



OPINION

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ORDER-DISORDER SCIENTIFIC PHILOSOPHY - IV

Evolution of Life

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The creation and destruction processes of the universe and life are based on some time-dependent Natural Laws, which is a universal truth. These processes are either interdependent or are controlled by some superpower. Human faith pronounces it is God. Is it a universal truth based on some scientific philosophy or simply a matter of perception? However, God is not an entity for discussion here. This remains for the learning of human beings.

It is a scientific fact that matter and radiation/energy possess dual particle-wave nature. According to Einstein, matter and energy are inter-convertible. A similar notion appears to be true for Nature and the universe during their creation and destruction. Planck's constant 'h' ($= 6.55 \times 10^{-27}$ erg.sec) for a photon denotes an elementary quantum which has the dimensions of action ($h = \text{energy} \times \text{time}$). The constant 'h' is also responsible for the discrete individuality and dual characteristics. This is also true in the Order-Disorder scientific philosophy [1,2] in which the quantum of action is responsible for the discrete individuality of that entity and which develops enlightening behavior; i.e., is an action represented by:

$$h = (\Delta D \cdot \Delta O) / (\iint f(D, O) \Delta D \cdot \Delta O) = \{(\Delta E \cdot \Delta t) / (\iint f(E, t) \Delta E \cdot \Delta t)\} = [(h/2\pi) / (1/2\pi)] \quad (1)$$

Many dimensional disordered / energy surfaces may be projected by the subspace area $\Delta D \cdot \Delta O$. The probability 'W' of the distribution 'D' (or 'E' : universe) may be described by:

$$\Delta W = f(D, O) = f(E, t) = \exp (E/k_B T) \cdot \exp (-D / k_B T) = \exp [(E-D) / k_B T] \quad (2)$$

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$$\text{Integral area} = W = \int \Delta W d\Gamma = \int_0^\infty \exp(E/k_B T) \Delta E \cdot \int_{t_{\min}}^{t_{\max}} \exp(-D/k_B T) \Delta t = (1/2\pi) \quad (3)$$

$$\text{Differential area} = \int \delta_{DO} = \int \delta_{Et} = \Delta D \cdot \Delta O = \Delta E \cdot \Delta t \geq h/2\pi \quad (4)$$

$$\text{Thus, in a certain equilibrium} \quad h = \text{Differential area} / \text{Integral area} \quad (5)$$

where these two different areas correspond to differential and integral spaces respectively.

An effort is made here to understand the contribution of biological activity to the evolution of life. A biomolecule differs from a non-living material molecule in respect of its capacity for growth and activity. The second law of thermodynamics is able to describe the Natural tendency towards decay, disorganization and death. In the act of creating something, a certain amount of energy is required such that the disorder generated is more than the order created; i.e., some excess energy is left over. No place exists in this universe where there is energy created and stored without further disorder occurring. Furthermore, nothing is known about the apparent paradox that “the World started in a state of disorder or order”. Similarly, the belief that the creation of the universe by some superpower “God” (as claimed by Lord Krishna in Gita - a Hindu mythological book - that “I am the source of the entire creation and during destruction the whole of my creation disappears in to me”; i.e., the point of destruction and creation is the same), corresponds to the current scientific understanding of what is known as a “black hole”.

Protein molecules in the human body are the basic building blocks of life [3]. Life evolved from a single protein molecular cell. Human reproduction results from an egg and a sperm uniting during fertilization inside a female ovary. These components possess a set of chromosome cells along with gene cells. Chromosomes are made up of DNA which has many functions of coding for proteins and the genetic blueprints of life. DNA transfers genetic information first to RNA molecules and then to proteins. X-linked gene cells and Y-linked gene cells grow together for a prescribed period inside the ovary during which life develops. Whether this development of life is an inherent property of the contents alone or is influenced by some external agency is still uncertain. In order to understand the complete process, let us move towards the Big Bang theory of universe evolution which explains that long ago there was the formation of water due to the cooling down and condensation of hot gases during which some energy was utilized. But from where did this energy come? The universe was expanding and the corresponding entropy increasing. Let us understand now the protein molecular cell activity from various points of view [4]. Actually a protein is a polymer which is a chain of amino acid components all linked together. All of the amino acids are of the left-handed variety and would have formed an original protein molecule during their movement towards a close contact position sometime long ago. In order to see the condensation behaviour of a single protein molecule during the evolution of life just like the role of a photon during the evolution of the universe [5], the order-disorder scientific philosophy has been applied here. Obviously, a protein molecule along with a DNA molecule and other associated molecules form a living cell and thus its condensation behaviour may throw some light on some basics of the evolution of life. Protein condensation differs from DNA condensation. The variation in the pH of the amino acids present in the active site of an enzyme that participates in the substrate affects the H⁺ ion concentration and indirectly the biochemical reactions involved. Also,

