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NEW UNIFIED SCIENTIFIC THEORY AND BIOTHERMAL WAVE MOTION IN THE HUMAN BODY SYSTEM

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ABSTRACT

A new Unified Scientific Theory based on the order-disorder concepts of the author has been employed in order to study thermal aspects of the quantized energy particle Lifton of bio-radiation. The present study concerns the motion of thermal waves generated by Lifton in the human body system. Two sets of homogeneous second-order differential equations based on (i) the variation of the Lifton wave function $\Psi_L(t, T)$ with respect to parameters t and T and (ii) the variation of Lifton temperature T with respect to time t have been developed. The first set of equations provide frequencies $\omega = (2\pi E_L / t)$ and $\omega_p = (2\pi E_L / T)$ which correspond to bio-radiation damping and plasma frequency respectively. Interesting results have been found. Whereas damping is along longitudinal lines, the effects of plasma are transverse. The possibility of liquid plasma is also discussed. The second set of differential equations is concerned with body to free vibration with damping. Here the damping vibration frequency is $\omega = 1 / t$ at which human elastic structure systems tend to oscillate. This is the case of underdamped, i.e., the variation of temperature T with respect to time t is oscillatory and not periodic.

An equation $\lambda_L = (E_T / p_L) Q_F$ describes the relationship between the Lifton wavelength λ_L and linear momentum p_L . This is Lifton's duality; a relationship between the quantized wave nature and particle nature of Lifton. This equation is very similar to the de Broglie duality relationship of photons: $\lambda_{ph} = h / p$, where h is Planck's constant.

The motion of thermal waves in the human body controls the ageing process of life. Equation $T = \exp [\log (1 / t)]$ is concerned with the ageing of the human life-death system, which describes that the body temperature T decays exponentially as ageing occurs. That is why low blood temperature affects the blood circulation in old age. Equation $T = (\pi E_{th} t)^{-1}$ is associated with the end-point of ageing when the human body system attains death (an ordered state). The Quantum vibration of Lifton generates thermal current in the human body system.

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1. INTRODUCTION

In recent years, a New Unified Scientific Theory [1] based on order-disorder concepts has successfully discussed the dynamics and has displayed satisfactory results in cases of atomic systems, molecular and bio-molecular systems, biochemical and biomedical systems, etc.

The human body is an incredibly complex and intricate system. Life and death are the biological phenomena of the human body system which occur at the beginning and end-point respectively. Production of life is a disordered phenomenon while death is an ordered phenomenon. The span of life depends on various factors including body temperature and ageing. The human body normally maintains steady levels of temperature and other vital conditions concerning water, sugar, fat, protein, oxygen, and the contents of the blood, etc. The human body uses a number of processes to control its temperature, keeping it close to a normal average of 98.6 °F. If the body temperature is raised by say 10 °F, the body's system operation becomes abnormal. If it is not normalized and the body becomes weak, a runaway process if not stopped can only lead to death.

Bio-thermal wave motion in the human body system is a thermal problem. In thermal problems, heat transfer concerns the generation and exchange of thermal energy (heat) between physical systems. When an object is at a different temperature from another body, its surroundings reach the same temperature at which point they are in thermal equilibrium. Such spontaneous heat transfer always occurs from a region of high temperature to another region of low temperature as described in the second law of thermodynamics. Thermal radiation is a fundamental mechanism of heat transfer. It is electromagnetic radiation. Thermal radiation occurs through any transparent medium of disordered materials. It is the transfer of energy by means of photons in electromagnetic waves governed by the same laws [2].

Over the years, a large number of bio-heat transfer models [3-5] to study the effects of blood flow on heat transfer have been developed by many researchers. The most popular model was introduced in 1948 by Harry Pennes. The importance of his investigation lies in the fact that when there was some disorder in temperature, the maximum muscle temperature was traced very close to or at the axis of the limb. The general trend in bio-heat modeling was that the heat transfer affects tissues. This was studied by second-order differential equations of temperature $T(x, t)$ variations [d^2T/dx^2 , d^2T/dt^2] with respect to space and time coordinates x and t . However, earlier methodologies were very complicated and lengthy.

A very simple methodology based on the New Unified Scientific Theory of this author is now reported in this paper in order to study bio-thermal wave motion in the human body system by means of Order-Disorder Transformations (ODTs).

