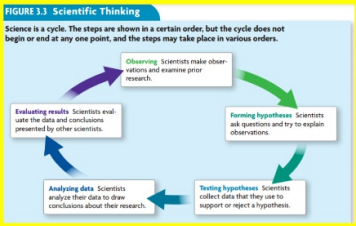
# 1.3 Scientific Thinking and Process

*Science is a way of thinking, questioning and gathering evidence
*Scientific thinking is based on curiosity and skepticism

I. Biology is a process of inquiry that requires evidence
A. Observations, Data and Hypotheses
1. Observation: using your senses to gather information
a. today we use computers and other technology as well
b. Inference: a conclusion based on the best available evidence
2. Data: important information collected during observation and experimentation

a. Qualitative data: descriptions written in words(color, texture) no measurements (think Quality)
b. Quantitative data: contain numbers from measurements like height, temperature, time etc (think Quantity)
*usually shown in tables and graphs

3. Hypothesis: a possible answer to a question that MUST be both Specific AND Testable
a. leads to a testable prediction of what would happen IF the hypothesis were valid (true)
b. predictions could be written in the form of an If...Then statement
c. Hypotheses are tested multiple times
d. data from tests are analyzed using statistics
*nonsignificant: no effect or a small effect that could be explained by chance
*Statistically significant: shows and effect that is not likely due to chance
e. Peer review: other scientists check for bias and make sure proper procedure was followed
4. Scientific thinking



5. Biologists use experiments to test hypotheses
    a. in an expriment scientists study Independant, and Dependent variables to find cause and effect
    b. Independent variable: a factor that is tested
        *manipulated (changed) by the scientist
        *the factor that should cause change
        *only test ONE at a time
        * on the X-Axis of a graph
    c. Dependent variable: the factor that changes because of the independent variable
        *what we measure and record
        *on the Y-Axis of a graph
    d. Constants: all of the other variables that are kept the same
6. Theories explain a wide range of observations and experimental results supported by a large body of evidence