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EARLY LIFE ON EARTH

Bhakti Madhava Puri, Ph.D.

Origin of life studies have presented one of the most serious challenges to the mechanistic conception that life can be explained scientifically as a mere product of chemistry and physics. Hypotheses about the origin of life can be divided into two categories: (1) biogenesis – life comes from life, and (2) abiogenesis – life comes from non-living matter. The theory of the spontaneous generation of life from inanimate matter had been held even by the ancient Greeks and by numerous scientists well into the 19th century.

However, by mid 19th century, Louis Pasteur and others had accumulated so much scientific evidence that the theory of spontaneous generation had been effectively disproven. In fact, Pasteur himself remarked in 1864: “*Never will the doctrine of spontaneous generation recover from the mortal blow struck by this simple experiment.*” [1]

Abiogenesis: Primordial Soup and Other Recipes

It was several years later, in 1871, that Charles Darwin suggested in a letter to Joseph Dalton Hooker, that life may have begun in a “*warm little pond, with all sorts of ammonia and*

phosphoric salts, lights, heat, electricity, etc. present, so that a protein compound was chemically formed ready to undergo still more complex changes.” This was perfectly in line with the materialist manifesto that “*there is no fundamental difference between a living organism and lifeless matter,*” held by the Russian scientist Alexander Oparin. In 1924 he proposed his “primeval soup” of organic molecules that would form coacervate droplets. [2] J. B. S. Haldane propagated similar views at about the same time. Harold Urey, Nobel Laureate, physicist and follower of Oparin, performed the famous Miller-Urey experiment in 1952 in which a mixture of organic compounds were formed by passing an electric discharge through the vapors from boiling water, hydrogen, methane and ammonia gases.

Sidney Fox in the 1950’s and 1960’s studied spontaneous peptide formation of spherical membranes called “protenoid microspheres.” In 1967 this led to the naive claim that “laboratories will be creating a living cell within the next ten years,” typical of the poor fund of knowledge of the enormous complexity of the cell even at that time. [3] Since then a plethora of hypotheses have been put forward

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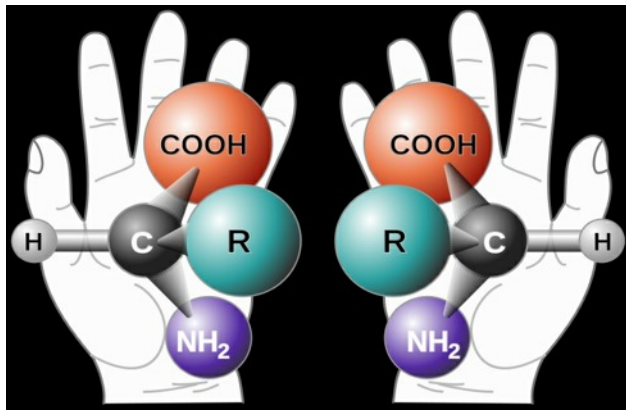
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such as the iron-sulfide world, the Zn-world, self-organization and replication models, metabolism first models, deep sea vent hypothesis, coenzyme world, RNA world, clay hypothesis, extraterrestrial life, lipid world, and polyphosphates as cause of peptide formation.

Of course, none of these even begins to address the serious complexity of forming the simplest living cell. First, the single chirality of biological molecules—possessing exclusively left-handed amino acids and right-handed sugars presents an insuperable problem if random processes were involved in their original formation. Left and right handed molecules are chemically equivalent, so there



is no apparent energetic reason why one would be selected over an other. Furthermore, how was such a bias sustained and propagated throughout the biological world.

The “Wow! Signal” of the terrestrial genetic code.

Since the discovery of DNA in 1953, it has led to even greater mysteries about life than it has solved. From the simple dogma of Watson and Crick who first hypothesized its role in protein production, it has now become a topic of great controversy concerning its dynamic functionality in the cell. In a recent paper, astrobiologist, Maxim A. Makukov, and mathematician, Vladimir I. shCherbak, found in their study of the DNA genetic code, information content that defies natural explanation:

