

Biology/Geology 350  
Invertebrate Paleontology: The History of Life on Earth  
Exam Number Two

**B**ACKGROUND: In the last century Louis Pasteur did a series of experiments that culminated several centuries of speculation and experimentation on the spontaneous generation of life from dead organic matter. Until that time it was widely believed that life could arise spontaneously without benefit of parents, but Pasteur's experiments finally demonstrated to the satisfaction of all scientifically minded people that life could not arise spontaneously. And thus for about half a century questions about the origin of life were non-questions and no one felt the need to ask them.

Beginning early in this century with writings by Alexander Oparin (*The Origins of Life*, 1929) and J.B.S. Haldane (*Origins of Life: The Central Concepts*, 1929) the questions were reopened from a much wider knowledge and understanding of chemistry and the history of the earth. Then Schrodinger's very influential 1944 book "What is Life?" (a physicist's look at life) led eventually to Stanley Miller's 1952 experiments demonstrating that organic compounds could easily be created from a few simple gasses, and energy. From that point on research into the origins of life have expanded dramatically. Not that there are still not formidable problems, but we have so much more to theorize about now.

Question One  
BIASES AND ASSUMPTIONS ABOUT THE ORIGINS OF LIFE

*To exit, to grow, to function, to survive . . . modern living system that most of us are familiar with must do two things.*

1. *Obtain and dissipate energy - (traditionally as ATP)*
  2. *Obtain and dissipate information for their biochemistry - (traditionally as RNA and DNA.)*
- That is, they must, as any open system must, be in a positive and negative feedback relationship. It is then axiomatic that once such a system comes into existence it will increase the quality of its information (and complexity.)*

These are the traditional assumptions that underlie the search for the origin of life. But are they true? Using the handout "***Biases and Assumptions About the Origin of Life***" as a framework, write a plausible scenario for how life could have arisen spontaneously from the inorganic stuff of the universe.

In your discussion you should address each bias and assumption in the list, but do not have to discuss them in any particular order. Plus, you may combined and discussed more than one together, just make it clear that you are doing so.

☺ Be sure to approach the problem from the point of view of evolving, open dissipative systems, and the necessary stratified stabilities along the way.

- ☉ Include where appropriate along the way theoretical discussion of Genetic Algorithm systems (e.g. Gene, Microant, etc), fitness landscapes, autocatalytic networks, autopoietic networks, hypercycles, quasispecies, and any other subjects required to answer the question.
- ☉ Include discussion of the essential core information and energy dissipating components in life systems and the biochemical substrates in which they exist.

***If this question is part of the test you may have in front of you the handout: “Biases and Assumptions About the Origin of Life”***