

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

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Adaptive radiations

Mass extinctions

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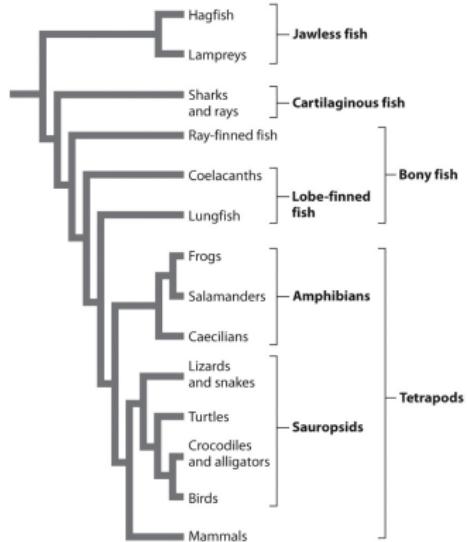


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Interpreting phylogenetic trees

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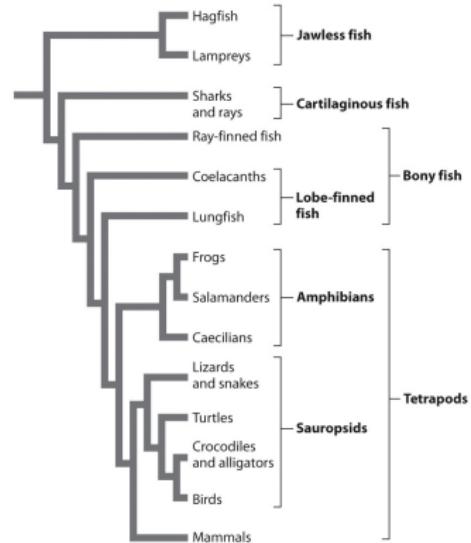


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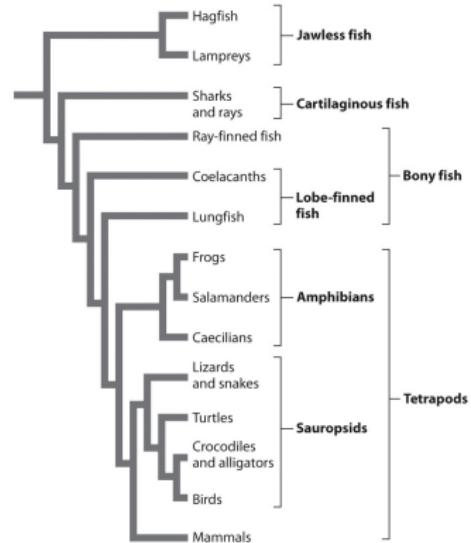


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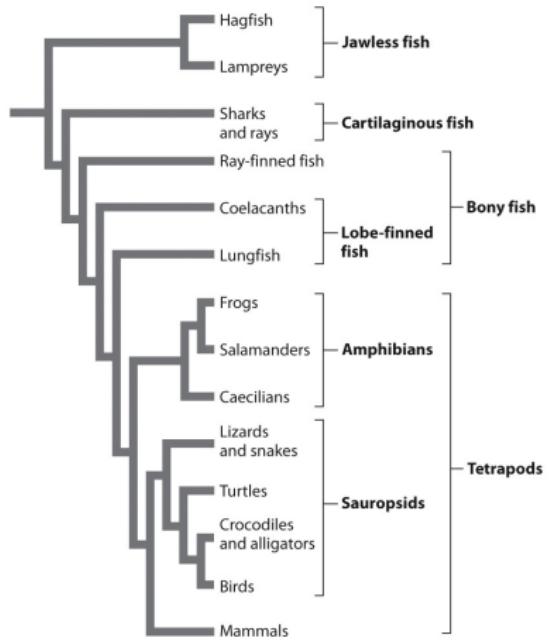


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Sister taxa

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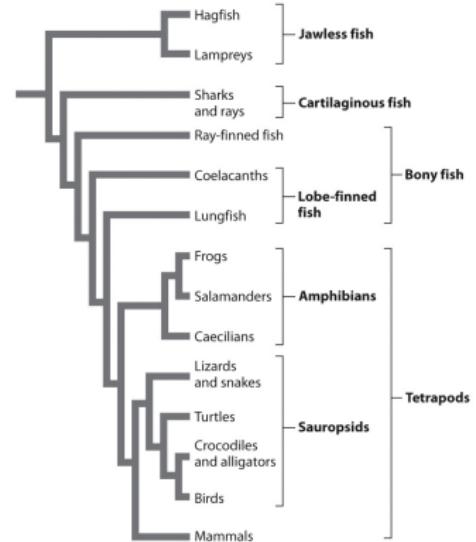


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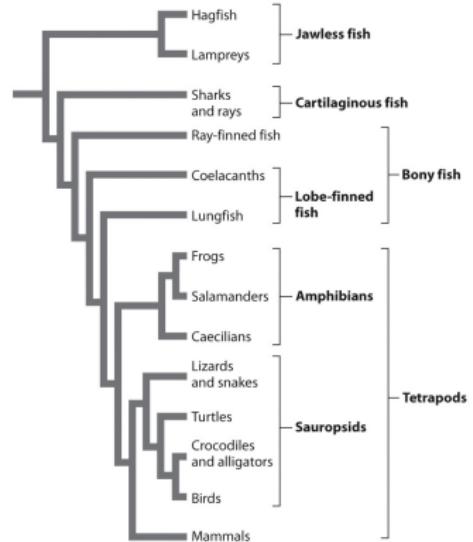


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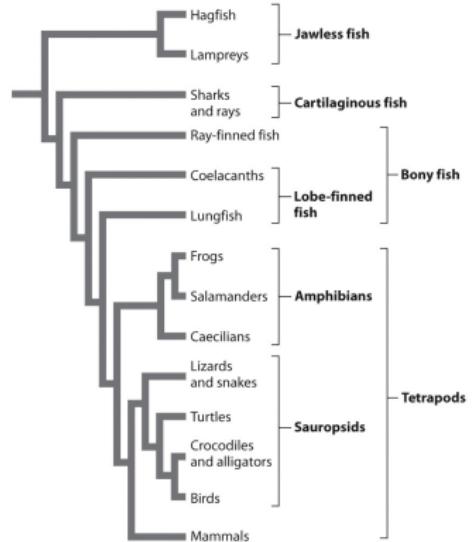


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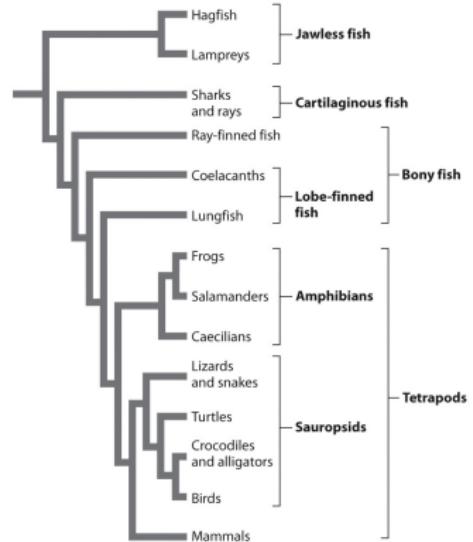


