The Language of Electricity

A formal study of physics requires use of some of the basic language of electricity that was introduced in this and previous sections. (The terms to which you were introduced in the previous sections are shown in *italics*.)

- There are two kinds of **electric charges**, positive and negative. **Protons**, which have a positive charge, and **electrons**, which have a negative charge, are the source of these charges.
- Like charges repel, and opposite charges attract.
- There is a smallest amount of the property called electric charge, the amount possessed by one proton or one electron. While protons and electrons differ in several ways (such as mass), an electron and a proton have an identical amount of charge.
- Electrons move in *electric circuits* of the kind you have been exploring. They carry the *electric current* as they flow through the circuit path, delivering energy that is transformed into light and heat by the light bulb. Protons, although present in the materials from which circuits are made, do not flow because they are locked within atoms.
- Scientists have agreed upon a standard "package" of electric charge, called the *coulomb* (C). The charge of a single proton or electron is 1.6×10^{-19} C. In order to get a single coulomb of charge, it would take 6.25×10^{18} electrons (6.25 billion-billion, an amount equal to one over the charge of the electron). One coulomb is approximately the charge transferred during a lightning bolt.
- Scientists have agreed upon a standard rate of flow of the electric current in circuits. When one coulomb of charge passes through a point in a circuit during each second of time, the current is said to be one *ampere*, often abbreviated to amp and written with the symbol A.
- Different materials offer different electrical resistance, or opposition, to the flow of electric charge through them. That's what the word "resistance" means, opposition to the flow of electric charge. A material in an electric circuit that offers resistance is called a *resistor*. Tungsten, from which light bulb filaments are made, has high electrical resistance. When electricity flows through a light bulb, for instance, the part that glows is a metal called tungsten. It "robs" energy from the moving electrons, gets hot and glows. Copper, by contrast, has low resistance; electrons transfer very little energy when flowing through copper. That is why copper wire is used to conduct electricity in electric circuits. Electrical resistance is measured in **ohms**. The symbol for an ohm is the Greek letter *omega*, or Ω.
- *Batteries* or generators provide energy to the electrons. These electrons are then able to light bulbs, heat wires, or make motors turn. The energy given to each coulomb of charge is measured in *volts* (V).