Abstract: Life contains all ifs and buts when we look into the complex organisms. But it remains definable as is evident from the simple life-forms. Life is referred to as a property of matter. The property comes to exist by the orderly arrangement of chemicals which makes matter ultimately functional, in the sense, it governs or performs various physico-chemical work during which energy is transmuted into different functions accounting for what we call “living”.

Life is the most wonderful thing on the Earth. The stirring life and its surroundings make our planet beautiful and shine like a jewel.

The questions pertaining to life such as "how" and "when" life began on Earth have relatively been answered. Available evidences indicate that living organisms are the product of chemical evolution. The earliest fossil record dates back to 3.5 billion years which closely resembles the present day single-celled prokaryotic blue-green-alga. We are familiar that blue-green-algae are self-sustaining, photosynthetic humble organisms, leading solitary life or live in association with fungi (together called lichen) or with other organisms such as fern, worms etc. Those chloroplasts (photosynthetic apparatus) found in green plants are generally thought to be once freely crawling algae but have become integral part of the plant in the long evolutionary run.

But, the most vital question- what is life? has not been addressed convincingly. Hence, my attempt will be mostly centered on the anatomical aspects of life.

Life is the central focus for both religion and science. When religion refers to soul, science attributes life to property of matter for which an acceptable definition is yet to be evolved. Various attempts in the past turned out to be merely descriptions of the property of living-beings rather than definition of life. According to religion, the soul is the quintessence of life. It is the spiritual entity temporarily housed in the physical frame of the body. Thus, soul and body are the two separate entities together constitute a living-organism. At the dawn of 21st century, when both religion and the scientific community have grown shoulder to shoulder the perception of common man on this subject starts tilting from religion towards the sense of reasoning and verification. Today, with the scientific advancement and the advent of molecular biology, life remains no longer inexplicable as it was earlier. Let us take fresh stock of it without religious bias.

Are living-beings unequivocally special?

Life is considered, very often, as the ability of system to perform a number of functions such as eating, excreting, breathing, metabolizing, moving, and reproducing and so on. But many such properties are either present in machines or absent in those organisms referred as living. Life is attributable to known quality if only a living-being exhibits uniqueness of possessing at least one such character not shared by non-livings.

Animals exhibit whole body movement called locomotion (self-propulsion). But for a majority of plants, the phenomenon is merely a movement of a specific organ. Insectivorous plants are astonishingly quick in preying on innocent insects. For instance, the Touch-me-not plant is known for its quick retreat. At the same time, coral- the sea organism is often mistaken for rock. If movement has to include those of subatomic particles of an atom, then this character is no more unique to living-beings. Like locomotion, respiration too stands scrutiny. In single celled bacterium, respiration represents mere ATP (energy currency) production, which shares the property of test-tube chemical reaction.

Sea horse resembles almost seaweed. Ice flakes have their own architecture matching with the ornamentation of any plants.
DNA is hooked out of simple monomers such as adenosine-, guanidine-, cytidine- and thymidine-nucleotides, like beads to a string. The minimal life requirement adapted by them only enlightens us that living and non-living inseparably form a continuum in the chemical evolution. It also endorses the fact that living beings are thought to have graduated from the stepwise transition of energy into matter, molecule, organic compounds and simple-life-forms.

**The software of living system**

The blueprint of all living-beings is stored in the form of miniature software called deoxyribo nucleic acid (DNA) which is in fact a chemical polymer. DNA is the only molecule that is specifically repaired and all others are replaced. Though the DNA is fundamentally same in all, individuals differ in the sequence of nucleotide arrangements. DNA mostly exists in duplicate; each one is derived from father and mother. During replication, a copy of the original DNA is taken from each parent through semi-conservative replication, involving cell division and reaches to offspring after fusion of sperm and egg. During cell growth, the information is read from the DNA, like a computer retrieves data from a floppy, which tells about how and when the cell should function or multiply. When DNA is absent, RNA takes the hereditary role as in the case of Tobacco Mosaic Virus.

Also in viroids (simplest virus without protein coat), the ribonucleic acid (RNA) instead of DNA, acts as an individual organism. The infectious nucleic acids are incorporated into a cell, as they are miniaturized structures and thereafter hijack the host.