“...the terrestrial code displays a thorough precision-type orderliness matching the criteria to be considered an informational signal. Simple arrangements of the code reveal an ensemble of

arithmetical and ideographical patterns of the same symbolic language. Accurate and systematic, these underlying patterns appear as a product of precision logic and nontrivial computing rather than of stochastic processes (the null hypothesis that they are due to chance coupled with presumable evolutionary pathways is rejected with P -value $< 10^{-13}$). The patterns display readily recognizable hallmarks of artificiality, among which are the symbol of zero, the privileged decimal syntax and semantical symmetries. Besides, extraction of the signal involves logically straightforward but abstract operations, making the patterns essentially irreducible to natural origin.” [4]

While instructions for making proteins are encoded in DNA, including necessary enzymes, the DNA molecule cannot be made without highly specific proteins. Harold Blum captured this paradox when he wrote:

“The riddle seems to be: How, when no life existed, did substances come into being which, today, are absolutely essential to living systems, yet which can only be formed by those systems.” [5]

Robert Shapiro acknowledged the same dilemma,

“Genes and enzymes are linked together in a living cell – two interlocked systems, each supporting the other. It is difficult to see how either could manage alone. Yet if we are to avoid invoking either a Creator or a very large improbability, we must accept that one occurred before the other in the origin of life. But which one was it?” [6]

The RNA world was postulated to solve this problem, but RNA is not quite as good at chemical reactions as proteins and not as good at storing genetic information as DNA. However, RNA is too complex to have arisen prebiotically, inherently unstable, and rarely or limitedly catalytic.

In the 1970’s the British astronomer Sir Frederick Hoyle actually calculated,

“The likelihood of the formation of life from inanimate matter is one to a number with 40 thousand naughts [zeros] after it. It is enough to

bury Darwin and the whole theory of evolution. There was no primeval soup, neither on this planet nor on any other, and if the beginnings of life were not random they must therefore have been the product of purposeful intelligence.” [7]

And in a provocative statement, Hoyle and Wickramasinghe wrote:

“The speculations of The Origin of Species turned out to be wrong. . . It is ironic that the scientific facts throw Darwin out, but leave William Paley, a figure of fun to the scientific world for more than a century, still in the tournament with a chance of being the ultimate winner.” [8]

Hadean Earth

In addition, life seems to have existed almost as soon as Earth was formed since fossil evidence for life is found close to the origin of the Earth itself.

Atlas of Early Life on Earth [9]

Geological Age	Geological Location
>3,700 Ma (Ma = million years)	Isua Supracrustal Belt and Akilia Island, S.W. Greenland
>3,400 Ma	Dresser Formation, East Pilbara, Western Australia
>3,470 Ma	Mount Ada Basalt1 East Pilbara, Western Australia
>3,460 Ma	Apex Basalt, East Pilbara, Western Australia
>3,450 Ma	Hoogenoeg Formation, Barberton, South Africa
>3,450 Ma	Panorama Formation, East Pilbara, Western Australia
3,426—3,350 Ma	Strelley Pool Formation, East Pilbara, Western Australia
3,416—3,334 Ma	Kromberg Formation, Barberton, South Africa
>3,350 Ma	Euro Basalt East Pilbara, Western Australia
>3,250 Ma	Fig Tree Group, Barberton, South Africa
>3,244 Ma	Kangaroo Caves Formation, East Pilbara, Western Australia
>3,200 Ma	Moodies Group, Barberton, South Africa
>3,200 Ma	Dixon Island Formation, Cleaverville Greenstone Belt, West Pilbara, Western Australia
>3,000 Ma	Cleaverville Formation, Cleaverville Greenstone Belt, West Pilbara, Western Australia
>3,000 Ma	Farrel Quartzite, East Pilbara, Western Australia

“The existence of highly productive plankton that fractionated Carbon isotopes strongly and set up oxidation contrast in the environment suggests that

oxygenic photosynthesis evolved before 3700 Ma.” [10] The earliest fossils of microbial life, such as cyanobacteria, are found in stromatolites. Yet even



Stromatalite – Strelley Pool Chert, Pilbara, Western Australia

the simplest prokaryotes (living cells not containing a nucleus) are far too functionally complex to have spontaneously arisen by chance molecular formation, especially so close to the estimated origination of the Earth.

Mission to Really Early Earth

A scientific quest called “Mission to Really Early Earth” has discovered that our planet had an ocean, continent, and atmosphere suitable for life 200 million years after it was first formed, i.e. about 4.3 million years ago. This scenario was determined by analyzing zircon crystals unearthed from Jack Hills, Western Australia. [11] Thus the beginning of life has been pushed back to the birth of the Earth itself.

