Bulgarian Journal of Agricultural Science, 13 (2007), 627-634
National Centre for Agrarian Sciences

Causality Implies the Lorenz Group for Cryobiological "Freezing-Drying" by the Vacuum Sublimation of Living Cells

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Abstract

TSVETKOV, Tsv. D., G. PETROV and P. TSVETKOVA, 2007. Causality implies the Lorenz group for cryobiological "freezing-drying" by the vacuum sublimation of living cells. *Bulg. J. Agric. Sci.,* 13: 627-634

From the new results by the contributions of the living cells and systems environmental "freezing-drying" and vacuum sublimation for the intracellular ice formation after sublimate condensation and the following vitrification of the living cells (Belaus, A. M., Ts. D. Tsvetkov, 1985, Zwetan D. Zwetkow, 1985, Tsvetkov et al., 1989, 2004, 2005, 2006, 2007) it is hopped that by the ice grate form and expressed e.g. by the thermodynamically and kinetic jump behavior of the living cells will be possibly to describe the biological expressions of the non equilibrium vitrified living cell state by means causality and Lorenz group too describing by quantum field theory. Freeze–drying or "lyophilization" is a drying process where the living cells environmental solvent is first frozen and then removed by sublimation under low pressure. The process consists of 3 main stages: freezing at a given time t, primary –and secondary drying for $t \in (t_{-2(n-½j)}, t_{2(n-½j)}]$,. After complete solidification in the first stage at a time $t = \tau_{j+1}{}^{R}\widetilde{\mathbf{x}}^{0}$, the shelf temperature is then at the time $t = \tau_{j}{}^{L}\widetilde{\mathbf{x}}^{0} + 0$ slightly increased to supply heat for the sublimation of ice and by the sublimate condensation for the formation of the vitrified living cell state. The secondary drying phase includes removing of water from solute phase by desorption usually at temperature above room temperature. So the primary drying step should be carried out at the highest temperature possible; wish is limited by the so called "maximum allowable temperature". This temperature indicates the eutectic temperature for a solute that crystallize to the ice grate of the living cell during freezing or the "leap temperature" for systems that remains in the non equilibrium vitrified state. Lyophilization is the most expensive at all drying operations, both in capital investment and in operation expenses. In this context the main theoretical focus in process development is to minimize consistly drying times, while maintaining constant preserved product quality. It is believed that for the studying of the living cells and systems the concept of the classical cryobiological non equilibrium thermodynamics and the axiomatic quantum field theory 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

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and the time arrow. With other words the connection in the cryobiology between the entropy and the causality according to quantum field theory of the interactions, the external conditions models between elementary cells and living cells with classical environmental biofields modeled by the additional boundary conditions by the vitrification obtained e.g. as by the Casimir effect.

At the molecular level (Mitter and Robaschik, 1999) the thermodynamic behavior is considered by any electromagnetic quantum field 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.

Key words: causality condition in the cryobiology, impulse wave equation, Casimir effect, vitrification, classical biofields

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., 2004, 2005, 2006, 2007), 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 Results

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 living cells and between the quantum fields and the classical external fields in the environment of the iving cells that make possible to consider the so called kinetic leap effect of the vitrification by the iving cells 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

$y^{\mu}_{-2(n-\frac{1}{2}(j-1))}$, $y^{\mu}_{-2(n-\frac{1}{2}j)}$, $y^{\mu}_{2(n-\frac{1}{2}j)}$, $y^{\mu}_{2(n-\frac{1}{2}(j+1))}$, and the point $x^{\mu} = (ct,\overline{x})$ between the plates

so that $t \in (t_{-2(n-\frac{1}{2}j)}, t_{2(n-\frac{1}{2}j)}]$,

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

for $x^3 \in (0, \lambda vt_0)$, or $x^3 \in (\lambda vt_0, L)$

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

with $t \in (t_{2(n-\frac{1}{2}j)}, t_{-2(n-\frac{1}{2}(j-2))}]$,

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

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.

