-Science-

What is it???

Objectives

- **Explain** what science is.
- **Identify** what a scientific fact, theory, and law are.
- **Explain** what scientific method is and how scientists use it.
- **Identify** the importance of communicating the results of a scientific investigation.
- **Describe** how science and technology are related to one another.

Objectives

- **Identify** what can and can't be investigated by science.
- **Explain** what an observation, inference, and prediction are.
- **Explain** what an observation, inference, and prediction are.
- **Develop** a testable hypothesis and reasonable conclusions based on data collected.

Science – what pops into your mind…

Science – definition

- Fancy definition:
  - **Science** is the intellectual and practical activity encompassing the **systematic** study of the structure and behavior of the **physical** and **natural world** through **observation** and **experiment**.

- Simple Definition:
  - **Science** is a way of learning how stuff works.

Scientific Facts, Theories, and Laws

- **Fact** – an objective and verifiable observation that has been repeatedly confirmed.
- **Theory** – A general statement intended to explain a fact.
  - Theory of gravity
- **Law** – A description of what nature does under certain conditions. Much more mathematical and can be used to make predictions.
  - Example: Newton's laws of motion

Scientific Laws

- Scientific laws are the same everywhere you go in the natural world.
- Same results: Barnesville or Beijing China

- Examples:
- Law of gravity
- Laws of motion
- Mendel's laws of inheritance

Always Changing

- Scientific knowledge is always subject to change when new evidence comes along to support it.

- We used to believe that the Earth was flat. When science provided new evidence that showed the Earth was round we changed our theory.

- Why is this important?

Science or Not Science

- Which hypotheses can we investigate using science and which can't we:

1. The plant that gets the most sunlight will grow the tallest.
2. The plant that has purple flowers will grow the tallest.
3. The plant that has purple flowers is the best.
4. The purple plant will grow taller because it is magic.
5. The plant with purple flowers is the most popular plant sold at the greenery.

When will I even need to know this crap!?

- Science is important because it uses logic and reasoning to reach an answer.
- Whether you know it or not you use science all the time when you try to solve a problem
- Example: You walk into a room and flip the light switch but the light doesn't turn on. What happened?

Important things we have as a result of scientific discovery

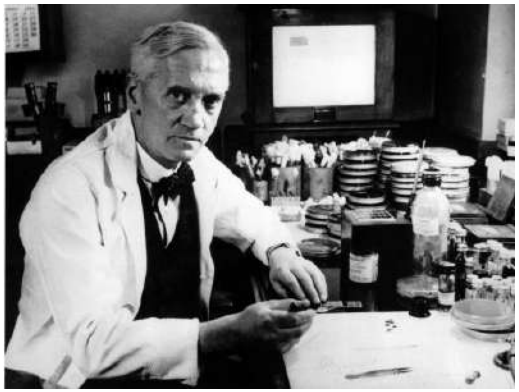
- Modern Medicine
  - Anesthesia
  - Antibiotics
  - Vaccines
  - Treatments for diseases
- Electricity
- Engines
- Pretty much every modern convenience we have.

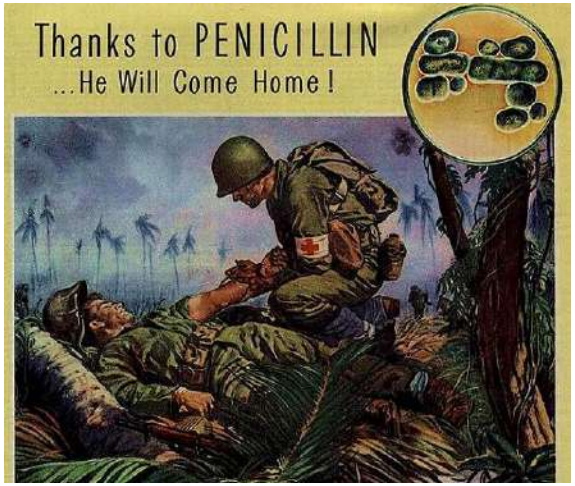
Science and Technology

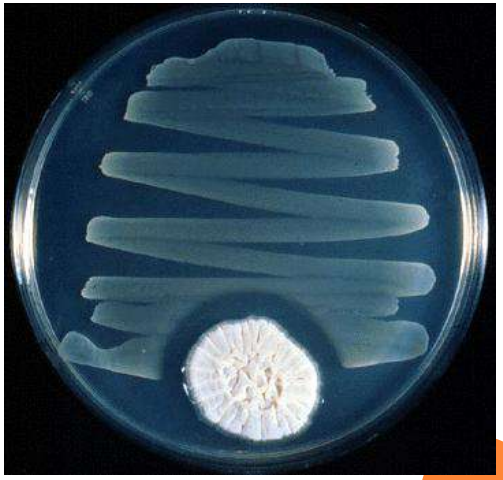
- Science and technology have always been very closely linked.
- What is technology?
- Technology = The development of something useful to humans
- Science = Scientific inquiry
- The purpose of science is to learn about the natural world

The discovery of penicillin

- The discovery of Penicillin, an extremely important antibiotic is an excellent example of how science and technology are linked, and how scientist can work together to benefit us all.







