

# The Scientific Method Lab

One thing, last weeks lab  
When I ask for “why” or “explain”, that  
is what I care about and that what I  
grade

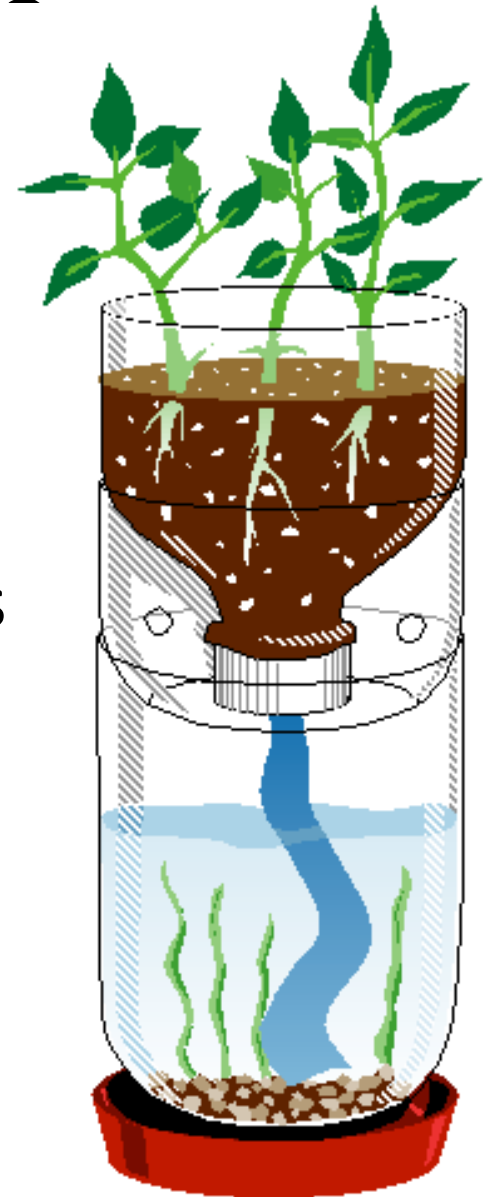
# What is Science?

- Process of explaining natural phenomena through observation and experimentation
  - Measure observed phenomena
  - Test hypotheses
  - Follow the Scientific Method



# What is a hypothesis

- provisional explanations requiring verification or falsification through testing
  - proposes a causal relationship between two variables
  - Predict how X will affect Y
- **(X) Independent variable(s)** – things that are
  - Water, sunlight, soil
- **(Y) Dependent variable(s)** – things that are affected
  - Height of plant
  - Thickness of roots
  - Number of leaves



# The Scientific Method

- Question
- Read
- Hypothesis
- Methods
- Collect data
  - Rigorous & replicable
  - Quantitative
  - Statistics
  - Falsifiable
- Relate back to your hypothesis



Repeat!

# The process of science generates a theory

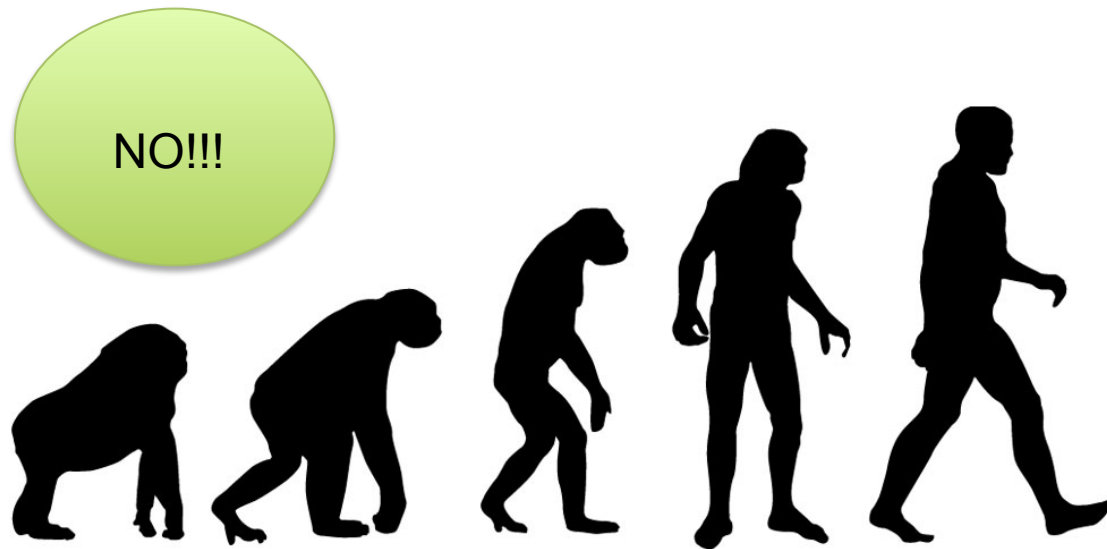
- broad statement of scientific relationships
- underlying principles
- substantially verified through the testing of hypotheses
- A broad explanatory statement of scientific fact
  
- It guides the formation of hypotheses to explain things observed in the world
- It has been supported by repeated and varied testing of related hypotheses
  
- **Hypothesis** - narrow focus explaining the relationship between a few specific phenomena