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

$y^3 \in (0, \lambda\, vt_0]$,

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

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

$t_{-2(n-\frac{1}{2}(j-1))} = t_{2(n-\frac{1}{2}j)}$,

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

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

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

for $t \in (t_{2(n-\frac{1}{2}j)}, t_{-2(n-\frac{1}{2}(j-2))}]$ and

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

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

as a light like Minkowski space vector and $y^{\mu}{}_{2(n-\frac{1}{2}j)}$ and $y^{\mu}{}_{-2(n-\frac{1}{2}j)}$ 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

$k'x^{\mu} = \tau_j{}^{r}\widetilde{x}^{\mu} + \frac{1}{2}(x + \tau_j{}^{r}\widetilde{x})^{\mu}\, f_{k'}$

with $f_{k'} = \frac{1}{2}y_0{}^{-2}\, (x\, \tau_j{}^{r}\widetilde{x})((1 + 4k'^2x^2y_0{}^2/(x\, \tau_j{}^{r}\widetilde{x})^2)^{\frac{1}{2}} - 1)$

for $y_{2(n-\frac{1}{2}j)}{}^{\mu} = \frac{1}{2}(x + \tau_j{}^{r}\widetilde{x})^{\mu}$, $t \in (t_{-2(n-\frac{1}{2}j)}, t_{2(n-\frac{1}{2}j)}]$, $n = 0,1,2, ..., j = 0,1,2, ..,2n$,

$kx^{\mu} = \tau_j{}^{l}\widetilde{x}^{\mu} + \frac{1}{2}(x + \tau_j{}^{l}\widetilde{x})^{\mu}\, f_k$

with $f_k = \frac{1}{2}y_0{}^{-2}\, (x\, \tau_j{}^{l}\widetilde{x})((1 + 4k^2x^2y_0{}^2/(x\tau_j{}^{l}\widetilde{x})^2)^{\frac{1}{2}} - 1)$

for $y_{2(n-\frac{1}{2}j)}{}^{\mu} = \frac{1}{2}(x + \tau_j{}^{l}\widetilde{x})^{\mu}$, $t \in (t_{2(n-\frac{1}{2}j)}, t_{-2(n-\frac{1}{2}(j-2))}]$, $n = 0,1,2, ..., j = 0,1,2, ..,2n$,

$kx^{\mu} = \tau_{2n-1}{}^{l}\widetilde{x}^{\mu} + \frac{1}{2}(x + \tau_{2n-1}{}^{l}\widetilde{x})^{\mu}\, f_k$

with $f_k = \frac{1}{2}y_0{}^{-2}\, (x\, \tau_{2n-1}{}^{l}\widetilde{x})\, ((1+4\, k^2x^2y_0{}^2/(x\, \tau_{2n-1}{}^{l}\widetilde{x})^2)^{\frac{1}{2}} - 1)$

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

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

${}^{r}D = {}^{l}D_{\kappa x,\, \tau_j{}^{r}\widetilde{x}} = V^{+}{}_{\tau_j{}^{r}\widetilde{x}} \cap V^{-}{}_{\kappa x}$

with the basis $S_{\kappa x,\, \tau_j{}^{r}\widetilde{x}}$

and the axis $[kx^{\mu}, \tau_j{}^{r}\widetilde{x}^{\mu}] = y_{2(n-\frac{1}{2}j)}{}^{\mu}\, f_k$,

$^{l}D = {}^{r}D_{\kappa' x,\ \tau_j{}^1\tilde{x}} = V^{+}_{\tau_j{}^1\tilde{x}} \cap V^{-}_{\kappa' x}$

with the basis $S_{\kappa' x,\ \tau_j{}^1\tilde{x}}$ and the axis $[k'x^{\mu}, \tau_j{}^1\tilde{x}^{\mu}] = y_{-2(n-½j)}{}^{\mu} f_{k'}$.