Earlier studies [6,7] have shown that ODTs have enabled the study of the biochemical and biomolecular systems of the human body through a quantized energy particle Lifton (life particle) where temperature plays an important role. This quantum particle is an energy particle of bio-radiation. Lifton provides consciousness to every cell and organ of the human body. Quantized vibrations of Lifton in the human body system generates thermal waves and, as a result, the tissues and blood emit thermal radiation. Such radiation occurs through the formation of a transparent medium by existing materials and energy inside the human body. Thermal radiation heats the human body. The transfer of energy

by means of Lifton in the human body is governed by the same laws as those in the case of photons. Temperature plays an important role in such thermal problems. The order-disorder concepts and ODTs are described in the following section 2.

2. ORDER-DISORDER CONCEPTS AND ODTs

The author introduced Order-Disorder concepts in the year 2012. This was in developing Order-Disorder Transformations [8,9] (ODTs) for the description of a New Unified Scientific Theory for the systems of the Universe and Nature, according to which every system and body of the universe possesses the behavior of order and disorder. Nature follows complete order behavior, which is associated with symmetry. Disorder refers to incompleteness – a quality of the universe created by nature which follows randomness. Order within disorder and disorder within order is the nature of all existing systems and bodies of the Universe. Order and disorder form a pair of conjugate quantities similar to other paired conjugate quantities such as completeness-incompleteness, symmetry-asymmetry, and the death-life system, etc. The displacement of time develops thermal vibration in atoms of the materials, which enhance the temperature and ultimately randomness in the behavior of matter and radiation, i.e., Order-Disorder Transformations are responsible for producing particle and wave characteristics (dual nature) in matter and radiation, which is supported by the Third Law of Thermodynamics. The degree of order and disorder characteristics may be measured in terms of entropy (S). The disorder behavior lies between entropy values of $S=0$ and $S=1$, while at the extreme values of $S=0$ and $S=1$ there lies order behavior. Order (O) and Disorder (D) are just like two faces of same coin. They form a pair of conjugate quantities (O,D).

The Heisenberg Uncertainty Principle [10] states that it is impossible to specify simultaneously the values of conjugate members of particular pairs of physical variables that describe the behavior of an atomic system. According to this principle, there lies uncertainty in both measurable quantities, say (i) the value of the energy 'E' of a particle and (ii) the corresponding measurable time 't'. Then, in terms of the measurable uncertainties (Δ : uncertainties of the measuring variables) concept of the variables, according to Heisenberg:

$$\Delta t \cdot \Delta E \geq (h / 2 \pi) \quad (h = \text{Planck's constant}) \quad (1)$$

According to the Unified Scientific Theory of the author, for all systems and bodies, the generalized form in order and disorder concepts is given by:

$$\Delta O \cdot \Delta D \rightarrow \text{constant} \quad (2)$$

This constancy may be considered as H (say), where $H = h / 2\pi$ for the atomic system, which is the minimum value of the quantization condition. That is to say, in general the uncertainty lying in measuring disorder in a system is inversely proportional to ΔO and for measuring order is inversely proportional to ΔD .

The creation of the universe is based on matter-energy equivalence phenomena which follow random behavior and happen in multi-activities in terms of quantum energy packets inside the sun with different radiation wavelengths λ , which develops a temperature notion T as in:

$$T \rightarrow f(E) \rightarrow f(1/\lambda) \quad (3)$$

and the wave function $\Psi(t)$ corresponding to simple harmonic waves

$$\Psi(t) = \sin[(2\pi/\lambda)vt] \quad (4)$$

For the case of Order-Disorder Transformations (ODTs) due to the existence of the dominance of temperature T in the whole sun's space, such that the wave function becomes bi-functional (t, T) and transforms to:

$$\Psi(t, T) = \sin[2\pi f(t, T)] \quad (5)$$

which for satisfying the quantum parity condition $\int \Psi \Psi^* dt = 1$ leads to ODTs of the form:

$$\iint f(t, T) \Delta T \Delta t = (1/2\pi) \quad (6)$$

The scientific hypothesis behind the above analogy of ODTs is that the variation of temperature ' T ', a disordered quantity with respect to the natural order quantity ' t ', is the occurrence of all the existing systems of the whole universe. A generalized form of the ODTs is given by [9].

