



# Biology

The study of life and living organisms

## Chapter 1: Science Processes

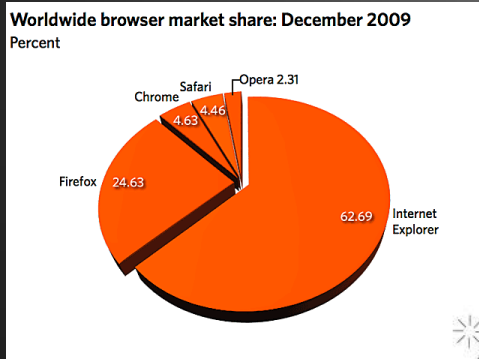
<https://www.youtube.com/watch?v=7L7x0BAqWis>

# After reading Biology and technology solve problems,

- ▶ Brainstorm questions a reporter may ask scientists living in Antarctica.
- ▶ Circle the question you think is the BEST question.
- ▶ Explain why the question you circled was the best.

# After Experimentation.....

## 1. Report Those Findings!!



## 1. Why?

- A. Credit – so YOU get the credit & not someone else
- B. Peers Check Work for Mistakes
- C. Repeat Experiments to get the same result.
- D. Build Off Your Own Work (next level)

# What Does it Mean to Be Alive?



## The Characteristics of Life

# Characteristics of Life

- ▶ 1. Made of Cells
- ▶ 2. Reproduce
- ▶ 3. Obtain and Use Energy
- ▶ 4. Maintain Homeostasis (Balance)
- ▶ 5. Pass on Genetic Information (DNA)
- ▶ 6. Respond to Environment
- ▶ 7. Grow (Bigger)/Develop (Change)
- ▶ 8. Species Adapt over time



# Compelling Questions

- ▶ Under harsh conditions will a Burlington coat suffice?

Positives	Room for Improvement

- ▶ Should the use of hydroponics be used over the traditional way of growing plants in other places than Antarctica?

Positives	Room for Improvement



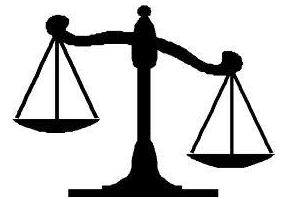
# Observation

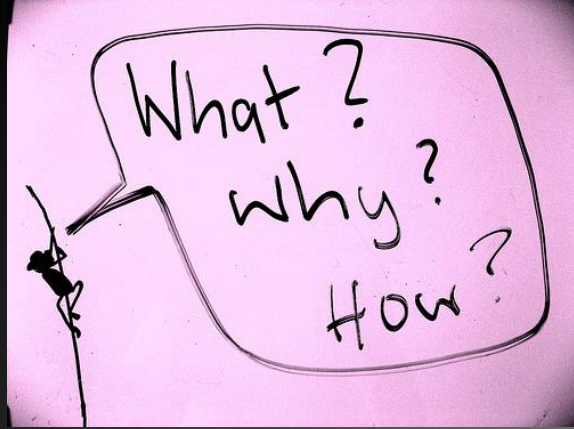


OBSERVATION  
POINT  
ELEV 9430

**Observation:** Using one of the 5 senses to make understand the world around you.

- A. Sight, touch, hearing, smell, taste(NOT usually in science class!), and numbers
- B. These are facts
- C. Recorded as DATA in an experiment.





# Inference

**Inference**: Using reasoning to make sense of what you are observing

## 1. **BASED** on observations

1. **Example**: You entered the classroom and a new adult was by my desk. You might infer that I am sick or that the person is a substitute teacher.
2. I think..., Like..., Because...
3. Used in writing the CONCLUSION of a lab report.



# Research

# Scientific Process



Hypothesis – educated EXPLANATION for an observation.

- Must be able to be tested
- Usually in “If/Then...because” format.
- NOT a “guess”
- NOT simply a prediction
- Based on research

# Experiment Requirements

## A. Independent variable:

- What scientist purposefully changes.
- Only ONE independent variable in an experiment.
- Usually the “if” part of hypothesis.