As is well known Hermitian 2 x 2 matrices

$$X^{\mu} = ½\begin{bmatrix} x^{\mu} + \tau_j x^{\sim\mu} & kx^{\mu} + ik'x^{\mu} \\ kx^{\mu} - ik'x^{\mu} & (x^{\mu} - \tau_j x^{\sim\mu}) \end{bmatrix}$$

after reflexion on the mirrors, also

$$X^{\mu}{}_{\acute{a}\hat{a}'} = \begin{bmatrix} X^{\mu}{}_{00'} & X^{\mu}{}_{01'} \\ X^{\mu}{}_{10'} & X^{\mu}{}_{11'} \end{bmatrix}$$

$= ½(\sigma_0 x^{\mu} + {}_k\sigma_1 kx^{\mu} + {}_{k'}\sigma_2 k'x^{\mu} + {}_{\tau_j}\sigma_3 \tau_j x^{\sim\mu})$;

where $(\sigma_0, \overline{\sigma})$ are the Pauli matrices and $x^{\mu} = (x^0, \overline{x}) = (x^0, x^1, x^2, x^3)$

may conveniently be used to label the points of Minkowski space-time M, where

$½(x^{\mu} + \tau_j x^{\sim\mu}) = y^{\mu}{}_{-2(n-½j)}$

$kx^{\mu} = \tau_j x^{\sim\mu} + y^{\mu}{}_{-2(n-½j)} f_k$

$k'x^{\mu} = \tau_j x^{\sim\mu} + y^{\mu}{}_{-2(n-½j)} f_{k'}$

$½(x^{\mu} - \tau_j x^{\sim\mu}) = x^{\mu} - y^{\mu}{}_{-2(n-½j)}$

$(\tau_j x^{\sim})^2 = 0,\ y_0{}^2 = y_{-2(n-½j)}{}^2,\ f_k = (x\tau_j x^{\sim}/2y_0{}^2)((1 + 4k^2 x^2 y_0{}^2/(x\tau_j x^{\sim})^2)^{½} - 1)$,

$f_{k'} = (x\tau_j x^{\sim}/2y_0{}^2)((1+4k'^2 x^2 y_0{}^2/(x\tau_j x^{\sim})^2)½ - 1),\ (kx)^2 = k^2x^2,\ (k'x)^2 = k'^2x^2$

$0 \le k \le 1,\ 0 \le k' \le 1,\ k' \le \tau_{2n} \le \tau_{2n-1}, \ldots, k' \le \tau_j \le \tau_{j-1}, \ldots, k' \le \tau_1 \le \tau,\ k' \le \tau \le k$,

$X^*X = X^{\alpha\beta'}\overline{X}^{T\alpha\beta'} = x^2\ ¼(1 - (k^2 + k'^2))$

and $t_{-2(n-½j)} \le t$ £ $t_{2(n-½j)}$, $0 < x^3 < vct_0$, $0 < y_0{}^3 < vct_0$,

$y^3{}_{-2(n-½j)} = -ct_0 sh(n-j/2)s + y_0{}^3 ch(n-j/2)s = -ct_0 (sh(n-j/2)s - \lambda v\ ch(n-j/2)s)$,

$t_{-2(n-½j)} = t_0 ch(n-j/2)s + y_0{}^3 sh(n-j/2)s = t_0(ch(n-j/2)s + \lambda v\ sh(n-j/2))$,

$y^3{}_{2(n-½j)} = ct_0 sh(n-j/2)s + y_0 3\ ch(n-j/2)s = ct_0 (sh(n-j/2)s + \lambda v\ ch(n-j/2)s)$,

$t_{2(n-½j)} = t_0\ ch(n-j/2)s - y_0{}^3 sh(n-j/2)s = t_0(ch(n-j/2)s - \lambda v\ sh(n-j/2))$,

$y_0{}^3 = \lambda vct_0,\ 0 < \lambda < 1,\ 0 < v < 1$

for n = 0,1,2, ..., j = 0,1,2, …., 2n .

$s = \ln[(1+v)/(1-v)]$

The light cone of the origin is then represented by such matrices of rank unity. It follows that two points of M can be connected by a light ray if and only if the difference $X^* - X$ between the respective Hermtian matrices X*, X, representing the points, has vanishing determinant

$|X^* - X| = 0.$

The purpose of this note is to show that, by applying a theorem of the Hua (1949) to this representation, a theorem of Zeeman (1964) may be immediately deduced too.

