1. Electricity—Setting the Stage

Long before Benjamin Franklin conducted his famous kite-flying experiment, mankind had been fascinated by the concept of electricity. The Greek philosopher Thales, in the 500s B.C., observed that if you rubbed a piece of amber with a cloth, it attracted small pieces of straw, and in A.D. 1551, Jerome Cardan, an Italian mathematician, observed that while amber attracted a variety of lightweight objects, **loadstone**, a magnetic black rock, attracted only iron.

Subsequent historic developments in electricity explored the conductivity of various substances. Scientists noted that some objects attracted one another while others repelled each other. In 1746, Benjamin Franklin developed a theory to explain how oppositely charged objects neutralized each other, though he was unaware of the role electrons played in this process. Several decades later, a French scientist named Charles A. de Coulomb formulated Coulomb's law, which states that "the force between two electrical charges is proportional to the product of the charges and inversely proportional to the square of the distance between them."[1]

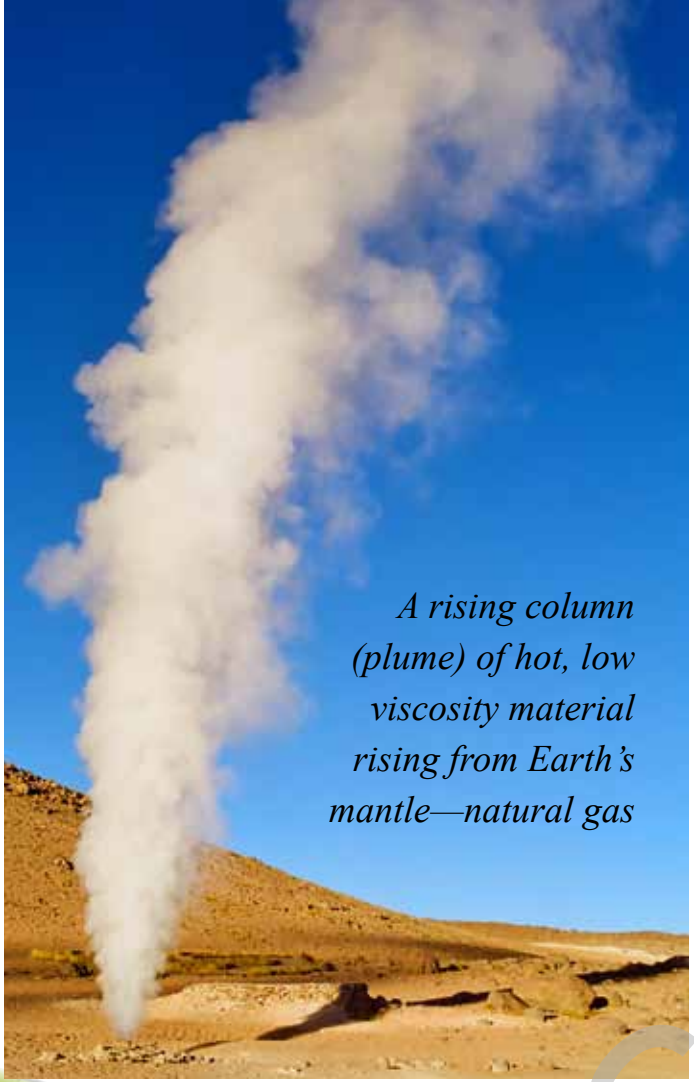
Franklin confirmed his hypothesis that electricity from lightning could be transferred to an object.

