# Phylogeny and the history of life

Phylogeny

The history of life

Processes of diversification

# Outline

- Phylogeny
  - Interpreting phylogenetic trees
  - Constructing phylogenetic trees
  - Example: the evolution of whales
- The history of life
  - The shape of the tree
  - The fossil record
  - Putting the timeline together
- Processes of diversification
  - Adaptive radiations
  - Mass extinctions

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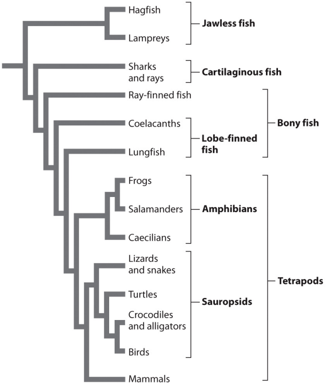


**Figure 22.2**
*Biology: How Life Works*

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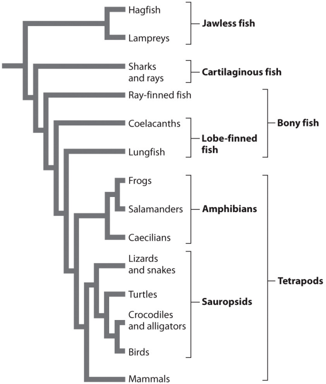


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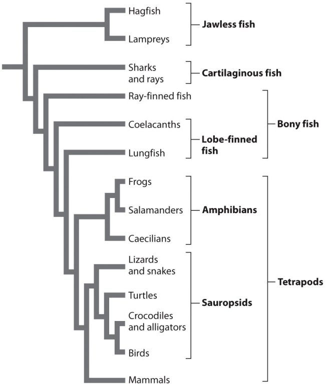


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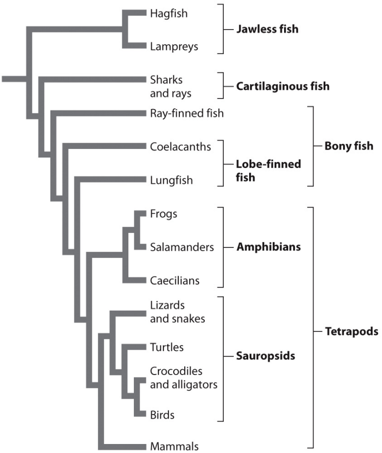


**Figure 22.2**
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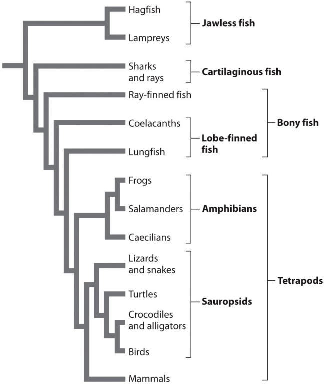


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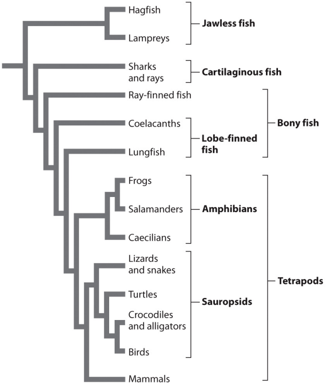


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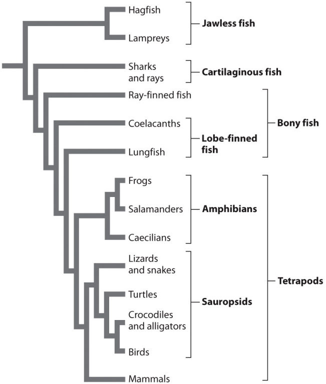


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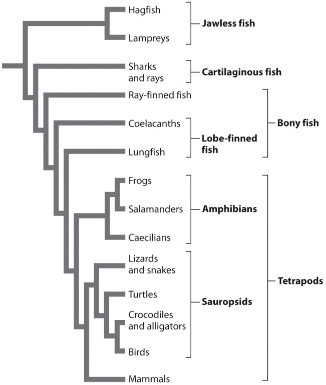


