



# Scientific Method

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# Steps in the Scientific Method

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- Observation
- Hypothesis
- Experiment
- Data Collection
- Conclusion
- Retest

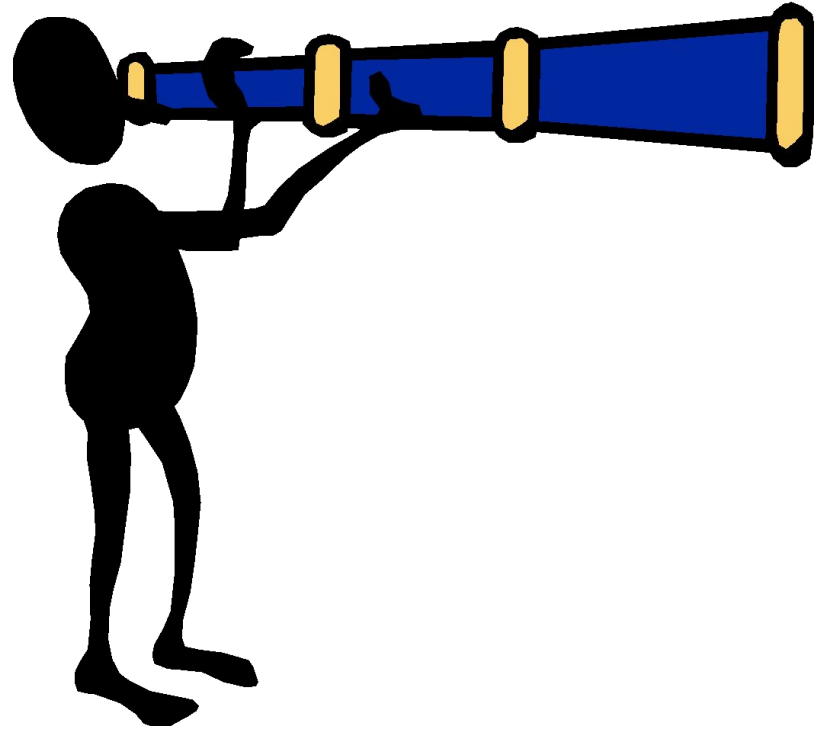




# Observations

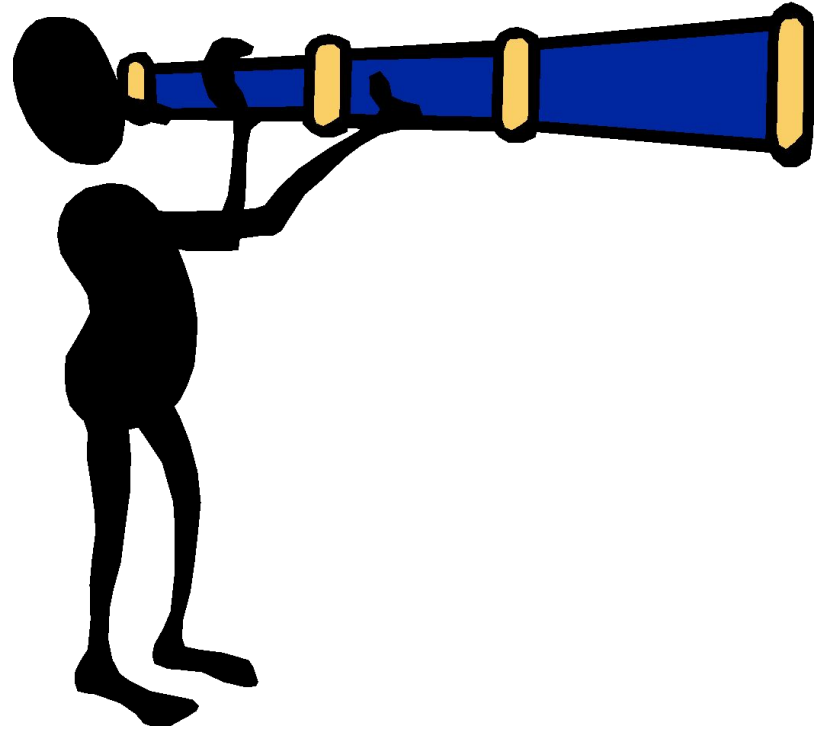
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- Gathered through your **senses**
- A scientist notices something in their **natural world**



