Bohr's Model of the Atom

Diagrams of an atom that look like a solar system with planets revolving around a sun are based on a model of the atom that was developed by Neils Bohr, a Danish physicist who worked for a while with Rutherford. Bohr agreed with Rutherford's model of a nucleus surrounded by a large volume of space. But Bohr's model did something that Rutherford's model did not do. It focused on the electrons. A description of electrons in an atom is the centerpiece of the modern atomic model.

In Bohr's model, electrons move with constant speed in fixed orbits around the nucleus, like planets around a sun. Each electron in an atom has a specific amount of energy. If an atom gains of loses energy, the energy of an electron can change. The possible energies that electrons in an atom can have are called energy levels. To understand energy levels, picture them as steps in a staircase. As you move up or down the staircase, you can measure how your position changes by counting the number of steps you take. You might take one step up, or you might jump two steps down. Whether you are going up or down, you can move only in whole step increments. Just as you cannot stand between steps on a staircase, an electron cannot exist between energy levels. The landing at the bottom of the staircase is like the lowest energy level in an atom.

Each step up represents a higher energy level. The distance between two steps represents the difference in energy between two energy levels. To continue the analogy, there would be a different staircase for each element because no two elements have the same set of energy levels. An electron in an atom can move from one energy level to another when the atom gains of loses energy. An electron may move up two energy levels if it gains the right amount of energy. As electron in a higher energy level may move down two energy levels if it loses the right amount of energy. The size of the jump between energy levels determines the amount of energy gained or lost.

What evidence is there that electrons can move from one energy level to another? Scientists can measure the energy gained when electrons absorb energy and move to a higher energy level. They can measure the energy released when the electron returns to a lower energy level. The movement of electrons between energy levels explains the light you see when fireworks explode. Light is a form of energy. Heat produced by the explosion causes some electrons to move to higher energy levels. When those electrons move back to lower energy levels, they emit energy. Some of that energy is released as visible light. Because no two elements have the same set of energy levels, different elements emit different colors of light.