

Life and Environment – Sequence and Pre conditions

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Abstract: *Life, the everlasting mystery of origin in this very planet emerges from either non-living material or eternal one which was introduced in this Earth from these ever existence of the depths of the space. Mass size, gravitational pull, luminosity, optimum incoming and radiant energy and alternative diurnal thermal extreme may have fulfilled the criteria of generation. Whatever are these sequences or arrangement or presence of elements and congenial atmosphere, life might be evolved in the natural setting of mostly open air theatre. Environment, i.e. the unique circumferential circumstance which is more or less affected by external, internal and extra terrestrial events such as cosmic rays, hailstorm, cyclones, famine, flood, earthquake, vulcanicity, polar wandering, infall of meteorites have been paused the smoothness of normal flow.*

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I. Introduction

Life on the Earth, be it spontaneous or long process of evolution certainly as a result of complex and chaotic but organized interactions of various components paved the way of that very moment of generation. Energy, the guiding force; substance, the base and the organization process altogether have played an integrated and sequential role in developing life forming environment from the primordial one. The life, a more or less continuous entity on Earth, probably began in the Achaean Eon of at least 3.8 billion years before. This era is also noted for the initiation of atmosphere, hydrosphere and development of ocean basins and continents.

Environment, i.e. the sum of all the external aspects of both biotic and abiotic nature that affect the physiological behaviour or performance of one or group of organisms is our immediate beyond which was evolved from this extreme hot Planet Earth. Subsequent cooling of Earth's surface has resulted too many of chaos to hostile unto placid environment. It was often believed (before 1970s) that life became possible on Earth by cell using solar energy during photosynthesis. But age long authentic study have helped to reveal that a huge number of bacteria and archaea can obtain energy from geologically developed and 'electron donors' and are capable of maintaining the characteristics of life in a self sufficient way by not accepting photosynthetic energy. These can thrive by uptaking carbon, nitrogen, trace metals and mineral salts from hydrothermal sources.

II. Environment - A Past Sequence

Atmosphere, of its first kind after the very inception of this Planet Earth (if it is considered at all) consisted with hydrogen, helium and trace amount of lithium did not last long owing to the low gravitational pull, high heat factor of the Earth and the sun and the tremendous force of solar wind. The subsequent phases of atmosphere development might have evolved from volcanic outgassing comprising of H₂, H₂O, CO, CO₂, N₂, NH₃, CH₄, HCl, H₂S. "As the planet cooled, huge volcanoes filled the air with toxic gases. But they also erupted vast quantities of water vapour that cooled and fell as rain, filling the oceans. Lightning may have then triggered chemical reactions in the water, forming complex molecules that are able to make copies of themselves - the basis of life" [1].

Life supporting environment with all its components is the outcome of long continuous and multifarious phases of evolution. The great oxygenation event or the appearance of the Earth's atmosphere was probably an incidence of 4.5 billion years before present. Free atmospheric oxygen generation and thereby the new interaction with other gaseous elements might have resulted many climatic events.

"About twenty thousand million years ago, somewhere in the expanse of the Universe there arose a large hydrogen cloud, which began contracting due to the forces of gravity. Gravitational energy was gradually converted into heat energy; the cloud got heated and changed into a star. After the temperature within the star had risen to several millions of degrees, nuclear reactions began which converted the hydrogen to helium... The helium nuclei combined with the carbon nuclei to form nuclei of oxygen and subsequently nuclei of neon, magnesium, silicon, sulphur, etc. When the remains of the nuclear fuel were exhausted some stars lost their stability and exploded. And so-called supernova stars arose" [2]. The Oparin-Haldane Hypothesis suggested the

reducing nature of the primitive atmosphere and lightning or ultraviolet ray induced energy source for probable synthesis of organic compound which was supported by Miller-Urey Experiment in 1952. The formation of elements within the stars interior which are chemical in nature might have constituted the Earth. This small blue planet akin to that of a pale blue dot in 28 billion parsecs or 91 billion light years or many fold (than the estimated value) diameter finite or infinite Universe has undergone multitude of phases of evolution from the Early Atmosphere to Primordial to Evolutionary to Living and ultimately to Modern Atmosphere [3]. Earth's internal heat economy had probably generated a slow but steady movement within the Planet. It had the driving force of fragmentation of rigid outer layer into plates over billions of year to form ocean basins and continents. Chaos or disorder 'a philosophical abstraction' might lead to order in ultimate and this orderly and sequential event had made environment possible.

