Foreword

Dedicated to the memory of Oleg Georgievich Gazenko
and Lev Mikhailovich Mukhin

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In 2006, Academician N.S. Kardashev and Prof. L.M. Mukhin had a meeting with Academician A.Yu. Rozanov to discuss the possibility of organizing a small colloquium to discuss problems of the origin of life. Apart from the above organizers, the working group included Academician N.L. Dobretsov, Academician G.A. Zavarzin, Academician A.S. Spirin, Dr. Sci. S.V. Rozhnov, and Dr. Sci. A.V. Lopatin. Later this group was expanded to include Academician O.G. Gazenko, Academician A.I. Grigoriev, and PhD V.N. Snytnikov. These colloquia were held in the Paleontological Institute once every month or six weeks and were attended by recognized specialists who delivered reports on the foremost problems in this field: Corresponding Member of the Russian Academy of Sciences V.I. Agol, Dr. Sci. A.V. Vityazev, Academician Yu.V. Natochin, and Academician M.Ya. Marov. From the very beginning, the organizers were planning to later hold a workshop with 30–35 participants.

The members of the working group realized that this workshop should not cover all fields that are one way or another connected with the origin of life, but to focus only on those where a considerable amount of new information had recently been obtained. In addition, it was decided to make this discussion limited to a small number of people, to give all the participants sufficient time to express their views.

We also realized that despite all the above restrictions and limitations, the range of the problems discussed should be sufficiently broad and multidisciplinary.

We agreed that we would not discuss the definition of the term *life*, since we understood that this would lead to terminological disputes. The meeting showed that each of us places the beginning of the phenomenon, which is called "life" at different stages of the physicochemical evolution of the Universe. However, all this results in the most productive way of studying the process of the evolution of the matter and the beginning of life and the formulation of the most urgent and complicated problems while understanding this beginning. To understand the above, a simple scheme (see figure) may be useful. The complexity of this problem is also apparent in that, in contrast to repeatable research, which is a usual objective of scientific study,

for which some regularities and differentiating features can be worked out; in this case (at least it is assumed) the phenomenon (the appearance of life) has not been repeated. No graph can be built based on one data point, and any prognosis is difficult if at all possible. The world-famous biologist and renowned thinker Nikolai Vladimirovich Timofeev-Resovsky (in his years in Russia he worked at the Institute of Medical and Biological Problems and conducted monthly seminars widely attended from all over Moscow), when asked about the origin of life, always said: "You know, I was only very young then, I don't remember much, you would be better off asking Academician Oparin, he probably knows the answer." Even though the knowledge of origin of life has become better understood since then, we still unfortunately know incredibly little. However, there is a strong desire to find out more.

Figure.

As a result, this small meeting was prepared. The following blocks of problems were discussed: (1) the possibility of assembling the cell from its components; (2) viruses—before or after the cell?; (3) the RNA World and its possible existence before the Earth; (4) organic substances in the Universe and the significance of autocatalysis in the problem of the origin of life, (5) conditions on the early Earth 4.6–4.0 Ga; (6) conditions on the early Earth after 4.0 Ga; (7) primary ecosystems and the deep subsurface biosphere; (8) the problem of the origin of membranes.

The above blocks of problems naturally predetermined the multidisciplinary nature of the meeting, whereas a broad and limitless discussion facilitated mutual understanding and satisfaction of specialists from various fields. The meeting was attended by specialists from many fields: paleontologists, astrophysicists, biologists, physiologists, geneticists, molecular biologists, physicists, chemists, geologists, etc. Various people have varying knowledge, but everybody wanted

to expand their knowledge, and such an informal discussion helped that.

The meeting was attended by 36 people (a complete list is in the appendix) was so interesting that it became apparent that the proceedings should be published. The English version of the *Paleontologicheskii zhurnal* (Paleontological Journal) contains the publications of the reports, while the Russian version contains the complete discussion. The discussion was videotaped, and it is expected that CDs will be issued with a complete set of reports and discussions. In addition, the proceedings will form the basis of the suggested new Program of the Presidium of the Russian Academy of Sciences.

The volume is dedicated to the memory of our dear colleagues, Academician Oleg Georgievich Gazenko (December 12, 1918–November 17, 2007) and Professor Lev Mikhailovich Mukhin (October 24, 1933–April 24, 2009).

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