

PHYLOGENY

DEFINITION

evolutionary relationships among organisms

used in modern classification systems/
methods called **CLADISTICS**

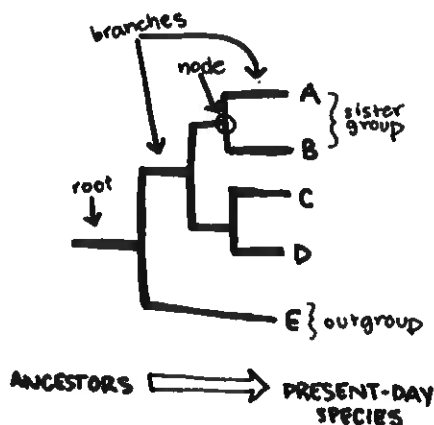
DIAGRAMS

- called phylogenetic trees or cladograms
- represent evolutionary relationships among organisms
- phylogenetic trees are *hypotheses*, not facts

INTERPRETATIONS

- in trees, two species are **MORE** related if they have a more recent common ancestor, and **LESS** related if they have a less recent common ancestor
- generally:
 - the more traits shared, the more closely related the organisms are

ANATOMY OF PHYLOGENETIC TREES

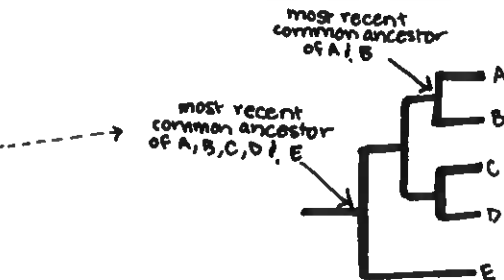


node where branches connect; represents:
 - a divergence event, or the splitting apart of a single group into two descendant groups
 - most recent common ancestor

root represents species leading up to the most recent common ancestor of all the groups on the tree



some phylogenetic trees indicate the **TIMING** of evolutionary events



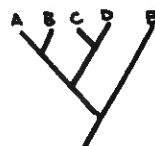
sister group the closest relative of a given unit on an evolutionary tree
 ex: A and B are a sister group
 C and D are another sister group

outgroup the most distantly related species/group on a phylogenetic tree, often used as a reference when determining evolutionary relationships of the ingroup

ORIENTATION

Many orientations of phylogenetic trees are possible as long as they show the same evolutionary relationships

These trees all show the same relationships



can be rotated at a node

CLADISTICS

hypothesizing relationships among organisms by using characters (traits)

data you can use:

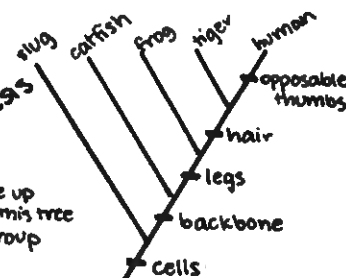
- morphology (structures)
- development (e.g. embryos)
- molecular sequences (DNA, amino acids)

	cells	backbone	legs	hair	opposable thumbs
Human	✓	✓	✓	✓	✓
Tiger	✓	✓	✓	✓	
Frog	✓	✓	✓		
slug	✓				
catfish	✓	✓			

DATA

HYPOTHESIS

Tigers & humans make up a sister group in this tree
 slugs are the outgroup



Don't have enough info?
POLYTONY



POLYTONY: we don't have enough info to draw conclusions

could also mean rapid speciation/
 multiple speciation events simultaneously

Created by Ms. Maerna Kauffman
 Adapted from: Khan Academy
 evolution.berkeley.edu

LAW OF PARSIMONY

when choosing among possible cladograms, choose the cladogram implying the fewest number of changes in character states