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Non Equilibrium Thermodynamics of the Cryobiology and Quantum Field Theoretical Methods in the Temporal Organization in Cells

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Abstract

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From the new results by the contributions of the environmental freezing-drying and vacuum sublimation (Belaus and Tsvetkov, 1985; Tsvetkov et al., 1989, 2006; Zwetkow, 1985) is hopped that by the grate form expressed e.g. by the thermodynamically and kinetic jump behavior of the living cells and systems will be possibly to describe the biological expressions by means of concrete quantum field system too describing by methods of the quantum wave fields. It is well known that the thermodynamics and the methods of the quantum wave fields are based of the axiomatic physics also causality condition. The temporal organization in cells (Goodwin, 1963) that is also that the dynamics of cellular regulatory processes require causality condition which is a fundamental for the axiomatic theory of N.N. Bogolubuv for the quantum wave fields where was supposed the existence of the S-matrices and asymptotic fields. We believe that for the studding of the living cells and systems the concept of the classical non equilibrium thermodynamics of cryobiology and the axiomatic of the N.N. Bogolubov are sufficiently for the theoretical consideration of the dynamic of cellular control processes. From a great interest is the so called problem of the connection between the entropy and the time arrow. With other words the connection in the cryobiology between the entropy and the causality according to quantum wave field theory of the interactions between a quantum field system and classical bio fields modeled by the additional boundary conditions e.g. as by the Casimir effect.

It is knowing that one of the major causes of damage produced by the several effects at cellular level (i) low temperature per se**,** (ii) direct effects of freezing and (iii) indirect effects of freezing and (iv) the biochemical modifications in the structure of the living cells by the lipids, phospholipids, proteins in the cell membrane formed by interacting of the “matter” fields such as a new electron distribution or the protonisation at a given time for the living cells and systems is freezing induced dehydration at very short distance scales, where various properties of the physical vacuum of any one concrete quantum field system, e.g. the systems of see scalars wave fields, for which the vacuum state must be conformed by means of the interactions with the classical bio fields or of additional boundary conditions are of crucial importance.

At the molecular level (Mitter and Robaschik, 1999) the thermodynamic behavior is considered by any concrete quantum field system with additional boundaries as by the Casimir effect between the two parallel, perfectly conducting square plates (side L, distance d, L > d), embedded in a large cube (side L) with one of the plates at face an periodic boundary condition. It is considered contributions from the volume L^2d between the plates resp. $L^2(L-d)$ outside have different temperature (outside T', inside T). For the temperatures T' < T, the external pressure is reduced in comparison with the standard situation (T' = T). Therefore it is expected the existence of a certain distance d_0, at which the Casimir attraction is compensated by the net radiation pressure. That is possibly to investigate this field equilibrium point for this system or for hydrological equilibrium of the system membrane-solutions-water and its stability both for an isothermal and an adiabatic treatment of the interior region.

Key words: causality condition in the cryobiology, impulse wave equation, Casimir effect, vitrification, control processes in living cells and systems, classical bio wave fields

Introduction

The study of the damage produced by freezing and/or low temperature and low contents water is important in a variety fields (Belaus and Tsvetkov, 1985; Zwetkow, 1985 and there are the very full References to this problem; Tsvetkov et al., 1989; Tsvetkov et al., 2005, 2006), of which here are some examples: In medicine, surgeons would like to be able to cryopreserve organs for transplants. To date, however, the cryopreservation of large organs (except blood) has a very poor success rate. Blood and sex cells are routinely frozen and thawed for later use but even then, in many cases, the cellular survival rates are unacceptably low. Cryopreservation is also important in meaning germplasm for important or endangered species. Frost damage is an important agronomic concern: if farmers can get a crop into the ground before the last frost, then they have a longer growing season and a greater yield. Damage in seeds during drying and dehydration may also be agronomical and ecologically important. Because of the impact of temperature on all reactions of the cell, adaptation to fluctuations in temperature is possibly the most common response researched. Drying and freezing are also important in the food industry.

Main Result

By calculations of the Casimir effect from great importance is the infinite sequence of the causal ordered events points in the Minkowski space without accumulative event point obtained by hyperbolical turns and reflections on the two mirrors which one is parallel inertial moved to the other at rest. Also it is to be possible to define the so called time arrow then by this case the Minkowski space-time is no more finite compact. For the considerations of the evolutions of the interactions between the quantum wave fields and the classical bio fields that make possible to consider the so called kinetic jumps effect of the vitrification by the living cells and systems or glassing by the body physics by low temperature by the help of impulse differential equations in Banach spaces.