Virus enters into a host cell as a naked DNA/ RNA leaving its protein coat outside. Once inside the cell, viral DNA/RNA takes the control of the host

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Plants synthesize their own food by photosynthesis. But few plants (fungi) and most animals do not. We assume that growth is an important characteristic of living-beings and expect organisms continue to grow for some times before they reproduce and die. But, we are aware of crystal growth. Contrarily, virus does not grow in size. Virus can be crystallized. The growth phase between two reproductions is totally absent. Thus growth is no more unique to living-beings. Also many bacteria that undergo binary fission do not grow in size once they are formed.

Reproduction is considered to be the hallmark of living organism. In a simpler sense, it is the begetting of like form. But nerve cells and muscle fibers loose potential to reproduce once they reach maturity. Yet we consider them as part of the living-system. Also, lymphocytes in our blood once reach maturity, do not divide, but do function much like other living cells. The red blood corpuscles (RBC) which most part of our blood are the cells without nucleus but still we consider them as living as they facilitate the oxygen transportation in our body. The most acceptable definition let me quote, "living things are those that reproduce, mutate, and reproduce the mutations. Accordingly, the viroids and prions are to be considered as living entities as they infect, mutate and self-propagate in a host. Being the obligate parasites, they require a host, as much *Mycobacterium leprae*, a leprosy bacterium, need a human host to sustain. But a chemist still considers prions and viroids as simple protein and nucleic acid. Certainly, these bugs defy the man-made distinction of living and non-living. The minimal life requirement adapted by them only enlightens us that living and non-living inseparably form a continuum in the chemical evolution. It also endorses the fact that living beings are thought to have graduated from the stepwise transition of energy into matter, molecule, organic compounds and simple-life-forms.

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"The Root of Life" by Gajendran N
The technique is commonly known as genetic engineering, where the host DNA is altered by adding or removing some genes. Viral DNA also orders for its protective protein coat from the cytoplasmic workshop of the host. At this stage of infection, the victim experiences bleeding of nose and throat as one suffers from common cold. Apart from nucleic acids (DNA&RNA), the mounting knowledge on "prion" places protein as another commandung molecule in the living world.

**Life can be an artifact**

Mankind now learnt the trick of altering the life forms by adding or removing some genes. The technique is commonly known as **genetic engineering**. He can also synthesize artificial genes of his interest. He can control the functioning of an organism or can determine the sex at his will. Dolly, Polly and Terminator technology are the few dangerous outcomes, even though the contribution by genetic engineering is immense. The smallpox virus, which was eradicated from the face of the earth, can now be synthesized in a laboratory at our will by reconstituting few chemicals in a known sequence. Further it can be multiplied (without involving the living-host) using Thermocycler- a machine that spins out billion copies out of a viral model. Thermocycler works on the principle of polymerase chain reaction (PCR), which requires few chemicals viz., nucleotides, enzymes, buffering agents and minerals. Thus, in the presence of a given life-model (genetic material), huge population can directly be churned out from molecules (matter) at once. Also, necessary heritable changes can be introduced. But nature took billions of years to evolve life in the course of chemical evolution by trial and error.

When we deal with biological virus, it is appropriate to think of the man-made **computer virus**. The computer virus is akin to biological viruses as both of them can infect, transmit, modify and propagate inside of a host system. Computer scientists take cue on the biological viruses to evolve disinfections and vaccination of computers.

**Life is no more a soul**

It is evident that simplest organisms are not much different from complex molecules. For both are fundamentally made up of atoms and molecules. To understand the present day life-forms one has to travel 3.5 billion years back, at a time when molecules had assembled into simple life-forms and still back to 15 billion years when the universe was borne after a Big-bang. It is accepted in general that matter including living-beings are the product formed out of energy transmutation. Today, the infectious protein-"prion" which brought the entire British-meat-industry to a standstill can be considered either way- living or non-living, according to the perception of the observer. With the advent of genetic engineering, the dogma of begetting life only from existing life is no more relevant, at least in the primeval form.

At living-state, a cell acts as an organic circuit for the energy flow. Death acts as an irreversible damage to the energy circuit of the complex organisms. To set it right, we are yet to develop a suitable know-how. According to religion, soul is said to rest within the abode of the Almighty. When energy is considered to be the base for everything including human race, the whole dogma of God and Procreation is under stake. If the religious views are important in moral up keeping of society, the balancing responsibility of science is to clear any misgivings in that process. Painful incidents of death in religious cults do occur due to the belief in soul.