Life Before Earth

Recently, Alexei Sharov and Richard Gordon in a controversial paper observed that if evolution follows Moore’s Law, with complexity increasing logarithmically as a function of time, the plot of log-genome-complexity versus time of appearance gives a straight line, that when extrapolated backwards gives a time of 9.8 billion years before Earth was originated for life to have begun. [12] In other words, life did not have enough time to form on Earth. Although this was actually meant to be demonstrative of a certain point rather than proving anything, it does nicely demonstrate the scope of the problem.

Conclusion

The theory of abiogenesis poses many problems for understanding the origin of life on Earth, and the appearance of life early in Earth's history. Numerous chemical, mathematical and informational problems arise which make random mechanical processes of cellular formation and function unlikely. Fossil evidence contradicts a gradualist evolutionary mechanism of development of life, especially the well-known Cambrian explosion, in which highly developed metazoan species suddenly appear in the geological column without intermediate predecessors. But the physical conundrums that mechanistic theories of chemistry and physics face are only one side of the problem. Along with a rising chorus of philosophers, Thomas Nagel, an atheist philosopher, has protested that essential questions about the origin of life, and features such as mind, intelligence and morality are completely left unexplained by mechanistic evolutionary theories. In *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature Is Almost Certainly False*, Nagel plainly lays out his argument that the modern materialist approach to life has conspicuously failed to explain something so integral to nature as mind or consciousness, thereby threatening to unravel the entire naturalistic world picture of biology, evolutionary theory and cosmology. [13] As an alternative he argues that at least natural teleological principles must be admitted to play a role in our view of science. He writes: "Each of our lives is a part of the lengthy process of the universe gradually waking up and becoming aware of itself."

The Vedantic view of the Absolute as sentient conceives of Bhagavan as the conscious and consequently personal source of the universe. This view holds that life is fundamental, and not merely coextensive with matter. It is thus consistent with the law of biogenesis which is scientifically established in agreement with empirical evidence. Life is the basis of Nature, not matter, and Nature is a system in which the different species are nodes or niches, each possessed of variety and adaptability. Evolution is of consciousness, not of the bodies of organisms. The sedimentary fossils are the result of catastrophic deposits, and are thus not indicative of gradual evolution which is concluded only on the questionable assumption of uniformitarianism.

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TWENTY-FIRST CENTURY VIEW OF BIOLOGICAL LIFE

From causal determination to self-determination and free will

Bhakti Niskama Shanta, Ph.D.

Abiology and The Mechanistic Understanding of Life

Modern science is based on causal determinism, which explains that: “every event is necessitated by antecedent events and conditions together with the laws of nature.” [1] Hence, scientists assume that there is nothing uncaused or self-caused. By definition ‘Biology’ is a science meant for the study of life. However, many biologists in reality study abiology (study of matter/inanimate-objects – DNA, RNA, Protein, and so on.) in the name of biology. Following a causal determinism, even today, several biologists believe that, as scientific technologies and knowledge advance, they can completely understand life merely based on the analysis of a living organism’s DNA sequence. They have a misconception that DNA contains all the secrets of life. These a-biologists blindly presume that the traits and flaws of the body can be predicted, exclusively, based on an organism’s genes, and that such a determination is as simple as using the laws of mechanics to predict the motion of an inanimate object.

Genetic Determinism Disproven

Genetic determinism insists that the morphology of organisms is solely determined by their genes. In 1890, Austrian theorist August Weismann theorized that the deciding factors in the struggle for survival are not organisms but their genes, which he labeled as determinants. Darwin proposed that natural selection was applicable for all organisms, however, Weismann revised Darwin’s proposal to include the concept of “germinal selection”. Because, the fittest determinants are those which are associated with the most favorable phenotypic traits, it is believed that germinal selection will produce organisms that are most fit to survive and reproduce.[2] Weismann considered the chemical transporter of these determinants as the germ plasm and modern biologists termed it as DNA. Weismann assumed that the only means of inheritance is by means of transfer of germ plasm from parents to offspring. This assumption was Weismann’s purely wishful thinking, and not based on empirical observation: “We accept it,” Weismann stated, “not because we are able to demonstrate the process in detail... but simply because we must, because it is the only possible explanation that we can conceive.”[3] This view of Weismann’s, that determinants shape the body, and never vice versa, is now technically known as Crick’s central dogma of modern biology.