A number of cosmic and planetary events including the formation of oceans and continents and so lithospheric cover have laid foundation stone for base materials of life supporting environment. Atmosphere, a complex blanket of gases and suspended solids and liquids enveloping around the Earth covering lithosphere, hydrosphere and cryosphere probably developed through photochemical reactions, accession of gases to the atmosphere by degassing of the Earth's mantle through volcanic activity and by green plants photosynthesis. Photochemical decomposition of water vapour resulting oxygen changed the atmosphere from a strongly reducing to an oxidizing character.

Atmosphere, the life supporting sphere save the Earth from dangerous events through filtering phenomena of solar and meteoritic activities and helps to maintain an equilibrium temperature by preserving them during sun and shade. It nurtures the whole biotic world by providing available moisture through rain, snow, fog and drizzle.

III. Origin Of Life

Life, the unstable physico-chemical equilibrium enabling growth, irritability, adaptation, homeostasis, metabolism, organization and reproduction has emerged as an age long mystery by its origin. It might keep space in this Planet as only one in a million stars can provide favourable conditions for development of life [4]. The structural complexity of even simplest known cell undermines us about these of not sudden event. But again, it is 'miracle of miracles' of life's onset, growth and replication. Anaerobic and aerobic bacteria might be the developmental sequence of organisms which have gained their energy from 'primordial soup' to transfer of electrons to oxygen [5]. It is often believed that Archaea or Prokaryote, the single celled simple organisms without defined cell nucleous or organelles such as bacteria might have originated some 3.7-3.8 billion years ago and generally more complex nucleous enriched aerobic Eukaryotes such as amoebas have originated about 2.7 billion years before in this 4.6 billion years Earth.

Amino acids, sugars, nitrogenous bases, polyphosphoric compounds etc. have helped to develop organisms primarily by taking one thousand million years. Amino acids and nucleotides are the two fundamental molecules of life which are essential for the formation of proteins and DNA, RNA respectively. Synthesis and destruction chemical processes of "The restless chemical Earth" have unearthed the concept of life and death. Smith et al. were in opine that "An equilibrium Earth would be a lifeless Earth. Even a geologically frozen Earth with an Atmosphere driven to a shifted oxidation state (or stripped altogether) would be unable to support major subsystems of the Earth's observed biota" [6]. It is worthwhile to mention that on the heaps of death and decay the new spore begins. The Greek philosopher Aristotle (3rd Century BCE.) believed the spontaneous generation of life. The works of Oparin (1924) and Haldane (1929) revealed that the origin of life on Earth was the result of long continued process of generation. "Chemical Evolutionists" believed that the long process of evolution from simplest organic chemical to the first living thing is rooted in the accumulation of physical forces and chemical reactions from the beginning of the Earth's Geological History. "In the iron-sulfur world theory, primitive life is assumed to have started at deep sea hydrothermal vents as a mineral base; redox reactions provided the chemical energy to drive the emergence of cellular life" [7]. Smith et al. are in view of "The origin of life was a planetary process, in which a departure from non-living states led to a new kind of order for matter and energy on this planet" [6]. Moreover, "...life can proceed only due to substances which can take up photons and convert their energy into the energy of a relatively long-time electron excitation (function of accumulation of energy)" [2]. Simpson has also echoed the same as balancing coinage of perfection and extinction [8]. The origin of life on Earth by theory, is one of the dilemma whether it was originated by a 'Conscious Creator' or 'More Superior' or 'Intelligent', or 'All-Powerful Beings' or evolved through 'Spontaneous Generation' or from a rich broth of 'Primordial Soup' or 'Life is Somehow Ingrained in all Matter and the Creation of Matter no Matter what we cause of the Creation of Life', or 'Extra terrestrially Originated' and 'Came with the Fallen Comet or Asteroid' or 'Cosmozoan Contact with Micro-organisms'. Extraterrestrial Origin is the corollary of *Panspermia Hypothesis* as proposed by Svante August Arrhenius. It supports that life exists throughout the Universe in asteroids, meteoroids, planetoids and comets. It might have transported even with body contact of spacecraft with microorganisms. "The truth is that despite the prestige of evolutionary