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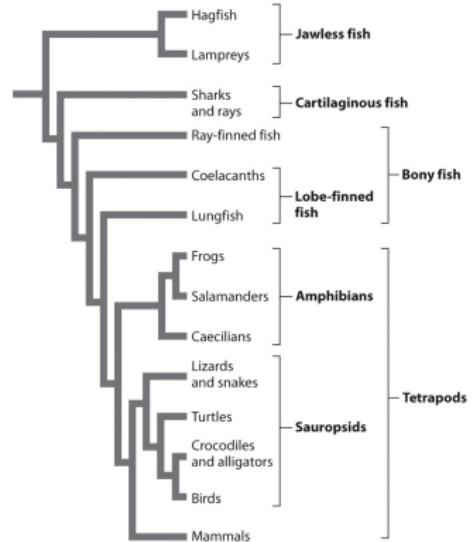


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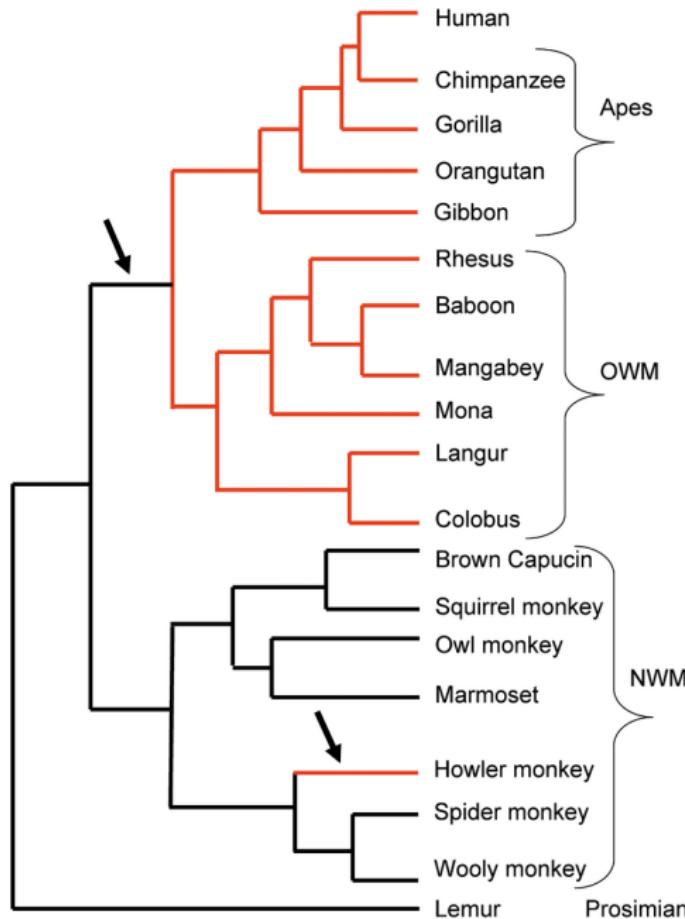
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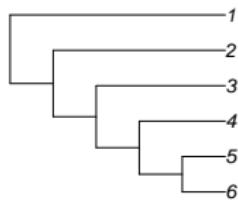
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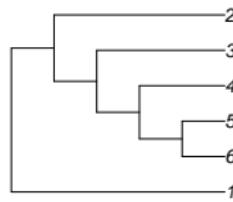
Wikimedia commons: Phylogenetic Tree of Primates

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

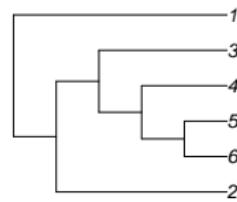
A



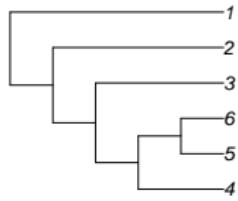
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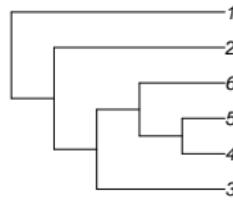
C



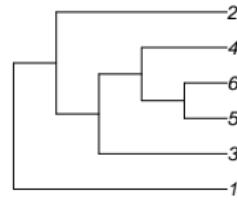
D



E



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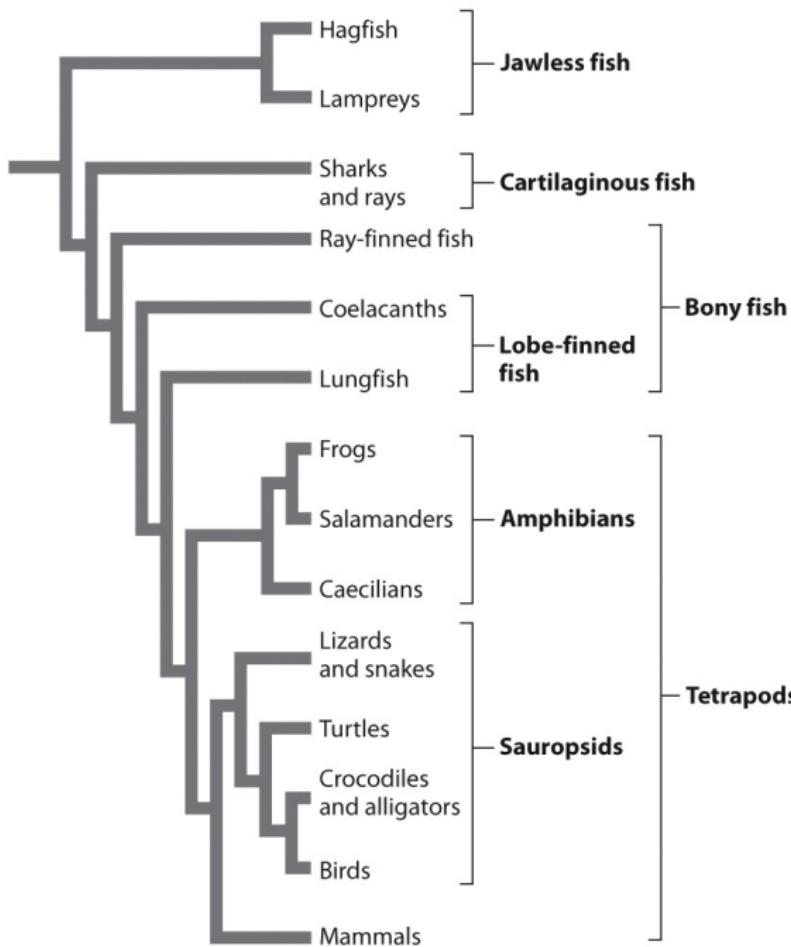
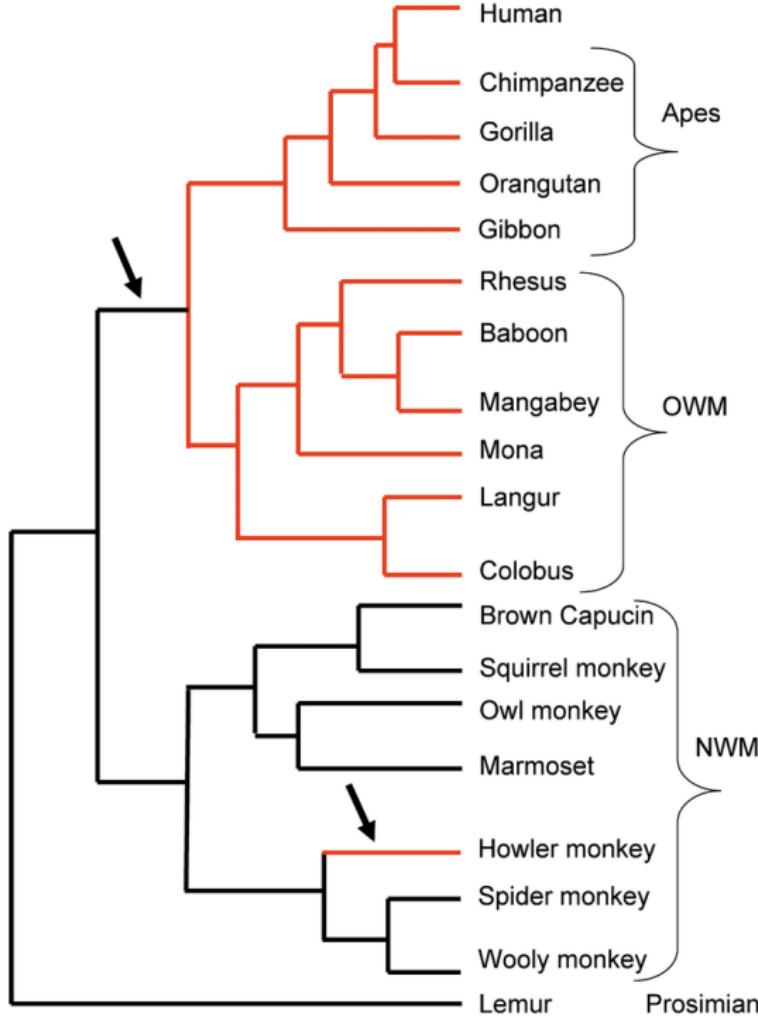