$$\iint f(O, D) \Delta O \Delta D = \iint f(t, E) \Delta t \Delta E = (1/2\pi) = \iint f(t, T) \Delta t \Delta T \quad (7)$$

This agrees with the following Heisenberg result

$$\Delta \nu \cdot \Delta t = (1/2\pi) \quad \text{where } \nu = \text{frequency} \quad (8)$$

The first quantity in each parenthesis of Eq (7) possesses ordered behavior while the second quantity possesses disordered behavior. The above equations are concerned with the Order-Disorder Uncertainty Principle in integral space, which is parallel to the Heisenberg Uncertainty Principle of differential space for atomic systems. The statistical quantity $f(O, D)$ (say) is described by

$$f(O, D) = \exp(E/E_D) \cdot \exp(-E_O/E_D) \quad (9)$$

where the symbol E represents energy.

3. METHODOLOGY

A very simple methodology based on the Unified Scientific Theory of the author [1] has been used in this paper in order to discuss Lifton duality, the ageing of life and thermal wave motion inside the human body system. Temperature has played important roles in the description of these aspects. Order-disorder concepts play basic roles in propounding the Unified Scientific Theory, while order-disorder transformations (ODTs) explain that Nature (symmetry) and the Universe (randomness: disorder) affect every event and action. They also develop the Order-Disorder Uncertainty Principle in integral space which on application to different systems has presented satisfactory results. The relevant theoretical analysis and conclusions are given in the following sections 4 and 5.

4. THEORETICAL ANALYSIS

(A) Bio-Radiation and Lifton Duality

Bio-materials emit radiation known as bio-radiation. In the "Theory of Bio-radiation" [11], it has been considered that the transmission of bio-radiation takes place in the human body system in the form

of a special type of “Bio-resonator: Lifton” developed through ODTs. Lifton is the life particle which provides consciousness to every cell and organ in the human body. A mother’s womb is the natural site where a fetus develops. The fetus is the developing embryo which is formed when an ovum is fertilized by a sperm within a protein cell. During fertilization, bio-radiation is generated of which the quantized energy particle is Lifton. A period comes sometime before the delivery of a child, after 4-5 months of pregnancy, when a photon (external energy resource) interacts with a Lifton and through ODTs develops Life-Soul complex energy [7] (bio-electromagnetic radiation - cosmic). Different types of matter and bio-radiant energy exist inside the human physical body system. Lifton energy, $E_L(t, T)$, and Lifton wave function, $\Psi_L(t, T)$, are bi-functional quantities of time ‘t’ and temperature ‘T’ parameters as given by:

$$E_L(t, T) = Q_F \cdot k_B T = \epsilon_T / t = \epsilon_T \nu = \epsilon_t T \quad (10)$$

$$\Psi_L(t, T) = \sin [2\pi f(t, T)] = \sin [2\pi E_L(t, T)] \quad (11)$$

In the case of bio-radiation, we consider $f(t, T) = E_L(t, T) / h$. $Q_F = (h / c t)$ is called a quantization factor. Here, $\epsilon_T = (h / c) k_B T$, has been pronounced as a SYA constant and $\epsilon_t [\epsilon_t = (h / c) k_B]$ as an equivalent thermal capacity constant of Lifton (Life particle), where k_B is the Boltzmann constant, c is the velocity of light and $\nu (\nu = c / \lambda_L)$ is the frequency. In the order-disorder concept, we consider the disorder conceptual form of Lifton energy, $E_L(t, T) = \epsilon_T \nu = \epsilon_T / (Q_F \cdot t)$ and the order conceptual form of energy $E_L(t, T) = \epsilon_T / t$ for maximum quantization $Q_F (Q_F \rightarrow 1)$. The validity of Eq. (11) has been discussed in previous studies [6,11].

In the subsequent section (B), it is observed that the Lifton vibration generates thermal waves. The quantized energy particle Lifton of bio-radiation follows the particle-wave duality as the quantized energy particle photon of solar radiation. The linear momentum, p_L , of the Lifton is given by

$$p_L = E_L(t, T) / c = \epsilon_T / c t \quad (12)$$

From the above Eq., after using the value of the quantization factor Q_F , we obtain

$$\lambda_L = (h / p_L) Q_F \quad (13)$$

The above equation is Lifton’s wavelength – linear momentum relationship. This is Lifton’s duality; a relationship between the quantized wave-particle nature of Lifton. Eq. (13) which is very similar to the de Broglie duality relationship for photons.

$$\lambda_{ph} = h / p \quad h = \text{Planck's constant} \quad (14)$$

A beam of bio-radiation has no mass but, if it is trapped in a protein cell group, then the Lifton would contribute to the total mass of that protein cell group. However, it does not mean that the bio-radiation has mass in general. Momentum $p_L (p_L = E_L(t, T) / c = \epsilon_T / \lambda)$ of Lifton exists without mass and that is why Lifton is a mass-less particle.

