What is life? New answers to an age-old question in astrobiology

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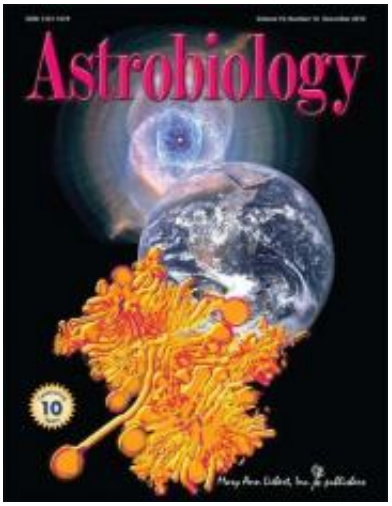

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Biologists have been unable to agree on a definition of the complex phenomenon known as "life." In a special collection of essays in *Astrobiology*, a peer-reviewed journal from Mary Ann Liebert, Inc., leaders in the fields of philosophy, science, and molecular evolution present a variety of perspectives on defining life. Tables of content and a free sample issue are available online.

Why is a definition of life so important yet so elusive? As David Deamer, Guest Editor and Research Professor of Biomolecular Engineering, University of California, Santa Cruz, writes in his Introduction, a definition is needed to help determine what is and is not life as scientists begin to develop artificial life forms in the laboratory and, in the future, dispatch exploratory rovers that investigate what appear to be life forms on other planets.

Mark Bedau, Reed College (Portland, OR) and the University of Southern Denmark (Odense), relies on the Program-Metabolism-Container (PMC) model to define minimal chemical life. He supports his belief that this integrated triad of chemical systems is all that is needed for a living organism to maintain its existence, grow, reproduce, and evolve, in the essay entitled, "An Aristotelian Account of Minimal Chemical Life."

Antonio Lazcano, National Autonomous University of Mexico, and colleagues present an historical perspective of the many definitions of life put forth over the years and why they have been unsatisfactory, in the essay, "The Definition of Life: A Brief History of an Elusive Scientific Endeavor."

Steven Benner, Foundation for Applied Molecular Evolution and The Westheimer Institute for Science and Technology (Gainesville, FL), explores the various definitions of life popular in the astrobiology community and how each is connected to a "theory of life." In the essay "Defining Life," Benner describes how chemical structures capable of Darwinian evolution might be useful as universal biosignatures.

Finally, an essay adapted from the writings of deceased Ukranian scientist Sergey Tsokolov asserts that feedback loops should be an essential component of any definition of life. Life could not exist in the absence of negative feedback, concludes Tsokolov in the essay "A

Theory of Circular Organization and Negative Feedback: Defining Life in a Cybernetic Context."

David Deamer commented, "These essays represent a remarkable effort on the part of the authors. We asked them to address a question that has challenged some of the great minds in biology, including Schrödinger himself, who initiated the discussion in 1944 with his book entitled "What Is Life?" Our authors rose to the challenge, and their ideas and perspectives are genuinely new. It was a pleasure to work with them and help them wrestle with this difficult and complex problem." Deamer is the new Senior Editor in charge of essays on timely topics for *Astrobiology*.

Provided by Mary Ann Liebert, Inc.