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Tortoise in a box

A tortoise's shell is made of two bone plates - the plastron on the underside and the carapace on the underside. The carapace is covered in scales called scutes, cover

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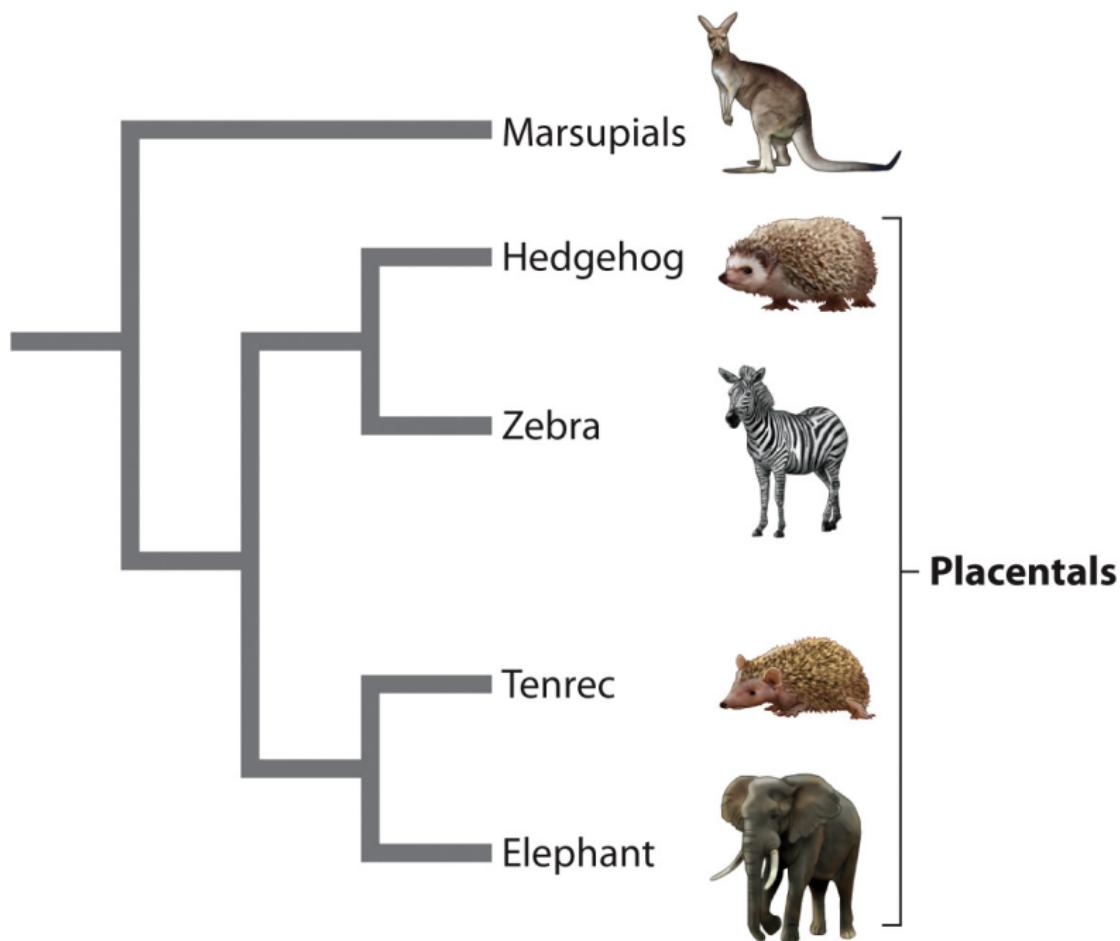


Figure 22.7
Biology: How Life Works
© Macmillan Learning





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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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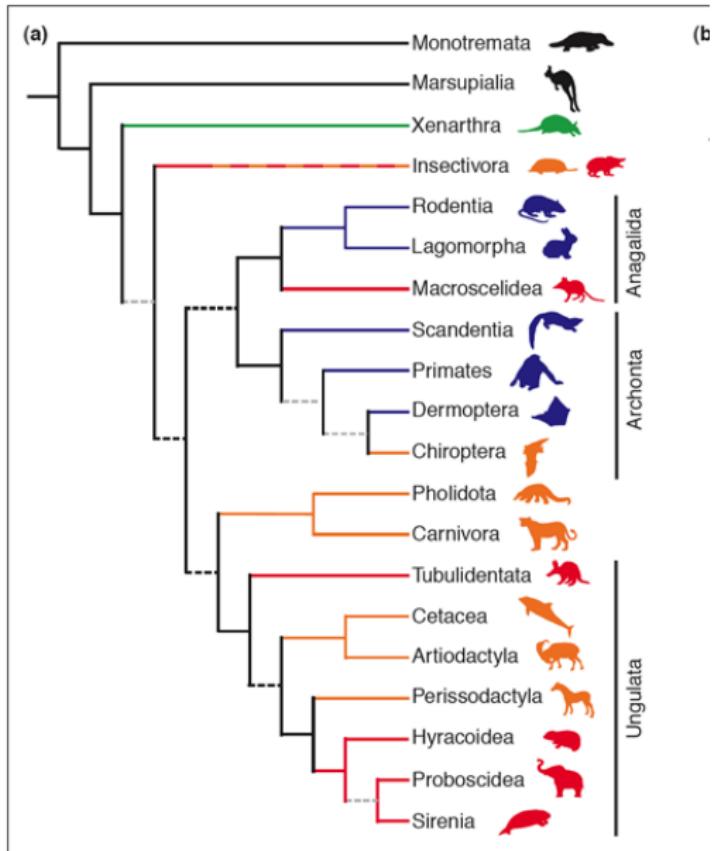
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Morphological tree