At the first we take the infinite sequences of the causal ordered mirror reflecting points without accumulative event point in the Minkowski space and so also defined the time arrow

$y^{\mu}_{-2(n-½(j-1))}$, $y^{\mu}_{-2(n-½j)}$, $y^{\mu}_{2(n-½j)}$, $y^{\mu}_{2(n-½(j+1))}$,

and the point $x^{\mu} = (ct, \overline{x})$ between the plates so that

$t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$,

$n = 0,1,2, ..., j = 0,1,2, ..,2n$

for $x^3 \in (0, \lambda v t_0)$, or $x^3 \in (\lambda v t_0, L)$

and $L = vt_0$, $0 < \lambda < 1$,

with $t \in (t_{2(n-½j)}, t_{-2(n-½(j-2))}]$,

$n = 0,1,2, ..., j = 0,1,2, ..,2n$, where

$\mu = 0,1,2,3$, and n is the reflecting number of the see point y_0 from the Minkowski space time at the time $t = t_0$ between the plate at the rest and the inertial parallel moved plate with the constant velocity v so that the d is to consider as a sea mirror height.

$$y_{-2(n-½(j-1))}^2 = y_{-2(n-½j)}^2 = y_{2(n-½j)}^2 = y_{2(n-½(j+1))}^2 = y_0^2 = (ct_0)^2 - \overline{y}^2 = (ct_0)^2 - \overline{y}_{\perp}^2 - y^{3^2} > 0,$$

$y^3 \in (0, \lambda v t_0]$,

$t_{-2(n-½j)} = t_{2(n-½(j+1))}$,

$y^3_{-2(n-½j)} = - y^3_{2(n-½(j+1))}$,

$t_{-2(n-½(j-1))} = t_{2(n-½j)}$,

$y^3_{-2(n-½(j-1))} = - y^3_{2(n-½j)}$.

Further we can defined by the distinguishing marks "l" = left and "r" = right the following relations between the point x between the plates and the reflecting see events points from the infinite sequence points without accumulative events point in the Minkowski space

$$^{l}\tilde{x}^{\mu} = x^{\mu} + (y^{\mu}_{2(n-½j)}/y_0^2)((xy_{2(n-½j)})^2 - x^2y_0^2)^{½} - (xy_{2(n-½j)})\, y^{\mu}_{2(n-½j)}/y_0^2 = x^{\mu} + y^{\mu}_{2(n-½j)}\,((xy_{2(n-½j)})/y_0^2)((1 - x^2y_0^2/(xy_{2(n-½j)})^2)^{½} - 1) = x^{\mu} + y^{\mu}_{-2(n-½j)}\, f$$

for $t \in (t_{2(n-½j)}, t_{-2(n-½(j-2))}]$

and $$^{r}\tilde{x}^{\mu} = x^{\mu} + (y^{\mu}_{-2(n-½j)}/y_0^2)((xy_{-2(n-½j)})^2 - x^2y_0^2)^{½} - (xy_{-2(n-½j)})\, y^{\mu}_{-2(n-½j)}/y_0^2 = x^{\mu} + y^{\mu}_{-2(n-½j)}\,((xy_{-2(n-½j)})/y_0^2)((1 - x^2y_0^2/(xy_{-2(n-½j)})^2)^{½} - 1) = x^{\mu} + y^{\mu}_{-2(n-½j)}\, f'$$

for $t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$,

$n = 0,1,2, ..., j = 0,1,2, ..,2n$,

as a light like Minkowski space vector and $y^{\mu}_{2(n-½j)}$ and $y^{\mu}_{-2(n-½j)}$ are fixed Minkowski space-time vectors described the infinite sequence of the causal ordered events points without accumulative events point.

Further we define by the following relations

$\kappa' x^{\mu} = \tau_j\, {}^{r}\tilde{x}^{\mu} + ½\,(x + \tau_j\, {}^{r}\tilde{x})^{\mu} f_{\kappa'}$ with

$f_{\kappa'} = ½ y_0^{-2}(x\, \tau_j\, {}^{r}\tilde{x})((1+4\kappa'^2x^2y_0^2/(x\, \tau_j\, {}^{r}\tilde{x})^2)^{½} - 1)$

for $y_{2(n-½j)}{}^{\mu} = ½\,(x + \tau_j\, {}^{r}\tilde{x})^{\mu}$,

$t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$,

$n = 0,1,2, ..., j = 0,1,2, ..,2n$,

$\kappa x^{\mu} = \tau_j\, {}^{l}\tilde{x}^{\mu} + ½\,(x + \tau_j\, {}^{l}\tilde{x})^{\mu} f_{\kappa}$ with