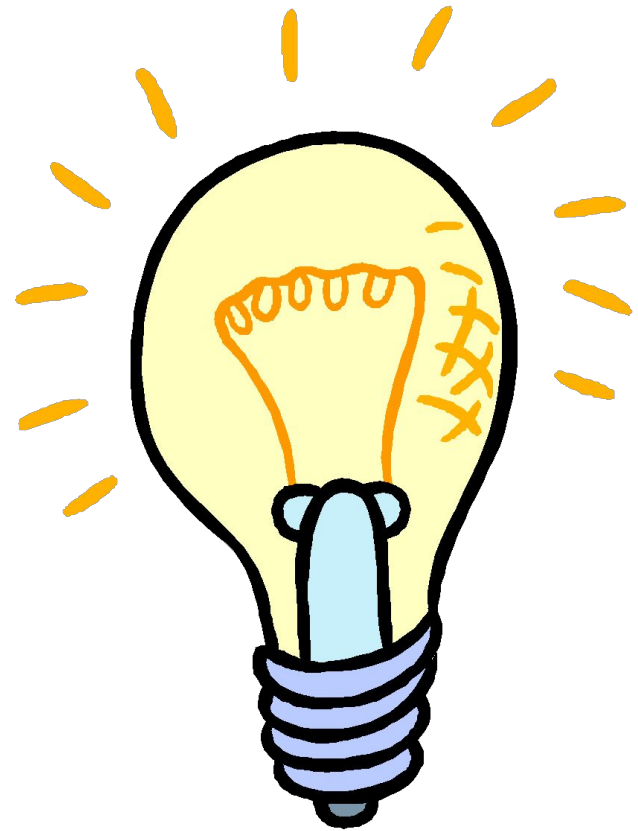
# Observations

- An **example of an observation** might be noticing that many salamanders near a pond have curved, not straight, tails



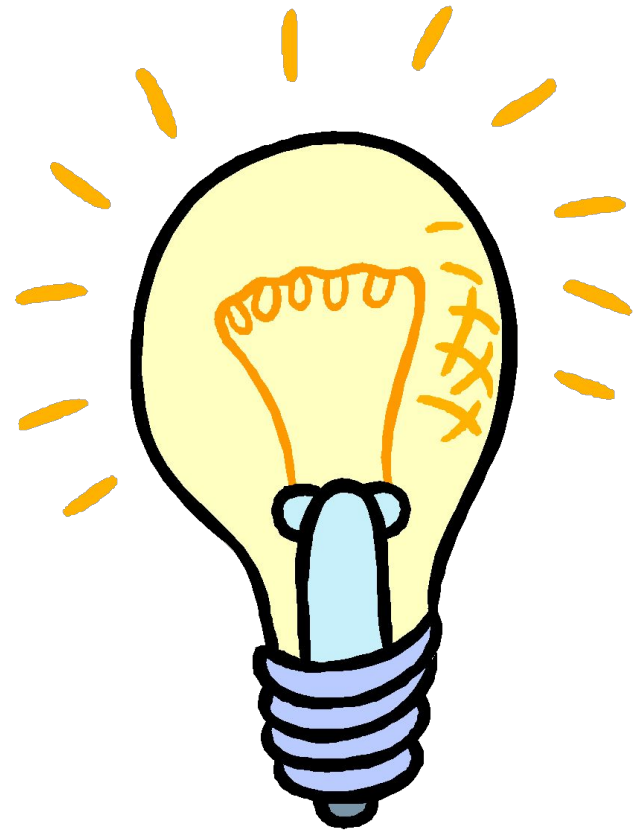
# Hypothesis

- A suggested solution to the problem.
- Must be **testable**
- Sometimes written as **If...Then...** statements
- **Predicts** an outcome



# Hypothesis

- An **example of a hypothesis** might be that the salamanders have curved tails due to a pollutant in the moist soil where they live.