Which comes first: Science or Technology?

- Does a scientific discovery always occur before new technology can be developed?

- No!!!

- There are many examples of new technological advancements leading to scientific discoveries.
  - Microscopes – cells
  - Seismographs – earthquakes
  - Telescopes – the solar system

Science and Technology

- How have science and technology contributed to:
  - Agriculture
  - Manufacturing
  - Sanitation
  - Medicine
  - Warfare
  - Transportation
  - Information processing
  - Communication

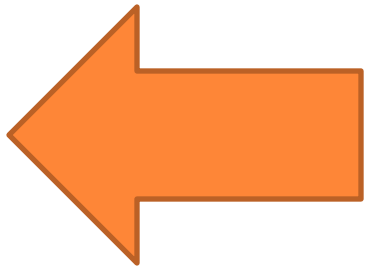
Systematic

- What system do scientists use to study the natural world?

- Hint: It has a series of steps…

The Scientific Method

1. Make an observation
2. Ask a question
3. Research
4. Make a hypothesis
5. Experiment or make more observations
6. Analyze the results (data)
7. Draw conclusions
8. Report results
   - Did the results support your hypothesis?
   - Repeat, repeat, repeat



Natural World

- The natural world consists of every known thing in our universe!
- Science can only answer questions about things in the natural world.
- Science can't provide an explanation for **supernatural** phenomena.

Supernatural Phenomena

- Something that occurs and which science has no explanation for.
  - Examples:
  - God creating the universe
  - Miracles
  - The existence of the spirit
- Religion falls under the classification of supernatural.

Science and Religion

- Can they coexist?
- Science is not able to prove the existence of a God because God is a supernatural being.
- The laws of nature and physics don't apply to God.
- **Belief** – something you know to be true even though there is no direct evidence to show it.
  - Example: I **believe** in God even though there is no scientific evidence to show there is one.
- **Acceptance** – you can either accept or reject scientific evidence.
  - There is a large amount of evidence supporting the theory of gravity. Most people **accept** the theory of gravity.

Observation

- **Observation** – To gain information about something through the use of the 5 senses.

- **Inference** – The development of ideas based on observations and prior knowledge.

- **Prediction** – Use of knowledge to explain observations in advance.

Tricky Tracks – Make observations, inferences and predictions about the pictures you are shown.

Experiment

- **Experiment** – A scientific procedure designed to test a hypothesis. Essentially it is a test.
- Creativity
- You must be able to test your hypothesis.
- Isolate variables – controlled experiment
- **Variable** is a factor that may influence the outcome of a scientific investigation.

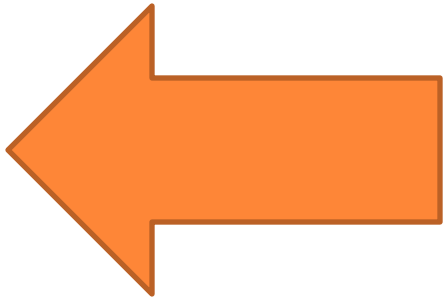
Number of Trials & Sample Size

- When conducting an experiment it is important that you do several trials and have a large sample size.
- What is the purpose of this?

Number of Trials & Sample Size

- Which experiment would be the most reliable?

1. 1 trial, one plant in the sample
2. 3 trials, 100 plants in the sample
3. 4 trials, 1,000 plants in the sample
4. 4 trials, 1,000,000 plants in the sample



