

INVESTIGATING ORIGINS

By Stephen Caesar
Associates for Biblical Research

“Prebiotic Soup?”

The origin of life is one of the most hotly debated topics in science today. The current reigning theory is that life first sprang from non-life in a “prebiotic soup” (“prebiotic” means “pre-life”) of various chemicals in the early Earth’s oceans. Over vast amounts of time, some of these chemicals gradually came together and formed molecular chains that would eventually form the first primitive life forms.

Despite the popularity of this theory, it is more speculation than scientific fact. One of the leading experts in this field is Antonio Lazcano, professor of the origin of life at the Universidad Nacional Autónoma de México and president of the International Society for the Study of the Origins of Life (ISSOL). He wrote in the journal *Natural History*:

“Given so many difficult and unanswered questions about life’s earthly origin, one can easily understand why so many investigators become frustrated and give in to speculative fantasies. But even the most sober attempts to reconstruct how life evolved on Earth is a scientific exercise fraught with guesswork. The evidence required to understand our planet’s prebiotic environment, and the events that led to the first living systems, is scant and hard to decipher. Few geological traces of Earth’s conditions at the time of life’s origin remain today. Nor is there any fossil record of the evolutionary processes preceding the first cells” (Lazcano 2006: 37).

One theory of life’s origin is the “heterotrophic” theory, which maintains that the first life evolved “abiotically,” that is, from systems of nonliving organic molecules (“organic” means it contains carbon). According to this theory, amino acids were chemically combined in a prebiotic soup and “cooked” by various sources of energy (Ibid.).

Two famous experiments were conducted to prove the plausibility of this scenario. The first was performed by Stanley Miller and Harold Urey in 1953; they created a “prebiotic soup” in a laboratory, ran a current through it, and produced carbon-based compounds. “But if a highly reducing [containing certain gases necessary for life] atmosphere was destined for the scientific dustbin,” notes Lazcano, “so was the origin-of-life scenario to which it gave rise” (Ibid. 36).

In 1988, chemist Günter Wächtershäuser theorized that iron and sulfur were necessary for the first life to appear. Despite its wide popularity, as Lazcano pointed out, “there is little empirical support for Wächtershäuser’s hypothesis” (Ibid. 39). He goes on to point out that, “since the Earth’s geologic record from those early times is so sparse, the rocks cannot answer the kinds of questions raised by the Miller-Urey and Wächtershäuser experiments. Most rocks that are more than three billion years old have so thoroughly metamorphosed that life’s precursor molecules are no longer detectable. There is no direct evidence of Earth’s environmental conditions at the time of life’s origin, either. No one knows the temperature of the early Earth, its ocean acidity, the composition of its atmosphere, or any other factors that may have substantially affected early life. Nor is there any fossil record of entities predating the first cells” (Ibid. 39-40).

The Miller-Urey and Wächtershäuser experiments did show that amino acids, purines, and pyrimidines, all of which are biologically significant, easily formed under atmospheric conditions thought to be like those of the early earth (Ibid. 40). “Yet,” cautions Lazcano,

“exactly how those simple organic compounds assembled themselves into more complex molecules, or polymers, and then into the first living entities remains one of the most tantalizing questions in science” (Ibid.).

Some scientists speculate that RNA may solve this “tantalizing question.” According to Lazcano, “the first entities that could replicate, catalyze, and multiply would have truly marked the origin of life and its evolution. Surely, RNA meets all those requirements. But RNA is also highly unstable. A self-catalyzing, self-replicating RNA molecule is unlikely to have arisen spontaneously. So where did it come from? The answer is not so clear. This difficulty has led to the suggestion that a pre-RNA world of primordial living systems predated and gave rise to the RNA world. Such a pre-RNA world would have spawned the first ‘genetic polymers’ capable of encoding and perhaps transmitting information....Did systems of such polymers predate the RNA world? The answer to that question remains unknown. Precisely how the first genetic machinery evolved also persists as an unresolved issue....The exact pathway for life’s origin may never be known” (Ibid. 41).

Reference:

Lazcano, A. 2006. “The Origins of Life.” *Natural History* 115, no. 1.

Stephen Caesar holds his master’s degree in anthropology/archaeology from Harvard. He is a staff member at Associates for Biblical Research.