Teachers:

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(DD, DM, SP: PA Department of Chemistry; FF: PA Molecular Biology)

Educational objectives:

The course aims to provide knowledge on the hypothesis of the origin of life by showing how the multidisciplinary approach is essential to address this topic.

Number of lesson hours:

24

Potential interested PhDs:

All PhD students are potentially interested, as are all curious people. Only basic scientific knowledge is required. In particular, PhD students in chemistry, biology and physics will find notions similar to their courses and will be able to grasp ideas for personal study.

Scheduled program:

The course aims to retrace the fundamental prebiological stages of the origin of life and evolution of the biosphere. The most accredited theories regarding the birth and development of the first living organisms will be considered: panspermia, abiogenic origins, spontaneous generation, the hypothesis of the primordial soup of Oparin, the replicon, the world of RNA and DNA and others. We will consider the main chemical reactions that may have occurred on the primordial Earth, and which may have given rise to the formation of compounds essential for the survival and development of living organisms. Therefore, starting from the pioneering Miller-Urey experiments, we will describe possible reactions of formation of sugars (such as the Butlerov reaction), of amino acids and more complex molecules obtained from their condensation (nucleic acids). The environments in which such reactions may have taken place will also receive attention: hydrothermal springs, volcanoes, terrestrial depths (Gold's hypothesis), radioactive lagoons (Adam's hypothesis).

Some problems not yet resolved and of fundamental importance will be taken into consideration, such as the origin of chirality, the selection of particular molecules by living organisms to the detriment of others, self-organization, Orgel's paradox, self-catalysis in the replication of the first forms of life.

The approach will be integrated, both chemical and biological, with the use of a lexicon understandable to students of all scientific faculties.

Delivery mode:

Lessons, slides, round tables and workshops.

Course language:

English.

Learning modes:

participation in lectures, bibliographic work.

Methods for verifying learning:

Presentation to the supervisor of the bibliographic work and discussion of the work itself.