theory and the tremendous intellectual effort directed towards reducing living systems to the confines of Darwinian thought, nature refuses to be imprisoned. In the final analysis we still know very little about how new forms of life arise. The “mystery of mysteries”- origin of new beings on earth - is still largely as enigmatic as when Darwin set sail on the Beagle” [9].

The ample amount of radiant energy from the Sun with time long and alternate exposure has provided the optimum preconditions for life. “For 500 million years, Earth was a giant furnace of searingly hot rock, constantly bombarded by asteroids and meteorites. As each lump of space rock crashed into the planet, its energy was converted into more heat. But these impacts also delivered chemical elements that were to be vital ingredients of life” [1]. The presence of many molecules and compounds formed from gases of primordial atmosphere and high cosmic abundance of elements such as hydrogen etc. has strengthened the footing of life “Fig.1”. Moreover, Earth’s rotation and revolution phenomena and the resultant temperature dissipation, heat budget and considerable orbital distance have made life possible. Again, the appearance of water and its excellent ionizing and reaction potential and unquestionable solvent properties to transmit nutrients, oxygen, blood or fluid, maintenance or regulation of body temperature and many more Earthly events have made the origin of life on the Earth. Haldane was of opinion that the aqueous environment of ocean served as the chemical laboratory as well as the cooking pot powered by sun or lightning to form “hot dilute soup” containing huge populations of organic monomers and polymers. Recent studies have opened up the enormous possibility of synthesis of life in lakes nearby sea. That ‘pre-biotic soup’ or ‘Haldane Soup’ has unearthed the organic compounds and thereby formation of first living cells. It is generally believed that the emergence of a primordial living molecule from non-living components made the way of forming primary organisms through one thousand million years [10].

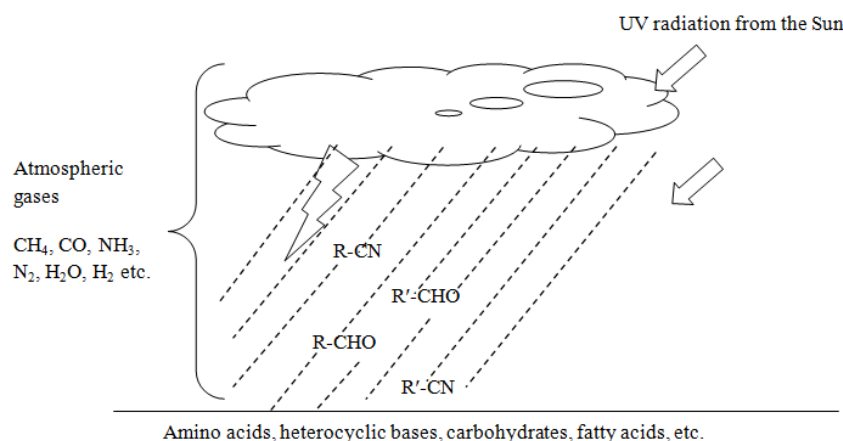


Figure 1: Simplest organic compound formation from the gases of primordial atmosphere under the influence of UV radiation from the Sun [2].

Henderson believed that the carbon dioxide has immense importance after water as ‘Suitability for life’ [11]. High solubility and thereby huge mobility have made it one of the key life generating substances. Denton believed that “...the idea that living things have originated gradually as a result of the interplay of chance and selection, has a long pedigree. It can be traced back from the views of current advocates of Darwinian orthodoxy such as Huxley, Mayr and Simpson to Darwin and from Darwin via Hume in the eighteenth century right back to the materialistic philosophers of classical times” [9].