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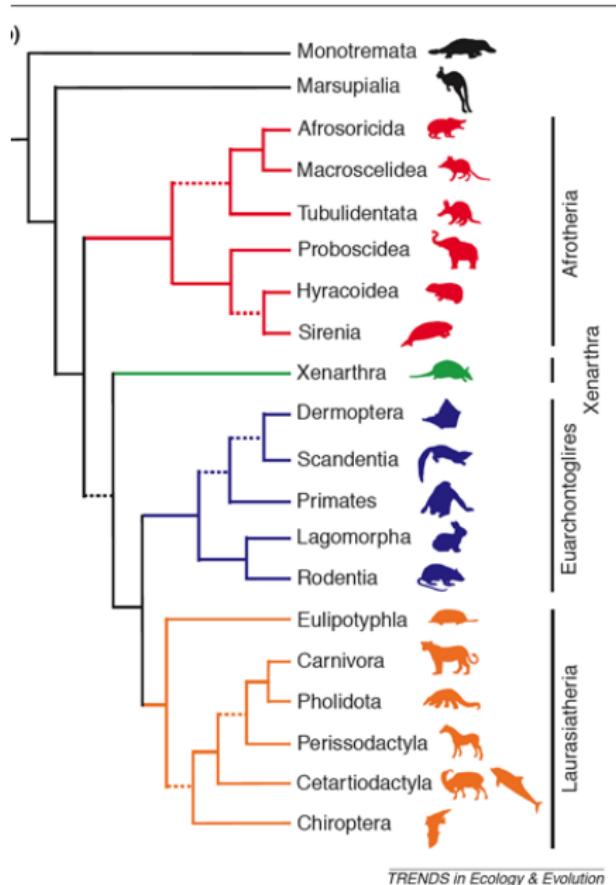
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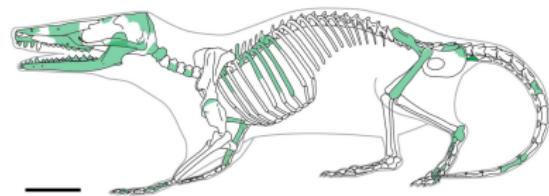
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Modern tree

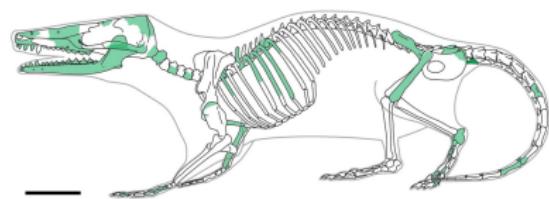


Confirmation



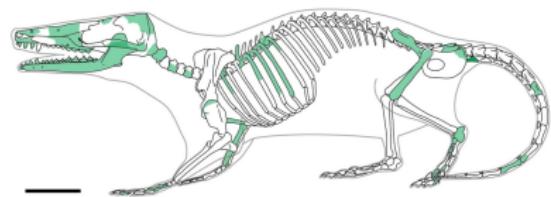
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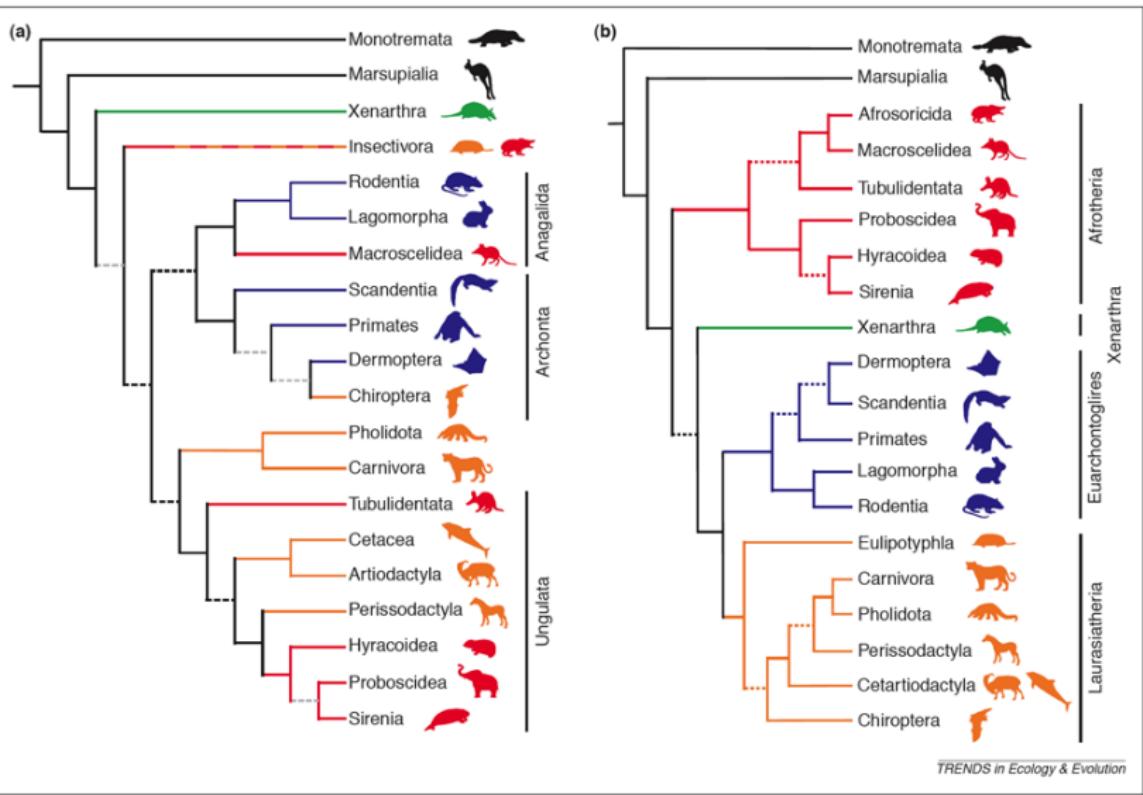
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- ▶ 2. They are no longer active. Make a new node halfway between them
 - ▶ Average the traits
 - ▶ This step is conceptually simple and practically tricky
 - ▶ *This is why we have computers*
- ▶ 3. Go back to step 1

