Scientific Method

Why science works!!
Steps

1. Observations
2. Explanatory Model
3. Hypothesis
4. Experimentation
5. Conclusion
Observations

- Senses
  - Preexisting ideas, beliefs or emotions do not play a part
  - Verification by others

- Two Ways of Thinking:
  1. Induction
  2. Deduction
Correlation

- Relationship between two or more variables
  - Variables are factors that might affect an observation
- Positive
- Negative
Hypothesis

- Hypothesis must be stated in a way that can be tested

- Hypotheses are never proven absolutely true
Hypothesis Testing

- Repeatable so other parties can duplicate them
- Null hypothesis
- Alternative hypothesis
- Scientific theory
Experimentation

- Experimentation is a powerful way of establishing causes and correlations

- Controlled Experiment
Controlled Experiment

Field Observations

Warm Site

- Food
- Water quality
- Temperature
- Mussel type
- Unknown factors

Cold Site

- Food
- Water quality
- Temperature
- Mussel type
- Unknown factors

Mussels from different sites

Controlled Experiment

- Water quality
- Food
- Mussel type
- Disease
- Unknown factors

Mussels from same site

Temperature
Review of Hypothesis Testing

Initial Observations -> Explanatory Model -> Hypothesis

DATA

Experiment or field test

Hypothesis formulated with experimental test in mind
Classification & Taxonomy

The reasons why you have to know Latin & Greek
Classification & Taxonomy

- Classification
- Taxonomy
- Phylogeny or Phylogenetic Relationships
Cladogram

Common Ancestor

Common Ancestor
Carolus Linnaeus

- 18th century Swedish naturalist
  - Hierarchy

- Linnaeus also originated the methodology for naming organisms
  - Binominal Nomenclature
<table>
<thead>
<tr>
<th>Taxonomic Level</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Human</strong></td>
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<tr>
<td>Domain</td>
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<tr>
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<td>Animalia</td>
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<tr>
<td>Phylum</td>
<td>Chordata</td>
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<td>Class</td>
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<td>Order</td>
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<tr>
<td>Species</td>
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<td><strong>Dolphin</strong></td>
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<tr>
<td>Genus</td>
<td>Tursiops</td>
</tr>
<tr>
<td>Species</td>
<td>Tursiops truncatus</td>
</tr>
</tbody>
</table>

*Tursiops truncatus*, the bottlenose dolphin.

Note: The term “division” is used in place of “phylum” in the classification of plants.
Hierarchy

- The basic unit of evolution and classification is the species
  - Species

- What is a scientific name?

- Why do we use scientific names?
Binomial Nomenclature

**RULES:**

- First letter of the genus must always be capitalized
- The species is never used by itself and is always lower case
- *Seriola dumerili*
- Can also refer to *Seriola spp.*
- When typed = *italicized*
- When written = *underlined*
Classification

Prokaryotes

Domain Bacteria

Domain Archaea

Common ancestor

Eukaryotes

Domain Eukarya

Kingdom Animalia

Kingdom Fungi

Kingdom Plantae

Protista