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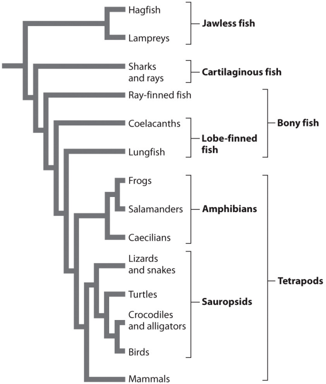


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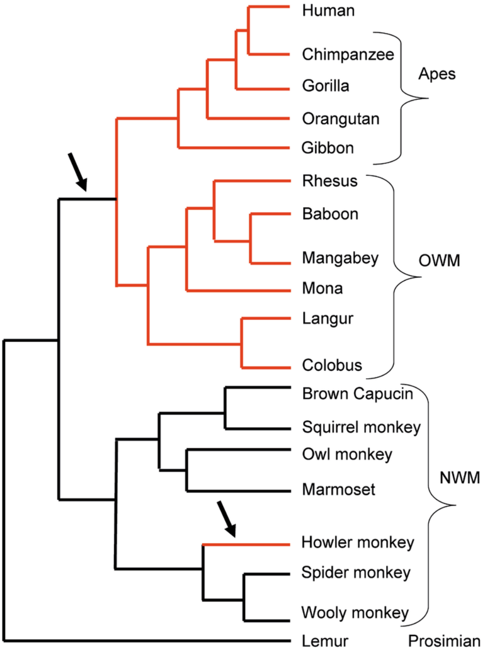
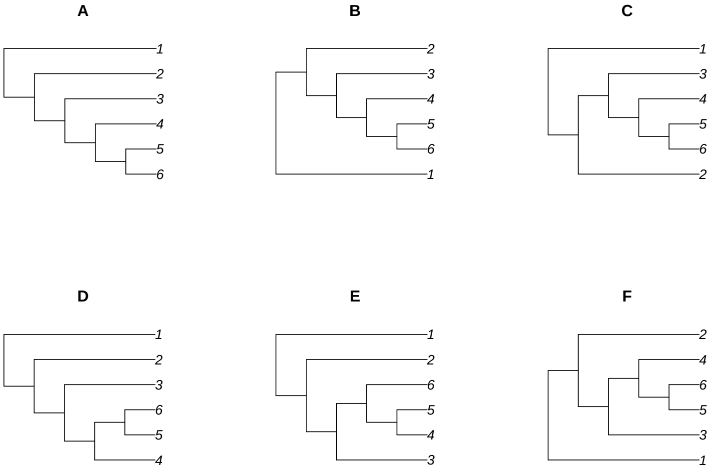



*Wikimedia commons: Phylogenetic Tree of Primates*

# Activity: which of these things is not like the others?



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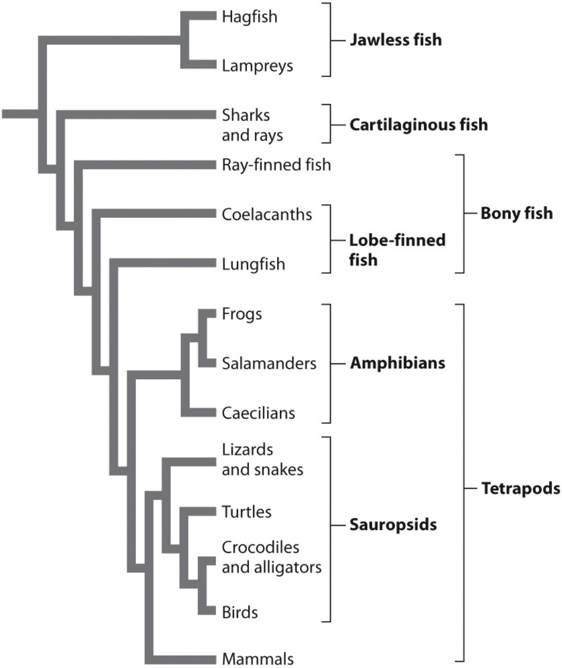


