

BHAKTIVEDANTA INSTITUTE BULLETIN



Vol. 2

Absolute is sentient thou hast proved, Impresonal calamity thou hast removed

No. 8

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AUGUST 1980

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Bhaktivedanta Institute Bulletin

Published Monthly

Bhaktivedanta Institute Bulletin

Founder, under the direction of

His Divine Grace A. C. Bhaktivedanta

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Published by :

T. D. Singh, Ph.D.

Bhaktivedanta Institute

Juhu Road, Juhu, Bombay 400 049

Printed at :

Nityavijay Printers, Mahim, Bombay-400 016.

MANIFESTO

I. There are five basic truths for scientific understanding : 1) the original source of all energies, 2) life (conscious energy) or self, 3) matter (unconscious energy), 4) time, and 5) activity. Unconscious energy appears as a reflection of conscious energy. As such it is real while having only an apparent nature.

II Matter exists not only in space and time but also in an interpenetrating, coexisting continuum known as subtlety. That which can be perceived by the senses is called gross matter. That which cannot be so perceived is called subtle matter (eg. mind, intelligence and apparent self). As such the mind is not the brain, the true self is not the body.

III. Life (consciousness) is a fundamental, irreducible principle of nature. Life does not arise from a combination of chemicals, nor does the body evolve from simple to complex forms via Darwinian evolution. The consciousness evolves. Life is conserved, i.e., it is never created or destroyed. It is in this sense that we can say that life comes from life.

IV. The source of the cosmos is not blind natural laws but an original, conscious intelligence. We do not accept the "big bang" or other non-intelligent explanations of origins. It is in this sense that we can say that matter comes from life.

V. An individual living being can be understood in three phases : 1) as the consciousness pervading the

body, 2) as the non-material living force within the heart, and 3) ultimately as a person. The complete whole cosmic being can likewise be understood as 1) all-pervading Brahman, 2) as residing within every atom as Paramatma and 3) ultimately as a Person (Bhagawan). The individual and cosmic beings are qualitatively one but quantitatively different. We uphold the individuality of the individual and cosmic being.

VI. There are different departments of knowledge throughout the world, but there is no department to study the difference between a dead body and a living body, namely the position of the non-material living force or consciousness. The purpose of Bhaktivedanta Institute is to fill this gap in modern education.

VII. The body is changing but the non-material living force, or identity continues to exist without change. This fact can be perceived within our own life time. The process known as "growth" is in actuality a change of body.

VIII. The Institute attempts to present the principles of the non-material living force—not in some dogmatic fashion, but through complete scientific and philosophical understanding. Materialistic scientists may deny the existence of the non-material entity or living force, but they can present no better explanation of the phenomenon of life in the universe.

The theory of chemical evolution rests upon three assumptions: (1) The hypothetical primitive atmosphere must have been either reducing or neutral. This means that there was no free oxygen in the atmosphere in the earth's distant past. (2) Simple molecules like amino acids, purines, pyrimidines, and sugars were formed within this atmosphere under the action of ultraviolet radiation, electrical discharges, radioactivity, thermal energy and so on. (3) In the course of time these molecules gave rise to protoproteins, proto-nucleic acids, and other protocellular components, which in turn gave rise to the so-called protocells and finally to the living cell.

The idea of the primitive reducing atmosphere has received strong and serious criticisms from scientists of various disciplines. Their arguments suggest overwhelming drawbacks in the conjecture. Available data from geology, geophysics and geochemistry argue strongly against this idea. Abelson⁴, for example, argues that there is no evidence for the reducing atmosphere, and that ammonia would have quickly disappeared because the effective threshold for degradation by ultraviolet radiation is 2,250 Å. He suggests that a quantity of ammonia equivalent to the present atmospheric nitrogen would be destroyed in approximately 30,000 years.

Chemical Evolution: A Molecular Fairy Tale?

● T. D. Singh, Ph. D, & R. L. Thompson, Ph. D.

We can briefly analyze these assumptions by purely scientific reasoning and argument. It is a foregone conclusion of many molecular evolutionists that the primitive atmosphere consisted of carbon in the form of hydrocarbon such as methane, nitrogen in the form of ammonia, oxygen in the form of water and sulfur in the form of hydrogen sulfide. This was first proposed by Oparin¹, the Russian evolutionist, and Urey², the American physicist.

Based on this assumption, Miller³ performed an experiment in which he passed an electric discharge through a gaseous mixture of methane, ammonia, hydrogen, and water vapour. Amino acids such as glycine, alanine, aspartic acid, and glutamic acid were observed as some of the components of the reaction products. Since amino acids are the smallest units of the protein molecules, Miller's experiment gave the molecular evolutionists great hope and encouragement for their idea of the chemical origin of life. They claim that such steps are the ones that will finally lead to life. However, to accept this claim as proven would be quite premature.