**What makes life to tick?**

*Life* may be complex if we look into much advanced species like man. It may be easily understood if we look into simpler forms. As seen earlier, the small-pox virus which was eradicated from the face of the earth can be re-synthesized in a laboratory. What makes few chemicals combine to form a virus? Only their arrangements in right sequence give birth to life-virus. Otherwise, there will be a mere chemical polymer. The orderly arrangement infuses the feel of life into the matter.

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**A parallel logic can be drawn in the case of electronic gadget, where the right arrangement of circuits put together facilitates for the electricity to flow ultimately into a visual picture.**

All life forms represent the mortal phase of the dynamic energy. Death only brings irreversible changes in living-circuit which kept the energy flow manifesting into various functions. The cessation of ‘living condition’ could very well be loss of coordination among individual cells or organs of a system.

"The Root of Life" by Gajendran N
**Death is unavoidable for living beings because of the instability of chemicals and molecules that make our body.**

Protein and nucleic acids constantly undergo wear and tear. Molecules change their property due to interaction with free-radicals produced in our body during metabolism or by constant exposure to natural radiation. Even a simple chemical like iron loosens its identity to rusting. The important task of our body is therefore to remove the damaged part and replenish with a new chemical taken from the present environment. Thus, environment plays a key role in sustaining the life on earth. Polluted environment hastens death. Complex organisms are more susceptible to subtle change in environment. For instance, death comes soon if our body temperature drops below 30 °C (86 °F) or rises above 40 °C (104 °F). But few lower organisms can live at extreme temperature variations due to chemical constitution. A completely dried-out moss kept in a museum for over 120 years can unfold and crawl soon upon addition of water. It contains a special sugar called trehalose that helps stabilize the cell membrane structure. All life-forms represent the mortal phase of the dynamic energy. Death to individual organism can be noticed. But, death to its germplasm is never easily realized. However, as understood from fossil records, the vanishing of many organisms from existence and the growing list of endangered species only indicate the mortality of germplasm.

**Black-box of life**

Life remains a mystery in some aspects. How is the juvenility preserved in senility? How is it retrieved in the form of gametes from parents to offspring? Probably it is achieved by segregating the germ cells from the main stream of cell divisions during body making at the early stage of embryo development thereby reducing the chance of ageing due to error-prone cell division. It prevents the germ cells co-aging with somatic cells of the adult. It is believed that ageing is associated with active cell division. For instance, heart is the last organ to stop functioning and least participate in cell division. But the convincing answer still eludes away. Another intriguing aspect of life is its complexity in higher organism. Emotional aspects are still more difficult to comprehend. It is yet not clear how the past experience is unearthed from the nerve base. One thing remains clear that though the brainpower of higher organisms is fully not understood, there is no need to invoke a "Super Power" to explain some of its unknown functions. The much said Extra Sensory Power (ESP) reportedly shared by some of us could only be viewed as the brain skill to perceive the unknown moderm of information hither to not been realized by most of us. Many distinguished characters of human beings including rational thinking and memory have mental base in brain tissues. The ability of human brain to perceive sorrow or joy can only put the super computer in shame. The working of living things is of interest to computer scientists. Daniel Mange et al (1997) reported that they made a self-repairing, self-replicating version of a specialized computer (ref. Science 277, p:1936).

**Life and environment**

Molecule on this earth are not stable so as the Life is. The common elements of our body are also the common elements of our earth. Today's environmental pollution can turn out to be tomorrow's genetic pollution. Ultimately future life can be at stake. As we understood, Mars and Moon shunned life long ago. Our motherly earth is placed in the Universe in such a way that the congenial atmosphere prevails for abiotic and biotic factors to recombine. We should strive to preserve the homeostasis of the ecosystem that helps sustain life on earth. All life forms must coexist in harmony. Man represents the coordination of 100 trillion cells. If he trespasses nature's law, it will not take much time for any one of the cells to trespass the overall control of the body, which may lead to cancer and genetic disease Man has learnt to kill and has also learnt to alter living being. He can even re-create some of the life forms. But understanding of life is most important for his survival; leave alone his aspiration for resurrection.

*The content of the article has appeared in ‘Kalpakam Calling’*

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http://www.indjst.org Vol.1 No.1 (Nov. 2007)