

# SPECIATION

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# Extinction

- A species goes extinct when ALL of its members die.
- Many factors can cause—climate, reproductive barriers, disease.
- No matter what it is, it is a FAILURE of that species to adapt to the new conditions
- More prevalent in small, less genetically diverse populations

# Types of Extinction

- **Background Extinction**—gradual loss of species over time.
  - Loss of habitat, small climate change, etc.
- **Mass Extinction**—many number of species disappeared over a relatively short period of time.
  - Open up new habitats for adaptive radiation
  - Two theories:
    - Impact Theory—meteor, comet crashes into earth making it inhabitable for the life there
    - Movement of Earth's Crust—causes dramatic environmental changes

# Taxonomy

- How we name and classify organisms
- Binomial Nomenclature
  - First name—Genus
  - Second name—Species
  - *Homo sapiens*
- Organisms are classified based on a hierarchy of more specific categories



Subspecies: *Canis lupus familiaris*

Species: *Canis lupus*

Genus: *Canis*

Family: Canidae

Order: Carnivora

Class: Mammalia

Phylum: Chordata

Kingdom: Animalia

Domain: Eukarya

Subspecies:  
*Canis lupus familiaris*



Dog

Species: *Canis lupus*



Wolf

Dog

Genus: *Canis*



Jackal

Wolf

Dog

Family: Canidae



Fox

Jackal

Wolf

Dog

Order: Carnivora



Cat

Fox

Jackal

Wolf

Dog

Class: Mammalia



Rabbit

Cat

Fox

Jackal

Wolf

Dog

Phylum: Chordata



Fish

Rabbit

Cat

Fox

Jackal

Wolf

Dog

Kingdom: Animalia



Insect

Fish

Rabbit

Cat

Fox

Jackal

Wolf

Dog

Domain: Eukarya



Plant

Insect

Fish

Rabbit

Cat

Fox

Jackal

Wolf

Dog

# Phylogeny

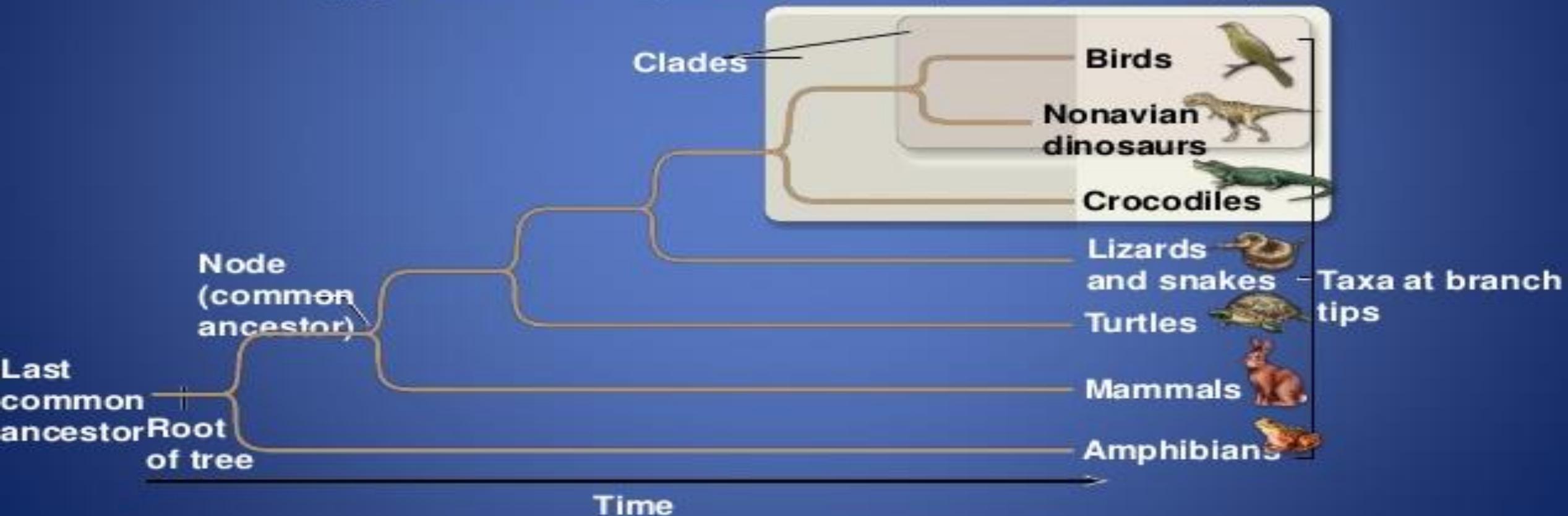
- Phylogeny—Depiction of species relationships based on descent from shared ancestors
- Phylogenetic Trees—pictures of these relationships
  - Anatomical features of fossils and living creatures
  - Behaviors
  - Physiological adaptations
  - Molecular sequences