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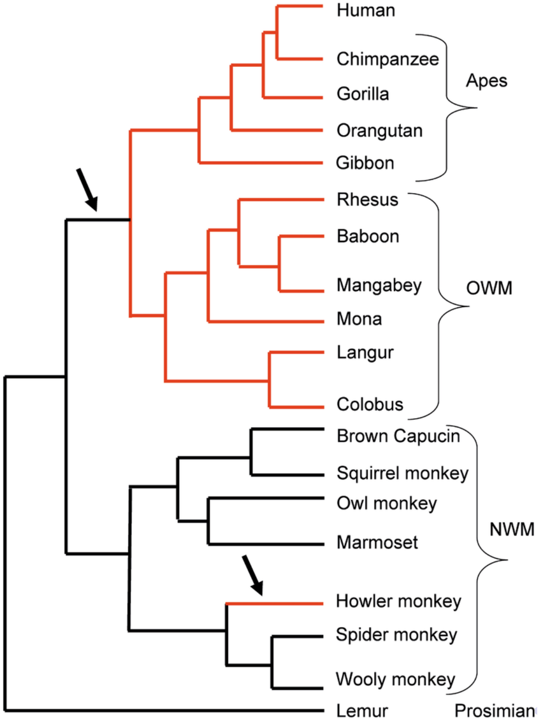
Human
Chimpanzee
Gorilla
Orangutan
Gibbon
Apes
Rhesus
Baboon
Mangabey
Mona
Langur
Colobus
OWM
Brown Capucin
Squirrel monkey
Owl monkey
Marmoset
Howler monkey
Spider monkey
Wooly monkey
NWM
Lemur
Prosimian

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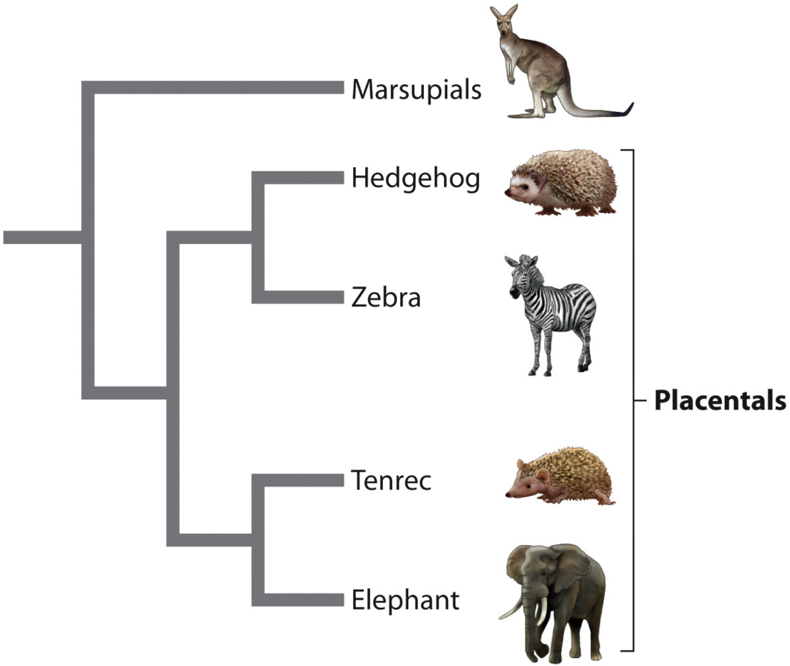


**Figure 22.7**
*Biology: How Life Works*

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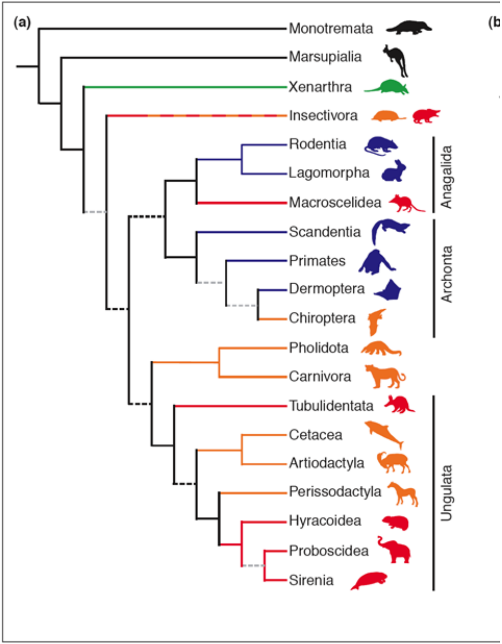

