is one component of a luminescent substance, having a meta-stable electron of P atom in double linked P=O able to keep 1,2, 3, or... n photons (a) round him, as in a trap of photons in the P atom (Macarovici D. et al, 1985) The BL intensity on the graphics curves shows length of time decrease, proportional to PO_4 concentration and the type of BLS: 0,1s – 6s till to minutes, hours, days, years. The light power amplification in frequency and amplitude modulation, length of time, are well registered at the organs level of vegetables (leaves, branches, fruits) and animals too (nervous systems), but all these forms the subjects of some other paper.

Conclusions

It is a problem to extend the KH_2PO_4 (nonlinear medium) optic properties

to $\left[PO_4^{-3}\right]$ group, but both of them are exposed in living matter to the same natural conditions: ionic forms, the same concentration of water and molecular oxygen in medium.

The Biological Laser Theory BLT is a fundamental multidiscipline study, which introduce in biology some knowledge and principles from technique domain as nonlinear optics, lasers, liquid crystals. More, the BLT proves the existence of a biological way to discover new properties of matter. As example for the thermodynamic of the living matter, is possible now to be explained in good terms and it permit testing of some unknown properties *of the molecular complex system phosphate - water – molecular oxygen* $PO_4^{-3} - H_2O - O_2$ *or mol. Sem.BLS.* It is an internal source of light, which is able to maintain the inside light, as bioluminescence. It *is a high and low temperature semiconductor type*, able to absorb radiation by its metastabil π electron and to emit radiation, free electron e⁻, negative ions, to generate hydrolysis, as active oxygen atom (electron e^-, proton H^+, hydroxyl OH·, peroxide ·HO-OH·) or $\left[e^-\right],\left[H\right]^+,\left[O\right],\left[OH\bullet\right],\left[\bullet HO - OH\bullet\right],\left[PO_4\right]^{-3}$,to initiate: redox reaction, hydrolysis, polymerization, izomerization etc.

It is excitable by a large spectrum of light stimulus (*IR, visible, UV*) and it is based on *phosphorus atom propriety* of *phosphorescence* that we detect as *delayed luminescence* DL (DL and SE tests) and the *length of bioluminescence*. It changes the *light frequency* and intensity and *amplifies the light power, as laser phenomena (for cell division and differentiation).* It generates the *thermal laser effect*; it initiates *water hydrolysis and redox reaction.* It is able to maintain DL in the limits of a *large temperature domain* and *explains a large extension of forms of life* in extreme conditions of the Earth (desert, poles). The *energy "dissipation" problem* of living matter thermodynamic may be solved: there is *an intermediary phases between the entropy growth and the entropy decrease, when the molecular complex system (phosphate - water*

– molecular oxygen) $PO_4^{-3} - H_2O - O_2$ *or mol sem BLS action.* The heat is first absorbed and later is rendered in the medium as laser thermal effect. The anti - Stokes (or Stokes) rules of nonlinear optics apply and modify both the light frequencies and the power of *bioluminescence as laser type phenomena.* The scientists may have *a new, biological model for: high and low temperature semiconductor type* in sem mol BLS, who animates the living matter with it's light as a LED; it is an *ideal active laser substance, an ideal thermodynamic model* for a *different length* of long time *thermodynamic cycles.* The water absorbs a large spectrum of radiation (visible, IR, UV), but give them back when outside the temperature decrease. So the cell which has about 90 % water is able to accumulate radiation (light energy) during the day time and restore them in the night time, when the light is absent and temperature decrease, for life maintenance.

The large domain of temperature which is able to activate mol sem BLS permit to enlarge the living zone for life extending, between the north pole and the desert, the possibility of different forms of living systems existence, the species diversification. It is possible to exist also other types of atoms and molecular association for creating a semiconductor diode type, as phosphate – water- molecular oxygen group. I suppose that on the Earth there are and another molecular group as $H_3SO_4 - CO_2$ sensitive to IR, nitrate sensitive to UV, other combinations to X-rays sensitive.

Acknowledgments

References

Drăgulescu C., Petrovici, *Introducere în chimia organică*, Bucureşti, Tehnique Publishing House, 1973

Lengyel B., *Introduction á la physique du laser*, Ed. Eyrolles , Paris, 1968

Macarovici D., Elisabeth-Jeanne Popovici, Zsolt Hegedus, Maria Aneculăesei, *Luminescent Substances*, Bucuresti, Technique Publishing House, 1985

Manu Mariana Daniela, *The biological laser systems as biophotonic models of the living matter, with living matter thermodynamic implication. The Biological Laser Theory* (I), from "Al. I. Cuza"University Scientific Analles of, Iaşi, II section, Vegetal Biology, XLIX tom pp.205-214, 2003

Manu Mariana-Daniela, *Teoria Laserilor Biologici, I - Efecte ale câmpurilor electromagnetice optice la nivelul celulei vii, din perspectiva biofotonicii"* (Ediţia I, iulie 2007), Editura Zboina Iaşi, 2007.

Muşcutariu I., *Liquid Crystals and applications. The applied modern Physics*, Bucureşti, Technique Publishing House, 1981

Nemeş G.,*Introduction in the Non LinearOptics*, Bucureşti, Academy Publishing House, 1972.

Popp F.A., Ho M.W., *Biological Organization, Coherence and Light Emission from Living Organisms,* in: Stein, W.D. (ed.), Thinking About Biology, New York, Addison-Wesley Publishing House,1993

Tarasov L.V., *Lasers – Reality and hope,* Bucureşti, Technique Publishing House, 1990.

Vsevolod Radcenco, *A Thermodynamic Theory on the Physical Interactions*, Bucureşti, Romanian Academy Publishing House, 2001.

Arthur T.Winfree, *The timing of biological clocks*, New York, Scientific American Library (1987).