Zeeman's theorem states that the most general point transformation of M to itself that preserves the causality relation on M (continuity not assumed) is eleven-parameter group generated by the orthochronous Lorenz's transformations, the translations and dilatations. The causality relation on M is a reflexive transitive order relation, which can be write as

$$X^* \ge X$$

asserting that a signal can be transmitted from X to X^*, and which in terms of Hermitian matrices, takes the form of the statement

$X^* - X$ is non-negative definite, since matrices is equivalent to the condition

$[(X^{0*} - X^0)^2 - (X^{1*} - X^1)^2 - (X^{2*} - X^2)^2 - (X^{3*} - X^3)^2]^{½} = ½\,(x^2)^{½}\,(1 - (k^2 + k'^2))]^{½}$

Now, from the results of Hua (1949), it follows that the most general transformation on the space of n x n Hermitian matrices preserving a relation referred to as 'coherence' is the group generated by

(i) $Y = AX\overline{A}^T + B$, A´H 0 $\overline{B}^T = B$

(ii) $Y = X^T$

and

(iii) $Y = - X$.

Here, the relation 'X^* is coherent to X' means that the rank of $X^* - X$ is unity. For n = 2 this is the condition on (distinct) points of M that can be connected by a light ray, as mentioned of the beginning of this article. Thus, the group of transformations of M preserving this relation is generated by (i), (ii) and (iii).

When B = 0, |A| = 1, the transformations (i) are the proper orthochronous Lorenz transformations. When A = I, we get the translations, and when

$A = \lambda I$ ($\lambda \neq 0$) B = 0, we get the dilatations. The transformation (ii) is a space reflection and (iii) is a space-time reflection.

Preservation of the causality relation $X^* \geq X$ certainly entails preservation of coherence, since X^* and X are coherent if and only if the following three properties hold

(a) $X^* \neq X$

(b) either $X^* \geq X$ or $X \geq X^*$;

(c) if $X^* \geq Y \geq X$ and $X^* \geq Z \geq X$, or if $X \geq Y \geq X^*$ and $X \geq Z \geq X^*$, then $Y \geq Z$ or $Z \geq Y$.

Thus the causality-preserving group of M must be a subgroup of that generated by (i), (ii) and (iii). Only (iii) fails to preserve causality, so it can be obtain Zeeman's result that this group is G, generated by (i) and (ii), as required.

The theorem of Hua (1949) was proved for n-rowed matrices. The case n = 2, which being used here, is essentially a result of Laguerre geometry of Hermitian matrices. A pair of matrices (X, Y) of rank n with $X\overline{Y}^T = Y\overline{X}^T$ defines the homogeneous coordinates of the Hermitian matrix $Y^{-1}X$ (when Y is non-singular; otherwise it provides a point at infinity). For n = 2 these are related to the Penrose twistors, the symmetry group arising being the space-time conformal group. The geometry is then equivalent to the Lie geometry of spheres. The low of causality is not valid in this geometry.

For the further consideration is to remark that it is possible to take the following way of the consideration of the scalar mass field.

$\varphi_{m_\kappa}(\overline{x}, t) = (\varphi_t(\tau_j \tilde{x}) * \delta(\tau_j \tilde{x} - (x - y_{2(n - ½j)})) * \varphi_{m_\kappa}(\overline{\imath}, \xi^0)) =$

$= \int d\overline{x}^{\sim} \varphi_t(t_{2(n - ½j)}, \overline{x}^{\sim}{}_\perp y_{2(n - ½j)}{}^3) \varphi_{m_\tau}(\xi^0, ½(\overline{x}_\perp + \overline{x}^{\sim}{}_\perp), \xi^3)),$

$\xi^0 = t, \ \xi^3 = y_{2(n - ½j)}{}^3$

where $(\partial_{\xi^0}{}^2 - \Delta + m_\kappa{}^2)\varphi_{m_\kappa}(\overline{\imath}, \xi^0) = 0$,

so that for $\xi^0 = t$ and $\xi^3 = y_{2(n - ½j)}{}^3$ the domain of the solution $\varphi_{m_\kappa}(\overline{\imath}, \xi^0)$ intersect the domain of $\varphi_t(\tau_j \tilde{x})$.