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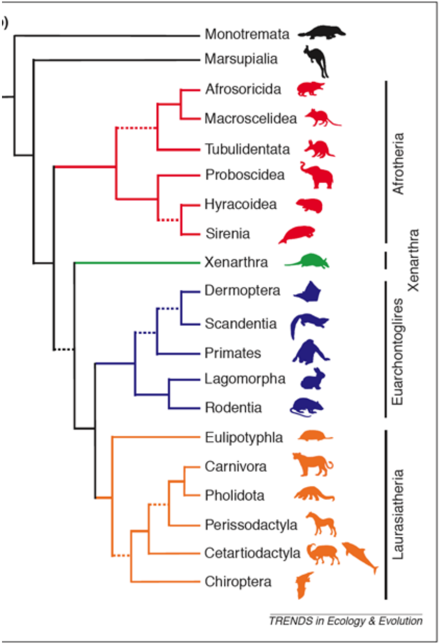

Monotremata
Marsupialia
Afrosoricida
Macroscelidea
Tubulidentata
Proboscidea
Hyracoidea
Sirenia
Xenarthra
Dermoptera
Scandentia
Primates
Lagomorpha
Rodentia
Eulipotyphla
Carnivora
Pholidota
Perissodactyla
Cetartiodactyla
Chiroptera
Afrotheria
Xenarthra
Euarchontoglires
Laurasiatheria
TRENDS in Ecology & Evolution

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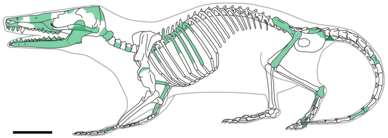

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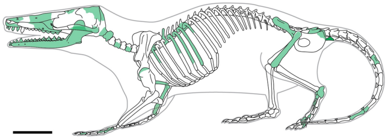

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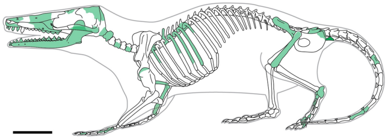

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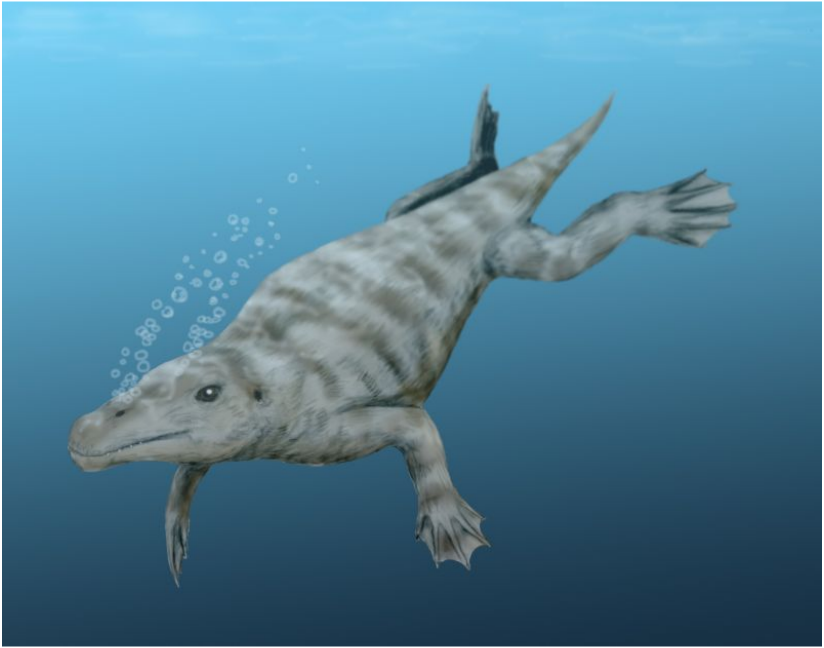