Crick initially speculated (central dogma) about two linear information flows: DNA → DNA during replication and DNA → RNA → protein during protein synthesis. Latter in 1970, evidence (Mizutani and Temin’s work established that reverse transcriptase activity can copy RNA back into DNA) forced Crick to revise his unidirectional formulation.[4] Crick had to allocate an additional arrow from RNA to DNA in his dogmatic proposal. However, he adamantly rejected any possibility of transfers of information from protein to nucleic acid or from protein to protein: [5]

“...sequence information cannot be transferred from protein to either protein or nucleic acid” and “the discovery of just one type of present day cell which could carry out any of the three unknown transfers (protein → DNA, protein → RNA, protein → protein) would shake the whole intellectual basis of molecular biology...”

Crick’s Cartesian dualistic view of molecular information transfer presumed that nucleic acids contained the coded information, and proteins executed the encoded instructions. This vision of the way DNA worked was translated into conventional evolutionary theory, and random mutations were considered as copying errors that changed the DNA sequence one base-pair at a time, which, as a result, changed protein sequences one amino acid at a time. This scheme was in line with the Neo-Darwinian view of gradual undirected change. It supplied a molecular depiction of how proteins, the working molecules of the cell, could evolve new structures and functions. The random errors in replication processes are presented as the molecular interpretation of chance or accident.

Darwinists insist that all genetic alteration happens accidentally and randomly. They believe that the organism has no control over the alteration process, and that the genome mechanically decides organism characteristics. For them, a genome is a ROM (read-only memory), which is modified only by accident. This claim of Darwinists about randomness and accident became dogmatic with the intent to reject all possible revival of the role of God as the causative factor for the diversity of living organisms.

However, due to modern advancement in cellular biology, we now know that cells can rearrange their genomes, thereby writing information that influences all features of genome function. Cell regulatory functions, such as the DNA proofreading/repair mechanisms and alternative splicing of pre-mRNA, clearly disprove the simplistic central dogma, and thus significantly modify our understanding of information dynamics. Furthermore, epigenetics (influences from chromatin structures), DNA methylation, and histone modifications, also invalidate the misleading central dogma.[6, 7] Protein splicing (the capability of a protein (inteins) to modify its own sequence) has been reported very recently.[8] Prions can also change other protein sequences.[9] James A. Shapiro termed many such examples as natural genetic engineering and these are adequate to falsify the central dogma.[10] Hence this dogma can be dismissed as limited validity in 21st century biology.

Environmental Determinism and Its Constraints

Genes cannot decide the makeup of an organism by themselves. Evolutionists believe that the other decisive element in the blueprint is the environment. Not only does the environment supply raw materials for the processes controlled by genes but it also manipulates gene accomplishment in a variety of ways. Two monozygotic or identical twins will appear if a single fertilized egg divides and produces two complete babies. If those twins are allowed to grow in two different environments, despite having identical genes, they will exhibit completely different cultural values, customs and other differences. Such cases clearly establish that environment plays a vital role in determining differences, and genetic effects are of no importance whatsoever to explain these differences.

The basic idea of environmental determinism is that the psychological mind-set, behavior, and culture of the individual/society is determined by physical geography, particularly the climate in which those individuals developed. This concept is often used by evolutionists to trace the migrations of groups to determine what environmental conditions they had evolved under. However, environmental influences cannot bring any big changes (macro evolution). There is no environment in which a dog will give birth to a cow. An acorn grows into an oak tree, while the spore of a moss grows into a moss, even though both are growing alongside each other in the same environment. Although different species have access to the similar narrow range of materials from the environment, in reality we find that different species appear from their own developmental blueprint (from

fertilized egg to adult), look like their respective parents within the species and differ from each other.

Life Exhibits “Self-Determination” – Biologism or ‘Biological Determinism’ is Illusory on Fundamental Grounds

By itself a genome is an inert or inanimate object. DNA by itself can neither reproduce itself, nor produce a protein. Hence, an actual cellular function cannot be accomplished by DNA itself. The Human Genome Project scientists were calling DNA the ‘Book of Life’, but evidence establishes the imprudence of such claims. Even Craig Venter, president of Celera Genomics and the corporate arm of the DNA sequencing project, stated [11]:

“Genes can’t possibly explain all of what makes us what we are.”

