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Life Origination Hydrate Hypothesis (LOH-hypothesis): Its Answers to Some of the Session Questions

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We believe that the processes that led to living-matter origination and to its subsequent development are thermodynamically conditioned, natural, and inevitable and that all they are governed by universal physical and chemical laws.

According to the Life Origination Hydrate Hypothesis (LOH-hypothesis) [1–7], the living matter simplest elements (LMSE) originated and, possibly, originate in our days from CH4 (or other CH_4-hydrocarbons), niters, and phosphates under the Earth's surface or seabed within honeycomb structures of hydrocarbon hydrates. The underground deposits of CH_4 and other hydrocarbons could be produced by the reaction between H_2 and CO_2, and CO_2 could be produced from carbonates as a result of their thermal decomposition induced by the gravitational compression of the young-Earth crust. Thus, the living-matter sources are H_2, carbonates, and phosphates resulted from transformation of the nebula. The nebula that was the progenitrix for the Solar System arose after the supernova explosion.

The hypothetical sequence of the processes that led to formation of protocells from methane, niter, and phosphate is as follows: niter diffusion into methane hydrate structure → formation of N-bases and riboses within structural cavities → phosphate diffusion from outside into small structural cavities → formation of DNA- (RNA-) like molecules through polymerization → melting of the system and water–organic-soup formation → formation of amino-acids and simplest organelles in the soup → self-replication of nucleic acids and concentrating of the soup → formation of protocells.

The LOH-hypothesis allows for answering the following questions. From what substances and by what mechanism had the LMSE originated? How had it happened that methane hydrate had formed? How had it happened that CH_4 and NO_3^- met together, and why had no other substances reacted with them? Why are the DNA and RNA monomer links limited in size, and why are they so similar? What had hampered the subsequent chemical transformations of the rings and side groups of N-bases and riboses? How had it happened that the sequences of N-bases in DNA and RNA molecules are not random? Why do atoms other than C, N, P, O, and H almost never enter the DNA and RNA compositions? Why do only five N-bases usually participate in DNA and RNA formation, and why do some other N-bases, e.g., xanthine, sometimes enter the DNA and RNA compositions? Why did Nature select the D-ribose molecules for DNA and RNA construction?

This presentation will contain the experimental and observational facts that led us to the formulation and development of the LOH-hypothesis, thermodynamic estimations showing that the LMSE can be produced on the basis of the internal energy of the source substances with no external heat flows, answers to the above-listed questions, available independent environmental observations counting in favor of the hypothesis, and descriptions of the experiments that could be performed for its validation and subsequent development.

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