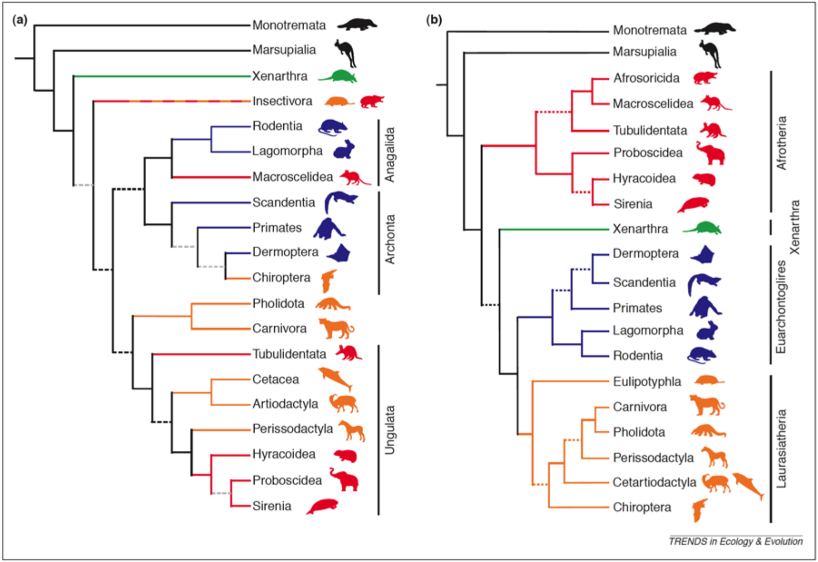

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Artiodactyla
Perissodactyla
Hyracoidea
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Archonta
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(b)
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# How to make a phenetic tree in this course

- 1. Join the two open nodes that are closest to each other
  - Shortest distance
- * 2. *Stop!* You're done.
  - * I will only give you three species
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# Lessons

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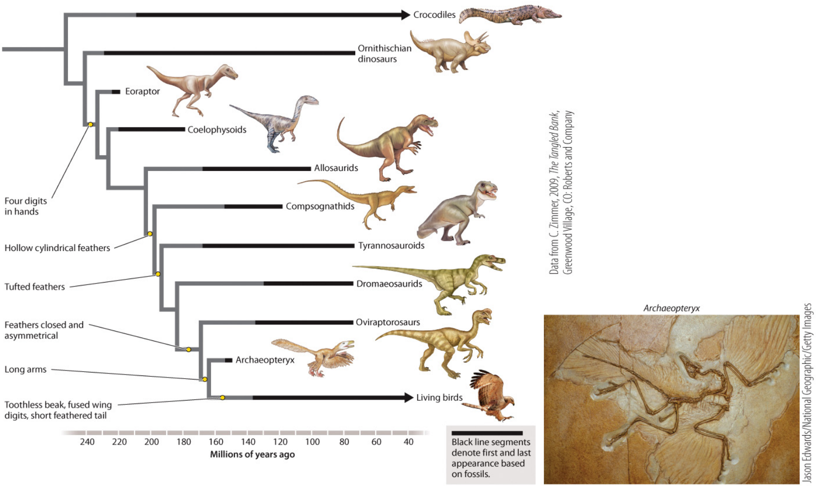