Harvard biologist Stephen Jay Gould also stated[12]:

“The collapse of the doctrine of one gene for one protein, and one direction of causal flow from basic codes to elaborate totality, marks the failure of reductionism for the complex system we call cell biology.”

If environment alone cannot explain to us who we are, if the program for life is not in our genes, then where is it? The program for life is the cell itself – ‘an organic whole’, and it cannot be reduced any further. The cell, through signaling pathways, is also connected to larger wholes (other living cells/organisms) and to the environment (external world). We are individual organic wholes and are living in an organic whole. Hence, we are subservient to a universal organic whole – Supreme Absolute. Ancient, Vedantic literature like *Srimad Bhagavad-Gita* and *Srimad Bhagavatam* have explained since antiquity that mere bodily analysis cannot help us understand who we are. Vedantic literature concludes that soul animates the bodies of living organisms and that sentience or consciousness is the symptom of the existence of soul. In other words, there is no program in the body of a living organism that we can read or analyze to understand the secret of life. Twenty-first century biology also explains that within each cell there are sentient regulatory networks of proteins that sense or evaluate alterations in the cellular environment and understand those signals so that the cell can create an appropriate response. Even the smallest living cells obtain information from their external environment and accordingly monitor their internal processes. Twenty-first century biologists,

rejecting abiology, now accept all living organisms, including the smallest cells, as sentient beings. In the context of multicellular organisms, Shapiro [13] states,

“Without an elaborate sensory apparatus to pick up signals about chemicals in the environment (nutrients, poisons, signals emitted by other cells) or to keep track of intracellular events (DNA replication, organelle growth, oxidative damage), a cell’s opportunity to proliferate or contribute to whole-organism development would be severely restricted. Life requires cognition at all levels.”

The last sentence, “Life requires cognition at all levels” is the same paradigm that Vedanta has advocated since antiquity. Under the banner of ‘biologism’ or ‘biological determinism’, scientists believed that genetic determinism, environmental determinism, or a combination of both could supply the means to fully explain the principles of living organisms. However, overcoming that illusion, the scientific evidence in 21st century biology establishes that life is an organic whole and it cannot be reduced any further to satisfy causal or mechanistic determinism.

We now know that living organisms within a species exhibit different behavior even in the absence of differences in the environment, and hence, individual organisms execute actual novel acts. Due to this, many scientists have been forced to conclude that living organisms possess “free will”. [14] Unlike dead matter (the motion of an inanimate object is determined by the laws of physics and chemistry), the prime symptom of life is that it exhibits free will or self-determined behavior, which is volitional and intentional, and which is self-caused or self-initiated action. Hence, life is self-caused – “Life Comes from Life”, and abiogenesis – “First life came from non-Life” – is only an illusion of determinism in a-biology.

Determinism is founded on the belief that everything (including human action) that happens can be explained precisely by certain prior causal factors. According to this idea, every action of an organism must have a genetic basis and thus undercuts moral responsibility. By strictly following determinism, one could argue that demons residing in people’s genes are responsible for criminal behavior and hence, a person’s DNA should be convicted and not the person himself/herself. How can someone judiciously be held responsible for something whose causes he/she

couldn’t control? Renowned American geneticist, Dr. T. Dobzhansky, stated [15]:

“Moral rightness or wrongness has meaning only in connection with persons who are free agents, and who are consequently able to choose between different ideas and between possible courses of action. Ethics presupposes freedom. . . . Ethics, as such, has no genetic basis and are not the product of biological evolution.”

A scientific acceptance of freewill or self-determination in living organisms is a direct challenge to mechanistic ‘Determinism’. [16] Scientists without the knowledge of 21st century biology carry a common misconception that life is causally determined, and that all actions of living organisms are direct consequences of gene–environment interactions. In reality nothing in the universe (even the macroscopic world) is deterministic. Since the advent of quantum mechanics we came to know that reality is beyond the reach of causal determinism. Prior to quantum mechanics, Newtonian physics dominated the scene and scientists believed that matter in our universe moves in a completely determined manner. Superficially, Newtonian mechanics remained handy, and provide somewhat correct calculations (e.g. calculating the trajectory of a projectile) only in the scale at which humans interact with the universe. The subsequent developments in science created reasonable suspicion on this key argument of determinism. For example, the equations of Newtonian mechanics display sensitive reliance on initial conditions. Henri Poincaré stated [17]:

“If we knew exactly the laws of nature and the situation of the universe at the initial moment, we could predict exactly the situation of that same universe at a succeeding moment. But, even if it were the case that the natural laws had no longer any secret for us, we could still only know the initial situation approximately. If that enabled us to predict the succeeding situation with the same approximation, that is all we require, and we should say that the phenomenon had been predicted, that it is governed by laws. But it is not always so; it may happen that small differences in the initial conditions produce very great ones in the final phenomena. A small error in the former will produce an enormous error in the latter. Prediction becomes impossible...”

Therefore, even an insignificant error in knowledge of initial conditions can produce erratically huge

differences from calculated behavior. This problem is well known as the butterfly effect in chaos theory (even a tiny butterfly can instigate a chain reaction leading to a hurricane years later). Chaos theory therefore offers a direct challenge to determinism. Moreover, German scientist Werner Heisenberg created a valid scientific suspension of scientific determinism with his theory of the uncertainty principle. In quantum mechanics it is impossible to precisely determine the position and momentum of a particle at the same time. Quantum mechanics does not provide a single definite result; it yields an array of probable outcomes and an estimate of the probability of its occurrence. Quantum mechanics reveals an unavoidable element of unpredictability or randomness in determinations of the scientific domain. Lawrence Maxwell Krauss a Canadian/American theoretical physicist and cosmologist stated [18]:

“...although the underlying laws of quantum mechanics are completely deterministic—I need to repeat this, they are completely deterministic—the results of measurements can only be described probabilistically. This inherent uncertainty, enshrined most in the famous Heisenberg uncertainty principle, implies that various combinations of physical quantities can never be measured with absolute accuracy at the same time. Associated with that fact, but in no way equivalent to it, is the dilemma that when we measure a quantum system, we often change it in the process, so that the observer may not always be separated from that which is observed.”

Hence, quantum mechanics thoroughly establishes that reality is not something that scientists can grasp within their fist, because, it does not follow a predetermined path. These theories provided a major challenge to the deterministic paradigm about the world. The founder of our organization, Srila Bhakti Raksak Sridhar Dev-Goswami Maharaja stated [19]:

“Sri Chaitanya Mahaprabhu says that the basis of reality is acintya bhedabheda, inconceivable bipolarity. Everywhere there is something common and something different. Whatever opposing points you may discuss will have something in common, and something different. Nothing is quite the same as anything else. And above all, the infinite is not within your fist. It is inconceivable. The unified and differentiated character of reality is inconceivable; its secret is in the hand of the Supreme. It does not depend upon your whim. Still, that differentiated character of the Absolute will be seen differently according to the subjective relationship we have with Him.”

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Classification of Species – Mind over Matter

Rsiraja Das, M.Sc.

Darwin's methods of classifying species are based on notions about matter that predate the development of modern physical theories, and recognition of their problems. While many biologists use atomic theory for studying deeper aspects of molecular biology, their day-to-day affairs with these large molecules are based upon ball-and-stick models of molecules, which fundamentally hide many difficult and problematic features of atomic theory.

Consequently, it should not surprise us that problems of modern physics have had little to no bearing on the development of biological theories. Here, I will try to outline the relation between difficulties in physical sciences and the modern view of evolution in biology. The solution of physical problems requires revisions to our view of matter, which when extended to biology imply a new way of classifying material living bodies, based on the mind rather than physical features. The old ideas about evolution of species must then change substantially.

What is Evolutionary Theory?

Every science begins with classification. We first want to identify commonalities underlying the diverse phenomena before we study these phenomena in detail. Common methods of study can be applied to areas with commonalities. The goal of biologists before Darwin was to achieve a success similar to the creation of the "Periodic Table" in Chemistry. In the same way that chemists put Helium, Neon, Argon, and Krypton in the class of "Noble Gases" because they were all chemically inert, biologists wanted to classify species into similar categories based upon physical structure, behavior patterns, reproduction, food habits, and so on. Darwin, too, wanted to formulate insights of the type that "Lions, Tigers and Leopards all belong to the Cat Family" – which can be facilely extended. [1] Darwin found similarities between species based on their habitats, mating habits, fossils of bones and the shapes of their skulls.