# Cladistics

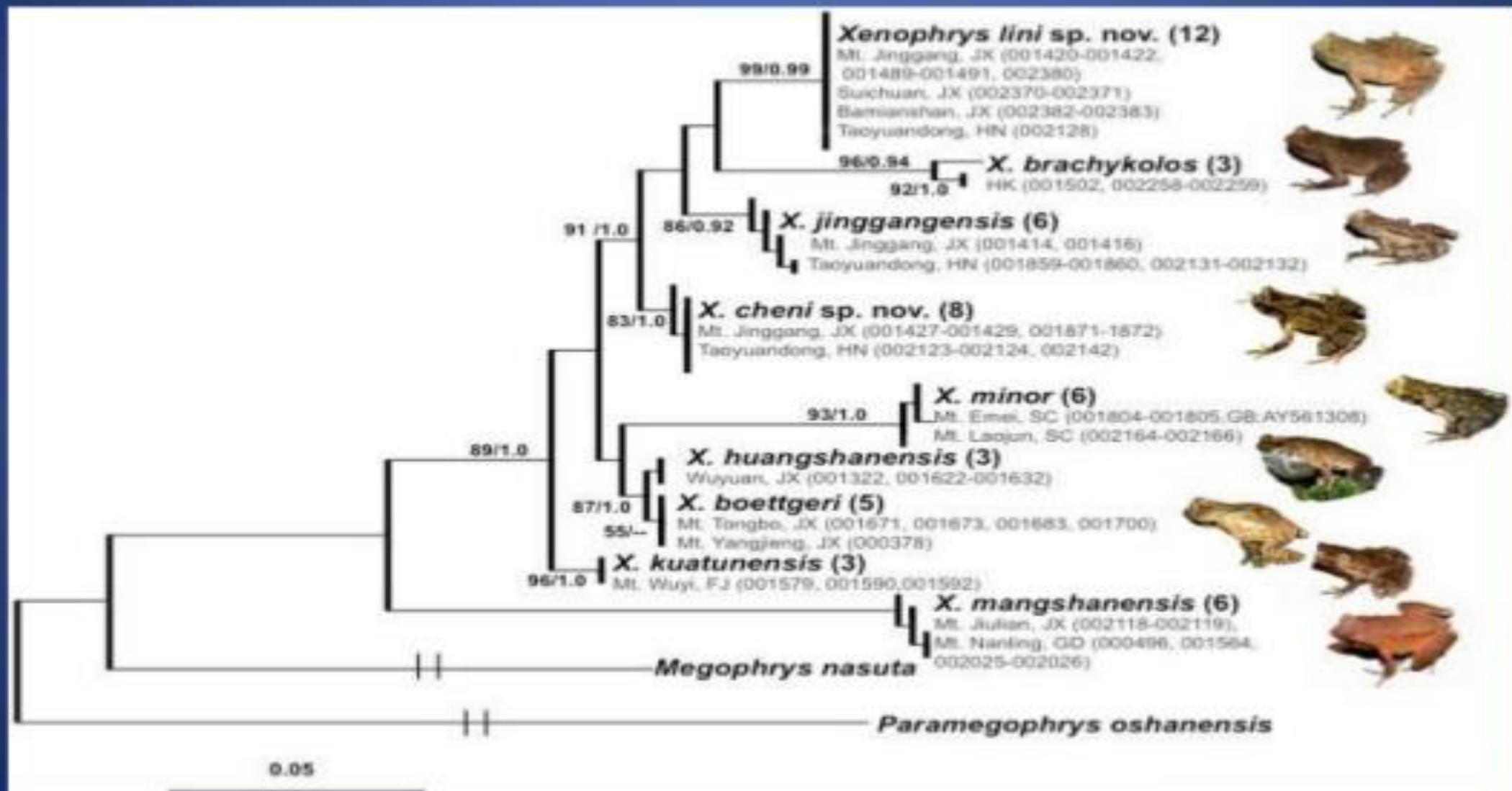
- Phylogenetic system based on ancestral and derived characteristics
  - **Ancestral Characteristics**—inherited attributes and RESEMBLE those of ancestor
  - **Derived Characteristics**—features that are different from ancestors group
  - **Monophyletic**—Group of organisms with 1 common ancestor and ALL the descendants
  - **Paraphyletic**—Group of organisms with 1 common ancestor and some, but not all descendants
  - **Polyphyletic**—Group of organisms that EXCLUDES the most recent common ancestor

