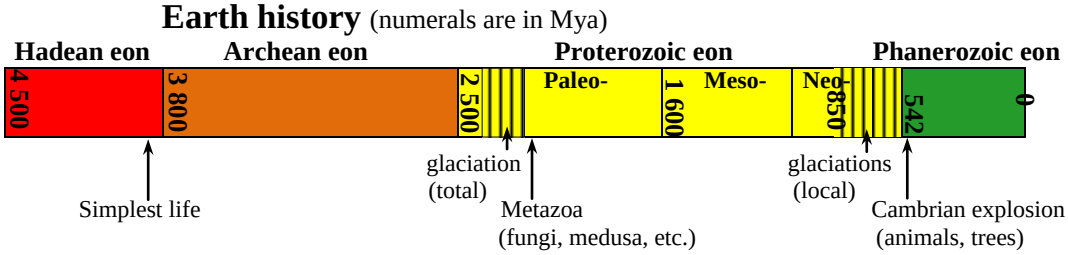
EPSC Abstracts
Vol. 9, EPSC2014-6, 2014
European Planetary Science Congress 2014

Life origination and development hydrate theory (LOH-Theory) in the context of biological, physicochemical, astrophysical, and paleontological studies

V.E. Ostrovskii (1) and E.A. Kadyshevich (2)
(1) Karpov Institute of Physical Chemistry, Moscow, Russia (vostrov@cc.nifhi.ac.ru), (2) Obukhov Institute of Atmospheric Physics RAS, Moscow, Russia (kadyshevich@mail.ru)



Abstract

Till now, we formulated and developed the Life Origination Hydrate Theory (LOH-Theory) and Mitosis and Replication Hydrate Theory (MRH-Theory) as the instruments for understanding the physical and chemical mechanisms applied by Nature for the living matter origination and propagation. This work is aimed at coordination of these theories with the paleontological and astrophysical knowledges and hypotheses of the Earth and Solar System remote histories.

1. Introduction

We affirm that living matter originated as a result of thermodynamically caused chemical transformations, which are inevitable under definite ambient conditions, and are governed by physical and chemical laws, which are universal for any celestial body. We showed earlier [1-5] the following. Living matter could originate from the following unique set of mineral substances: CH_4, niter, and phosphate. The syntheses of living matter simplest elements (LMSEs), i.e., nitrogen bases (N-bases), riboses, and nucleosides, and of simplest forms of the precellular living matter (DNAs) proceeded within the cavities of the CH_4-hydrate honeycomb structure, localizations of which represented natural thermostated "incubators". DNAs were synthesized on the basis of the intra-structural CH_4 and nitrate- and phosphate-ions that diffused into the CH_4-hydrate structure from the outside. The reaction process was initiated by Konovalov's reaction between CH_4 and nitrate-ions. The formation of cells (cellular life) and the first symbiotic reactions between DNAs proceeded within the semi-liquid media (super-cytoplasm) obtained after liquation of the hydrate structure as a result of the excessive water formation through polycondensation reactions and temperature increase. The origin of living matter from mineral substances and the extended self-reproduction of living organisms have in their ground the same physicochemical phenomenon that consists in the formation/destruction of the so-called gas-hydrate structures. All transformations, from mineral substances to cellular life, require no ambient energy; moreover significant amounts of energy liberate.

2. Living matter origination and development

The Earth, throughout its history, had passed several periods favorable for origination of definite forms of living matter and several periods baleful for some living-matter species that had originated earlier. Over the periods when the Earth's ambient conditions were catastrophically bad as a result of the cold, heat, or high radioactivity, the animal and plant species, the extended reproduction of which was controlled by some DNA modifications, became deserted or the corresponding DNAs ceased temporally their metabolic processes. Over the periods of favorable

ambient conditions, the "dormant" DNAs could renew their vital activity and new DNAs and new species arose.

The above scheme characterizes the paleontological information on the temporal connection between the post-glacial periods in the Earth's history and the periods of massaged flora and fauna distribution over the Earth or over its separated regions. It is seen that the explosive living matter expansion proceeded late in cold periods, about (Mya) 3900 (after the faint Sun period), 2100, and 542. In our opinion, late in the cold periods, the conditions arose when the CH_4-hydrate localizations were rather close to the Earth's surface and the temperature was sufficiently high for a rather long time to unbrake the DNA formation processes that were "frozen" earlier.

In the course of each interglacial Earth's history period favorable for syntheses of the LMSEs, DNAs, and cells and for development of plant and animal organisms, the diversity and multiplicity of the living species were caused by the following main causes: (1) a multiplicity of the DNA modifications that were produced within each natural "incubator"; (2) the occurrence of a great number of "incubators"; (3) in the periods of climatic catastrophes, the survival of some organisms and some DNA modifications that existed during previous favorable periods; (4) some variability of DNAs under the effect of the natural selection.

In our opinion, just the cooperative effect of all these factors determines the fallibility of Darwin's hypothesis and the sterility of the searches for the missing links and rather large fragments in the conceptual "continuous chain" of the fossil records.

Today, the LOH-Theory allows for answering the following questions. (1) In what phase did the LMSEs form? (2) From what substances did the LMSEs form? (3) By what mechanism did the N-bases, riboses, and nucleosides form? (4) Is Nature capable of synthesizing LMSEs from minerals with no external energy? (5) How had methane hydrate originated? (6) How had CH_4 and NO_3^- met together? (7) Why no substance but NO_3^- reacted with CH_4-hydrate? (8) How did DNA- and RNA-like molecules form from nucleosides? (9) Is there a relation between DNA and RNA formation, on the one hand, and the atmospheric composition, on the other hand? (10) Why do only five chemical elements usually enter into the DNA and RNA composition? (11) Why are N-bases entering into DNA and RNA similar in their composition and structure? (12) Why are N-bases and riboses limited in size? (13) Why are N-bases not identical? (14) Why do only five N-bases usually enter the DNA and RNA composition and why do other N-bases, such as xanthine, sometimes enter into the DNA and RNA compositions? (15) Could D-ribose (DR), desoxy-D-ribose (DDR), thymine, and uracil exist simultaneously in a reaction mixture containing CH_4 and niter? (16) How had it happened that the sequences of N-bases in DNA and RNA molecules are not random? (17) Why did Nature choose DR and DDR, but not their L-enantiomers or mixtures of enantiomers for DNA and RNA syntheses? (18) How did protocells originate? (19) Why did living-matter explosive distribution occurred late in cold periods? (20) Under what conditions can living matter appear on other planets? (21) Why can't Darwin's species diversity hypothesis be confirmed?

Acknowledgements

The work is supported by the Russian Foundation for Basic Research (project no. 12-05-01082-a).

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