

Introduction to Astrochemistry – Part II: In Search of the Origin of Life

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Two alternative theories have been suggested so far on the emergence of life on Earth: (1) *exogenous delivery* and (2) *endogenous synthesis*. In the first theory, prebiotic molecules came from space on comets, asteroids and meteorites.

- (1) The rationale behind this suggestion is that prebiotic molecules have been observed in interstellar clouds, including star-forming (protostellar) regions. The basic idea is that prebiotic molecules were formed in the solar nebula, preserved during the early phases of the solar system formation in the body of comets, asteroids, and meteorites, and finally delivered to Earth by cometary and meteoritic impacts. In the framework of this theory, the so-called RNA-World hypothesis is addressed in some details.
- (2) In the endogenous theory, the synthesis of simple organic molecules having a potential relation to the origin of life occurred on our planet, starting from simple parent molecules already present, such as liquid water, methane and ammonia. The Urey-Miller experiment revealed the plausibility of this idea, as it showed that most of the twenty common amino acids, as well as pyrimidines and purines, could be produced from these simple precursor molecules with the help of an electrical discharge, which is effectively a laboratory proxy for atmospheric lightning and other energy sources. Since the complexity of a planet cannot be reproduced in a single laboratory experiment, in the framework of this theory, Titan –the largest moon of Saturn– plays a role because it has been postulated as a model of primitive.

In this seminar, both theories are presented and discussed. The connections with the laboratory investigations addressed in the part I of this series of seminars are also provided.

