1/13/15

Scientific Method

1. Observation
2. Hypothesis
3. Experiment
4. Communication🡪 synthesis (theory which helps with observation)

Limitations

* Nothing is ever established
* Assumption of regular causality
  + Exclude exceptional events (is not repeatable and therefore cannot be studied)

Scientific Claims

1. Background
   1. What were known at the time
   2. What different hypothesis were offered at the time
2. Design and Methods
   1. Design: how distinguish between 2 claims
      1. Given multiple hypotheses, design an experiment different from the given hypotheses
   2. Method: come up with methods to design the experiment
      1. How to measure outcome, etc
3. Interpretation
   1. Taking data and making conclusions from it
   2. Come up with a way to account for error
   3. What hypothesis and alternative methods are not being considered?
   4. What are the limitations of the framework?
4. Synthesis
   1. MULTIPLE INDEPENDENT CONFIRMATION
   2. Typically at end of research paper
   3. Take results collected, compare interpretation with interpretations of other similar experiments

Observation: behaviors that are a key component that is repeatable

* observable
* quantifiable
* (hammer)

Processes: mental time travel, spatial reasoning

Chimpanzees:

* Explanation: same reasoning
* Explanation 2: trial and error

One shot learning

* Latency as a function of trials: sharp curve down

Trial and Error

* Linear downward

What is intelligence?

1. Is it discrete?
   1. You have it or you don’t
2. Is it one thing or many things?

Try to avoid in the field

* Human exceptionalism
  + Claim that only humans do certain things
    - Language
    - Tools
* Anthropomorphism
  + Imputing subjective mental states to animals when we don’t really know anything about that
  + Darwin raised point that animals are intelligent
* Scala naturae
  + All lifeform are arranged on a linear scale
  + Inanimate matter🡪 plants🡪 soft animals🡪 crustaceans🡪 insects🡪 fish/cetaceans (whales, etc.)🡪amphibians and reptiles🡪 birds🡪 mammals🡪 MAN
  + Blood and how many legs
  + Rank on brain size, etc.
  + Human tendency to want everything to be linear

Theory of Evolution

1. Common descent
2. Heritable individual variation
3. Selection
   * Primarily natural selection

Phylogenetic tree

Homology (Same word, same concept)

* Have trait because inherited from a common ancestor
* Example: arm; bone structure is remarkably similar

Homoplasy (same form)

* Same trait, but not because of same ancestor
* Wing in birds and insects
* Maybe environment produced similar constraints

MAP OF COURSE

2 big schools after Darwin

1. Ethology
   1. Primarily by people in Europe
   2. Natural behavior
   3. Adaptation
   4. Strong connection to evolution

* Behavioral ecology
* Neuroethology
  + Focus on neural mechanisms that implement the behavior

\*\*Merge of Ethology and Comparative Psychology

* Animal Cognition
  + Complex and comparative processes (compared to comparative psychology)

1. Comparative Psychology
   1. Primarily in US
   2. Looking at rats and pigeons
   3. How does the animal learn and change behavior?
   4. Simple general processes