$f_{\kappa} = ½ y_0^{-2}(x\, \tau_j\, {}^{l}\tilde{x})((1+4\kappa^2x^2y_0^2/(x\, \tau_j\, {}^{l}\tilde{x})^2)^{½} - 1)$

for $y_{2(n-½j)}\mu = ½\,(x + \tau_j\, {}^{l}\tilde{x})^{\mu}$,

$t \in (t_{2(n-½j)}, t_{-2(n-½(j-2))}]$,

$n = 0,1,2, ..., j = 0,1,2, ..,2n$,

$\kappa x^{\mu} = \tau_{2n-1}\, {}^{l}\tilde{x}^{\mu} + ½\,(x + \tau_{2n-1}\, {}^{l}\tilde{x})^{\mu} f_{\kappa}$ with

$f_{\kappa} = ½ y_0^{-2}(x\, \tau_{2n-1}\, {}^{l}\kappa)((1+4\kappa^2x^2y_0^2/(x\tau_{2n-1}\, {}^{l}\kappa)^2)^{½} - 1)$

for $y_1{}^{\mu} = ½\,(x + \tau_{2n-1}\, {}^{l}\tilde{x})^{\mu}$, $t \in (t_{-1}, t_1]$,

so that the following bounded open domains of double cons are defined

${}^{l}D = {}^{l}D_{\kappa x,\, \tau_j {}^{l}\tilde{x}} = V^{+}_{\tau_j {}^{l}\tilde{x}} \cap V^{-}_{\kappa x}$
with the basis $S_{\kappa x, \tau_j {}^{l}\tilde{x}}$

and the axis $[\kappa x^{\mu},\ \tau_j {}^{l}\tilde{x}^{\mu}] = y_{2(n - ½j)}{}^{\mu}\, f_{\kappa}$,

${}^{r}D = {}^{r}D_{\kappa' x,\, \tau_j {}^{r}\tilde{x}} = V^{+}_{\tau_j {}^{r}\tilde{x}} \cap V^{-}_{\kappa' x}$
with the basis $S_{\kappa' x,\, \tau_j {}^{r}\tilde{x}}$

and the axis $[\kappa' x^{\mu},\ \tau_j {}^{r}\tilde{x}^{\mu}] = y_{-2(n - ½j)}{}^{\mu}\, f_{\kappa'}$.
We can consider f_{κ} as a solution of the differential equation

$$w_j^{-1} d_t\, f_{\kappa} = \kappa^2 x^2 / [(x\, \tau_j {}^{l}\tilde{x}) + y_0{}^2 f_{\kappa}] - f_{\kappa}$$

where $(x\, \tau_j {}^{l}\tilde{x}) + y_0{}^2 f_{\kappa}$ is the linear term who decries the hyperboloid given in the Minkowski space time by x^2 to the light con in the same space-time and $\kappa = s_j/w_j$ where s_j is the rate of the see quantum scalar wave field system with great time of the relaxing and strong interacting, e.g. epigenetic interactions and w_j is the rate of the virtual quantum scalar wave field system with the shot time of the relaxing and weak interacting, e.g. quantum vacuum interactions in the cells, e.g. Casimir effect.

For $d_t f_{\kappa} = 0$ also in the stationary case we have:

$$\kappa^2 x^2 / [(x\, \tau_j {}^{l}\tilde{x}) + y_0{}^2 f_{\kappa}] - f_{\kappa} = 0,$$

$$f_{\kappa}[(x\, \tau_j {}^{l}\tilde{x}) + y_0{}^2 f_{\kappa}] - \kappa^2 x^2 = 0,$$

$$y_0{}^2 f_{\kappa}{}^2 + (x\, \tau_j {}^{l}\tilde{x}) f_{\kappa} - \kappa^2 x^2 = 0,$$

$f_{\kappa}{}^2 + y_0{}^{-2}(x\, \tau_j {}^{l}\tilde{x}) f_{\kappa} - y_0{}^{-2}\kappa^2 x^2 = 0$ so that

$$f_{\kappa} = ½ y_0{}^{-2}(x \tau_j {}^{l}\tilde{x})((1 + 4\kappa^2 x^2 y_0{}^2/(x \tau_j {}^{l}\tilde{x})^2)^{½} - 1).$$

