**The Scientific Method Continued: Parts of a Controlled Experiment**

When scientists set out to test a hypothesis with an experiment, they must first think about the variables that may affect the outcomes of the experiment. A **VARIABLE** is any condition that may cause a change in the system being studied. Some variables are measured quantitatively (with numbers or values), like temperature, mass or height. Other variables are recorded in a qualitative manner, like color, texture or species. The most important factor is that the scientist runs a **CONTROLLED EXPERIMENT**. In a controlled experiment, only one variable is changed or tested at one time to ensure that the effect of that one variable can be measured. In other words, in a controlled experiment only one factor is changed so that scientists will know what caused the results achieved. If too many factors are tested at one time there is no way to know which factor caused the results in the experiment.

In a controlled experiment there are two main groups: the **CONTROL GROUP** and the **EXPERIMENTAL GROUP**. The control group consists of the part of the experiment left as close to natural or unchanged as possible. This is an important part of a controlled experiment because it gives the scientist a reference point for comparison of the experimental group. The experimental group consists of the part of the experiment in which one factor (and only one factor) is changed. This one factor that is changed or tested in the experimental group should be the only things that makes it different from the control group. For example, an experimental group may be a group of monkeys receiving an experimental medication which the control group would be a group of the same kind of monkey but do not receive the experimental medication. Both groups’ results can then be compared to determine the effects of the experimental medication.

When designing a controlled experiment, scientists also need to consider the variables/factors of the experiment needing to be tested. The **CONTROL FACTORS** are all of the things in the experiment that are kept the same between the control and experimental groups. The **VARIABLE FACTOR** (sometimes called the experimental factor) is the ONE thing different between the control and experimental groups. Going back to the monkey example above- the control factors are everything kept the same between the two groups including: the type of monkeys used, the amount of food and water given to the monkey, the surroundings of the monkey, etc. The variable factor would be the amount of experimental medication given to the monkeys in the experiment.

Two more variables you need to understand: the **INDEPENDENT VARIABLE** and **DEPENDENT VARIABLE** in a controlled experiment. The independent variable is the factor or variable controlled or determined by the experimenter. This variable is also sometimes called the “manipulated” variable. When graphing data from a controlled experiment, the independent variable always goes on the X- axis. Examples of independent variable include: time or duration of the experiment, temperature, depth, etc because these are all factors the experimenter can determine or control. The dependent variable is what changes as a result of the change in the independent variable. This variable is sometimes called the “responding variable”. When graphing, the dependent variable always goes on the Y-axis. Using the monkey example one more time: the independent variable is the amount of experimental medication given to the monkeys and the dependent variable are the effects of the medication on the monkey.

Dependent Variable

Independent Variable