**Figure 22.21**
*Biology: How Life Works*

# Outline

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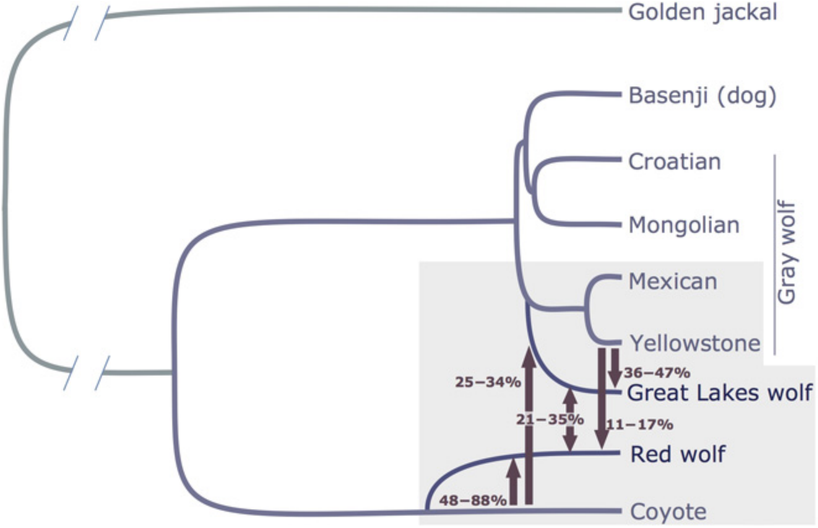
Golden jackal
Basenji (dog)
Croatian
Mongolian
Mexican
Yellowstone
Gray wolf
Great Lakes wolf
Red wolf
Coyote
25–34%
21–35%
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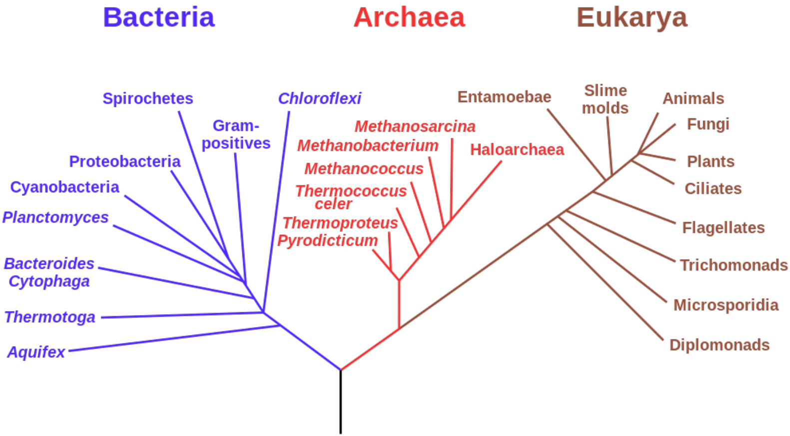
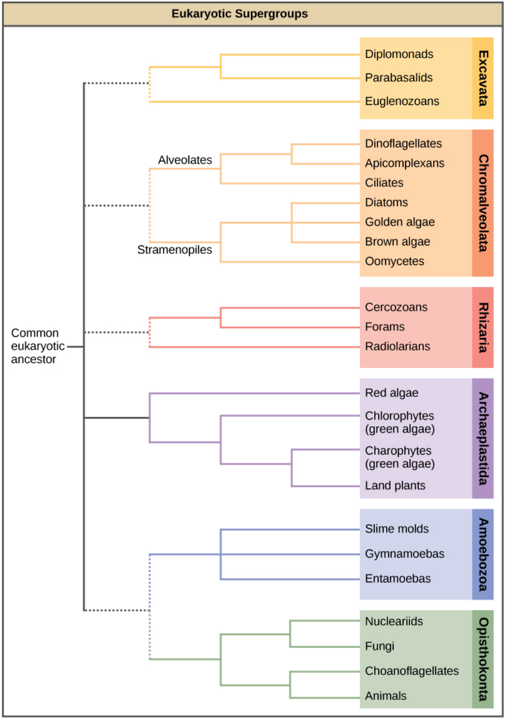
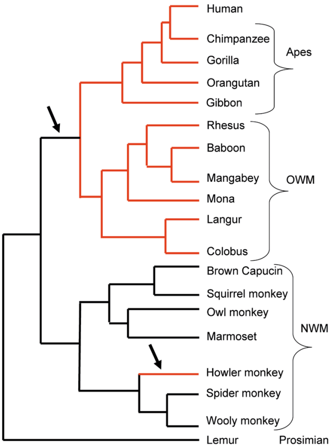

Bacteria
Archaea
Eukarya
Spirochetes
Chloroflexi
Gram-positives
Proteobacteria
Cyanobacteria
Planctomyces
Bacteroides Cytophaga
Thermotoga
Aquifex
Methanosarcina
Methanobacterium
Haloarchaea
Methanococcus
Thermococcus celer
Thermoproteus
Pyrodicticum
Entamoebae
Slime molds
Animals
Fungi
Plants
Ciliates
Flagellates
Trichomonads
Microsporidia
Diplomonads


Eukaryotic Supergroups
Diplomonads
Parabasalids
Euglenozoans
Excavata
Alveolates
Dinoflagellates
Apicomplexans
Ciliates
Diatoms
Golden algae
Brown algae
Oomycetes
Stramenopiles
Chromalveolata
Cercozoans
Forams
Radiolarians
Rhizaria
Common eukaryotic ancestor
Red algae
Chlorophytes (green algae)
Charophytes (green algae)
Land plants
Archaeplastida
Slime molds
Gymnamoebas
Entamoebas
Amoebozoa
Nucleariids
Fungi
Choanoflagellates
Animals
Opisthokonta

# When are trees a good approximation?

- *



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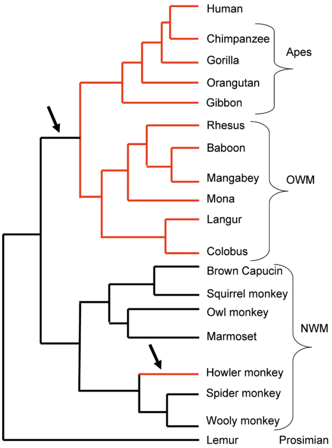

