

THE HARMONIZER

Science, Philosophy, Religion, and Art
All Branches of the Same Tree of Knowledge

August 2013

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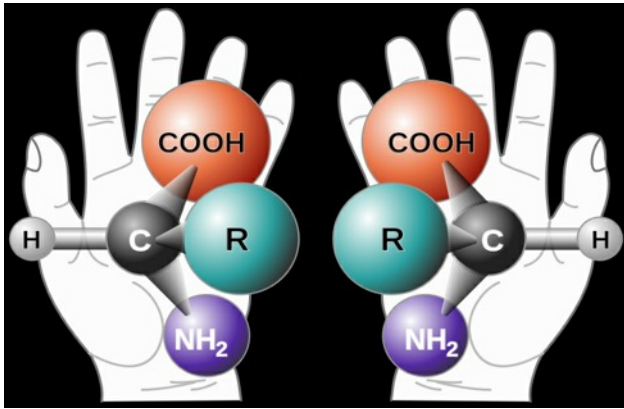
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such as the iron-sulfide world, the Zn-world, self-organization and replication models, metabolism first models, deep sea vent hypothesis, coenzyme world, RNA world, clay hypothesis, extraterrestrial life, lipid world, and polyphosphates as cause of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