The scientific process

***Pass out cards, ask for (i) name, (ii) email, (iii) cell (if you feel OK about it), and (iv) diet preferences. For this class, ask to define (i) science and (ii) ecology.

1. Defining science
    1.1. "Science" from Latin, *scientia*, meaning "know"
    1.2. OED: "the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment"
        1.2.1. Systematic: a fixed plan or system; in the case of science, empirical data
    1.3. Me, short: "The understanding of the testable"
    1.4. Me, long: "The collective, evolving body of knowledge of measurable phenomena through systematic, testable study of the universe knowable by this means.
2. How science works: scientific methodology
    2.1. The body of techniques for:
    2.2. Investigating phenomena,
    2.3. acquiring new knowledge,
    2.4. or correcting and integrating previous knowledge
3. Scientific reasoning
    3.1. Deduction
        3.1.1. From the general case to the specific
        3.1.2. Example:
            3.1.2.1. All of the mice in Little Valley belong to the genus *Peromyscus*
            3.1.2.2. I sampled for mice in Little Valley*
            3.1.2.3. Therefore, this mouse is in the genus *Peromyscus*
    3.2. Induction
        3.2.1. From the specific case to the general
        3.2.2. Example:
            3.2.2.1. This mouse is in the genus *Peromyscus*
            3.2.2.2. I sampled for mice in Little Valley*
            3.2.2.3. Therefore, all of the mice in Little Valley belong to the genus *Peromyscus*
4. Two and half scientific methods
    4.1. Inductive method: Observe-suggests->hypothesis-generates->prediction-experiments, data->new observations-Do new observations match predictions?<if yes (confirm hypothesis) then "Accepted truth"; if no (modify hypothesis)->hypothesis
    4.2. Modern-day induction: Bayesian inference:
    $P(hypothesis|data) = \frac{P(hypothesis)P(data|hypothesis)}{P(data)}$, or, in elglish:
    $posterior\ probability\ \propto likelihood \times prior\ probability$
    4.3. Hypothetico-deductive method: Initial observation-suggests->(many hypotheses)-falsifiable predictions (unique to each hypothesis)-predictions->new observation->Do new observations match predictions?<if yes (repeat attempts to falsify); if no (hypotheses crossed out; with no cross and exit arrow)-multiple failed falsifications->"Accepted truth"
5. Ecological science
    5.1. Defining ecology
    5.2. Derived from G. "oikos" and "logos"

5.2.1. OED: " the branch of biology that deals with the relations of organisms to one another and to their physical surroundings"
5.2.2. Me, short: "Contemporary biological systems."
5.2.2.1. Complex system: "Composed of interconnected parts that as a while exhibit one or more properties (behaviour among the possible properties) not obvious from the properties of the individual parts"
5.2.3. Me, long: "The study of interactions of contemporary complex, organic, adaptive systems (with each other and the environment)."

5.3. Biological organization
5.3.1. RNA, DNA, <prokaryotes + eukaryotes, multicellular, organized (tissues?), organisms (with organs), populations, communities
5.3.2. Environment?

6. Autecology
6.1. The study of the organism
6.1.1.

7. Synecology
7.1. Study of whole communities