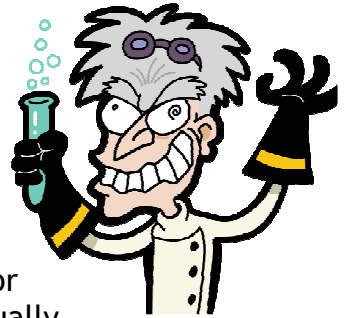# Independent Variables, Dependent Variables, and Constants

Scientists design experiments to search for cause and effect relationships. In other words, they design an experiment so that changes to one item cause something else to vary in a predictable way. These changing quantities are called **variables**. A variable is any factor, trait, or condition that can exist in differing amounts or types. An experiment usually has three kinds of variables: independent, dependent, and controlled.

The **independent variable** is the one that is changed/controlled by the scientist. To ensure a fair test, a good experiment has only one independent variable. As the scientist changes the independent variable, he or she observes what happens or results from that change.

Scientists collect data on the **dependent variable** to see how it responds to the change made to the independent variable. The new value of the dependent variable is caused by and depends on the value of the independent variable. For example, if you open a faucet part way (the independent variable), the quantity of water flowing (dependent variable) changes in response--you observe that the water flow increases.

Experiments also have **constants** or **controlled variables**. Controlled variables are things that a scientist wants to remain the same throughout the experiment. Consequently, they must watch over the constants carefully so they do not influence the dependent variable in a misleading way. For example, if we want to measure how much water flow increases when we open a faucet, it is important to make sure that the water pressure in the pipes (the controlled variable) is the same through the entire experiment. That's because both the water pressure and the opening of a faucet have an impact on how much water flows. If we change both of them at the same time, we can't be sure how much of the water flow is because of the faucet opening and how much because of the water pressure. In other words, it would be a fair test. Most experiments have more than one controlled variable.