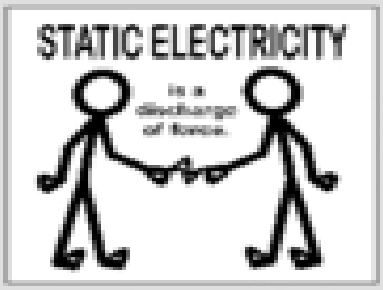
Static Electricity:
How Do We Experience a Transfer of Charge?



Static electricity is a common everyday experience. You experience it when you remove a wool hat from your head and your hair stands on end. Or as you discover when you walk across a carpeted floor, and get a shock when you touch a friend's hand. Or what about the sticky balloon? You can observe this when you rub a balloon on a sweater or your hair, then hold it to the wall and watch it stick.

To understand static electricity, we must review the structure of atoms. An atom is the simplest building block of an element, such as carbon. Each carbon atom has 6 protons in the nucleus, with 6 electrons orbiting around the nucleus. The protons in the nucleus are difficult to remove, but the electrons orbiting around the nucleus can be transferred from one atom to another. When electrons are transferred from one atom, or material, to another, a negative charge builds up. This negative charge will seek to flow, or move, toward a more positively, or neutrally charged material. The charge movement and charge transfer is called static electricity.

Let's [illegible] from [illegible] air has a net positive charge. Each hair, with a positive charge on it, repels the hair next to it, so you have a wacky head of hair with each hair sticking out. The balloon, meanwhile, with a net negative charge, will stick to a positive or neutral surface, such as a wall. It sticks there until the electrons have been transferred from it to the wall, then it falls down, a neutral balloon once again.

Throughout this transferring of electrons back and forth, we have what is called a conservation of charge. This means that electrons are neither created nor destroyed during the transfer, but are only moving from one material to another. The net charge of the system stays the same. Also, we have standard behavior for charges observed. This means that like charges repel (positive repels positive, negative repels negative). Unlike charges attract (positive attracts negative).

Why does it seem that you observe static electricity more frequently in the winter? If you live in a cold, dry climate, this is especially easy to observe. This is because charges build up from static electricity more easily in dry air. In humid, moist climates, charge dissipates into the air more easily. You may have heard that water is a good conductor of electricity. This is why you are told not to go swimming during a lightning storm. Similarly, electrons move off of statically charged materials, and onto water molecules in the air. But during the dry winter, you may get a shock from walking across a carpet, building charge up on yourself, and then touching a doorknob. The static electricity moves from you to the metal doorknob, giving you a zap!