

# Module 17: Speciation and Macroevolution

## Keys to Success & Study Guide

### Learning Objectives

By the end of this module, you should be able to: 1. **Define** biological species and identify limitations of the concept. 2. **Categorize** reproductive isolating mechanisms (Pre-zygotic vs Post-zygotic). 3. **Contrast** Allopatric and Sympatric speciation. 4. **Explain** macroevolutionary patterns like Adaptive Radiation and Convergent Evolution.

### Key Terminology Checklist

*Define these terms in your own words to ensure mastery.* - [ ] **Speciation**: The origin of new species. - [ ] **Macroevolution**: Large-scale evolutionary changes that take place over long periods of time. - [ ] **Hybrid**: Offspring of two different species (e.g., Mule, Liger). - [ ] **Polyploidy**: Having extra sets of chromosomes (Common cause of Sympatric speciation in plants). - [ ] **Analogous Traits**: Similar features evolved independently (Convergence).

### Concept Check

#### 1. Defining "Us" vs "Them"

- **Question**: How does the biological species concept work?
- **Deep Dive**: "Groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups."
  - Simple test: Can they make a healthy baby?
  - Yes = Same species.
  - No = Different species.

#### 2. Walls of Separation

- **Question**: What are pre-zygotic barriers?

- **Deep Dive:** Barriers BEFORE the zygote (fertilized egg) forms.
  - **Habitat:** Don't live nearby.
  - **Temporal:** Mate at different times.
  - **Behavioral:** Wrong mating song/dance.
  - **Mechanical:** Parts don't fit.
  - **Gametic:** Sperm/Egg don't fuse.

### 3. How it Happens

- **Question:** Describe the two modes of speciation.
- **Deep Dive:**
  - **Allopatric:** Physical barrier (Grand Canyon squirrels). Most common.
  - **Sympatric:** No barrier. Gene flow stops due to behavior or polyploidy (Plant suddenly becomes  $4n$ ).

### Study Tips

- **Mnemonic for Barriers: B.M.G.T.H.** (Big Men Get Tall Hats?) -> Behavioral, Mechanical, Gametic, Temporal, Habitat. (Okay, make up a better one).
- **Don't Confuse:**
  - **Homologous** (Shared Ancestor) -> **Divergent** Evolution.
  - **Analogous** (Different Ancestor) -> **Convergent** Evolution.