

宇宙生物学のフレームワークの創成 A way to establish a framework of Astrobiology

丸山 茂徳^{1*}; 戎崎 俊一²; 中村 栄三³

MARUYAMA, Shigenori^{1*}; EBISUZAKI, Toshikazu²; NAKAMURA, Eizo³

¹ 東京工業大学地球生命研究所, ² 理化学研究所, ³ 岡山大学地球物質科学研究センター

¹Earth-Life Science Institute, Tokyo Institute of Technology, ²RIKEN, ³Institute for study of the Earth's interior, Okayama University

One of an ultimate mysteries of Science is the existence of life in the Universe. In regard to this question, three ideas have been provided; (1) The Universe teems with life, (2) No other life other than Earth life, and (3) between 1 and 2. Also, we have two simple questions about life. (1) Is primitive life constantly emerging on present Earth? (2) Once whole life is killed, another new Earth life will emerge on the Earth? The answer to both questions is No.

Astrobiology is the academic field that can provide minimum conditions to bear life in the Universe, and also collateral conditions to make a planet to have civilization. Here we summarize such conditions to have life with civilization. To emerge life on the Earth, there are numerous kinds of conditions which are intricately interrelated. Here, we categorized such complex conditions into three groups. (1) Conditions to make life-sustainable planets derived from planetary formation theory. This category lists 19 conditions. For example, elliptical orbit is unacceptable condition for life. Even if such planet is covered by liquid water, planet is to experience snowball for half the year, and for other half year water component turn to vapor due to red hot scorching environment like Venus. (2) Conditions to emerge and evolve life on the planet. This category includes 7 significant conditions which control the emergence and evolution of life. One of conditions is lifetime of carbon. Carbon is necessary component for life body, however the amount of carbon for life is decreasing through time. Carbon will be depleted in 1 billion years, indicating termination of life. (3) Conditions to have civilization on the planet. This category has 5 conditions. The most significant condition is brain development. Discontinuous upgrowth of brain differentiate human being from chimpanzee, and human is to establish civilization finally.