# Experiment

- A procedure to **test** the hypothesis.





# Experiment

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**Variable** -  
factor in the  
experiment  
that is being  
tested







# Experiment

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A good or  
“valid”  
experiment  
will only have  
**ONE**  
variable!





# Controls and Variables

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# Scientific Experiments Follow Rules

- An experimenter **changes one factor** and **observes or measures** what happens.





# The Control Variable

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- The experimenter makes a special effort to keep **other factors constant** so that they will not effect the outcome.
- Those factors are called **control variables**.

# What is the Purpose of a Control?



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- Controls are **NOT** being tested
- Controls are used for **COMPARISON**



# Other Variables

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- The factor that is changed is known as the **independent variable**.
- The factor that is measured or observed is called the **dependent variable**.



# Example of Controls & Variables

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- **For example**, suppose you want to figure out the **fastest route** to walk home from school.
- You will try several different routes and **time how long it takes** you to get home by each one.
- Since you are only interested in finding a route that is fastest for you, **you will do the walking yourself**.

# What are the Variables in Your Experiment?



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- Varying the route is the **independent variable**
- The time it takes is the **dependent variable**
- Keeping the same walker throughout makes the walker a **control variable**.





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One more thing... it is best to make **several trials** with each independent variable.



# Valid Experiments

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# Remember: To be a Valid Experiment:

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- **Two groups** are required --- the control & experimental groups
- There should be only **one variable**



# Data

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- **Results** of the experiment
- May be **quantitative** (numbers) or **qualitative**





# Data

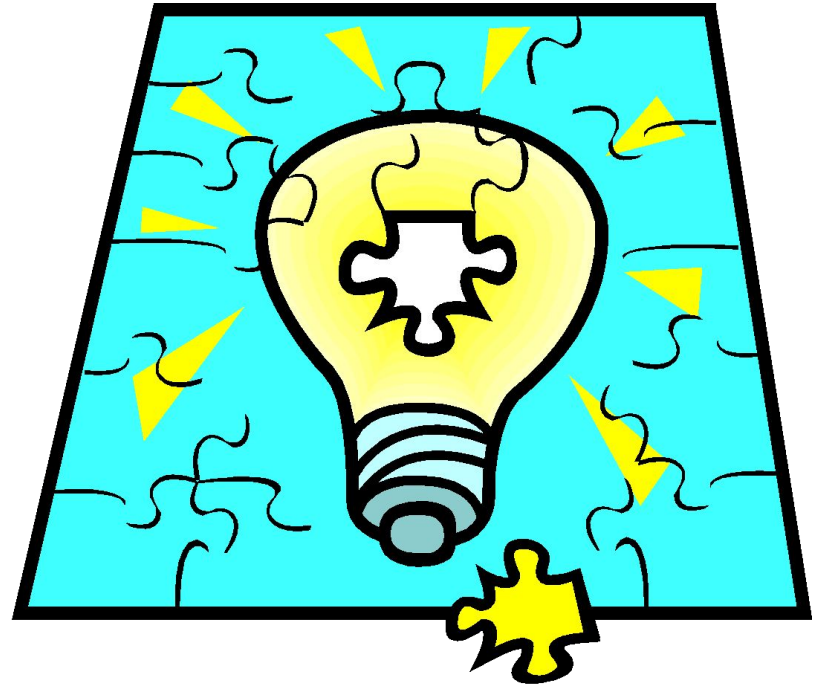
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- Must be **organized**
- Can be organized into **charts, tables, or graphs**



# Conclusion

- The **answer** to the hypothesis based on the data obtained from the experiment





# Retest

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In order to  
**verify the  
results,**  
experiments  
must be  
retested.





# Review

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# Solving a Problem

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- 1) **Identify** a Problem
- 2) State **Observations** about the problem
- 3) Form a **Hypothesis** about the problem (if...then...)
- 4) Design an **Experiment to test the hypothesis**
- 5) Collect **Data**
- 6) Form a **Conclusion**
- 7) **Retest**