# Cladogram

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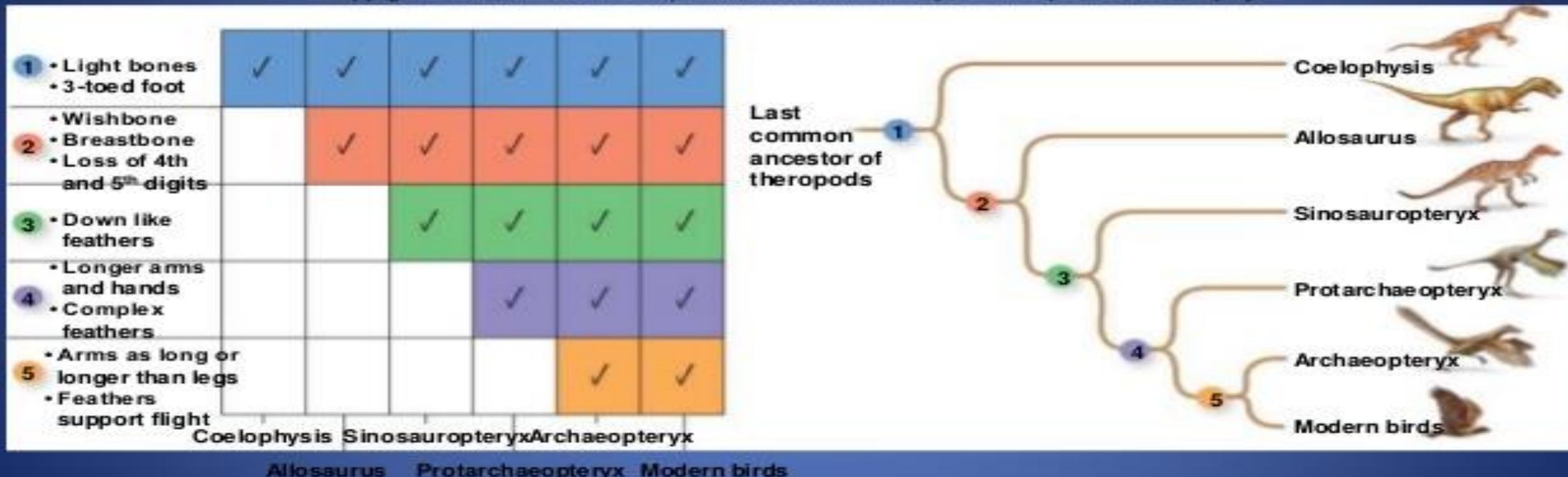
# Cladogram



