

# Benjamin Franklin and Electricity

## QuickTime Presentation—Teacher Notes

### Slide One: Title Slide

### Slide Two: Franklin's Early Life

In the eighteenth century, Benjamin Franklin was recognized throughout America and Europe for his achievements as a writer, diplomat, and scientist.

At an early age, Franklin moved from Boston to Philadelphia, where he began a successful printing business. As owner, he published the *Pennsylvania Gazette* and *Poor Richard's Almanack*, a pamphlet with seasonal weather forecasts, practical household hints, and other amusements. He also established community projects such as the American Philosophy Society, the Pennsylvania Hospital, and Philadelphia's Union Fire Company. As a diplomat and statesman, he represented the American colonies and the new United States in Europe.

Franklin was intensely curious about the natural world. He was a keen observer who conducted many experiments. In the process, he developed many useful inventions, including the iron furnace stove (known as the Franklin stove), the lightning rod, bifocal glasses, and daylight savings time.

### Slide Three: Experiments with Electricity

In 1746, Franklin attended a Boston lecture on electricity. He was so fascinated that he bought the presenter's experimental equipment. Franklin conducted demonstrations for friends in Philadelphia, making ladies' hair stand on end and giving electrical shocks to willing volunteers. By 1747, he conducted serious experiments that led him to discover how electrons flowed and how electricity could be stored in glass bottles—the first use of batteries.

Franklin also experimented with electricity by observing its similarities with lightning. He is believed to have flown a kite in a lightning storm: when lightning struck the kite, the resulting electric shock sent a charge down the line.

People feared lightning in the eighteenth century. Tall structures were the most likely targets to be struck and set on fire. Franklin hypothesized that if lightning was electricity, maybe the danger from lightning strikes could be prevented. He conducted a few experiments that helped to prove his theory.

### Slide Four: The Scientific Method

Like scientist Isaac Newton, Franklin used a systematic scientific method for his experiments. After developing a hypothesis, Franklin formulated questions such as: "If lightning is electricity, how can people protect themselves from being struck by lightning?" "What kinds of materials attract electricity?" "Could a material that attracts electricity be used to divert lightning in a less harmful direction?"

Franklin then designed experiments to test his hypothesis. Through observation, he collected and analyzed experimental data. When necessary, he revised his hypothesis to reflect the results of the experiments. Franklin's experiments with electricity led directly to the development of the lightning rod.

### **Slide Five: The Lightning Rod**

Through the famous “kite experiment,” attributed to him, Franklin confirmed that lightning was a form of electricity. He then attempted to devise a way to draw the electricity in lightning away from a structure to a grounded object, rendering the charge harmless.

From earlier experiments, Franklin proved lightning tended to strike tall objects and that discharges of electricity were more attracted to pointed objects. He hypothesized that by placing a grounded iron rod high on a building, lightning could be drawn away. Rather than striking the building, the resulting electrical charge would run harmlessly into the ground. Franklin created an experiment to test his theory. He waited for a Philadelphia church steeple to be completed so he could conduct the experiment.

In the meantime, scientists in France also experimented with electricity, using many of Franklin’s discoveries. Several French scientists devised and tested a lightning rod using Franklin’s proposed plan, successfully proving that electricity from lightning could be drawn to a large rod and safely directed to the ground.

### **Slide Six: Lightning Bells**

When Franklin heard about the French experiments, he took the discovery a step further. He installed a tall insulated iron rod on the roof of his house and ran a connected conducting wire down a stairwell into the ground. He then cut the wire in the middle and slightly separated the two ends. Then he placed two bell chimes on each end of the wire, and suspended a small metal ball between the bells.

When an electrified cloud passed overhead, it sent a charge to the iron rod on the house and down the wire to the lightning bells. The charge caused the metal ball to move and ring the bells. This effectively created an early warning system that signaled when an electrical storm was nearby.

Based on the results from these experiments, Franklin advocated using lightning rods to protect public buildings from lightning and fire damage. Soon afterward, people began installing lightning rods on many public buildings and homes.

### **Slide Seven: END**