BACKGROUND

Electric Charge

Electricity is one of the most important forces around, as far as living things are concerned. The electrical force allows atoms to form molecules, and together with the magnetic force, propagates light. That is to say nothing of the electricity that powers our cars, homes, and schools.

The electromagnetic force, like gravitation, varies inversely as the square of the distance—that is, it obeys the inverse square ratio—but electromagnetism is billions of times stronger than gravitation. Also unlike gravitation, which is an "attractive" force only, electromagnetism has both an attractive nature and a "repulsive" nature. These natures are known as electric charge.

Electric charge can be positive or negative.

In the universe, clusters of positive and negative charges are bound together in atoms, so the universe is generally electrically neutral. But on a smaller scale, it is relatively easy to see the result of electric charge. Electric charge can be positive or negative. Opposites always attract, which is why the negatively charged electrons orbit the positively charged nuclei of atoms. Like charges repel one another, which is why the protons in atoms do not normally clump together in large groups.

In any neutral atom, there are as many positive charges as negative charges. We say that the atom is balanced. Occasionally, electrons are lost, and this makes the atom unbalanced, or electrically charged. In the case of the loss of an electron or two, the atom is positively charged. Some atoms lose their electrons more easily than others. For instance, your hair loses electrons to a plastic comb. This makes the comb negatively charged, while your hair is positively charged. When something is charged, like the comb, electrons are merely transferred—they are neither created nor destroyed. Charge, therefore, is said to be conserved.

Electrical force decreases inversely as the square of the distance between the charges. This relationship was discovered by Charles Coulomb in the 1700s. **Coulomb's law** states that for charged objects that are much smaller than the distance between them, the force between the two charges varies directly as the product of the