Further we can define for the impulse Minkowski space by means of the following relation and fixed impulse four vector k^{μ} as given by the Bogolubov et al. (1976)

$$q_{\kappa}{}^{\mu} = {}^{l}\tilde{q}^{\,\mu} + k^{\mu} f_{\kappa}$$

with $f_{\kappa} = k^{-2}(k\, {}^{l}\tilde{q})((1 + \kappa^2 q^2 k^2/(k\, {}^{l}\tilde{q})^2)^{½} - 1)$,

$q_{\kappa'}{}^{\mu} = {}^{r}\tilde{q}^{\,\mu} + k^{\mu} f_{\kappa'}$ with

$$f_{\kappa'} = k^{-2}(k\, {}^{r}\tilde{q})((1 + \kappa'^2 q^2 k^2/(k\, {}^{r}\tilde{q})^2)^{½} - 1)$$

and $q^{\mu} = ½ (q_{\kappa}{}^{\mu} + q_{\kappa'}{}^{\mu})$,

$k^{\mu} = ½ (q_{\kappa}{}^{\mu} - q_{\kappa'}{}^{\mu}) = (½ (E_{\kappa} - E_{\kappa'}), 0_{\perp}, k^3)$,

${}^{l}\tilde{q}^{\,2} = 0 = {}^{r}\tilde{q}^{\,2}$, $q_{\kappa}{}^2 = \kappa^2 q^2$, $q_{\kappa'}{}^2 = \kappa'^2 q^2$.

The functional states vector $|\varphi_t\rangle = \Omega_t{}^3 \int d\bar{x}^{\sim} \int d\tau_j \tilde{x}^0 \varphi_t(\tau_j {}^{l}\tilde{x}^0), \bar{x}^{\sim})|0\rangle$ is a functional defined by the help of the non local field $\varphi_t(\tau_j \tilde{x})$, where the time t is considered as a parameter for the impulse differential equation in Banach space

$$\partial_t \varphi_t(\tau_j \tilde{x}) = \pi_t(\tau_j \tilde{x})$$

$$\partial_t \pi_t(\tau_j \tilde{x}) = \Delta_x \varphi_t(\tau_j \tilde{x}),$$

for $t \in (t_{-2(n - ½j)}, t_{2(n - ½j)}]$,

$n = 0,1,2, ..., j = 0,1,2, .., 2n$, $x = (\bar{x}_{\perp}, x^3)$ and the impulse parts

$$\pi^{+}_t(\tau_j \tilde{x}) = \pi_t(\tau_j \tilde{x}) - v\partial_{x3}\varphi_t(\tau_j \tilde{x})$$

for $t = t_{-2(n - ½j)}, + 0$ for $\pi^{+}_t(\tau_j \tilde{x})$

and $t = t_{2(n - ½(j+1))}$ for $\pi_t(\tau_j \tilde{x}) - v\partial_{x3}\varphi_t(\tau_j \tilde{x})$,
The impulse parts of this equation describe the kinetic jump by transition from equilibrium to the non equilibrium state of the see quantum scalar wave field system, e.g. the so called vitrification by the living cells and systems.

$$\varphi_t(\tau_j \tilde{x}^0, \bar{x}^{\sim}) = \Omega_t{}^3 \int d\bar{x}^{\sim} \int d\tau_j \tilde{x}^0 \delta((\tau_j \tilde{x}^0)^2 - \|\bar{x}^{\sim}\|^2)\varphi_t(\tau_j \tilde{x}^0, \bar{x}^{\sim}) =$$

$$\Omega_t{}^3 \int d\bar{x}^{\sim}(\varphi_t(\|\bar{x}^{\sim}\|, {}^{1}\bar{x}^{\sim}) + \varphi_t(-\|\bar{x}^{\sim}\|, \bar{x}^{\sim}))/2\|\bar{x}^{\sim}\|$$

for $|\tau_j \tilde{x}^0| = \|\bar{x}^{\sim}\|$,

and $\|\bar{x}^{\sim}\| = (\bar{x}^{\sim 2})^{½}$, $\varphi_t(\tau_j \tilde{x}^0, \bar{x}^{\sim}) \in C_0{}^{\infty}(\Omega_t{}^3)$ and $\Omega_t{}^3 \in {}^{l}D \cup {}^{r}D$

$\delta((\tau_j \tilde{x}^0)^2 - \|\bar{x}^{\sim}\|^2) = \delta(\tau_j \tilde{x}^0 - \|\bar{x}^{\sim}\|) + \delta(\tau_j \tilde{x}^0 - \|\bar{x}^{\sim}\|)/2\|\bar{x}^{\sim}\|$, for $\|\bar{x}^{\sim}\| \neq 0$, is the Dirac's function, defined on the light cone, so that the distribution $\varphi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim}) = 0$ if the domain of the function $\varphi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim})$ intersect not the domain of the light cone.

