

# SPECIATION

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# Evolution

- Microevolution—Relatively short term changes in ALLELE FREQUENCIES within a population or species
- Macroevolution—Large scale evolutionary changes
  - Over long periods
  - Small scale microevolution leads to macroevolution

# Biological Species Concept

- **Species**—Group of populations whose members have the potential to interbreed in nature and produce viable, fertile offspring, but do not produce viable offspring with members of other groups.
- What maintains species?
  - Gene flow
  - Reproductive isolation (biological)

# Other Species Definitions

- **Morphological Species Concept**
  - Characterizes by body shape and other structures
- **Ecological Species Concept**
  - Characterizes in terms of ecological niche
- **Phylogenetic Species Concept**
  - Smallest group of organisms that share a common ancestor



# Reproductive Isolation

- **Prezygotic Barriers**—block fertilization from happening
  - Prevent different species from attempting to mate
  - Prevent an attempted mating from being successful
  - Hindering fertilization
- **Postzygotic Barriers**—occur after zygote is formed
  - Developmental errors
  - Birth defects cause death
  - Infertile offspring

# Prezygotic Reproductive Isolating Barriers

- Behavioral isolation—Absence of cross-attraction between individuals of separate species inhibiting any courtship initiation or individual behavior during copulation does not allow normal fertilization to occur.
- Ecological isolation—Variations in the ecology of species give rise to barriers:
  - Habitat isolation—Even when living in the same common locality, species occupy diverse habitats due to different biological or genetic tendencies thereby limiting gene flow during breeding seasons.
  - Temporal isolation—Species living in the same area have different breeding seasons preventing gene flow.
  - Pollinator isolation—Flowering plants have varying interactions with pollinators thereby reducing gene flow.
- Mechanical isolation—Reproductive structures are incompatible between species inhibiting copulation or pollination.
- Gametic isolation—Gametes that are transferred during copulation or pollination are ineffectual for fertilization due to problems with storage or transfer of gametes or because of conspecific pollen or sperm partiality.



# Prezygotic Barriers—Habitat Isolation



# Prezygotic Barriers—Temporal Isolation





# Prezygotic Barriers—Behavioral Isolation



- [http://www.fiddlercrab.info/video/u\\_heteropleura02.html](http://www.fiddlercrab.info/video/u_heteropleura02.html)
- [http://www.fiddlercrab.info/video/u\\_ornata01.html](http://www.fiddlercrab.info/video/u_ornata01.html)

# Prezygotic Barriers—Mechanical Isolation



(a) Honeybee drinking nectar from a foxglove flower



(b) Ruby-throated hummingbird drinking nectar from a trumpet creeper flower



# Prezygotic Barriers—Gametic Isolation





# Postzygotic Reproductive Isolating Barriers

- Ecological unviability—Although normal development occurs, hybrids cannot find a suitable ecological niche thereby lowering viability.
- Hybrid unviability—Hybrid species have developmental issues causing complete or incomplete lethality.
- Behavioral sterility—Although normal gametogenesis occurs, hybrids are less fertile and typically exhibit phenotypes or courtship behaviors that make them less desirable mates.
- Hybrid sterility—Hybrids can have developmental problems of the reproductive organs or gametes, or can suffer from physiological or neurological issues that prevent effective courtship.



# Postzygotic Barriers—Reduced Fertility



**THANK YOU**