(B) Thermal Wave Motion in the Human Body System

The quantized energy particle Lifton generates thermal waves in the human body. Bio-heat transfer through Lifton inside the human body plays very important roles in blood circulation and other

activities. Two different methods have been employed for describing this bio-heat transfer process.

(1) 1st Set of Differential Equations

We have developed the first set of differential equations for bio-heat transfer through Eqs (9) and (10). On combining these equations, the following two second-order homogeneous differential equations may be written as:

$$d^2\Psi / dt^2 - (\omega / E_L) d\Psi / dt + \omega^2\Psi = 0 \quad (15)$$

$$d^2\Psi / dT^2 + \omega_p^2\Psi = 0 \quad (16)$$

where $\omega = (2\pi E_L / t)$ and $\omega_p = (2\pi E_L / T)$. Both of these Eqs. are thermal wave equations. Eq. (15) is an equation of free vibration with damping, as happens in the case of bio-radiation damping. Eq. (16) corresponds to plasma oscillation where ω_p is the plasma frequency. With the value of the Lifton natural frequency, ω , the Lifton wave function Ψ_L in Eq (11) becomes $\Psi_L = \sin \omega t$, which is an equation of a simple harmonic wave. Thus, the validity of the Lifton wave function in Eq (11) is justified.

For the case of bio-radiation damping in the thermal wave Eq (15), the damping coefficient, $D_C = 2\pi / t$ and the critical damping coefficient, $D_{Cd} = 2\omega$. Thus, the damping factor, $\xi = D_C / D_{Cd} = \pi / \omega t$. For the condition $\xi < 1$ (underdamped), the motion will be oscillatory and for the condition $\xi > 1$ (overdamped), the motion will be non-oscillatory. For the condition $\xi = 1$, the motion will be critically damped. The effects of vibration could be minimized by optimizing damping. In oscillatory wave motion, many oscillations may occur and motion decays to zero as time increases. The continuity of wave motion remains when there is presence of life, while discontinuity develops when a person is dead. The existence of many ups and downs in wave motion reflects severe disorder in the human body system. In bio-radiation damping, the vibrational energy of the moving Liftons is converted into electromagnetic energy and is emitted in the form of radio waves or infra-red or visible light.

Eq (16) corresponds to plasma oscillations. Bio-thermal wave motion due to the Lifton vibration component along the perpendicular direction (transverse) to the t-axis in the presence of medium formed by existing materials and energy inside the human body develop plasma oscillations, which are self-consistent motions having non-linearity and electromagnetic radiation characteristics. Plasmas are conductive and respond to electric and magnetic fields. Plasma frequency, $\omega_p = (2\pi E_L / T)$. Eq (16) depends on temperature T. Thus, the longitudinal component of the Lifton vibration frequency $\omega = (2\pi E_L / t)$ while the transverse component of the Lifton vibration frequency $\omega_p = (2\pi E_L / T)$. Thus, it can be concluded that the quantized Lifton vibration generates bio-radiation damping along the longitudinal direction (longitudinal component) and plasma oscillations along the transverse direction (transverse component).

The generated thermal waves in the human body will affect not only blood, tissues and organs but also the functional systems. For example, in cases where there are suitable temperature variations, there is the possibility of the formation of liquid plasma in blood, i.e., clot formation is possible in blood circulation. In a second example, in the case of a cataract, the mechanism of injury leads to eye lens opacity. Thermal waves develop heat during interaction with excited molecules of the substances

which cause the movement of a thermal current, i.e., quantum vibration of Lifton generates a thermal current in the human body system.

