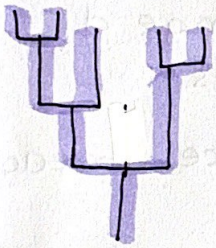
5.4 CLADISTICS

CLADES

Clade: group of organisms that have evolved from a common ancestor.

cladistics: method of classifying organisms into groups of species called clades.

- Each clade consists of an organism and all its evolutionary decendants.
- members of a clade will possess common characteristics



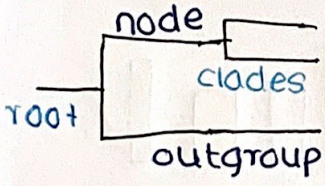
cladograms: tree diagrams that show the most probable sequence of divergence in a class.

- each branch point represents the splitting of two groups due to divergent evolution.
- the fewer number of nodes, the more closely related the species will be.

CLADOGRAMS

key features of a cladogram:

- Root: The initial ancestor common to all organisms in the cladogram.
- Nodes: Each node corresponds to a hypothetical common ancestor that speciated to give rise to two or more taxa.
  - Clades: A common ancestor (node) all of its descendants.
- outgroup: The most distantly related species in the cladogram.
  → functions as a point of comparison.

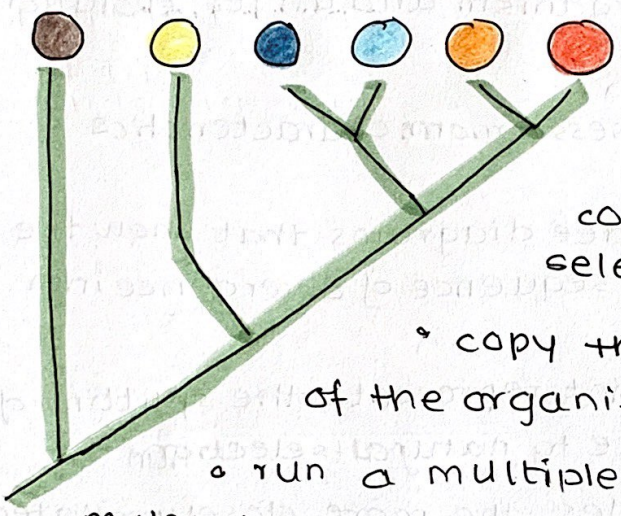


Constructing cladograms

↳ based on structural features or molecular evidence

Using structural evidence

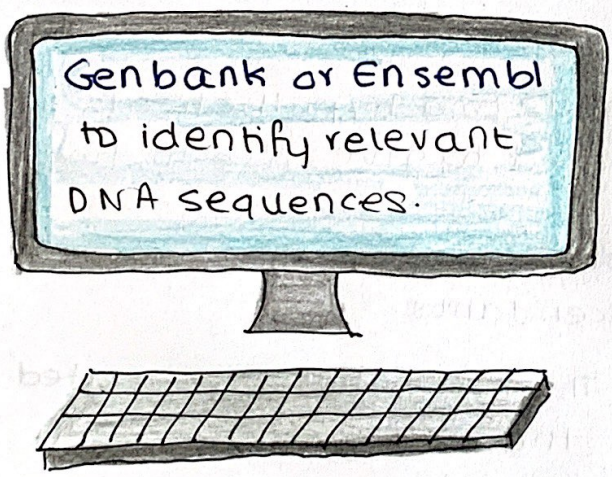
- organise selected organisms according to defined characteristics.
- sequentially order organisms according to shared characteristics to construct a cladogram.



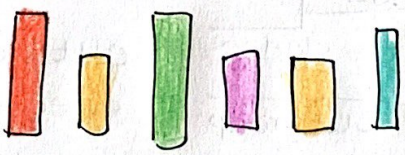
Using molecular evidence

- select a gene/protein common to a range of selected organisms.
- copy the DNA sequence for each of the organisms.
- run a multiple alignment to compare molecular sequences.
- generate a phylogeny tree (cladogram) from multiple alignment data.

Computer programs that help analyze biological sequence data:



Clustal omega: free online tool that aligns multiple DNA/amino acid sequences for comparison.



RECLASSIFICATION

Figworts

- 8th largest family of flowering plants
- contains 275 different genera.

→ Taxonomists examined the chloroplast gene & split the figworts into 5 different clades.

- orobanchaceae
- Plantaginaceae
- Phrymaceae
- lindernia ceae