IV. Life And Nature

Nature is well linked with all its components with life through the exchange of nutrients and energy. In ‘The Web of Life’ one may seek physical, physiological, biological and social or socio-cultural interdependence and interrelationship [12]. Few citations may undermine the uniqueness of life although it is restricted as follows “Life is resourceful and entrepreneurial. It takes advantage and it changes the chemistry of its surroundings. Life is a fantastically complex system the emergence of which remains the greatest mystery in science” [13]. Again, “Unlike strict Copernican ideas, which stress our mediocrity and therefore suggest an abundance of similar circumstances across the cosmos, the notion that life requires a varying and dynamic alignment of parameters narrows the options. The opportunities for life implied by this new view also differ from anthropic ideas, which at their most extreme predict as little one sole occurrence of life across all space and time” [14].

Wilson identified a set of nine criteria or properties to define living agents as these

- contain organic molecules of diverse nature including nucleic acids and proteins
- have a variety of internal mechanisms

- contain heterogeneous and specialized parts
- have a metabolism
- grow and develop
- reproduce
- repair themselves when damaged
- construct the niches
- bear environmental adaptation

He also asserted a ‘Tripartite View ‘ of organism which may be applied not only to plants and animals but also to Archaea, Eubacteria, Protista and Fungi like, a) organism is a living agent which contains the above mentioned (nine) properties, b) it belongs to a reproductive lineage and c) it has minimal functional autonomy [15].

Capra has identified a set of criteria which may be helpful to make a clear distinction between living and non-living things. Pattern, Structure and Process, the three are although different but inseparable perspectives on the phenomenon of life.

The key criteria of a Living System may be well classified in the following

Pattern of organization

the configuration of relationships that determines the systems essential characteristics

Structure

the physical embodiment of the system’s pattern of organization

Life process

the activity involved in the continual embodiment of the systems pattern of organization

[12]

Cell, the unit of living system though envisaged as the simplest one is often viewed as an intricate and complex system consisting of nucleous and cytoplasm. The nucleous or membrane enclosed organelle contains mostly DNA, the genetic code and cytoplasm or fluid of transparent nature which includes ribosome, mitochondria and some organoids. Cells, the units of life exchange information and regulate the inflow and outflow materials with the environment through its surrounded thin membrane of lipid and protein. Tiny organelles and sub cellular particles of cells afford machinery for life. Enzyme, the molecular catalyst helps to perform chemical reactions to facilitate energy generation, waste disposal, protein formation and generation of new cells [16].

“In living systems, every level, from all atomic locations and bonds to control, replication, and selection, is pervasively and continually subject to perturbing fluctuation. At a molecular level these include thermal fluctuations; in chemical systems they often include solvent effects and variations in electrical or magnetic environment due to fluctuation of molecular arrangement; in information systems they arise from errors in symbol persistence or symbol transmission; in higher-level processes they may result from aggregate phenomena, including randomness in birth and death, mutations, or fluctuations in the states of environment” [6].

V. Conclusion

Life, the ever-changing phenomenon of nearly 3.8 billion years earlier is a complex correlative sequential outcome in this planet. Its adaptive capability and adornment with organs and these functions are all the consequences of interaction with the prevailing and ever-changing environment from its very inception. These interactions and disturbances and continuous modifications have led to the onset of most spectacles and unique one in this Earth is the appearance of man along with the noosphere who have again advertently or inadvertently are in full play of altering the environment. With utmost unawareness about the endowment and blessings of the *Living Atmosphere* in the past, ancient civilizations had witnessed a disastrous, as specific as ruinous destiny by foiling environmental alarm in ancient times through the erasing of pristine green. Amidst the *Modern Atmosphere*, not to repeat the same to share as earlier, one may aptly raise in favour that *Environmental Changes have made life possible but Changing Environment may wipe out the humans from this Regressing Universe*.

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