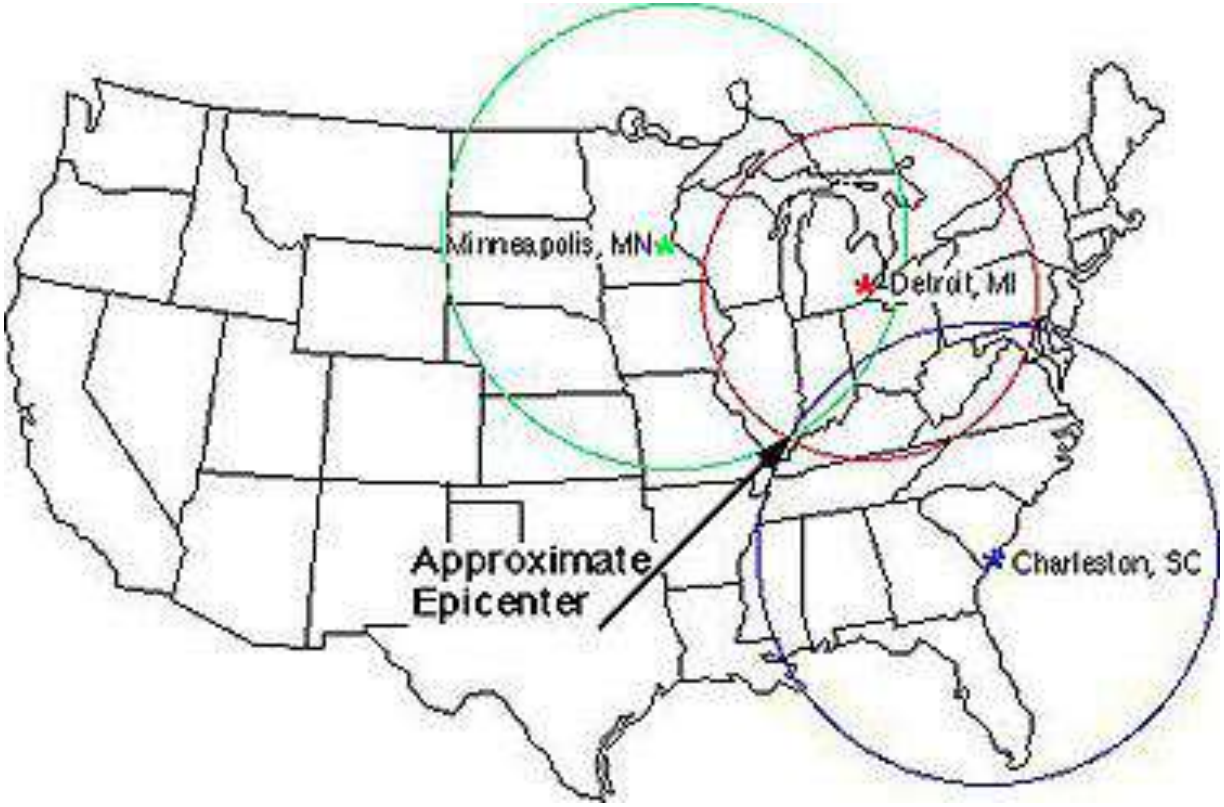
Why do scientists share?

- Scientists may at times work in teams, alone, or in collaboration. They may even compete.

- Why would scientists work together?

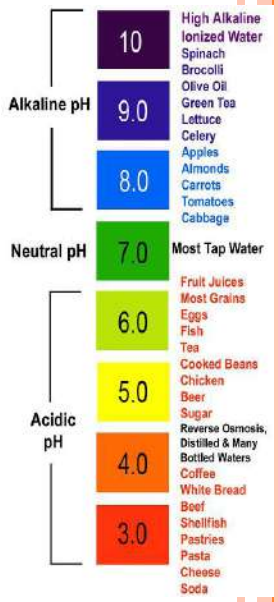
Science Collaboration

- Scientists trying to find an earthquake's epicenter need to work together.



Formulating a hypothesis

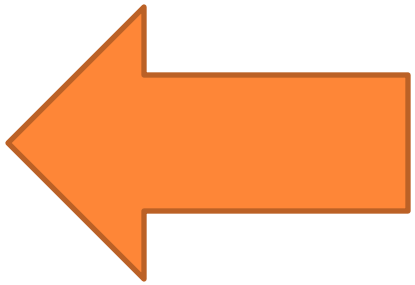
- Remember: Your hypothesis must be an educated guess based on prior knowledge and it must be testable.



- You want to know whether or not a particular species of corn would grow well in soil with a slightly acidic pH.
- You know from your research that corn grows best in soil that has a pH of 7.0 – 7.5 (neutral to slightly basic).
- After testing the field you determine that the soil has a average pH of 6.0 (slightly acidic).
- What is your hypothesis about the success of corn growth in this particular field?
- Could we test this?

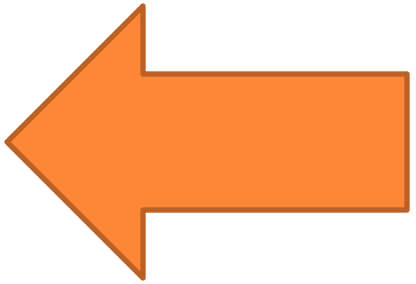
Assignment = Due tomorrow

1. Think of a question
2. Develop a hypothesis to answer that question
3. Describe the way that you would test that hypothesis



Conducting research

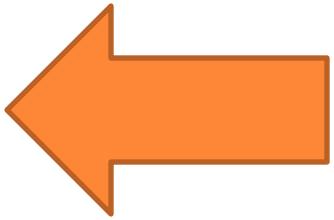
- How do you research?
- What does credible mean?
- How can we tell whether or not a source is credible?
- Questions to ask: What are the qualifications of the author? Has this research been published in a scientific journal? Is the website run by a reliable news source?



Analyze the Results

- After they finish their tests, scientists must analyze the results.

- Analyzing the results helps scientists construct reasonable explanations based on the evidence that has been collected.



Draw Conclusions

- After analyzing the results of their tests, scientists must conclude if the results support the hypothesis.

- Proving that a hypothesis is not true can be as valuable as proving that it is true.