$\pi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim}) = \Omega_t 3\int d\overline{x}^{\sim}\int d\tau_j \tilde{x}^0 \delta((\tau_j \tilde{x}^0)^2 - \|\overline{x}^{\sim}\|^2)\, \pi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim}) =$

$=\Omega_t^3\int d\overline{x}^{\sim}(\varphi_t(\|\overline{x}^{\sim}\|,{}^l\overline{x}^{\sim})+\varphi_t(-\|\overline{x}^{\sim}\|,\overline{x}^{\sim}))/2\|\overline{x}^{\sim}\|$

for $|\tau_j \tilde{x}^0| = \|\overline{x}^{\sim}\|$,

We can obtain the field of the impulse $\pi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim})$ as a distribution from the equality relations

$\delta((x - y_{-2(n-\frac{1}{2}j)})^2) = \delta((x - \frac{1}{2}(x + \tau_j^r \tilde{x}))^2) =$

$= \delta(y_0^2 - (x\tau_j^r \tilde{x})) = \delta(t_0^2 - \overline{y}_\perp^2 - y^{3^2} - (x\tau_j^r \tilde{x}))$,

for what is easy to obtain by the help of the article (Bordag et al. 1984, Petrov, 1986, 1989) and the relation for the massless Green's function, taken by the fixed point $y_0^2 = \varepsilon > 0$ and small,

$D(x - y_{-2(n-\frac{1}{2}j)}) = \int d^4\hat{q} \exp[-i\hat{q}(x - y_{-2(n-\frac{1}{2}j)})]/(q^{\sim 2} - i\varepsilon)$, of the following way if we define the convolution

$(\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u) * \delta(t_0^2 - \overline{y}^2 - (x\tau_j^r \tilde{x}))$

and formal for the substitution

$u = t_0^2 - \overline{y}^2 - x\tau_j^r \tilde{x}$, so that $du = 2t_0 dt_0$

and $t_0 = \pm (u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}$

$\varphi_t(\tau_j^r \tilde{x}^0, {}^r\overline{x}^{\sim}) = (\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u) * \delta(t_0^2 - \overline{y}^2 - (x\tau_j^r \tilde{x}))\, \varphi(t_0, \overline{y})) =$

$\Omega_t^3\int d\overline{y}\,{}_{-\infty}\int^{\infty} dt_0\, {}_{-\infty}\int^{\infty} du\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u)$

$\delta(t_0^2 - \overline{y}^2 - (x\tau_j^r \tilde{x}) - u)\varphi(t_0, \overline{y}) =$

$\Omega_t^3\int d\overline{y}\,{}_{-(\overline{y}^2 + x\tau_j^r \tilde{x})}\int^{\infty} du\delta(u)[\varphi((u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}, \overline{y} + \varphi(-(u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}, \overline{y})]/2(u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}] =$

$\Omega_t^3\int d\overline{y}\,{}_{-\infty}\int^{\infty} du\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u)[\varphi((u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}, \overline{y}) + \varphi(-(u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}, \overline{y})]/2(u + \overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}] =$

$\Omega_t^3\int d\overline{y}\, [\varphi((\overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}, \overline{y}) + \varphi(-(\overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}, \overline{y})]\, /2(\overline{y}^2 + x\tau_j^r \tilde{x})^{1/2}] = \varphi_{\tau_j{}^l\tilde{x}^0}(x)$.

where the Banach valued field vector $\varphi(t_0, \overline{y}) \in C_0^{\infty}(\Omega_t^3)$ with $\Omega_t^3 \in {}^lD \cup {}^rD$ is a solution of the wave equation taken in the nodes or the minima or the maxima of the scalar wave of the quantum field system in 4-point $(t_0, \overline{y})$ from the Minkowski space. Of the same way is to be given the field $\varphi_t(\tau_j^l \tilde{x}) = \varphi_{\tau_j{}^r\tilde{x}^0}(x)$.