Repairman climbing a cell phone tower

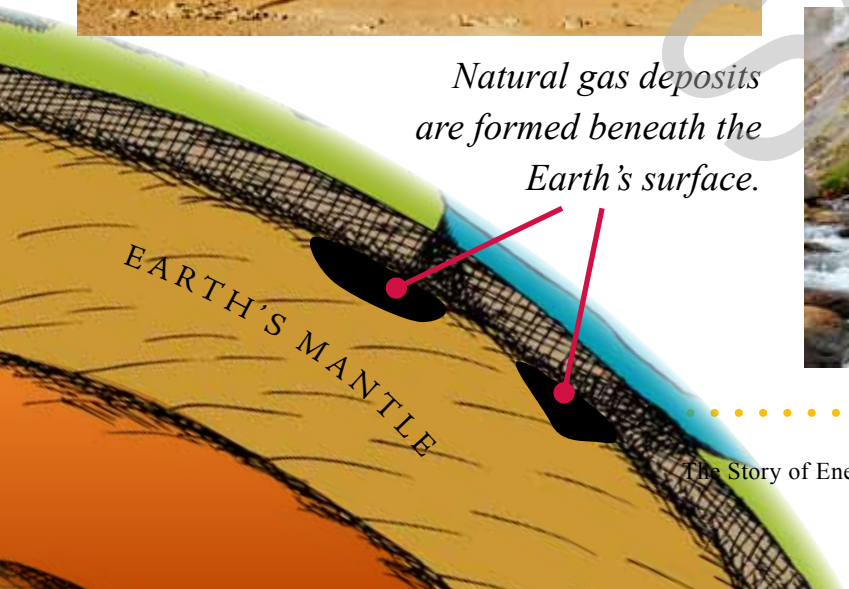
Scientists had proven that electricity existed. Now they needed to develop a way to conduct it. An Italian professor named Count Alessandro Volta investigated the role chemistry could play in the field of electricity. In the late 1790s, he developed the first battery capable of providing a steady electric current; it was called the **voltaic pile**. He constructed it out of one silver disk and one zinc disk that were separated from one another by a paper or cloth that had been treated with a salt solution.

The final step in electricity's journey to becoming an integral part of our everyday life was its generation. In 1820, a Danish scientist by the name of Hans C. Oersted proved that an electrical current could influence the direction of a compass needle. Michael Faraday took this research a step further. Could he prove that if electricity produced magnetism that the opposite was also true? Could magnetism produce electricity? In 1831, both Faraday and an American scientist named Joseph Henry, working independently from each other, proved that this was indeed the case. The groundwork for the production of today's generators and transformers had been laid.

Did you know that our English word electricity *comes from the Latin word meaning "amber":* electrum*?*



A rising column (plume) of hot, low viscosity material rising from Earth's mantle—natural gas



Natural gas deposits are formed beneath the Earth's surface.

2. Natural Gas—Setting the Stage

When we talk about using gas for energy, we are talking about one of two kinds of gas—**natural gas** or **manufactured gas**. Natural gas is formed beneath the Earth's surface and then carried to the Earth's surface by drilling. Manufactured gas is produced when heat and chemical processes are applied to coal or petroleum. The history of natural gas and the history of manufactured gas involve different discoveries and inventions. For the purpose of this book, we are going to discuss the development of natural gas as an energy resource.

Thousands of years before Thales made his discoveries about amber, the Chinese had realized the enormous potential of natural gas. As they discovered deposits of this vast resource, they developed ways to pipe natural gas through bamboo poles and harness its energy to separate salt from saltwater by boiling the water. In the A.D. 600s, priests in Baku, Azerbaijan, engineered a system of pipes to bring natural gas from nearby rocks into temple shrines, providing worshipers with fires that never burned out.

In 1775, in the British colonies in North America, there were reports of mysteriously burning pillars of fire and a spring of water that was on fire. These fires were likely caused as natural gas seeped into the air and water and was then ignited.

In 1821, a man in Fredonia, New York, set out to drill a well for water, but when he found mysterious bubbles rising in it, he abandoned his efforts. A short while later, William Aaron Hart drilled the first natural gas well in the United States on that very spot. Five years later, a second natural gas well was drilled near Westfield, New York. However, the natural gas industry was almost forgotten when another underground substance—oil—was discovered in Titusville, Pennsylvania, in 1859.

3. Distributing the Supply—Electricity

Today, electricity is manufactured by various kinds of power plants, including **fossil-fueled steam electric plants** (powered by burning coal, oil, or natural gas), **hydroelectric plants** (which generate power from moving water), **nuclear power plants** (powered by a nuclear reactor), and **geothermal power plants** (which harness the power of steam found deep underground).

The electricity that leaves these plants has a long journey to travel in order to get to your home or office, and it must be carefully and safely handled each step along the way. Keep in mind that the same electricity that powers machines hot enough to melt plastic or bake bricks also provides the soft glow of your desk lamp or nightlight! Control of the amount of current as it travels along power lines is a key component involved in the safe transportation of electricity, which is accomplished via a system of transformers and substations that are pieces of the nation's electrical grid.

Nuclear Power Plant

Geothermal Pool

Hydroelectric Power Plant