How to make a phenetic tree in this course

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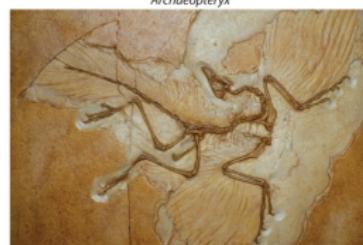
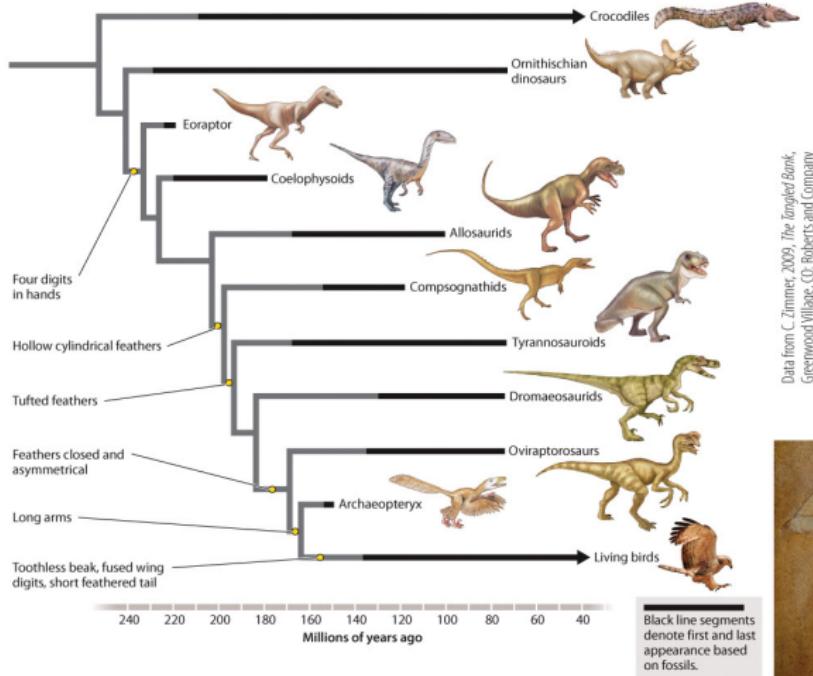


Figure 22.21
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Kason Edwards/National Geographic/Getty Images

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Example: the evolution of whales

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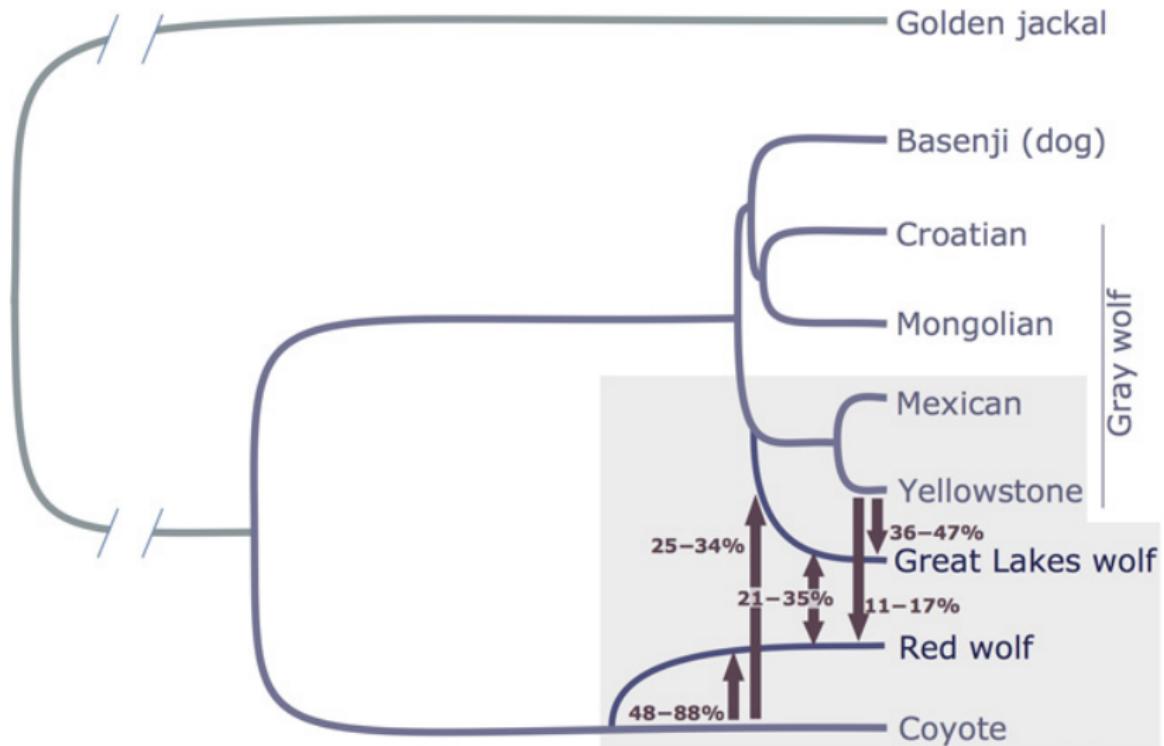
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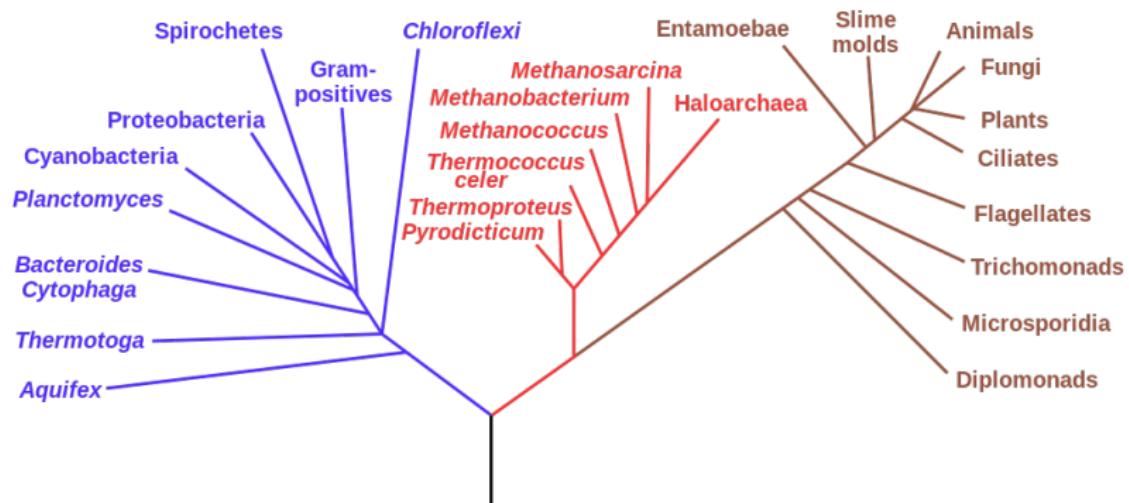
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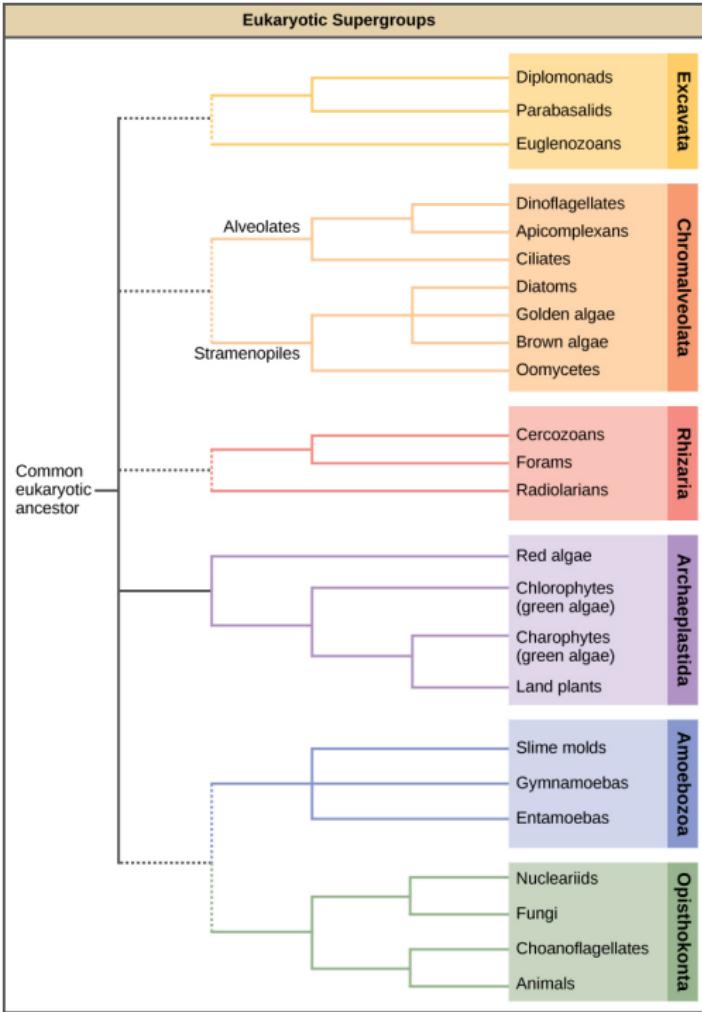
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Archaea