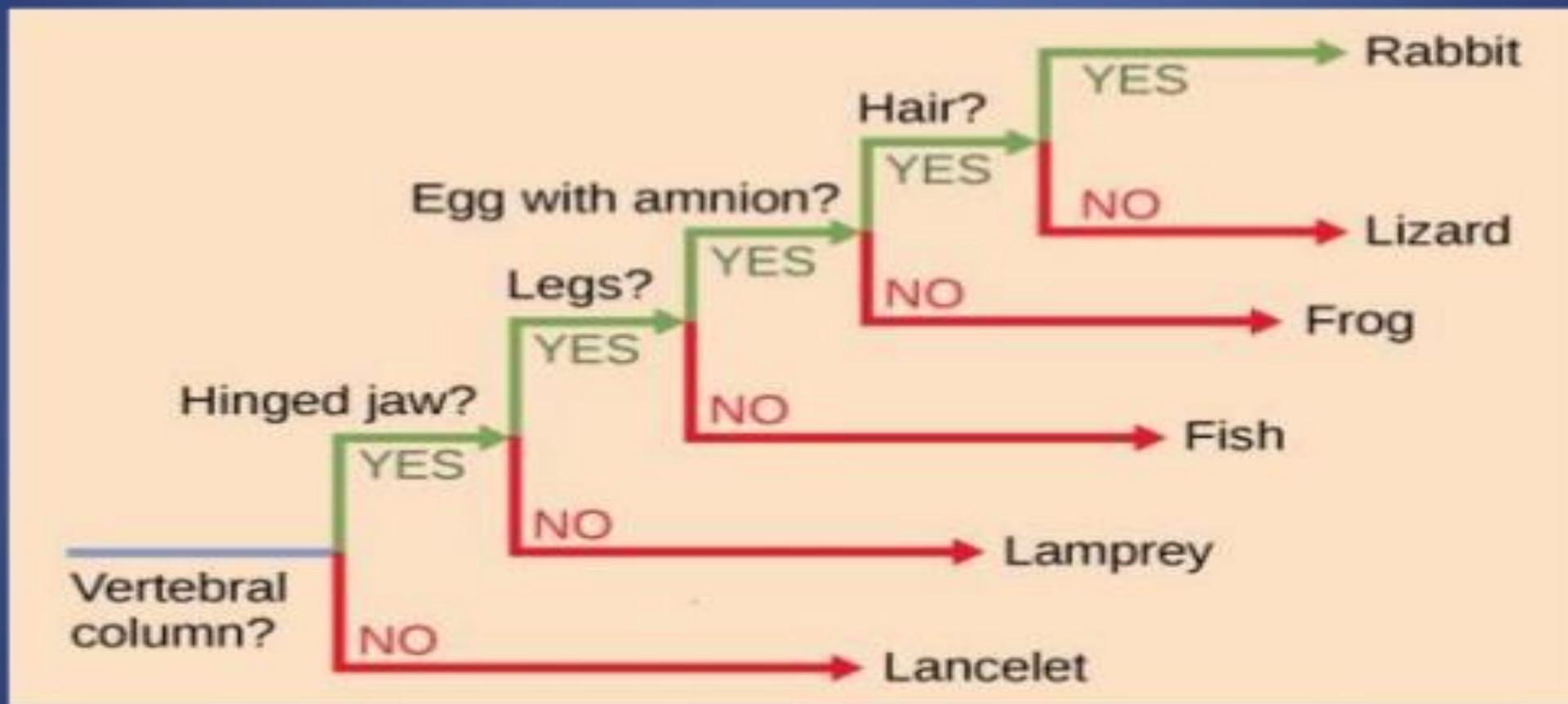


# Constructing Cladograms

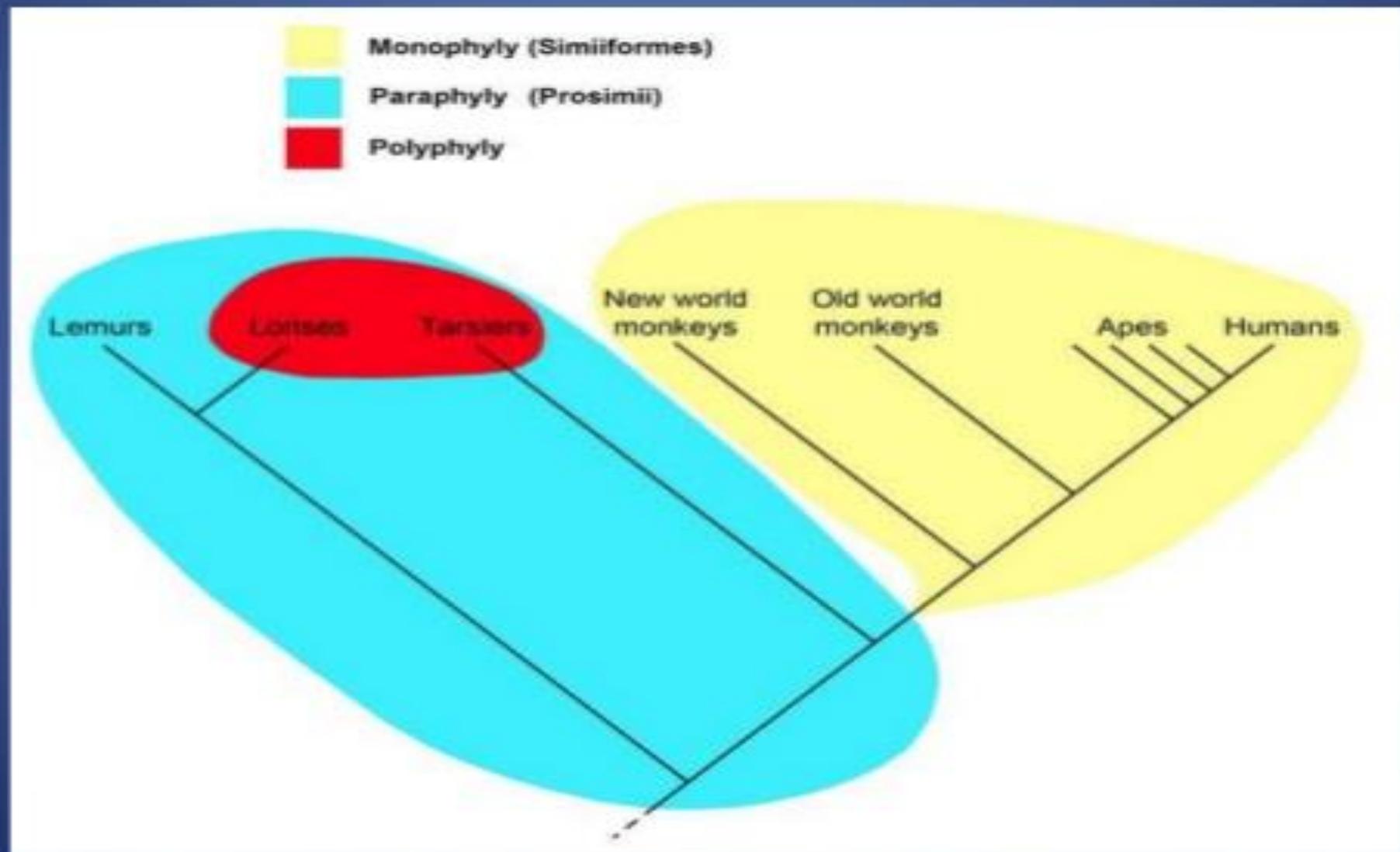
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# Constructing Cladograms