The same is to be given for

$\pi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim}) = \Omega_t 3\int d\overline{x}^{\sim}\int d\tau_j \tilde{x}^0 \delta((\tau_j \tilde{x}^0)^2 - \|\overline{x}^{\sim}\|^2)\, \pi_t(\tau_j \tilde{x}^0, \overline{x}^{\sim})$ also we have

$\pi_t(\tau_j^r \tilde{x}^0, {}^r\overline{x}^{\sim}) = (\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u) * \delta(t_0^2 - \overline{y}^2 - (x\tau_j^r \tilde{x}))\, \pi(t_0, \overline{y}))$

and

$\Delta_x\varphi_t(\tau_j^r \tilde{x}^0, {}^r\overline{x}^{\sim}) = (\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u) * \delta(t_0^2 - \overline{y}^2 - (x\tau_j^r \tilde{x}))\, \Delta_y \varphi(t_0, \overline{y}))$,

$\partial_{x^3}\varphi_t(\tau_j^r \tilde{x}^0, {}^r\overline{x}^{\sim}) = (\theta(u + \overline{y}^2 + x\tau_j^r \tilde{x})\delta(u) * \delta(t_0^2 - \overline{y}^2 - (x\tau_j^r \tilde{x}))\, \partial_{y^3}\varphi(t_0, \overline{y}))$.

For further investigations is from great importance the understanding the functional relations in the system DNA - RNA - albumen substance of the manner of the physics of the elementary particles and quantum theory.

We give the example of the equation of the regulation for the metabolite in the living cells also the weak interaction for the vacuum given by $\alpha_\kappa \in C_0^{\infty}(\Omega_t^3)$ and $\Omega_t^3 \in {}^lD \cup {}^rD$ restricted by the strong epigenetic interaction of the see scalar wave field system given by the norm $\| \varphi_t \|$.

In the case of finite $\alpha\kappa$ we can define the $\Psi_{\alpha_\kappa}(\varphi_t,t)$ ψ-functional as a wave functional from the non local field by the help of the following formal integration

$\Psi_{\alpha_\kappa}(\varphi_t,t) = \int D\varphi_t \int D\alpha_\kappa \delta(\alpha_\kappa^2 - \kappa^2\|\varphi_t\|^2) \langle\alpha_\kappa|(D, \varphi_t)(\tau_j^1 \tilde{x})\rangle = \int D\varphi_t [\psi_t(\kappa\|\varphi_t\|,\varphi_t)+ +\psi_t(-\kappa\|\varphi_t\|,\varphi_t)]/2\kappa\|\varphi_t\|$, where $|\alpha_\kappa| = \kappa\|\varphi_t\|$, $\psi_t(\alpha_\kappa,\varphi_t) = \langle\alpha_\kappa|(D, \varphi_t)\rangle$, and $D\varphi_t = \Pi_{(t, x)} d\varphi_t(\tau_j^1 \tilde{x})$ is the functional measure, the δ-functional $\delta(\alpha_\kappa^2 - \kappa^2\|\varphi_t\|^2) = =(\delta(\alpha_\kappa - \kappa\|\varphi\|) + \delta(\alpha_\kappa + \kappa\|\varphi_t\|)/2\|\varphi_t\|$ for $\|\varphi_t\| \neq 0$ is the Dirac's functional and $\|\varphi_t\|^2= \|\varphi_t \times_\alpha \varphi_{t+\Delta t}\| = \|\varphi_t\|_{\alpha\kappa'} . \|\varphi_{t+\Delta t}\|_{\alpha\kappa} \in B\times B$, where $\times_\alpha$ is the minimal tensor product of Banach spaces and $\|\bullet\|_\alpha$ is the so called α– crossed norm in the algebraically sense. So we can define the equation

$w_j^{-1} d_t \alpha_\kappa = \kappa\| \varphi_t \|_\bullet - \alpha_\kappa$,

where for the stationary case we define the functional $\Psi_{\alpha_\kappa}(\varphi_t, t)$.

For the non linear case when the strong interactions decries by the influence of the α_κ we can write the equation of the following manner

$w_j^{-1} d_t \alpha_\kappa = \kappa\| \varphi_t \|/[(x\, \tau_j^1 \tilde{x}) + y_0^2 \alpha_\kappa] - \alpha_\kappa$,

and for the stationary case we obtain

$\alpha_\kappa[(x\, \tau_j^1 \tilde{x}) + y_0^2 f_\kappa] - \kappa\| \varphi_t \| = 0$,

$y_0^2 \alpha_\kappa^2 + (x\, \tau_j^1 \tilde{x})\, \alpha_\kappa - \kappa\| \varphi_t \| = 0$,

$\alpha_\kappa^2 + y_0^{-2}(x\, \tau_j^1 \tilde{x})\, \alpha_\kappa - y_0^{-2}\kappa\| \varphi_t \| = 0$ so that

$\alpha_\kappa = \frac{1}{2} y_0^{-2}(x\tau_j^1 \tilde{x})((1+4\kappa\|\varphi_t\| y_0^2/(x\, \tau_j^1 \tilde{x})^2)^{1/2}-1)$.