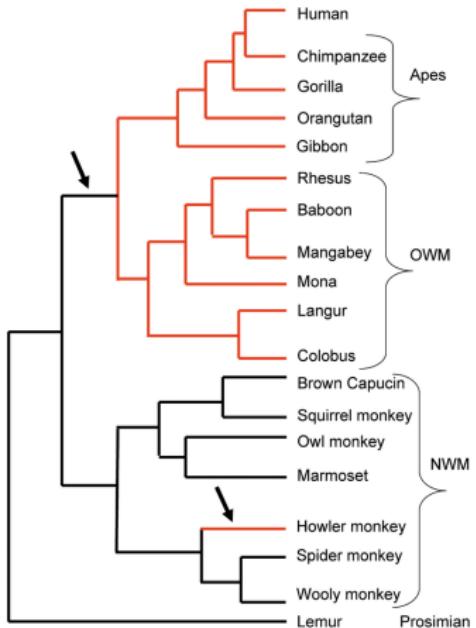
Eukarya



Eukaryotic Supergroups

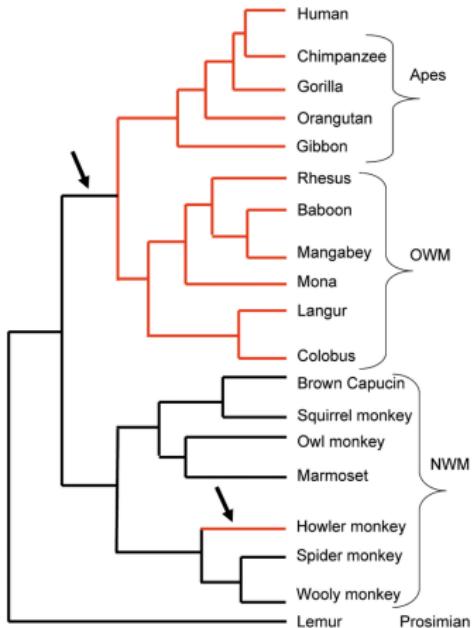


When are trees a good approximation?