# Theory or Law

- A **theory** explains something and is supported by a lot of testable evidence
- A **law** is a description of a phenomenon that is consistently observed under specific conditions

# The Process of Evolution

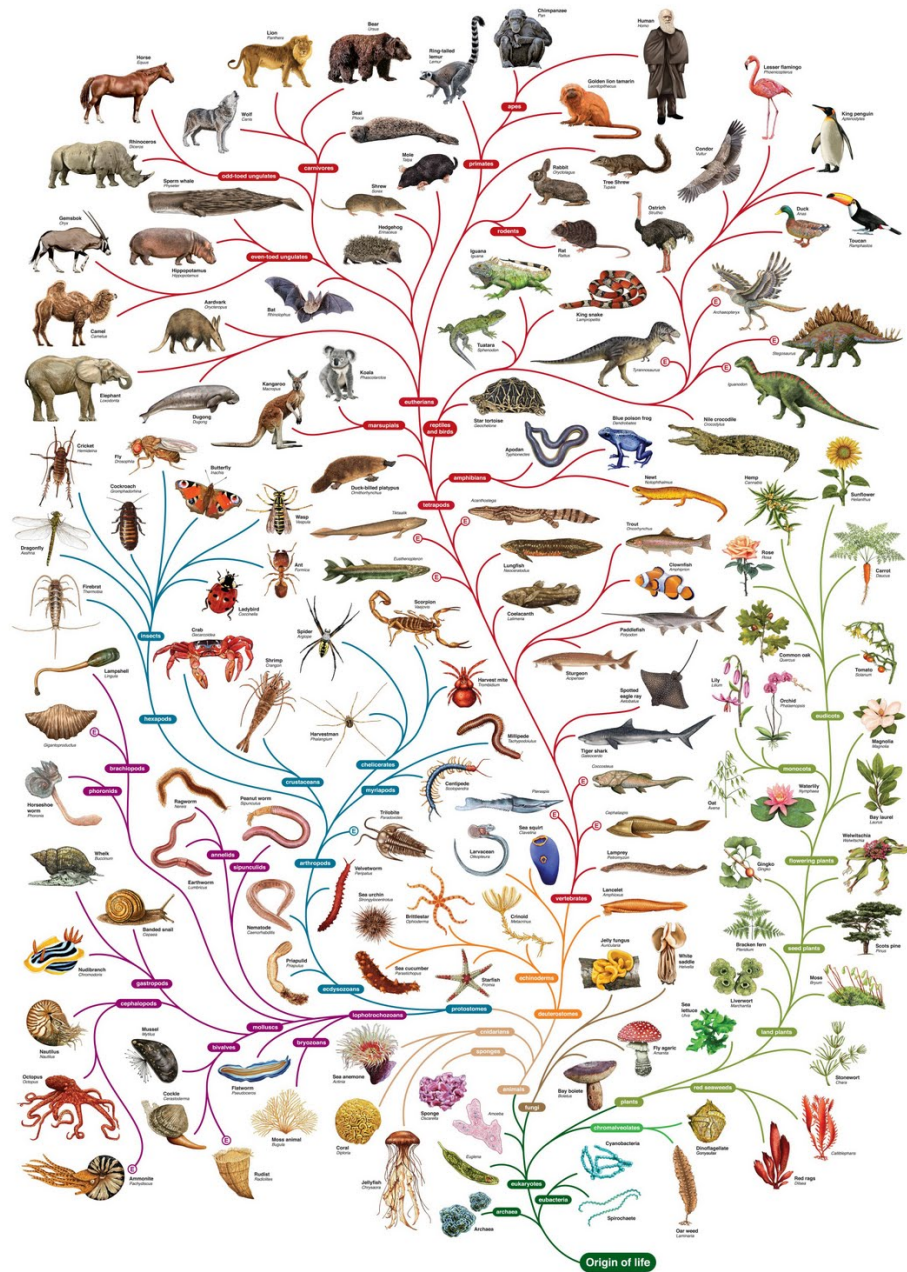
- **Evolution** is a change in gene frequency in a population from generation to generation
- **It is not** the changing from an ape into a human...that never happened



# The Real Shape of Evolution

- Instead, think of evolution as a branching tree, with everything connected





# The Process of Evolution

- For a **trait**, count the number of organisms with each form (different forms are called **alleles**) and you get the **frequency**
- You have certain traits because of your **genes**, made up of your **DNA**, which is the blueprint for your body
- The number of genes in a population that exists for each form of a trait (like blood type or eye color) is the **gene frequency**
- This is the basis for scientifically testing evolution

# How Evolution Occurs

- How do frequencies change?
- Evolutionary forces:
- **Migration** is the flow of genes from one population to the next
- **Genetic drift** is a skewed sample size from one generation to the next
- **Mutation:** any change in the genes from one population to the next
- **Natural selection:** individuals best suited to their environment will survive and reproduce

# Steps of Natural Selection

- More individuals are produced that can survive
- Variation means some are better adapted to their environment
- Individuals compete for limited resources
- Those with better adapted traits will survive and reproduce
- They thus pass down the better adapted genes to future generations
- This is **selective advantage**

# Lab 2

- Each Group has a handout, I am here for assistance
- Last page tear it out and read it over, please