**Topics**

- Macroevolution
- Definitions/concepts of species
- Reproductive isolation in speciation
- Mechanisms of speciation
- Types and scales of macroevolution

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**Species**

- Morphological species concept - Carolus Linneaus (18th century) - morphological similarities
- Biological species concept - Ernst Mayr (20th century) - reproductive isolation
- Evolutionary/phylogenetic species concept - long enough evolution causing statistically sig. changes in diagnostic traits – testable by comparing DNA of the two spp.
- Discuss drawbacks in each
- Key to speciation = reproductive isolation (we use biological species)

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**Prezygotic barriers of reproductive isolation**

- Temporal isolation -
  Mate at different times of day/month/year
- Habitat isolation -
  Reproduce at, or inhabit different parts of environment
- Behavioral/sexual isolation -
  Other species do not do the specific behavior
- Mechanical isolation -
  Structure of reproductive organs prevents fertilization
- Gametic isolation -
  Molecularly and/or chemically incompatible eggs and sperms
Postzygotic barriers of reproductive isolation

- Hybrid inviability - Embryo dies
- Hybrid sterility - Abnormal gametes in F₁, no F₂
- Hybrid breakdown - F₂ or later generations cannot reproduce successfully

Speciation – Evolution of a new species

Mechanisms - Allopatric and Sympatric

Allopatric - Geographical isolation and different selective pressures - Most important in animals
Read how geographic isolation can happen

Kaibab squirrels in north continue to evolve into a new sp. Albert squirrels (the rest) in south
Sympatric speciation

1. Polyploidy -
Most common in plants - allopolyploid Vs. autopolyploid - from same sp. ~80% of flowering plants are polyploids

2. Change in local ecology - e.g. pest animals changing host - e.g. hawthorn vs. apple maggot flies in NY

Discuss reinforcement, fusion and stability in hybrid zones

What do the fossil records say about the speed of evolution of species?

Both punctuated equilibrium and phyletic gradualism are accepted

Types of Evolution

A – Divergent B – Convergent C – Parallel
(Evolution toward adaptation and/or speciation)

A – Discuss scales – all biodiversity (broad scale) vs. chimpanzee and human (small scale) – Tree vs. a branch

B – Need for similar environment – in not closely related spp.

C – Maintains characteristics independently
Macroevolution

- Large scale phenotypic changes in populations over time causing evolution of new tax(a)on

- Attempts to explain:
  - Evolutionary novelties from pre-existing structures (pre-adaptations) - major body systems -
  - Changes in growth-regulating genes
  - Allometric growth and paedomorphosis

  - Appearance of taxa, biodiversity
  - Adaptive radiation and mass extinction

- What is background extinction?