

# Chan's ENVS200 Review

## Chapter 8 - Molecular and Evolutionary Ecology

### DIFFERENTIATION WITHIN AND BETWEEN SPECIES

- Though many evolutionary adaptations are antagonistic (like helping avoid attacks by predators), there are synergistic and mutually beneficial evolutionary traits as well, such as pollination, and farming
- Races/clades - subdivisions of species with clear morphological differences
- Molecular genetic markers allow ecologists to determine how closely “related” to individuals are, and DNA analysis helps to determine what species a specimen truly is
- Molecular markers also allow us to determine when a particular subtype of organism is actually part of a larger group, or whether it is its own distinct species (red wolf is a hybrid of gray wolf and coyotes)

### COEVOLUTIONARY ARMS RACE

- As prey adapts to be more difficult to be killed, predators must adapt to kill better
  - This may lead to coevolution which makes the given prey the only unique prey of a given predator (bruchid beetles are the only insects that can eat the Dioclea metacarpa legume)
- Some plants give off chemicals to reduce predation
  - Animals that have evolved along with a certain plant's chemicals do better than generalists towards that specific toxin
  - Generalists, however, do better against chemicals that have not provoked coevolutionary responses
- Molecular identification is important because we can only dream up countermeasures to specific species if we can correctly identify the species itself
- Parasites are prone to coevolution due to their intimate relationship with their hosts
  - e.g. the continuous evolution of the influenza (flu) virus
  - This selects for more resistant hosts, which then select for more infective parasites

### MUTUALISTIC INTERACTIONS

- Symbiosis (living together) is when one organism lives inside another
  - Symbiont inhabits a host
  - Usually saved for mutually beneficial relationships, so parasites aren't symbionts
- Mutualism - where multiple organisms interact to their mutual benefit (bees and flowers)
  - Not always “win win with no losses”, usually means “net benefit for both parties, despite possible drawbacks”
- Human agriculture and animal domestication is a form of mutualism
- Pollinators and certain flowers show extreme specialization
  - some plants have incredibly deep flowers, which are only reachable by organisms with long tongues

- The bacteria that digests cellulose inside the body is another mutualistic microbiota
- Most plants don't have isolated roots - they have mycorrhizas, mutualism between fungi in the earth and the plant's root tissue
  - fungal networks capture nutrients in the soil, which are transported to the host plant in exchange for carbon and energy
  - these fungi can use up to 30% of the plant's photosynthate production
  - Not strictly needed in environments that aren't lacking nutrients or water, but in the "real world" are generally required to survive
- Legumes are some of the only plants that are capable of nitrogen fixing completely on their own