he stopped in Boston to watch a demonstration lecture on electricity by a Dr. Adam Spencer who had just arrived from Scotland. Unfortunately, Dr. Spencer's tricks did not work very well—it was a humid day. But Franklin became absorbed in the subject and at once ordered a 3-foot-long glass electrostatic tube for rubbing with silk. First, he noted the effect of pointed objects in "drawing off" and "throwing off" the active force. His next experiment was, to quote a Nobel prize winner in physics, "the most fundamental thing ever done in the field of electricity." Standing on a cake of wax, which he knew was a non-conductor, he stroked the glass tube vigorously with silk. Then, to rid himself of the electricity produced on himself and the silk, he touched an object connected to the ground. The tube remained charged electrically and with it various experiments could be performed.

From his experiments, Franklin concluded that objects normally were electrically neutral; the glass, when rubbed by silk, received "electrical fluid" from the silk. Electricity was simply transferred from one body to another during the process of rubbing (or touching, we now know). Franklin said, in effect, that electricity is not created, simply communicated. His one-fluid explanation was not altogether correct, but if we think of modern electrons composing that fluid, there exists a very analogous situation. He was the first to use the terms "plus" and "minus" in regard to electricity, although by "plus" he meant an excess of his single fluid and by "minus" a deficiency of it.

Next, Franklin studied the similarities of the sparks seen in static electrical experiments to lightning. Others had noted this, including Sir Isaac Newton—whose life, by the way, overlapped Franklin's by 36 years—but no one had produced experimental evidence. This Franklin provided in his famous kite experiment. To the kite he attached a pointed metal wire, and on the lower end of the hemp cord he hung a metal key from a piece of silk string. During a storm he brought his bare knuckle to the key. At once, a strong spark was seen and felt. Clearly, lightning too was attracted to sharp metallic points.

By about 1750, the first lightning rod had been installed on a house. In 1752, Franklin advertised his invention in his almanac Poor Richard Improved. When the news reached England, King George III was annoyed that a committee of the Royal Society had recommended use of sharply pointed rods to protect powder magazines from lightning, and he supported a minority report that a rounded-end rod be used instead. The King asked Sir John Pringle, the President of the Society, to lend his influence to the rounded-end school, but Pringle replied, "Your Majesty, I cannot reverse the laws and operations of nature."

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CHEMISTRY IN 1776*

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The bases of the science of chemistry were decisively altered ca. 1770-1780, by Lavoisier and others, in Europe (the Chemical Revolution). American chemistry had no one remotely approaching Franklin's stature in electrical studies.

The chemical industries in the American colonies before 1776 were those of a country with great natural resources, but limited technology. John Winthrop, Jr. (1606-1676), an early FRS who was knowledgeable in chemistry, medicine, and astronomy, started unsuccessful ventures in mining and in salt manufacture from sea water. The Colonies exported large amounts of tar (from pine trees) for the British navy (135,000 barrels from South Carolina in 1768); they prepared potash (impure K_2CO_3) by leaching wood ashes, and pearl ash (72-95% K_2CO_3) by recrystallization of potash. The production of indigo, a complex process, was centered around Charleston, South Carolina, and 134,000 lbs. were exported in 1747. Potassium nitrate was produced by decomposition of organic material; "cave nitrate" was not utilized until about 1800. Salt deposits were

* Highlights of a presentation made at the General Session of the Tennessee Academy of Science, November 1976.