Abelson has also suggested that if the primitive atmosphere contained large amounts of methane gas, geologic evidence for it should be available. Laboratory experiments show that irradiating a highly reducing atmosphere produces hydrophobic organic molecules that are absorbed by sedimentary clays. This suggests that the earliest rocks should have contained an unusually large proportion of carbon on organic chemicals. However, this is not the case.

From observations based on the stratigraphical record, Davidson⁵ concludes that there is no evidence that a primeval reducing atmosphere might have persisted during much of Precambrian time. Brinkman⁶ shows from theoretical calculations that dissociation of water vapor by ultraviolet light must have generated enough oxygen very early in the history of the earth to create an oxidizing atmosphere.

In light of these arguments, the idea of a primeval reducing atmosphere does not seem tenable. Of course, this does not mean the end of speculation on the chemical origin

of life. Although the reducing atmosphere has been by far the most popular, many other hypothetical primitive atmospheres have been proposed.

Thus, the gaseous mixture in Miller's experiment can be replaced by a mixture of carbon monoxide, nitrogen, hydrogen, and water vapor, giving comparable results and thus indicating that the carbon need not be in the form of hydrocarbon gas⁷. The molecular evolutionist Mathews⁸ has advanced another theory about the possible formation of protein from hydrocyanic acid (HCN) gas. Electrical discharge experiments in a mixture of nitrogen, carbon monoxide, and hydrogen give HCN as one of the principal products. HCN is an even more promising candidate as far as the formation of proteins, purines, pyrimidines, and other molecules of biological importance are concerned.

One can arrive at many alternative theories about the unknown past, and these can be criticized in turn. (For example, the two atmospheres just mentioned would not endure if the dissociation of water vapor generated substantial amounts of free oxygen). But, where is the truth? We can only conclude that conditions (1) and (2) are shaky and speculative assumptions at best.

COACERVATE FORMATION

It has been claimed that the so-called coacervates of Oparin⁹ and the proteinoid microspheres of Fox¹⁰ are the protocells. We would like to examine what these words mean chemically. By definition, a coacervate is an aggregate of colloidal droplets held together by electrostatic charges. Coacervate formation has been observed when large molecules possessing hydrophobic and hydrophilic sites are dissolved in water. They consist of spheres or droplets separated from the bulk solution. It is believed that coacervates are the end product of the reduction of the hydration layer surrounding colloidal particles.

The phenomena of coacervate formation were first studied in detail by Bungenberg de Jong¹¹, who demonstrated that coacervation is an effective technique for concentrating compounds of high molecular weight from aqueous solutions. The coacervate droplets are usually obtained by mixing solutions of proteins and other polymers—for example, solutions of gelatine and gum arabic, solutions of various proteins and nucleic acids, and so on. Oparin has reported that in the synthesis of polyadenine *in vitro* in a polypeptide solution, coacervate droplets begin to separate from the bulk solution as soon as the molecules reach a certain size¹². He further draws the conclusion that non-specific polymerization of organic compounds must have taken place in the "primeval broth", leading to the formation of polypeptides and polynucleotides with randomly arranged monomeric residues in their chains. These polymers might have separated in the form of coacervate droplets, thus creating isolated systems where further evolution of organic polymers might have occurred that was not possible in the solution as a whole.

Oparin suggests that as soon as the polynucleotide chain reaches a certain size, even though it has a disorderly structure, it will interact with polypeptides and other compounds in the "primeval nutrient broth" and separate out from the solution in the form of coacervates. His reasoning is that although there could not be any selection of individual nucleotide molecules when they were in simple aqueous solution, the situation is different when they separate out as coacervate droplets after interacting with polypeptides. Because of the double helical character of the two complementary chains of polynucleotides, their inclusion in coacervate droplets (or protobionts) may have had certain effects on the polymerization of the amino acids in those systems. Those arrangements of amino acids unfavourable for the increasing catalytic activity of the polypeptides would be

destroyed by natural selection. In this way, the structure of the protein-like polypeptides, and also that of the polynucleotides controlling their synthesis, may gradually have become more ordered and better adapted.

This may sound convincing until we look at the scientific facts. Coacervate formation is similar to the well-known chemical process called "salting out". For example, if the salt potassium chloride is added to a soap solution of potassium oleate, the phenomenon of coacervate formation is exhibited. The hydrocarbon chain of this soap molecule is less soluble in water. If increasing amounts of potassium chloride are added to a concentrated soap solution, two layers (phases) will form, and just before the separation of these distinct layers, oily droplets will appear. These are termed coacervates. The explanation is that the potassium chloride molecules compete with the water molecules in the potassium oleate solution, thus allowing the water molecules to separate from the hydrophobic chain of the oleate moiety. In chemical language these droplets are commonly known as spherical micelles. In aqueous solution, the nonpolar (hydrophobic) portion of the monomers reduce their contact with water and form the micellar core, while the polar (hydrophilic) portions remain in contact with water, forming roughly spherical micelles. In some nonaqueous (nonpolar) solvents the reverse phenomenon is observed. The polar groups of the monomers may become solvophobic, thereby forming the cores of the micelles. These are called inverted micelles. Cylindrical or lamellar aggregates also result in highly concentrated solutions.