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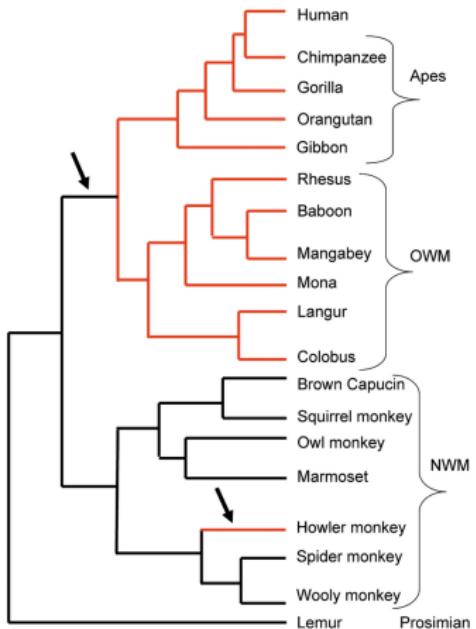
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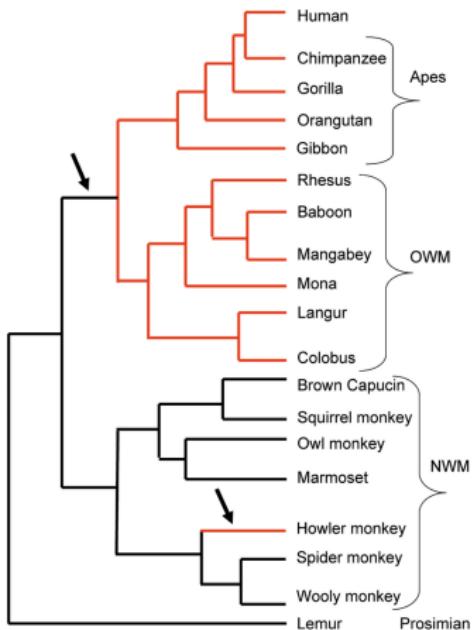
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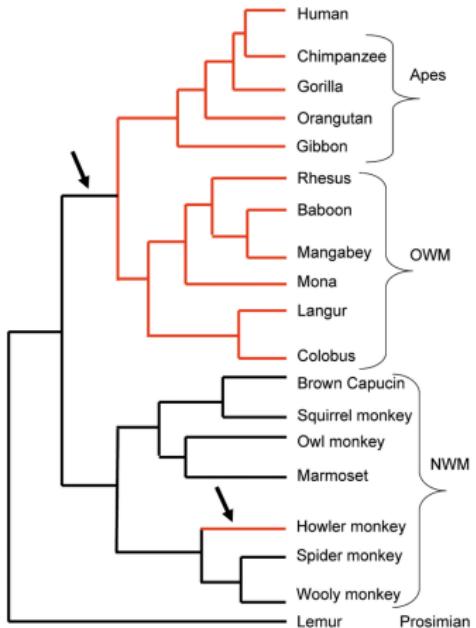
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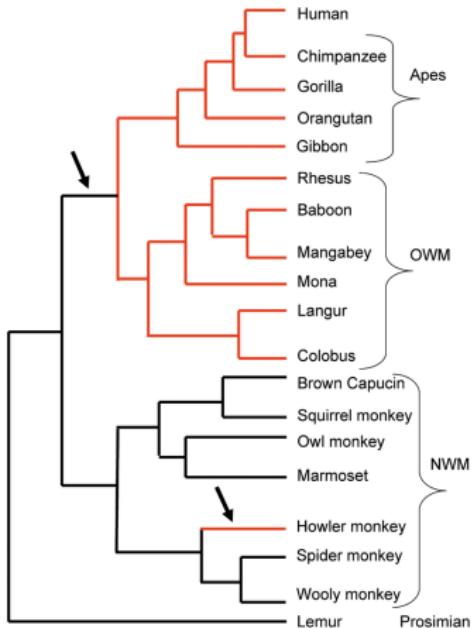
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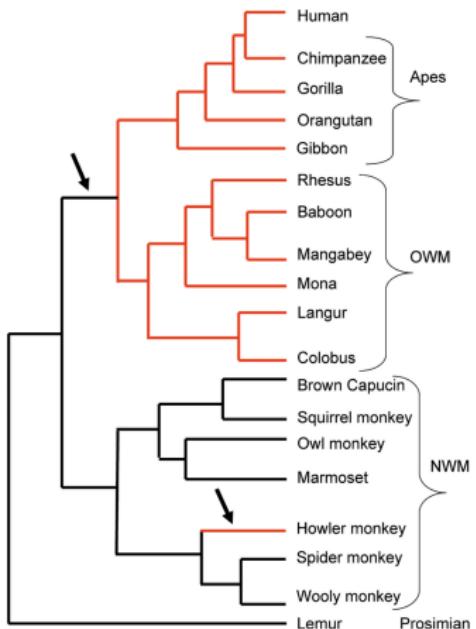
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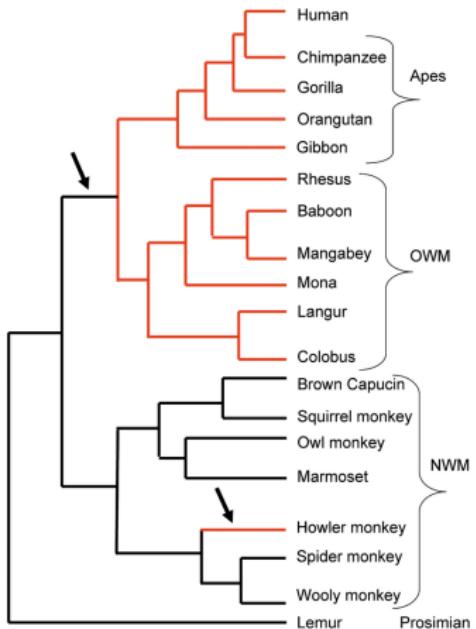
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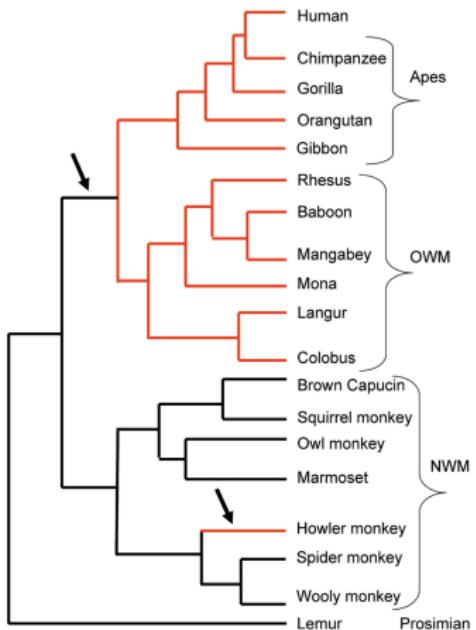
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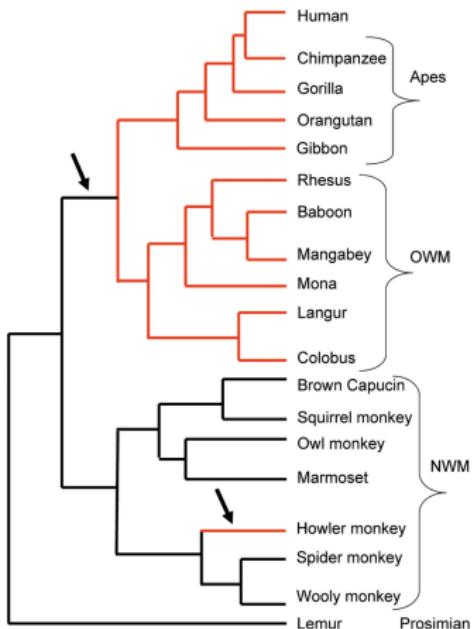
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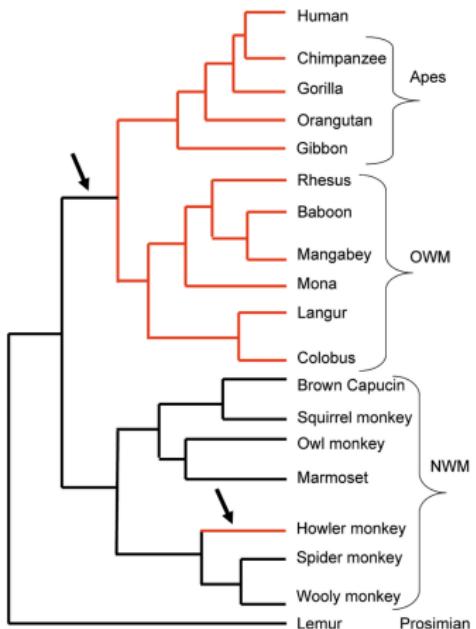
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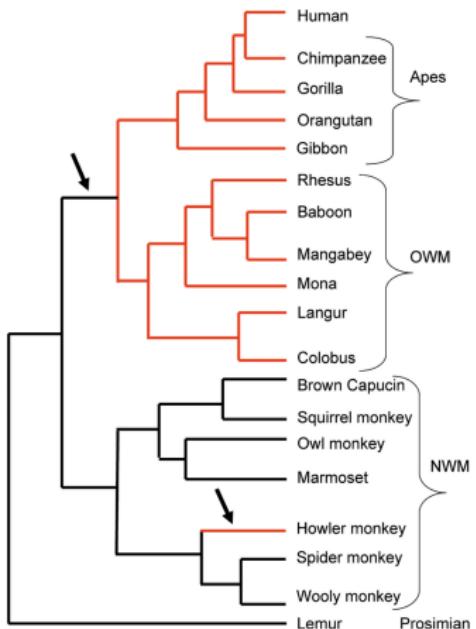
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White beds contain fossilized tracks of vertebrate animals that lived about 260 million years ago.

Limestone accumulated in the oceans about 335 million years ago, burying marine animals and preserving their skeletons.

Slopes made of mud laid down in a shallow sea about 500 million years ago contain fossils of early arthropods called trilobites.

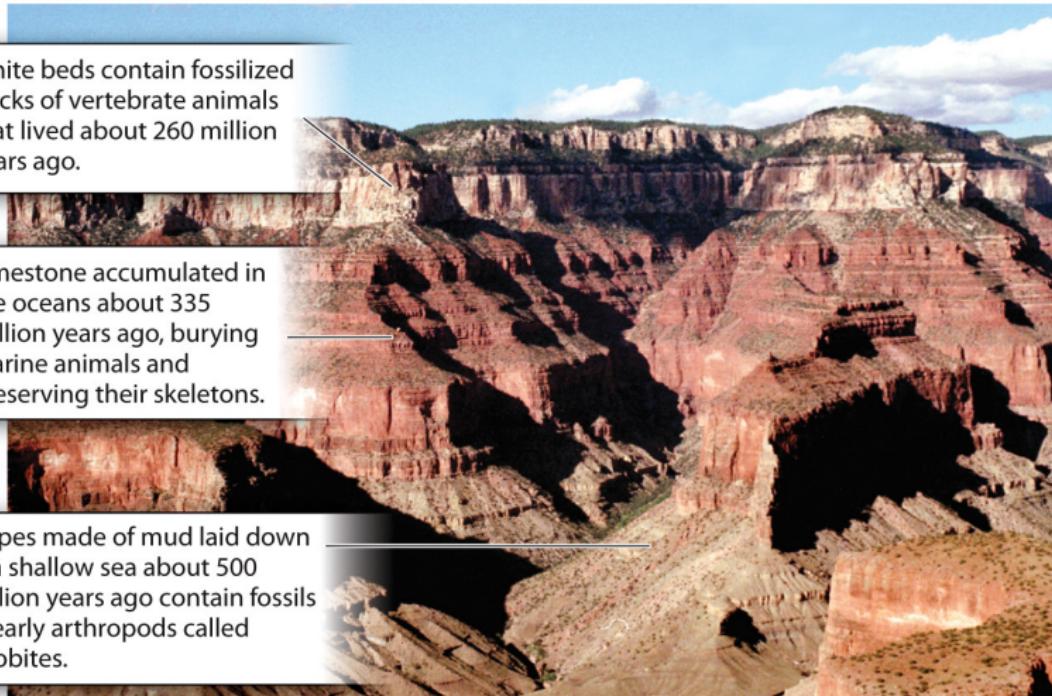


Figure 22.14

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Figure 22.15
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Figure 22.16
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Figure 22.17
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Biases in the fossil record