But just as physicists did not stop at identifying common classes of chemical elements, but wanted to seek out the origin of all elements through sub-atomic particles, Darwin too was not content. He wanted to seek out the "origins" of life – the common thing from which all life forms must have evolved. Biologists before him (such as

Lamarck) had propounded two main ideas that Darwin used: (1) environment plays an important role in a species developing new traits, and (2) these traits can then be passed on to the offspring as native traits of the species. Mendel later found a genetic basis for Lamarckian ideas of acquired characteristics, thereby reinforcing them. However, unlike Lamarck who thought that all evolution was based upon an individual effort (call it *choice*) to adapt, Darwin discarded this thought of freedom in the living being. According to him, species are not free to adapt. Rather, the ones that don't adapt are eliminated by the environment.

The modern evolutionary theory embellishes Darwin's ideas with molecular biology. Essentially, a living being's genes hold the key to explaining all physical traits, and genes undergo random "mutation" which alters their molecular structure. As the mutated genes are passed to the offspring, biological changes acquire permanence. Some of these changed species survive as they are better adapted to the environment resulting in the propagation of genes, while others perish, terminating that variety or instance of genetic mutation. The generation of species in evolution theory is thus not based on a *choice* to adapt but something that happens spontaneously. The only thing we now need to explain is the emergence of a molecule as complex as the genetic DNA, which is a problem of synthesis in biochemistry and not biology proper.

Alternatives to Evolutionary Theory

While it is undeniable that genetic mutations take place, and also undeniable that these mutations can dramatically alter the capabilities and functions of the body, I will here explore the possibility that these mutations may not be "random". The apparent randomness underlying genetic mutations today can be attributed to observed random behaviors at the atomic and molecular level. Within quantum theory, for instance, the state of an individual quantum is uncertain, the predictions of the theory are probabilistic and entangled systems can cause non-local behaviors unthinkable in classical physics. But, opinion amongst physicists is divided as to whether uncertainty, probability and non-locality are 'natural principles' or

problems of current theory remaining to be solved. If these problems were to be solved by a new kind of explanation, then the notion that there are ‘random’ chance mutations that are selected by the environment would be false, because the randomness of the mutation itself would be false. What we consider random mutation would then be a consequence of yet another type of cause.

Generally, we attribute uncertainty and incompleteness to missing information, which can be compensated by adding new variables to a theory. In the case of quantum theory, the problem is complicated by the fact that we cannot add new variables into the theory to complete it. [2] So, how do we complete the theory without adding new variables? This is where semantic information (different from quantitative information) can play an important role. For instance, a literate person reading a book will derive additional meanings from the book, while the illiterate person will not, although the literate person requires no additional variables to be added to the book to derive meanings. This means that incompleteness of quantum theory can be resolved by supposing that physical states in objects can also be viewed as semantic states.

Problems of indeterminism are not unique to atomic theory; they are also encountered in Theory of General Relativity. This indeterminism allows for space-time transformations that preserve events but not matter distribution on them. It leads to the idea that the universe is deterministic about what events will occur but not deterministic about who will see these events. This creates room for observers *choosing* events, within an event-deterministic universe.

The above two examples are not exhaustive, but intended only to illustrate the idea that problems of incompleteness in science can be addressed through semantics and choice. This is possible if scientists can view matter as semantic rather than merely physical objects.

Such changes to physical sciences will have far reaching consequences for biology. Chemical mutations will now be caused by meanings and choices and not at all randomly. In fact, meanings and choices will not be *emergent* properties of nature that came about late in the evolution of the universe. They will instead be fundamental *causal* properties of nature that have always existed. This changes dramatically how we classify species. If matter has to be thought in terms of meanings

and choices, then species are to be classified based on the kinds of meanings they experience and the types of choices they make. Like tables of various shapes are still ‘tables’, similarly, living beings with varying physical features can be semantically similar. A new way of classifying living beings based on meanings and choices is now needed.

The Vedic Theory of Evolution

In the Vedic view, the gross body is developed on the basis of the subtle body. As an illustration, a physical table is developed on the basis of a concept table. As a living being changes its mental states, it also changes its bodies. All kinds of bodies are therefore available to a living being like various kinds of concepts are available to us for adoption. Just as we are free to adopt different cultures, ideas and ideologies, a living being can also choose a particular body. The adoption of a certain type of body is not qualitatively different from the adoption of an idea.

