



## The Beginnings of Organic Chemistry

Today, “organic chemistry” refers to the study of carbon compounds. However, organic chemistry was originally thought of as unique among all chemical sciences, because it emphasized the study of compounds that came from living organisms. Chemists of the early 19th century viewed organic compounds as fundamentally different from inorganic compounds, such as rocks and minerals, because organic compounds seemed to come only from living things. But because living organisms are built from carbon-containing molecules, organic chemistry later came to mean the study of carbon compounds, including those that are manufactured artificially.

Like modern researchers, early chemists were interested in the workings of the body. They tried to characterize the chemicals in blood, tissue, and urine. Urea, the molecule that the human body excretes to get rid of ammonia waste, was first isolated from urine in 1773. Although scientists could successfully isolate urea and other organic compounds, they did not know how to synthesize—that is, make from other, simpler chemicals—organic compounds. This tended to confirm a commonly-held belief, called *vitalism*, that organic compounds could only be made inside living organisms with the help of a special life force known as the “vital force.”



▲ *Friedrich Wöhler was the first to synthesize an organic compound from inorganic chemicals.*

In 1828, the young German chemist Friedrich Wöhler announced that he had been able to make urea from inorganic chemicals. Wöhler had been attempting to prepare ammonium cyanate,  $\text{NH}_4\text{OCN}$ , from inorganic compounds, such as silver cyanate and ammonium chloride. But Wöhler unintentionally synthesized urea as a byproduct of the reactions that he carried out! Wöhler made an exciting discovery—the first example of organic synthesis—by using the same principles of qualitative analysis used by chemists today.

The remainder of the 19th century saw the syntheses of many other organic compounds. In 1845, acetic acid was prepared in several steps from charcoal. Many other organic molecules, such as dyes and glucose (blood sugar), were synthesized in the last half of the 19th century. Gradually, as more natural products were prepared in chemistry laboratories, the concept of vitalism was abandoned.

Today, urea, acetic acid, and many other organic chemicals are produced in huge quantities. Organic chemists can synthesize complex drug molecules, such as penicillin and taxol, which were once available only from natural sources. Using methods of organic synthesis, chemists can also prepare completely new drugs, polymers, flavors, and dyes that are not present in nature.

### Questions

1. What do people usually mean by the term *organic* when they use it to describe food, such as fruits and vegetables?
2. Think of three things that you use in your everyday life and that an organic chemist might be able to make.