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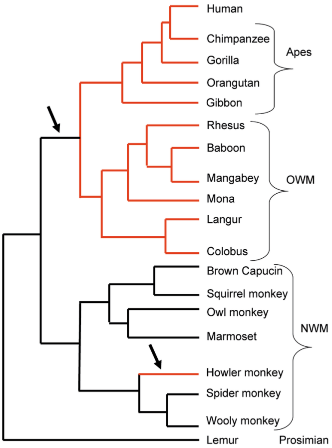

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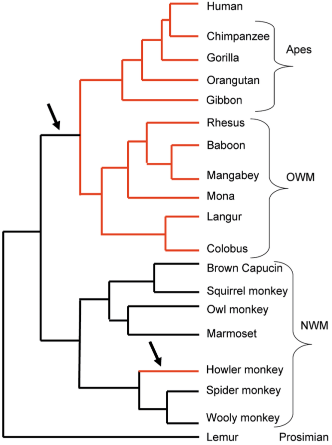

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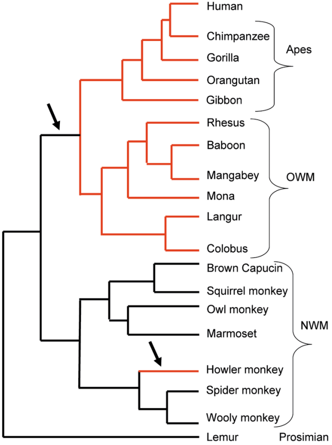

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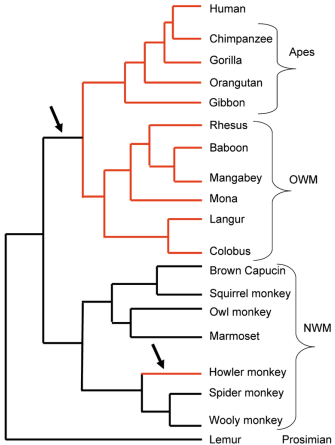

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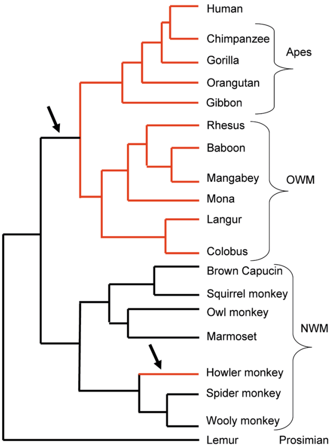

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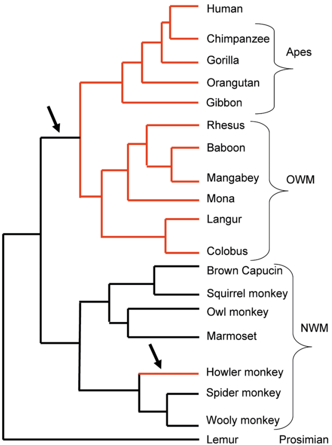

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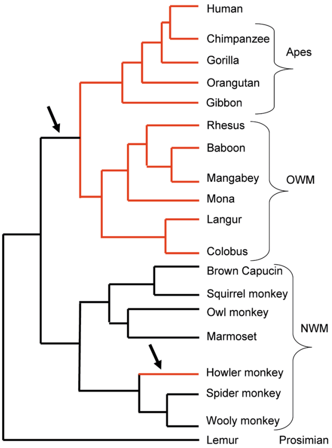

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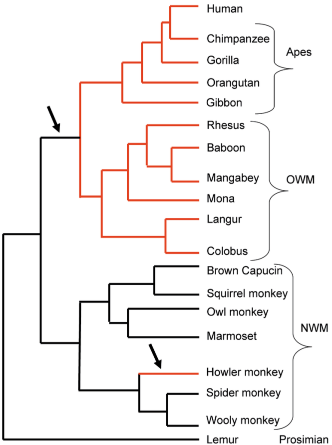

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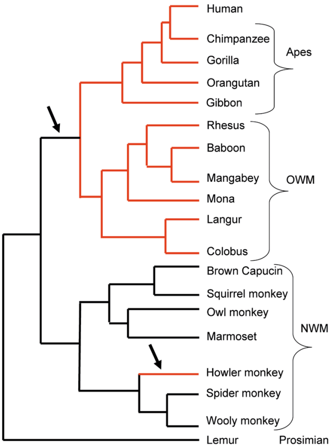