A living being is accorded a body based upon its *mentality* – which is essentially the meaning it sees in life. Thus, some people live to eat and have sex, others want to gain knowledge and propagate an ideology, and yet others simply want to realize their potential and know who they are. The “meaning of life” is a subtle level of physical reality, comprised of atomic meaning units. These atomic meaning units are fundamental distinctions out of which each one’s life-world (what continental philosopher Habermas called *Lebenswelt*) is constructed. [3] New meanings of life arise through mutations of fundamental distinctions under influence of Time, and consciousness must select or reject them. By selecting a particular meaning of life, a living being gets a different kind of mind and body than what it inhabits right now. A particular type of living body therefore may not be formed for two reasons: (1) a certain kind of mutated meaning of life does not arise anymore, or (2) even if the mutated meaning arises, a conscious being rejects it. The former can be seen as the collective extinction of a species (governed by Time) and the latter determining whether an individual consciousness inhabits a particular kind of body.

Both choice and Time operate simultaneously, but the action of Time can preclude some choices. Consciousness in the Vedic view is not an *efficient* cause but an *existential* cause. It does not create alternatives, but selects alternatives created by nature. Benjamin Libet,

who did experiments on freewill, [4] called this the “power of veto” or the choice of “free-won’t”. Basically, nature creates possibilities and consciousness selects or rejects them. Generation of possibilities is controlled by Time which may be adopted by living beings. The bodies of dinosaurs are conceptual entities not being allowed by Time currently and they are not therefore available for selection by any living being (even if some being desired to be a dinosaur).

The evolution of bodies can also be seen as the evolution of ideas and ideologies. All species are conceptually possible at all times, just as all ideas are feasible at all times. However, the physical realization of an idea depends on Time and choice. Archeology of fossils is an archeology of ideas and ideologies. But, to come to this stand, we must view matter semantically.

The Path Forward

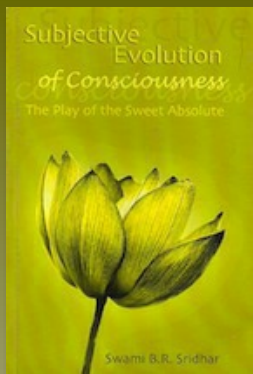
Vedic view of evolution (also called transmigration) requires a new view of material reality, different from current notions prevalent in modern science. This new view can emerge out of current science in the attempt to address current problems of indeterminism, incomputability and incompleteness. The solution of these problems within physical sciences, therefore, has

a greater implication for biology than biologists may have conceded thus far.

If, in order to solve these problems, we need to acknowledge that matter is semantic, then bodies of living beings are also semantic entities. The construction of these bodies then depends on the state of the mind, which carries meanings, and not on deterministic push-and-pull forces of the chemical elements. A scientific revolution in fundamental conceptions about matter will ripple through in other areas, including biological sciences. If and when such a change happens within physical sciences, current evolutionary theories will become increasingly untenable.

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Subjective Evolution of Consciousness

Evolution is generally thought of as something merely objective. But objective evolution is a misperception of reality. Evolution is actually based on consciousness, which is subjective. Subjective evolution, however, seems to be objective evolution to those who are ignorant of this perspective. Consciousness seems to be the unessential embedded in a concrete substance, but actually it is just the opposite. Consciousness is the substantial and its objective content or world is floating on it connected by a shadowy medium like mind. This view finds surprising support in advanced modern science from which physicists like Paul Davies have concluded that it is necessary to adopt “a new way of thinking that is in closer accord with mysticism than materialism.”

The dynamic super-subjective living reality that produces as much as is produced by its constituent subjective and objective fragmental parts or moments is in and for itself the embodiment of ecstasy, that is forever beyond the static reification of materialistic misunderstanding. With an irresistible passion for truth, Srila Bhakti Raksak Sridhar Dev-Goswami Maharaja, the author of *Subjective Evolution of Consciousness* takes us to an incomparable synthesis of thought from Descartes, Berkeley and Hegel in the West to Buddha, Shankara, and Sri Chaitanya in the East to reveal the ultimate conception of reality in all its comprehensive beauty and fulfillment.

To obtain a copy of the book *Subjective Evolution of Consciousness* please contact us at:
editors@scienceandscientist.org