



SECTION
12.3

ORIGIN OF LIFE
Reinforcement

KEY CONCEPT The origin of life on Earth remains a puzzle.

Details of Earth’s beginnings are still unknown, although most scientists agree that (1) Earth is billions of years old, and (2) the conditions of early Earth were very different from those of today. The most widely accepted hypothesis of Earth’s origins proposes that the solar system was formed by a condensing **nebula**, a cloud of gas and dust in space. This hypothesis is supported by computer models and observations made with the Hubble Space Telescope.

There are several sets of hypotheses to explain how life began on Earth. Organic molecule hypotheses consider how the very first life-supporting molecules arose on Earth. One organic molecule hypothesis was proposed as a result of a famous experiment. Stanley Miller and Harold Urey modeled conditions of early Earth in the laboratory and found that organic molecules can be made from a mixture of gases (representing the atmosphere) and an electrical current (representing lightning). The Miller-Urey hypothesis suggests that organic molecules formed spontaneously on early Earth. Another organic molecule hypothesis, known as the meteorite hypothesis, proposes that the first organic molecules on Earth arrived from outer space. A meteorite that fell to Earth in 1969 was found to have more than 90 amino acids, and was the basis for this hypothesis.

Early cell structure hypotheses consider how the first cells may have formed. Examples include the iron-sulfide bubbles hypothesis, which proposes that chimneylike structures on the ocean floor contain compartments that may have acted as the first cells. Laboratory experiments modeled this process, creating similar structures with elements such as iron, sodium, and sulfur. Another early cell structure hypothesis is the lipid membrane hypothesis. The lipid membrane hypothesis is based on the observation that lipid, or fat, molecules spontaneously form spheres that resemble cells. Perhaps they acted as the first cell membranes.

One hypothesis considers early genetic material. The discovery of **ribozymes**, RNA molecules that can catalyze specific reactions, led to the hypothesis that perhaps RNA came before DNA on early Earth.

CHAPTER 12
The History of Life

1. What are two types of evidence that support the hypothesis that Earth and the rest of the solar system was formed by a condensing nebula?

2. How did the Miller-Urey experiment model conditions of early Earth?

Copyright © McDougal Littell/Houghton Mifflin Company.