# Classification

Section 18-2

- Key Idea: Scientists have traditionally used similarities in appearance and structure to group organisms. However, this approach has proven problematic.

# Traditional Systemics

- Some groups look similar but turn out to be distantly related.
- Other groups look different but turn out to be closely related.

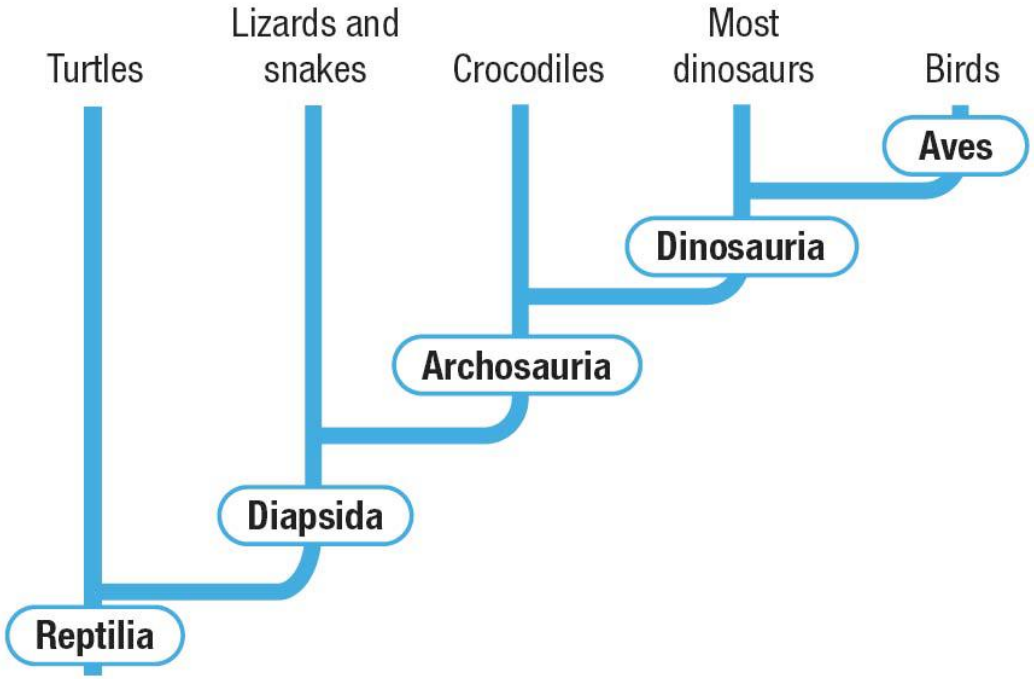
# Phylogenetics

- Key Idea: Grouping organisms by similarity is often assumed to reflect phylogeny, but inferring phylogeny is complex in practice.
- Phylogeny is the ancestral relationships between species.

# Phylogenetics

- Not all similar characteristics are inherited from a common ancestor.
- Through the process of *convergent evolution*, similarities may evolve in groups that are not closely related.
- Similar features may evolve because the groups have adopted similar habitats or lifestyles.

- Similarities that arise through convergent evolution are called *analogous characters.*



# Cladistics

- Key Idea: Cladistic analysis is used to select the most likely phylogeny among a given set of organisms.
- Cladistics is a method of analysis that infers phylogenies by careful comparisons of shared characteristics.

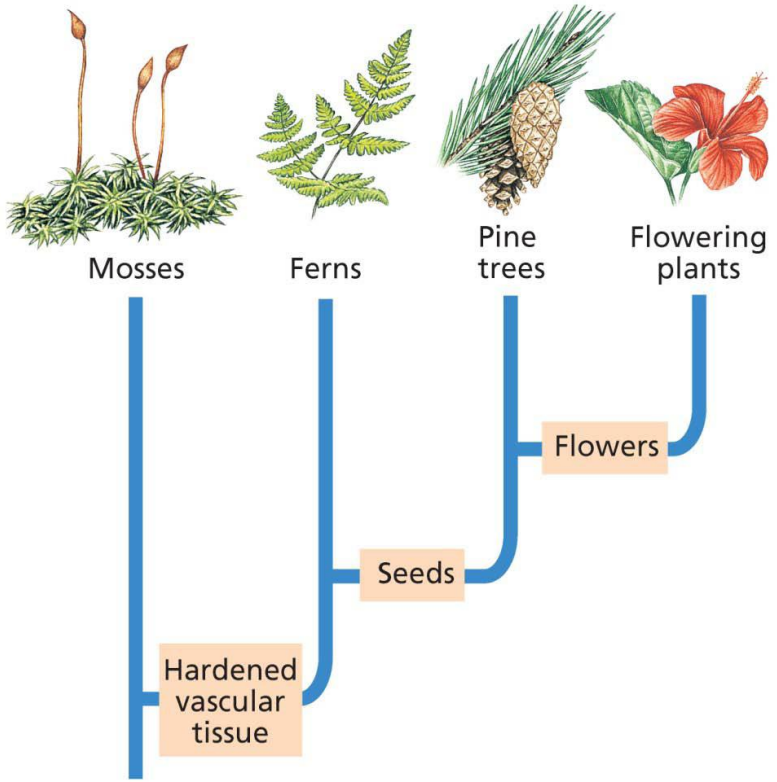
# Cladistics

- Cladistics focuses on finding characters that are shared between different groups because of shared ancestry.
- A *derived character* is one that evolved in one group but not the other.

# Cladogram

**Data Table for Cladogram**

| Group of organisms | Characters | | |
|---|---|---|---|
| | Vascular tissue | Seeds | Flowers |
| Mosses (out-group) | 0 | 0 | 0 |
| Ferns | 1 | 0 | 0 |
| Pine trees and other conifers | 1 | 1 | 0 |
| Flowering plants | 1 | 1 | 1 |



# Inferring Evolutionary Relatedness

- Key Idea: Biologists compare many kinds of evidence and apply logic carefully in order to infer phylogenies.
- Morphology refers to the physical structure or anatomy of organisms.
- Molecular evidence includes genetic information to infer phylogenies.

- The principle of parsimony holds that the simplest explanation for something is the most reasonable, unless strong evidence exists against that explanation.

# Evolutionary Relatedness

- Given two possible cladograms, the one that implies the fewest character changes between points is preferred.