in an earlier study [6], it was shown that the kinetics of the diffusion-controlled and bio-molecular (enzyme) reactions differ. In a bio-molecular reaction, a large part of the entropy of activation (ΔS) arises due to hydration, while for dry substances $\Delta S = 0$. In bio-molecular reactions such as the denaturation of proteins and inactivation of enzymes, the Gibbs energy function G plays an important role. In a bio-molecular reaction, the rate constant K_1 is given by:

$$K_1 = (k_B T/h) \exp [-\Delta G / k_B T] = (k_B T/h) \exp [-\Delta H/k_B T] \exp [\Delta S / k_B T] \quad (6)$$

where H is the Helmholtz free energy. For proteins, the G function used for D in equation (2) for ΔW forms the condensation equation as considered earlier [2,5]:

$$\iint f(D,O)\Delta D. \Delta O = \iint f(E,t) \Delta E. \Delta t = (1/2\pi) = \iint [\exp\{(E-\Delta G)/k_B T\}-1]^{-1} \Delta E. \Delta t \quad (7)$$

$$\text{or } \iint [\exp\{((E - \Delta H)/(k_B T)) + (\Delta S/k_B T)\} - 1]^{-1} \Delta E. \Delta t = (1/2\pi) \quad (8)$$

Case I: When $\{(E - \Delta H)/(k_B T)\} + (\Delta S/k_B T) = \Gamma(E,G) \rightarrow \text{small}$, the use of the first-order approximation ($\exp X = 1 + X$) in the left-hand side of eq. (8) leads to:

$$(t. k_B T) [\ell \log(x/y) - (T.\Delta S)\{(x - y)/xy\}]; \quad x=(E_{\max} - \Delta H_{\max}) \text{ and } y=(E_{\min} - \Delta H_{\min}) \quad (9)$$

The two energy values of x and y in the square bracket [] correspond to the formation of peptide bonds characteristic of proteins, i.e. $\text{OH}^- + \text{H}^+ = \text{H}_2\text{O}$. For $T.\Delta S = \Delta Q = 1$, eq. (8) finally gives:

$$(t k_B T). [\ell \log L - f_1(x,y)] = (t k_B T). f(x,y) = (1/2\pi); \quad L = x/y; \quad f_1(x,y) = \{(x-y)/xy\} \quad (10)$$

The behaviour between $(t k_B T)$ and $f(x,y)$ is as follows:

- (a) (i) For $f(x,y) = 0$, $(t k_B T) \rightarrow \infty$ at $x = y$. Condensation increases sharply to infinity, where evolution began.
- (ii) Sharp increase in condensation up to infinity when $f(x, y) = 1/2$, then $(t k_B T) \rightarrow 0.32$. When $f(x, y) = 1$, then $(t k_B T) \rightarrow 0.16$ at $x = y$, which is the start of the sharp increase in condensation.
- (iii) In the region $f(x,y) \geq 0.16$, the value of $(t k_B T) \leq 1$ and condensation decays logarithmically.
- (b) In the region $f(x,y) < 1$, the value of $(t k_B T) > 0.16$ and condensation is fast.
- (c) For $f(x,y) > 1$, the value of $(t k_B T) < 0.16$ and condensation is slow.

Case II: When $\Gamma(E,G) \rightarrow \text{large}$, then leaving -1 out of the left-hand side of eq. (8) for maximum entropy during condensation $\Delta G = 0$ gives:

$$(t k_B T) [1 - \{\exp(-A) - \exp(-B)\}] = (t k_B T) F(A,B) = (1/2\pi) \quad (11)$$

where $A = E_{\min} / k_B T$, $B = E_{\max} / k_B T$ and $F(A,B) = [1 - \{\exp(-A) - \exp(-B)\}]$

It is remarkable that the behaviour of $(t k_B T)$ with $f(x,y)$ in Case I and with $F(A,B)$ in Case II is the same. However, their forms differ, i.e. ΔG does not have much effect during condensation. Also, like a Boson or a molecule, the behaviour of proteins is similar during the condensation process.

Studies relating to the evolution of the universe and life [5] on the basis of the order-disorder scientific philosophy reveal that evolution took place through a cosmic egg (an energy entity) in the form of a photon/Boson and protein molecule, respectively and that the evolution process took place through some action in the form of quanta of energy. While it is not known if the creation of the universe and life began in an ordered or disordered way, it is true that the present theory has opened up a way for the investigation of different existing systems. This hypothesis confirms creation and destruction as the beginning and end points on the surface of a cyclic path. Just as the Sun controls some Natural laws and the motion of the planets in our solar system, so does the Soul control our human's body activities. These controlling actions – a superpower activity in each case – are neither visible to the planets nor to humans. This is a matter of perception only as the possibility of their localization is only through spirituality.

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