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Understanding the emergence of life on Earth and beyond

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Abstract

In the context of the emergence of Life on Earth it has been showed that in suitable environments, components typical of both extraterrestrial (iperstenic chondrites and siderites) [1] and terrestrial minerals and rocks containing iron (magnetite and olivine), in spite of extreme sterilization procedures, may catalyze inorganic and organic reactions leading to self-assembly metallorganic entities having a complex and composite chemical structure able to perform several catalytic activities typical of modern biology [2], [3]. In light of evidence accumulated during several years on viable microorganisms - including bacteria, archaea and fungi - found in mineral-associated environments, such as different kind of sediments and rocks (among which evaporites) as well as deep drillings and space vacuum exposure experiments, the aim of this work is to present and discuss the results of past [4] recent [1], [2], [5], and ongoing (molecular and catalytic) studies supporting the multiple root genesis hypothesis (MuRoGe) already proposed [4] in order to approach the problem of the origin of life. According to this hyphothesis, taking into account energetic, evolutionary, pre-biometabolic and environmental aspects, emergence of life on Earth accomplished through multiple origins, in different times, environments and selective contexts in which-using terrestrial and extraterrestrial material-cooperative/competitive, synergistic, interactive processes, life may be appeared or will emerge and survived or will survive to possible "mass extintion" due to cosmic impacts.

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