- ▶ Scientists have learned a lot from studying fossils, but care is needed. Very few things fossilize, and some things are much more likely to fossilize than others, for example:
 - ▶ Things that live in swampy areas, or underground (**Habitat bias**)
 - ▶ Hard things, or hard parts of things (**Taxonomic bias**)
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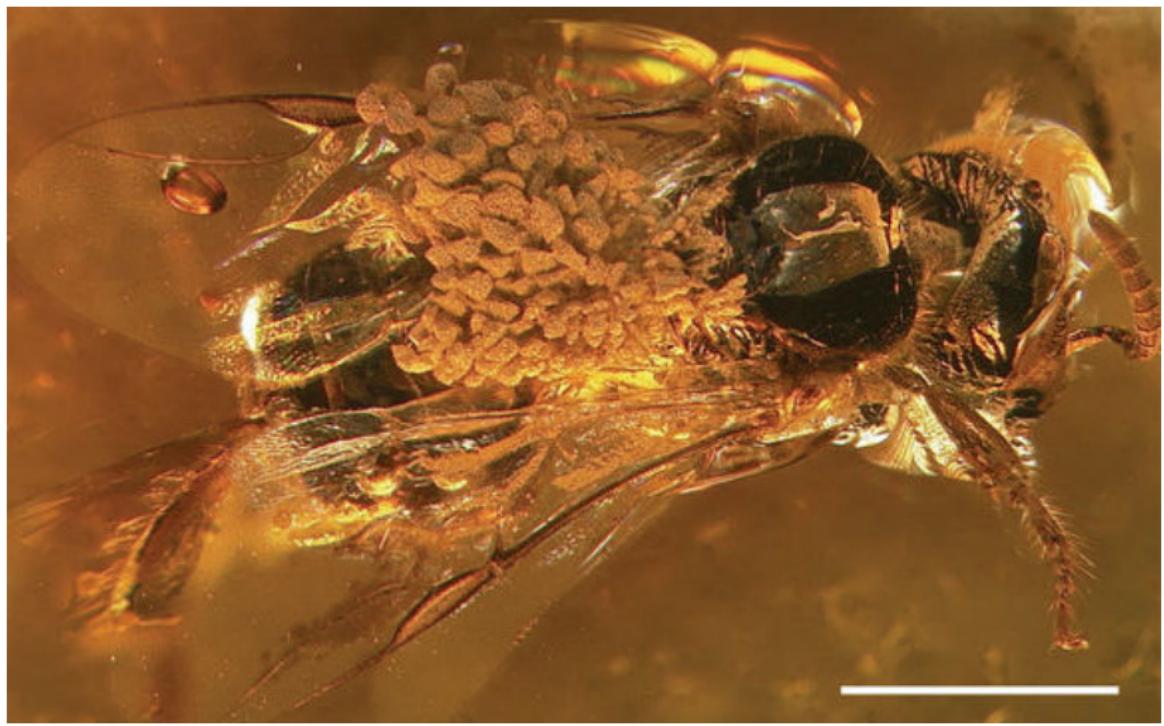
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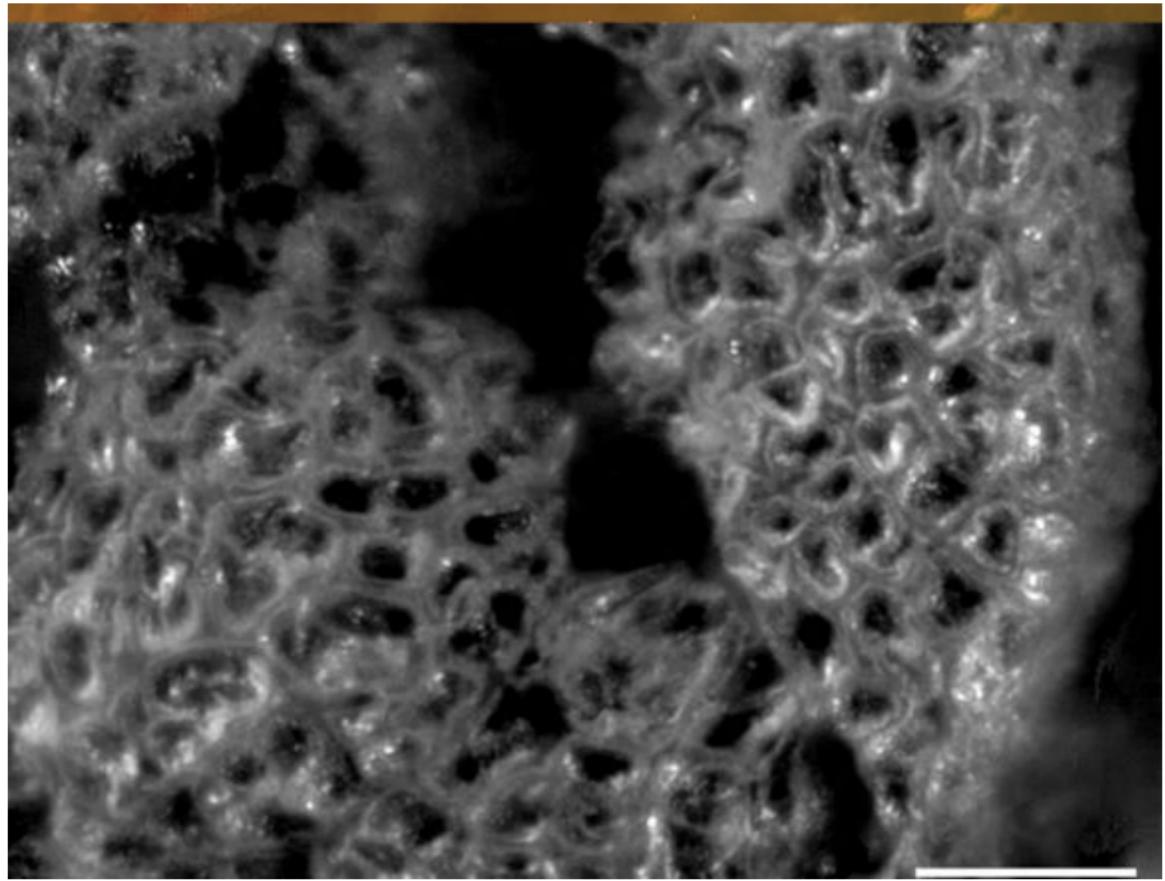
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