And for the vector field potential in the Minkowski space time it can be given

$A^\mu{}_{m_\kappa}(\overline{x}, t) = (\varphi_t(\tau_j \tilde{x}) * \delta(\tau_j \tilde{x} - (x - y_{2(n - ½j)})) * A^\mu{}_{m_\kappa}(\xi^0, \overline{\imath})) =$

$\int d\overline{x}^{\sim} \varphi_t(t_{2(n - ½j)}, \overline{x}^{\sim}{}_\perp y_{2(n - ½j)}{}^3) A\mu_{m_\kappa}(\xi^0, ½(\overline{x}_\perp + \overline{x}^{\sim}{}_\perp), \xi^3)),$

$\xi^0 = t, \ \xi^3 = y_{2(n - ½j)}{}^3$

where $(\partial_{\xi^0}{}^2 - \Delta + m_\kappa{}^2) A\mu_{m_\kappa}(\xi^0, \overline{\imath}) = 0$

The quantity m_k is a Bare mass so that the massive scalar field is scaling invariant.

Also from $\varphi_{m_\kappa}(\overline{x}, t) = \kappa\varphi_{m_\kappa}(\kappa x)$ and $A^\mu{}_{m_\kappa}(\overline{x}, t) = \kappa A^\mu{}_{m_\kappa}(\kappa x)$ follows for the restricted solution

$\varphi_{m_\kappa}(\kappa x) = \int dq_\kappa\ \delta(q_\kappa{}^2 - m_\kappa{}^2)\ \tilde{\varphi}_{m_\kappa}(q_\kappa)$

where $\tilde{\varphi}_{m_\kappa}(q_\kappa) = \exp[iq_\kappa\ \kappa\ x]\ \varphi_{m_\kappa}(q_\kappa)$

and $(\partial_{\kappa x}{}^2 + m_\kappa{}^2)\ \varphi_{m_\kappa}(\kappa\ x) = 0$,

$\varphi_{m_\kappa}(q_\kappa) = \int d\kappa x\ \delta((\kappa x)^2 - \kappa^2 x^2)\ \tilde{\varphi}_{m_\kappa}(\kappa x)$,

$\tilde{\varphi}_{m_\kappa}(\kappa x) = \exp[-iq_\kappa \kappa x]\ \varphi_{m_\kappa}(\kappa x)$,

$(\partial_{q_\kappa}{}^2 + \kappa^2 x^2)\varphi_{m_\kappa}(q_\kappa) = 0$ and $m_\kappa{}^2 = \kappa^{-2}x^{-2}$ can be considered as a mass of the "matter" scalar field.

Further

$\varphi_{\tau j}(k)=\int dx d\tau_j{}^{1}\tilde{x} \exp[ik\tfrac{1}{2}(x+\tau_j\tilde{x})]$ $\varphi_t(\tau_j\tilde{x})= \int dx d\tau_j\tilde{x}\Omega_t{}^3 \int d\overline{y} \int_{-\infty}^{\infty} dt_0\delta(t_0{}^2- \overline{y}^2 - x\tau_j\tilde{x})\ \exp[ik\tfrac{1}{2}(x+\tau_j\tilde{x})]\varphi(t_0, \overline{y})$

where $(\partial_k{}^2 + x\tau_j\tilde{x})\varphi_{\tau j}(k) = 0$, and $\tfrac{1}{2}(E_{\alpha_\kappa} - E_{\alpha_{\kappa'}})c^{-2} = c^{-2}(x\tau_j\tilde{x})^{-2}$ on equation for the fermions operator $\chi(q_\kappa)$ in the impulse Minkowski space