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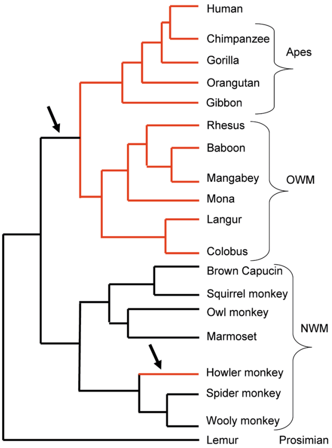

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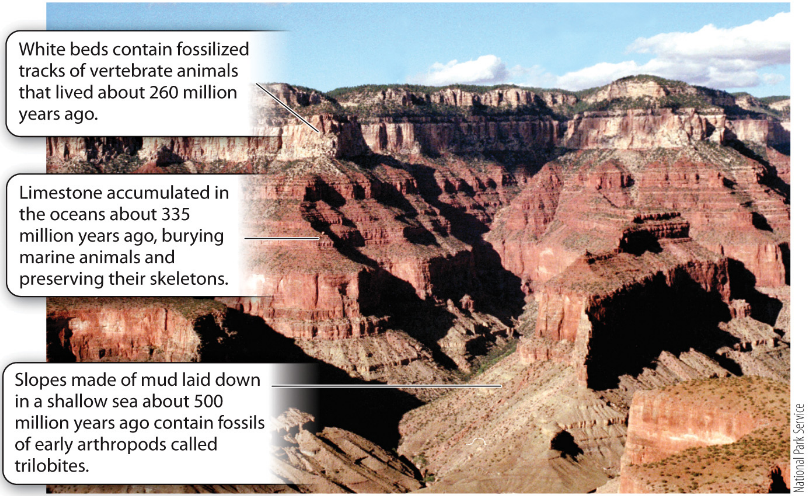


**Figure 22.14**
*Biology: How Life Works*

José Antonio Hernaiz/AGE Fotostock

**Figure 22.15**
*Biology: How Life Works*

© Smithsonian Institution–National Museum of Natural History (USNM 57683). Photo: Jean-Bernard Caron

**Figure 22.16**
*Biology: How Life Works*

Wild Horizon/Getty Images

**Figure 22.17**
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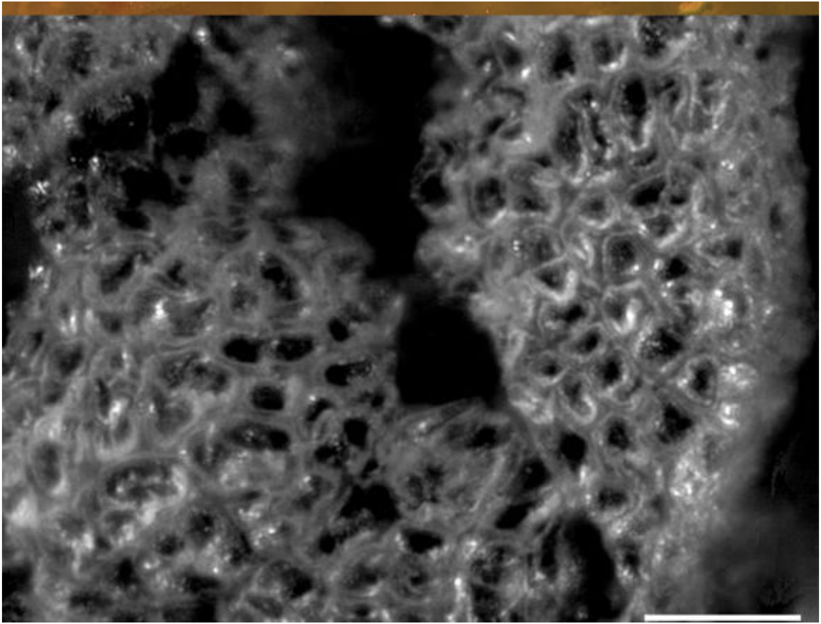
  - Just because you see a lot, doesn't mean that there were a lot (relatively speaking)
- Trying to figure out what happened based on what kind of fossils we happen to find is tricky
- Orchid phylogeny



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