

## ***Interactive comment on “Fundamental molecules of life are pigments which arose and evolved to dissipate the solar spectrum” by K. Michaelian and A. Simeonov***

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"Fundamental molecules of life are pigments which arose and evolved to dissipate the solar spectrum" by K. Michaelian and A. Simeonov

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Manuscript “Fundamental molecules of life are pigments which arose and evolved to dissipate the solar spectrum” by Karo Michaelian and Aleksandar Simeonov, I found very interesting as its introduction contains informative and comprehensive survey concerning evolution of Earth atmosphere. Secondly, the main premise of the hypothesis presented in this paper, that the solar light has provided the free energy for a number

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of photochemical reactions leading from H<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, HCN, H<sub>2</sub>O and common polycyclic aromatic hydrocarbons to the earliest more complex organic molecules, pigments which absorb light in far ultra-violet spectra and are considered as fundamental molecules of life, is reasonable, well founded and represents a novel concepts and ideas on the origin of life scientific area. RNA, DNA, the aromatic amino acids, and enzymatic cofactors absorb and dissipate strongly when dissolved in water. Overall presentation of hypothesis is well structured and clear. The arguments are clearly presented, mainly based from the literature data and substantial conclusions are accomplished and assumptions clearly outlined. The formation of pigments is emphasized as a photochemical autocatalytic dissipative process driven by the entropy production. In addition work is particularly valuable in highlighting the role of solar energy as an essential feature of life. The manuscript also brings new valuable insights in the origin of life problematic. The presented hypothesis generally fits to the current "Coenzyme world" model on the origin of life. Overall article is well written in erudite manner and it addresses relevant scientific questions. Title and abstract clearly reflect the contents of the paper. A comprehensive list of references is also valuable and informative. Therefore, I consider and recommend to the editor submitted manuscript as acceptable for publication.

However at the end, I would like to recommend the authors, as the Earth system is also driven by the Earth inner heat, to mention submarine hydrothermal vents as an alternative spot for the origin of life. In addition, I would also recommend to the authors to discuss their hypothesis presented in this paper vis-à-vis Gaia Hypothesis and possible implications for it. Please refer to:

- Herrmann-Pillath, C. Revisiting the Gaia Hypothesis: Maximum Entropy, Kauffman's 'Fourth Law' and Physiosemeiosis. Frankfurt School – Working Paper Series 160, Frankfurt am Main: Frankfurt School of Finance & Management, 2011.

- Kleidon, A. Life, hierarchy, and the thermodynamic machinery of planet Earth. Physics of Life Reviews, 2010, 7, pp. 424–460.

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I would also suggest including in the final version also the responses on my remarks which I have risen in my previous post in discussion regarding this manuscript.

Evaluation of the manuscript according to Review criteria: - Scientific significance: Excellent (1) - Scientific quality: Excellent (1) - Presentation quality : Good (2)

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Interactive comment on Biogeosciences Discuss., 12, 2101, 2015.

**BGD**

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