
Remote sensing of extraterrestrial life: Complexity as the key characteristics of living systems

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Abstract

Motivated by the detection of planetary candidates around more than one thousand stars since 1995 and the beginning characterization of their major properties (orbit, mass, physical conditions and chemical composition of their atmosphere), the quest for understanding the origin and evolution of life from the broadest possible perspective comes into reach of scientific exploration. Due to the apparent lack of a better starting point, the search for life outside Earth is strongly influenced and guided by biological and biochemical studies of life on our planet so far. Furthermore, this search is built on the assumption that life – in the sense of animated matter – is qualitatively different from inanimate matter. However, the first constraint might unnecessarily limit our search, while the latter underlying assumption is not justified. In this study, a more general approach to search for life in the universe with astrophysical means is proposed, which is not based on the above constraint and assumption. More specifically, the property of living systems to possess a high degree of complexity in structure and its response to the environment is discussed in view of its potential to be used for remote sensing of extraterrestrial life.

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