(2) 2nd Set of Differential Equations

A 2nd set of differential equation has been developed giving emphasis to temperature. In order to understand the importance of the temperature parameter ‘T’ in the human body system, we should know its variation with respect to time ‘t’, i.e. the important factor is dT / dt . The values of $d\Psi_L(t, T) / dt$ and $d\Psi_L(t, T) / dT$ are determined from Eq. (2). Then, by dividing their values we obtain:

$$dT / dt = -T / t \quad (17)$$

When we differentiate the above equation with respect to t, we obtain the following temperature wave equation which is useful in describing disorders generated inside the body as they are responsible for creating infections.

$$d^2T / dt^2 + (1 / t) dT / dt - (T / t^2) = 0 \quad (18)$$

$$\text{or} \quad d^2T / dt^2 + \omega dT / dt - \omega^2 T = 0 \quad (19)$$

which is a second-order homogeneous differential equation. This is an equation of free vibration with damping. Here the vibration frequency $\omega = 1 / t$. This is the natural frequency at which the human elastic structure system tends to oscillate. The damping coefficient $D_C = 1 / t$ and the critical damping coefficient, $D_{CD} = 2 / t$. Therefore, the damping factor ξ becomes

$$\xi = D_C / D_{Cd} = 1 / 2 \quad (20)$$

Here $\xi < 1$ (underdamped) and so the damping motion will be oscillatory, i.e., the variation of temperature T with respect to time t is oscillatory not periodic. This motion is under the influence of a damping force. Such oscillatory motion decreases exponentially with time as the following solution of Eq (18) reveals

$$T = \exp [\log (1 / t)] \quad (21)$$

This is the equation of the ageing of the human life-death system. We may also obtain the above relationship between T and t from Eq (17) which reveals that the motion of thermal waves in the human body controls the ageing of life.

(C) Ageing of Life

Life possesses some physical principles of conservation and transformation of matter and energy. Life is also maintained by transformation of energy from the sun. The quantized energy particle photon plays a very important role in human life and death systems. The human body is an incredibly complex and intricate system.

The ODTs formula for the combination (t, T) from Eq. (7) is given by

$$\iint f(t, T) \Delta t \Delta T = (1 / 2\pi) \quad (22)$$

Let us consider $f(t, T) = E_L(t, T)$ in the above equation and by using the value $E_L(t, T) = (\lambda_L / c t) k_B T$, we obtain Eq. (23)

$$\lambda_L = c / \pi k_B T^2 \log T \quad (23)$$

On combining Eqs. (11) and (23), we obtain:

$$\lambda_L = c t / \pi k_B T^2 t \log t = (\epsilon_T / p_L) \cdot (\pi k_B T^2 t \log t)^{-1} \quad (24)$$

By combining Eqs. (12) and (24), we obtain

$$Q_F = (\epsilon_T / p_L) \cdot (\pi k_B T^2 t \log t)^{-1} \quad (25)$$

which for maximum quantization ($Q_F \rightarrow 1$) provides

$$t \log t = (\pi k_B T^2)^{-1} \quad (26)$$

On differentiating both sides of the above equation with respect to t , we obtain

$$T = (\pi E_{th} t)^{-1} \quad (27)$$

where $E_{th} (= k_B T)$ is the thermal energy. Maximum quantization occurs when Lifton occupies an ordered state, i.e. a body temperature described by the above equation is associated with the end-point (death) of life.

In the previous section (B), it was observed that the variation of temperature T with respect to time t corresponding to the second-order differential Eq. (18) gives a solution $T = \exp[\log(1 / t)]$, which is the equation of the ageing of the human life-death system.

5. CONCLUSIONS

1. Thermal waves develop heat during their interaction with excited molecules of the substance, which cause the movement of a thermal current, i.e. quantum vibration of Lifton generates a thermal current in the human body system.
2. The equation $\lambda_L = (\epsilon_T / p_L) Q_F$ is the Lifton wavelength – linear momentum relationship. This is Lifton's duality; a relationship between the quantized wave-particle nature of Lifton. This equation is very similar to de Broglie duality relationship for a photon: $\lambda_{ph} = h/p$, where h is Planck's constant.
3. The equation $T = \exp[\log(1 / t)]$ is concerned with the ageing of the human life-death system which describes how the body temperature T decays exponentially as the ageing of life increases. This

is why low blood temperature affects the blood circulation during old age.

4. The motion of thermal waves in the human body controls the ageing of life.

5. The equation $T = (\pi E_{th} t)^{-1}$ is associated with the end-point (death) of the ageing of life when the human body system attains death – an ordered state.

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