# Cladistics



# Phylogenetics and Cladistics Cheat Sheet

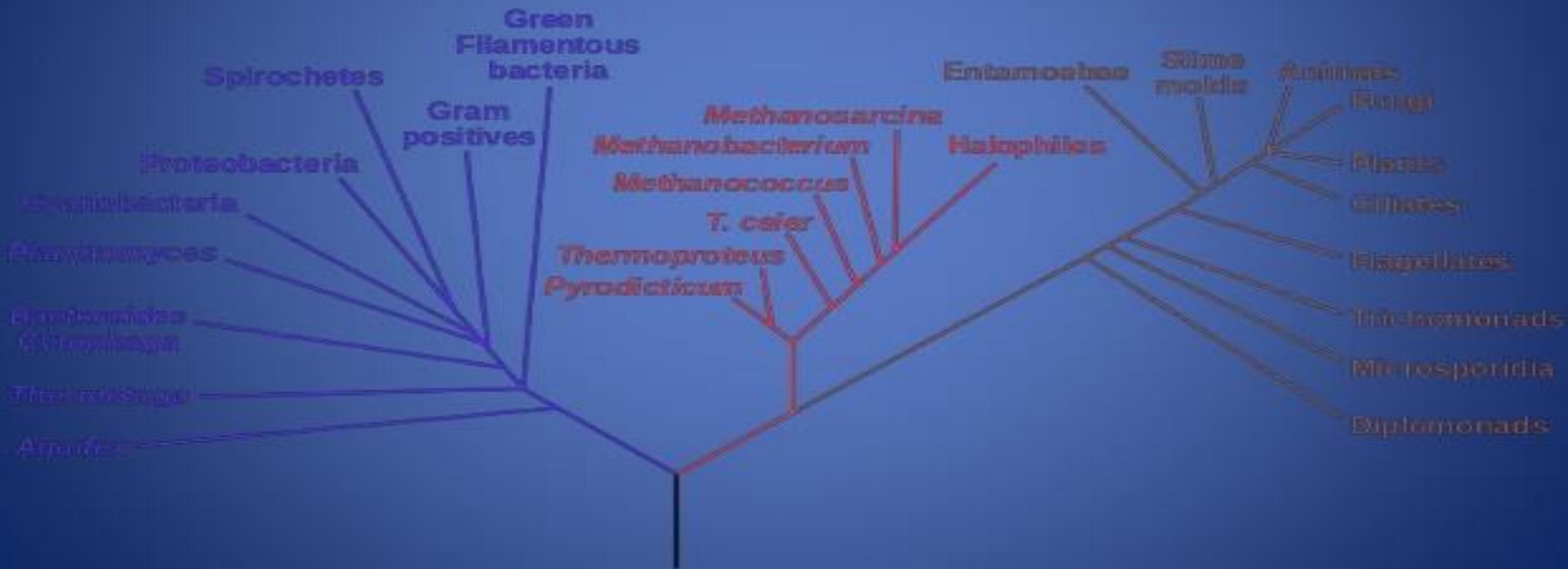
Term	Definition
Ancestral characters	a trait inherited from the ancestor of a clade
Clade	a group consisting of an ancestor and all its descendants—a single "branch" on the "tree of life"
Cladistics	the science that tries to reconstruct phylogenetic trees and thus discover clades
Cladogram	tree-shaped diagrams; the result of cladistic analyses
Derived characters	a trait that has evolved—not from the common ancestor of the clade
Monophyletic group	a taxon (group of organisms) which forms a clade
Outgroup	a monophyletic group of organisms that serve as a reference group when determining the evolutionary relationship among three or more monophyletic groups of organisms
Paraphyletic group	a group that consists of all the descendants of the last common ancestor of the group's members minus a small number of monophyletic groups of descendants
Phylogenetic tree	a branching diagram or "tree" showing the inferred evolutionary relationships among various biological species or other entities—their phylogeny—based upon similarities and differences in their physical or genetic characteristics
Polyphyletic group	a group characterized by one or more homoplasies: character states which have converged or reverted so as to appear to be the same but which have not been inherited from common ancestors
Systematics	the study of the diversification of living forms, both past and present, and the relationships among living things through time

# The World Around Us

## Bacteria

## Archaea

## Eukaryota



**THANK YOU**