For further investigations it is possible to take the linear case and to take the solution of the impulse differential equation in Banach space for φ_t and π_t and write for

$w_j^{-1} d_t\, \pi_t = \Delta_x \varphi_t(\tau_j \tilde{x}) \equiv a_j /[A_j + k_j\| \varphi_t \|] - b_j$

so that we have to obtain the change of strong interaction as a source for the see scalar quantum wave field system φ_t and described by the solution of the Schrödinger functional impulse equation. So that the $\Psi_{\alpha_\kappa}(\varphi_t, t)$ ψ-functional can describe the excitation of the vacuum state of any concrete quantum system, e.g. the system of the see scalars quantum wave filed system, by the help of the impulse operator $Q_{\kappa',\kappa}$ from the following impulse wave functional equation in the Schrödinger picture for the impulse wave functional in the Hilbert space with one remark that in this case the understanding of the operator $Q_{\kappa',\kappa}$ is to understand in the synthetically sense also it is to determine by the help of the kinetic jump of the information for any concrete quantum field system, e.g. the system of the see scalars, at a any one asymptotical stabile centre of the localization, e.g. the locus of the DNA for production of RNA.

$i\partial_t \Psi_{\alpha_\kappa}(\varphi_t, t) = H(t)\, \Psi_{\alpha_\kappa}(\varphi_t, t) =$

$= \int d^3x H(\varphi_t, -i\delta/\delta\varphi_t) \Psi_{\alpha_\kappa}(\varphi_t, t)$,

for $t \in (t_{-2(n - \frac{1}{2}j)}, t_{2(n - \frac{1}{2}j)}]$, $n = 0,1,2, ...$, $j = 0,1,2, ..,2n$ and $x^3 \in (0, d_0)$

$\Psi^+_{\alpha_\kappa}(\varphi t) = Q_{\alpha_{\kappa'},\alpha_\kappa} \kappa',\kappa(\kappa' x,\kappa x) \Psi_{\alpha_{\kappa'}}(\varphi_t) =$

$=[\Psi^{0*}_{\alpha_\kappa}(\varphi_t,t)[1+\sum_{n=0}^{\infty}{}_{\kappa'} \int^{\kappa} d\tau_{\kappa'} \int^{\tau} d\tau_{1....\kappa'} \int^{\tau_{2n-1}} d\tau_{2n} \mathcal{A}(0)...\mathcal{A}(2n)]\Psi^0_{\alpha_{\kappa'}}(\varphi_t,t)]\Psi_{\alpha_{\kappa'}}(\varphi_t)$

for $t = t_{-2(n - \frac{1}{2}j)}+0$, $n = 0,1,2, ...$, $j = 1,2, ..,2n$.

From the time translations invariance and the vacuum stabile states the kinetic jump operator can be defined by equal times and preservation of the energy by the interaction of the virtual quantum wave field system with the classical bio wave fields of the following way

$Q_{\kappa',\kappa}((E_{\alpha_{\kappa'}} + E_{\alpha_\kappa})/2) = \delta(E_{\alpha_{\kappa'}} - E_{\alpha_\kappa} + (E_\kappa - E_{\kappa'})$

$(\Psi^*_{\alpha_\kappa}(\varphi_t, E_{\alpha_\kappa}), \Psi_{\alpha_{\kappa'}}(\varphi_{\tau_{j+1}{}^r \tilde{x}^0}, E_{\alpha_{\kappa'}}) =$

$\int dt\, d\tau_{j+1}{}^r \tilde{x}^0 \exp[i\, (E_\kappa t - E_{\kappa'} \tau_{j+1}{}^r \tilde{x}^0](\Psi^*_{\alpha_\kappa}(\varphi_t, E_{\alpha_\kappa}),$

