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The origin of life was highly speculative until a graduate student at the University of Chicago, Stanley Miller designed and conducted an empirical research project under the guidance of his graduate advisor, Harold Urey. In this classic experiment, the researchers tried to simulate the chemical evolution process that generated life. Miller and Urey took a five-liter flask half filled with water and connected it with glass tubing to another flask into which they inserted tungsten electrodes. They then mixed methane, hydrogen, and ammonia into the water in the lower flask and heated it to induce evaporation, while at the same time subjecting it to continuous electrical charges that jumped across the space between the electrodes in the upper flask. The atmosphere was cooled again so that the water could condense and trickle back into the first flask in a continuous cycle. In this way, they sought to recreate the conditions in the early atmosphere of Earth, which they speculated was probably subjected to powerful electrical storms. In about an hour, the water turned orange. At the end of the first week, they observed that almost 15 percent of the carbon was converted into organic compounds. After several weeks, the liquid in the flask clouded and then gradually turned a dark brown. When they analyzed it, Miller and Urey found that it contained a large number of amino acids, which form one of the basic structures of living organisms. They then hypothesized that the amino acids that they had created in the laboratory might be typical of the chemical mixture of the early oceans on Earth, and further, that additional amino acids could have been added to the mixture in the early oceans by car- bon enriched meteorites or comets.

When the scientific results were popularized, the mixture became known as “primordial soup.” However, much was still unknown about the process that caused the first cell to develop within the soup. The molecules produced were relatively simple organic molecules, not a complete living biochemical system. Nevertheless, the experiment established that natural processes could produce the building blocks of life without requiring life to synthesize them in the first place. The experiment served as inspiration for a large number of further investigations.

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Source: Barron’s