

Chapter 11: The Myth of the Primordial Soup

Any discussion on the origin of life is not complete without considering the primordial soup. There is no direct evidence of the soup's existence, and on purely theoretical ground it should not exist. If it did exist, science can say with certainty that it was a very localized existence. That is it may have been a small puddle, near a volcano, right at the entrance of a cave, near an ocean or a river. The primitive ocean was definitely not the primordial soup. The ocean could not possibly serve as the soup because it would dilute the biological precursors, and it would not protect the precursors from ultraviolet light.

Many authors have criticized the concept of the soup. Its resilience in biology text books is quite amazing given that so few scientists believe that it ever existed.

"Accordingly, Abelson(1966), Hull(1960), Sillen(1965), and many others have criticized the hypothesis that the primitive ocean, unlike the contemporary ocean, was a "thick soup" containing all of the micromolecules required for the next stage of molecular evolution. The concept of a primitive "thick soup" or "primordial broth" is one of the most persistent ideas at the same time that is most strongly contraindicated by thermodynamic reasoning and by lack of experimental support." - Sidney Fox, Klaus Dose on page 37 in Molecular Evolution and the Origin of Life.

"the primitive ocean was steadily irradiated with a relatively high dose of solar ultraviolet light . . . A steady irradiation of a rather homogeneous solution results in degradative rather than synthetic reactions" Sidney Fox, Klaus Dose in Molecular Evolution and the Origin of Life.

"Based on the foregoing geochemical assessment, we conclude that both in the atmosphere and in the various water basins of the primitive earth, many destructive interactions would have so vastly diminished, if not altogether consumed, essential precursor chemicals, that chemical evolution rates would have been negligible. The soup would have been too dilute for polymerization to occur. Even local ponds for concentrating soup ingredients would have met with the same problem. Furthermore, no geological evidence indicates an organic soup, even a small organic pond, ever existed on this planet. It is becoming clear that however life began on earth, the usual conceived notion that life emerged from an oceanic soup of organic chemicals is a most implausible hypothesis. We may therefore with fairness call this scenario the myth of the prebiotic soup." - Thaxton, Bradley, Olsen on page 66 of The Mystery of Life's Origin.

"Contrary to earlier suggestions that essentially all stages of chemical evolution occurred in the open seas, it is now generally accepted that the concentration of the soup was probably too small for efficient synthesis....."- Nissenbaum, Kenyon, Oro, in the "Journal of Molecular Evolution," 1975.

Furthermore, any organic compounds not destroyed by UV light would react to form an insoluble polymer. This reaction known as the Maillard reaction would remove most of the organic molecules in the soup making them unavailable for chemical evolution.

"The rapid formation of this insoluble polymeric material would have removed the bulk of the dissolved organic carbon from the primitive oceans and would thus have prevented the formation of the organic soup." - Nissenbaum, Kenyon, Oro, Journal of Molecular Evolution, 1975.

In summary: 1) It is extremely difficult to create information and knowledge before life exists. 2) Excessive investigator interference is required to make biological subunits polymerize. 3) The prebiotic synthesis of the subunits required for DNA and RNA (especially ribose and cytosine) present some very serious design challenges. 4) It is unlikely that any single chemical can possess the required knowledge to replicate because it must not only know how to replicate, but it must also know how to use an energy source to drive its own replication. 5) Any favorable environment for chemical evolution would have been highly localized to a small puddle. 6) Because of the localized nature of the soup and the low concentration of biological precursors, any robust self replicating system (i.e. Life) would need the ability to synthesize many of the chemicals required for self replication. Any self replicating system lacking this capability would not be able to survive much less replicate.

Taken together the evidence suggests that the first living thing was not a self replicating molecule, but rather a system of chemicals that contained the knowledge required to replicate and the ability to couple this replication to an energy source. Furthermore, the scarcity of chemicals like ribose, adenine, and cytosine imply that for this system to survive, it must have been able to synthesize many if not all such chemicals from more abundant chemicals. All of these factors imply that the first living thing was not that much simpler than life as it exists today. It may have even been more complex.

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