Bio Diversity Chapter 1

What is Science?

1) Understanding
2) experimental process/ based on research
3) study of knowledge (data, observations)
4) process- based sequence of events
5) testing hypothesis
6) purpose/ goal- gain increasingly accurate understanding of natural world
7) assumptions/ data/ observation- upon which understanding data based on obeservations.
8) Purpose: seek (gain) ^ accurate understanding/ explanation (that are natural) of natural world.

Physics: matter or E
Chemistry:atoms and molecules
Biology: organisms & environment

Assumptions: of Science

- natural phenomena have natural explanations/ Follow natural patterns & rules
- these patterns / rules are unchanging across space and time.
- We can uncover / understand explanations patterns/ rules by using Scientific Method.

Science must be....

1) Based on best available evidence – anything based on lacking evidence, poor supported will never be accepted. Has to be objective- unbiased by personal or philosophical viewpoints
2) verifiable/ testable/ repeatable. Science is "self correcting"- weedout biased ideas
3) acquired through sci. method- consistent protocol/ approach

Scientific Method

1) Observation
2) Ask a question
3) Hypothesis
4) Prediction
5) Experiment (surveys) accept hypothesis (hyp. Supported by resutls) reject hyp. (hyp. Not supported)

Observations: single or multiple (over time or space)

- data
- objective, unbiased, impartial
- restricted- to use of our senses, smell, touch-can improve by sensors/ instruments that enhance senses.

Question:

- framed based on observation/ data
- often based on inductive reasoning- specific observations, general idea.

Hypothesis

- a tentative explanation of obser.> not a guess
- based on previous data, other new observ.
- Deductive reasoning (general---->specific)

Ex: Every X has characteristic Y 2. This thing X is a dog therefore this thing has characteristic Y.

- make sure predictions are clear (focused, specific wording)
- must be testable----> through further obser., develop theoretical models, or experimentation (most rigorous test)

Experiments

- involve manipulation of suspected cause & measurment of effect (of manip)- important to account for all known variables that might influence experiment.-use manip. Group (control group),

repeat /replicate---> testing for consistenty of results.

Science does not/ cannot "Prove" anything

- does not determine "truth"
- all claims are viewed as tentative
- based on current understanding
- of best avail. Evidence
- --->hyp's can always be re-tested
- to support : see every swan
- To falsify: find one swan that's not white.
- Most probs have mult. Hyps
-

Important & often misused terms in Science

Fact: a well-confirmed data point/obser.

- Lots of independent evidence
- unlikely to be overturned
- not proof or truth

Law: general statement describing some aspect of natural world & how it behaves under stated circumstances.

- Not known to vary
- law of gravity, thermodynamics

Hypothesis

- possible/ tentative explanation of observation
- may be untested
- may be weakly, well-supported or not supported by more data

Theory-very well supported explanation that incorporates tested hypothesis, facts, laws

- supported by increasing observations
- multiple, independent lines of evidence
- scientists
- would never say "It's just a theory"

Facts & Laws

- require explanations
- hypothesis and theories are explanations

Biology

- science of living things/ life

What is a living thing?

- Something that can reproduce
- growth & develop
- composed of cells
- capable of independent activity, manipulation of environment
- ability to adapt to environment.
- Small-scale+ larger scale (longer time periods) evolution
- homeostasis- maintain relatively constant internal conditions (e.g body temp)
- requires nourishment to survive (energy)-then has ability to obtain & consume that E.

- produces waste following consumptions of Energy.
- Take in O2 (and other things) needed for metabolism
- highly complex structure
- yet, highly ordered (atoms, tissue)
- sensitive to environment stimili
- respond to environment

Evolution

- can think of as can be defined as dual nature (fact and theory)
- fact-observations, data, well confirmed
- living organisms change overtime
- as theory (explanation)
- change over time
- big or small changes
- a long time has generated the biology diversity we see today

Charles Darwin- (1809-1862)

- published mechanism of evolution
- natural selection on origin of species.

Alfred Russell Wallace(1823-1913)

- adaption responsible for diversity of life & formation of new species

Darwin's ideas- voyage on the Beagle

- was a cabin boy/ naturalist
- sailed for islands and kept detailed notes
- studied geology
- "Father of Geology"
- realized Earth was older than he thought
- recognized that process of evolution by natural selection would require long periods of time for small change to accumulate leading larger change.

3 key Observations on the Beagle

1. fossils resembled currently living species
   - recognized shared ancestry, fossil organisms were related to modern organism
2. Similar species varied from place to place in ways that suited their environment
   - suggested that organismal change from common
3. Island species resembled coastal mainland species
   - organisms move, creating new populations
   - shared ancestry

Darwin's 4 Postulates

Postulate 1:

- Individuals within species are variable
- these variations may have no impact 2 all
- but sometimes variation can give an individual an advantage----> for survival & reproduction

Postulate 2:

- Some of the individuals variations are passed on to that individuals offspring (E.g most parents