$\Psi_{\alpha\kappa'}(\varphi_{\tau_j} \tilde{x}^0, E_{\alpha\kappa'}) = \int dt\, d\tau_{j+1} \tilde{x}^0 \exp[i\,(E_\kappa t - E_{\kappa'}\tau_{j+1} \tilde{x}^0]\, \exp[i\,(E_{\alpha\kappa'} - E_{\alpha\kappa})(t + \tau_{j+1} \tilde{x}^0)/2]\, (\Psi^{0*}{}_{\alpha\kappa}(\varphi_t),\ \Psi^0{}_{\alpha\kappa'}(\varphi_{\tau_j \tilde{x}^0})) = \int dt\, d\tau_{j+1} \tilde{x}^0 \exp[i\,(E_{\alpha\kappa'} + E_{\alpha\kappa})(t + \tau_{j+1} \tilde{x}^0)/2]\, (\Psi^{0*}{}_{\alpha\kappa}(\varphi_{(t-\tau_j \tilde{x}^0)/2}),\ \Psi^0{}_{\alpha\kappa'}(\varphi_{(\tau_j \tilde{x}^0 - t)/2})) = \int dt\, \exp[i\, \tfrac{1}{2}(E_{\alpha\kappa'} + E_{\alpha\kappa})t]\, (\Psi^{0*}{}_{\alpha\kappa}(\varphi_{t/2}), \Psi^0{}_{\alpha\kappa'}(\varphi_{-t/2}))$ and $n = 0,1,2,\ldots$ is the numbers of the fields subsystems, e.g. the system of the virtual scalar quantum wave field systems, at the fixed time t and the Hamiltonian $H(t) = H_\alpha + W(t)$.

The definition for the energies $E_{\alpha\kappa}$ and $E_{\alpha\kappa'}$ of the stabile vacuum states is given by the stationary equations

$H_\alpha \Psi_{\alpha\kappa}(\varphi_t, t) = \int dE_{\alpha\kappa} i\partial_t \exp[i\, E_{\alpha\kappa} t]\Psi^0{}_{\alpha\kappa}(\varphi_t)$ for $t > t_{-2(n - \frac{1}{2}j)} + 0$,

$H_\alpha \Psi_{\alpha\kappa'}(\varphi_t, t) = \int dE_{\alpha\kappa'}\, i\partial_{\tau_{j+1} \tilde{x}^0} \exp[i\, E_{\alpha\kappa'} \tau_{j+1} \tilde{x}^0]\Psi^0{}_{\alpha\kappa}(\varphi_t)$ for $t = t_{2(n - \frac{1}{2}(j+1))}$, $n = 0,1,2, \ldots, j = 0,1,2,..,2n$.

So it is possible to define the impulse 4-vector k as a impulse vector in the 4-impulse Minkowski space-time without the finite compactness with the energy depended from the distance and impulse $k^3 = d_0 F_c/c$ + const where the const $= (d_0/c)\, F_g^2/2F_c \in [0, 1]$ for $t_0 > 0$ and F_c is the so called Casimir force and F_g is the earth gravitations force and the $k^0 = (\tfrac{1}{2}c)(E_{\alpha\kappa'} - E_{\alpha\kappa})$.

The 4-vector $q^\mu = (\tfrac{1}{2}(E_{\alpha\kappa'} + E_{\alpha\kappa}),\ \overline{q_\perp}, q^3)$ and $q_\kappa{}^\mu = (E_{\alpha\kappa'} q_\perp, q^3 - k^3)$,

$q_\kappa{}^\mu = (E_{\alpha\kappa'}, q_\perp, q^3 + k^3)$ [10].

It is clear that we can so consider the non-equilibrium thermodynamics of the kinetic jumps from the point of view of the impulse Schrödinger wave functional equation in Banach space. The kinetic jumps by the transition of amorphous substance from the fluid state in the body by the change of the temperature or the pressure is called vitrification. By so one transition are changed the volume, hit contents and so the mechanical, electrical und other properties of the substance too. In the fluid state for any one temperature correspond eigen equilibrium structure. By vitrification the coefficients of the hit extending and the hit capacity are changed abruptly what make the vitrification likely the phase transition at the second kind. But there is principal difference of the structure vitrification from the phase transition in the following:

i) By phase transition we have a transition from less ordered structures to the more ordered; the transition of the fluid in glass is not related with the change of the degree of the ordered structure.

ii) By phase transition we have a transition from thermodynamically equilibrium structure to equilibrium structure too. By the vitrification we have transition from equilibrium structure (fluid) to the non equilibrium structure (glass).

iii) By great velocities of the cooling the temperature of the beginning of the phase transition of the first kind can depend from the velocity (it is possible to observe subcooling). Whereby with the increase of the velocity the degree of the subcooling increase, the temperature of the beginning of the transition decrease. The temperature of the vitrification increase with the increase of the velocity of the cooling what show of the kinetic and not thermodynamically nature of this transition.

Here we have a quantum field system, e.g. the system of the virtual scalars quantum wave field systems weak interacting with classical bio wave fields, and that can be considered as a dynamically problem for the evolution of one small subsystem, e.g. the system of the virtual scalars quantum wave field systems, interacted with a great box defined by the boundary condition with vacuum as a ground state conformed to these boundary conditions.

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