$(\partial_{q\kappa}{}^2 + \kappa^2 x^2)\ \langle 0|\ \chi(q_\kappa)|n-\tfrac{1}{2}j\rangle = 0$

that

$i\sigma^\nu \partial_{q\kappa}{}^\nu \langle 0|\ \chi(q_\kappa)|n-\tfrac{1}{2}j\rangle = \kappa|x|\langle 0|\ \tilde{\chi}(q_\kappa)|n-\tfrac{1}{2}j\rangle$,

$i\overline{\sigma}^\nu \partial_{q\kappa}{}^\nu \langle 0|\ \tilde{\chi}(q_\kappa)|n-\tfrac{1}{2}j\rangle = \kappa|x|\langle 0|\ \chi(q_\kappa)|n-\tfrac{1}{2}j\rangle$

and

$\langle 0|\ \chi(q_\kappa)|n-\tfrac{1}{2}j\rangle = \int d\kappa x\ \delta((\kappa x)^2 - \kappa^2 x^2)$ $\exp[-iq_\kappa \kappa x]\ \langle 0|\ \chi(\kappa x)|n-\tfrac{1}{2}j\rangle$.

For further investigations it is possible to define for the indefinite Hilbert space

$\chi(\kappa x) = \chi(\tau_j\tilde{x}) + \chi[\tfrac{1}{2}(x+\tau_j\tilde{x})]\alpha_\kappa$,

where $\chi(\tau_j\tilde{x})$ is indefinite Hilbert spinor field

for

$w_j{}^{-1}d_t\alpha_k = k\|\ \varphi_t\ \|[\chi(\tau_j\tilde{x})\chi[\tfrac{1}{2}(x+\tau_j\tilde{x})]+ \chi^2[\tfrac{1}{2}(x+\tau_j\tilde{x})]ak]^{-1} - \alpha_k,\}$

and for $d_t\alpha_k = 0$ and $\chi^2(\tau_j\tilde{x}) = 0$

$\alpha_k = \tfrac{1}{2}(\tau_j\tilde{x})\chi\chi(\tfrac{1}{2}(x+\tau_j\tilde{x}))\chi^{-2}(\tfrac{1}{2}(x+ \tau_j\tilde{x}))\{1+4k||\varphi_t||\chi^2[\tfrac{1}{2}(x+\tau_j\tilde{x})][\chi(\tau_j\tilde{x})\ \chi(\tfrac{1}{2}(x+\tau_j\tilde{x}))]^{-2} - 1\}$

so that

$\chi^2(\kappa x)=[\chi(\tau_j\tilde{x}) + \chi[\tfrac{1}{2}(x+\tau_j\tilde{x})]\alpha_\kappa]^2 = k\|\varphi_t\|$.

And

$A^\mu{}_{m_\kappa}(\kappa x)=\langle 0|T\chi^*(\kappa x)\sigma^\nu\chi(\kappa x)|\varphi_t\rangle$

Where T denotes the causal time ordered operator product.

Therefore, if the cells are close, diffusion of water, in the liquid or vapor phase, can allow rapid approach to hydraulic stationary equilibrium and the system membrane-solution-water is no more open but isolate and can behaved kinematical also there is a structural leap transition of the system. We think that the conformed vacuum as a state quantum field system with additional boundaries conditions on the matter objects fulfilled and such the membranes the external conditions modeled are from very great importance for the life and living cells and living systems. So we can see that the physical causal conditions for the life matter are from very great importance [1] and the further investigations in the importance of the studying of the freezing-drying by vacuum sublimation of elementary cells under the physical vacuum for the life matter is plausible and the possibility to influence the intra feedback regulatory processes of the production of enzyme and metabolite. May be it is the way theoretical to understand the connection between the time arrow, i.e. entropy decrease and growth and the thermodynamically fluctuations of the external fields in the environment of the living cells. Also that is that the entropy by the achieving of the thermodynamically or kinematical equilibrium the possibility to achieve other an stabile kinematical equilibrium by the reversible processes for the intracellular quantum field systems of the living cell.

Acknowledgments

The one of the authors takes pleasure in acknowledging the help and encouragement given to him by (nav) captain of first rank Ing. T.P. Todorov

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Received September, 3, 2007: accepted October, 24, 2007.