Monomers and micelles are usually in rapid dynamic equilibrium, and micelles are known to catalyze chemical reactions. Thus one can safely conclude that Oparin's coacervates simply exhibit the phenomena characteristic of micellar chemistry. Apart from his many "may have beens", he is simply describing a few physical properties of inanimate

matter. Fox, Oparin's own colleague, has criticized his conjectures about these coacervates: "besides failing to answer the crucial primordial question, they are neither uniform nor stable¹³".

SO CALLED MISSING LINK

Fox, on the other hand, claims that his so-called protenoid is the "molecular missing link between pre-life and life¹⁴". But we can also show that this claim is completely erroneous and unfounded.

Proteinoids are formed by pyrocondensing dry amino acids. The amino acids are heated at 140° to 180° C for about six hours. Only a sufficient proportion of one of the acidic amino acids, aspartic and glutamic acids, or of the basic amino acid, lysine, is required. The reaction mixture is treated with hot water and, after being stirred, the water-insoluble material is separated by filtration. When the filtrate cools down, the product precipitates as microscopic globules that Fox calls proteinoid microspheres. The molecular weights of the products can be as high as 20,000 when glutamic acid is heated with glycine. The proteinoids give all the color test results common to proteins. Fox further claims that the amino acid sequence in these proteinoids are highly non random. Proteinoids catalyze like enzymes in hydrolysis of esters, decarboxylation, amination, and deamination reactions. He also claims that these proteinoids multiply by division in a manner similar to that of living cells.

We would like to suggest that all the above properties are simply the physico-chemical properties inherent in such molecules. They have nothing to do with the characteristics of living cells. Chemically, it is expected that when a mixture of amino acids is heated at elevated temperatures, polymers will be formed. These are the peptides, and they show the properties inherent in proteins. However, Fox's argument for the non random sequencing of the amino acids in his reaction is quite objectionable. As a matter of fact, some

of his own supporters accuse him of deception. Miller and Orgel in this respect remark :

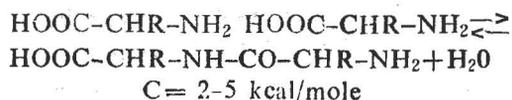
*the degree of non randomness in thermal polypeptides so far demonstrated is minute compared with the non randomness of proteins. It is deceptive, then, to suggest that thermal polypeptides are similar to proteins in their non randomness*¹⁵.

They continue by saying,

*The importance of these thermal syntheses in prebiotic chemistry is a very controversial matter. We do not believe that they were very important because we doubt that polypeptides could have been synthesized in large quantities at the surface of the earth by thermal reactions of the kind so far demonstrated.*¹⁶

So many unique events and conditions have to be simultaneously fulfilled in Fox's model of proteinoid formation that it is very doubtful whether many chemists will ever take it seriously. First of all, the temperature specified by Fox for the heating of the amino acids is very unlikely to occur on the surface of the earth. Although the temperature in some hot springs may rise to 140° or 180° C, such reactions are extremely improbable. Fox's conditions require that the amino acids be in the right place and also be dry. The polymerization reaction of amino acids does not take place in the presence of water. In fact, the reverse reaction will be favoured, and the polypeptides will be completely hydro-

lysed to amino acids under such conditions. The thermodynamic free energy of this condensation reaction is about 2.00 to 5.00 kcal/mole, which means that the reaction is very unfavorable towards the product side.



The other possibility of temperatures as high as 140° to 180°C is in volcanoes. Here again the conditions are not favorable for the production of the polypeptides. In volcanoes the temperature of molten lava is about 1,200°C, which will completely destroy the amino acids. It should also be mentioned that ultraviolet radiation, being a very powerful source of energy, cannot only create organic molecules but also destroy them—especially macromolecules such as proteins and nucleotides.

Finally, from a purely chemical point of view, Fox's proteinoids may be expected to possess some catalytic activity as general acid-base catalysts according to a catalysis law of the Bronsted type. This has nothing to do with the true nature of a living cell and, therefore with life. One can see that all these claims amount to no more than molecular fairy tales. They are like taking a rope to be a serpent. Thus, from the above evidence, we can see that assumptions (2) and (3) have no valid scientific foundation. □

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