# Experiment Requirements

B. Dependent variable: Measured outcome

- What are you collecting data on?
- Usually the “then” part of the hypothesis.

C. Constants: Everything else that is kept the same in an experiment



# Controlled Experiment

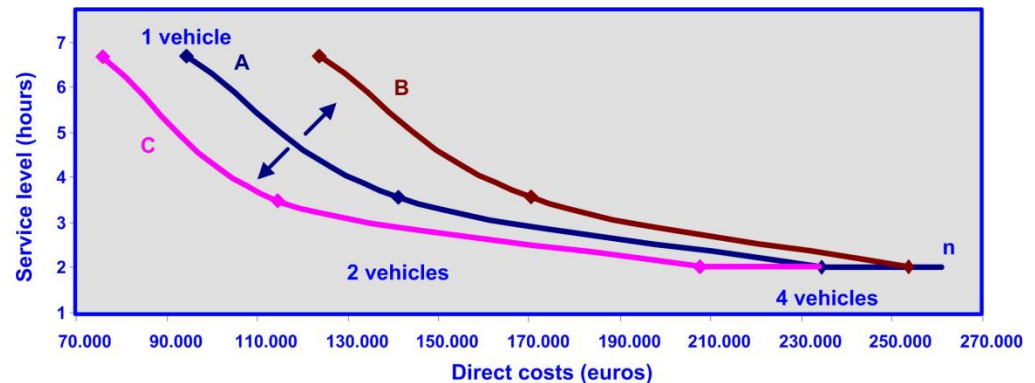
**Controlled Experiment:** Experiment that contains 2 set-ups, with ONLY ONE factor/variable different between the set-ups.

1. **Control Group:** Standard to compare to. May be the “normal” condition w/o the independent variable.
  - A. Used for comparison to the experimental group.
  - B. Helps determine the effect of the independent variable in the experimental group.
2. **Experimental Group:** The group containing the independent variable – what you are testing.



# Experiment

- ▶ Test your hypothesis.
- ▶ Look for patterns in your data.
  - Direct
  - Inverse
  - No relationship
- ▶ Report those findings!





# When Experiments Are not Possible

- ▶ When subjects need to not be disturbed
- ▶ Ethical issues



- ▶ Too many variables
  - Example: It is difficult to run a controlled experiment during human medical studies....WHY?
  - Different ages, races, genetic makeup, pre existing medical conditions
  - Goal would be to try to find subjects that are as similar as possible (but it never will be truly controlled)

# Theory vs. Law

- **Scientific Law**: Fact that describes what is happening.
  - Example: Law of gravity.
    - If I drop my phone, it will fall to the floor.



# Theory vs. Law

- ▶ **Theory**: An Explanation of WHY something happens.
  - Based on MANY observations & lots of factual evidence.
  - Describes why laws exist and how they work

**BOTH Laws and Theories can be proven false with new data.**





# Bell Work #1

## Observations

## Inferences

# Bellwork #2

1. What is a possible explanation for a set of observations that must be tested?
  - A. Theory
  - B. Law
  - C. Fact
  - D. Hypothesis
  
2. Why is a virus NOT a living organism?

# Bellwork #3

1. Compare and Contrast dependent and independent variables.
2. What is a well tested, evidence based, explanation of why something occurs?
  - A. Theory
  - B. Law
  - C. Inference
  - D. Hypothesis



# Bellwork #4

1. A scientist grows tomatoes in greenhouses that differ only in the amount of carbon dioxide in the air.
  - She determines the weight of the tomatoes produced by the plants in each greenhouse, and compares them to each other.
  - She also compares the tomatoes grown in air with a natural, unaltered amount of carbon dioxide.

Is this a controlled experiment? Why or why not?

# Bellwork #5

- ▶ A group of scientists decide to post their research results on the internet instead of publishing in a scientific journal.
  1. What part of the scientific process have they skipped?
  2. Why does it matter?