

# Chapter 27: Phylogeny and the history of life

Phylogeny

The history of life

Processes of diversification

# Outline

## Phylogeny

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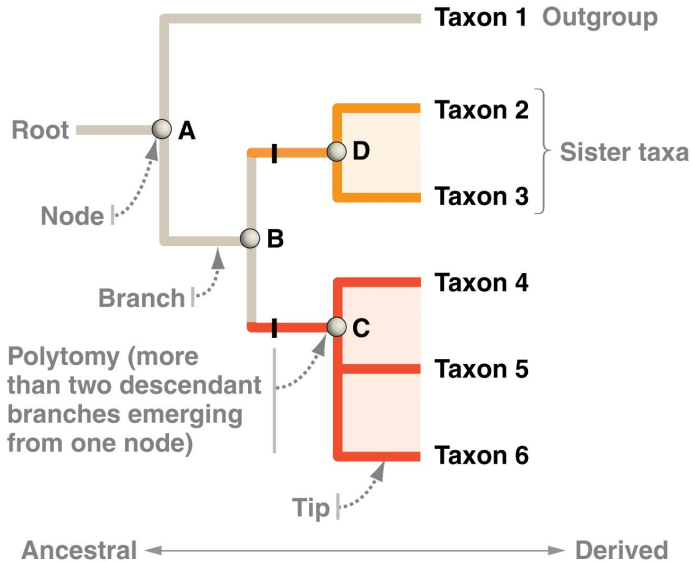
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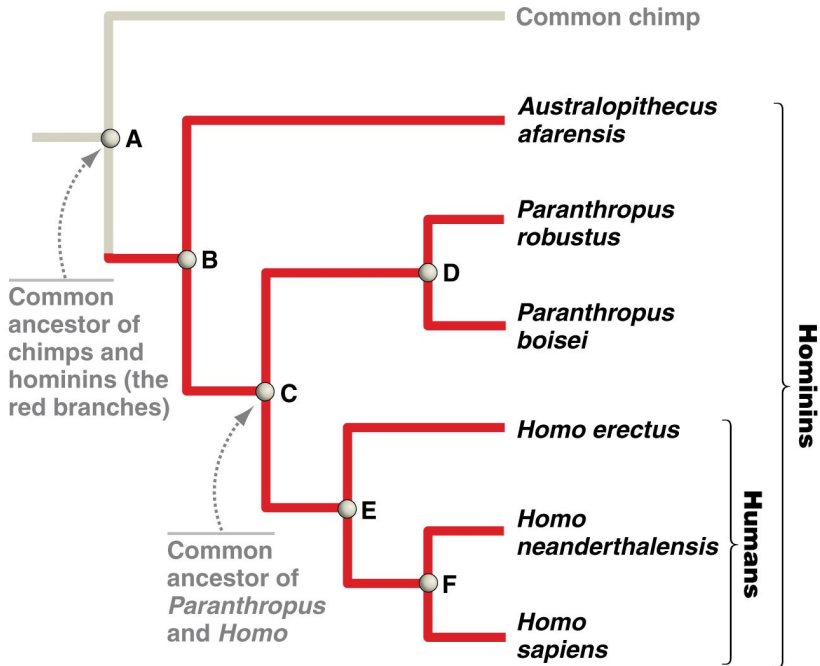
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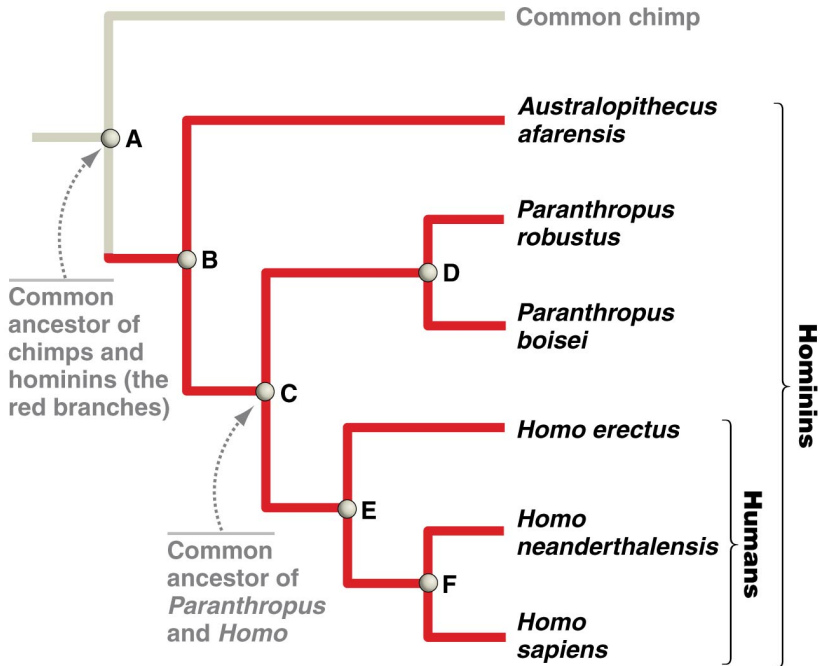
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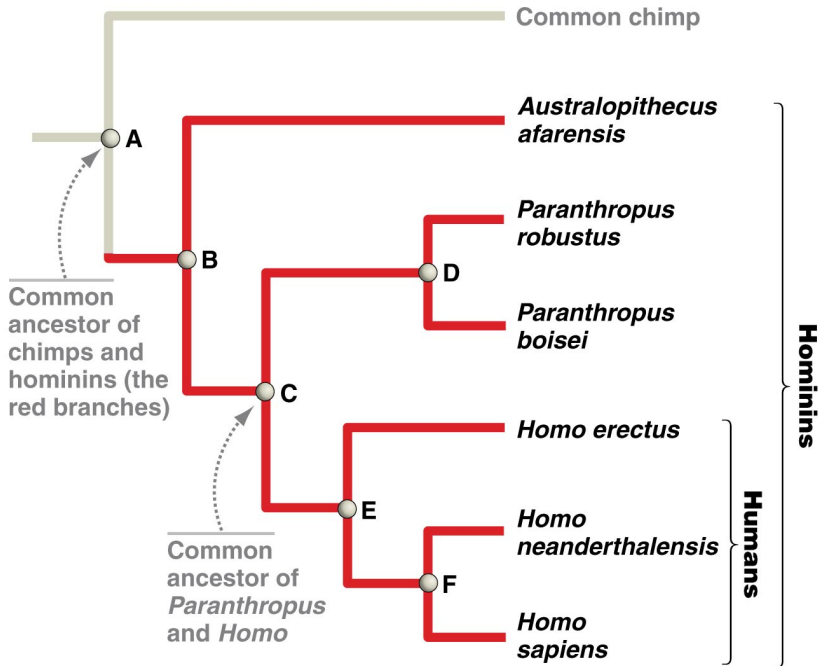
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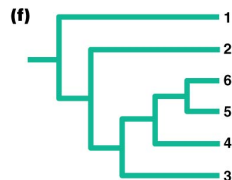
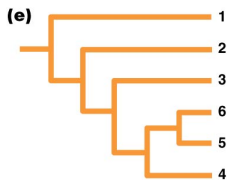
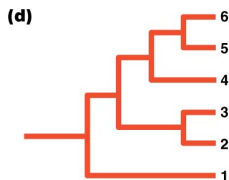
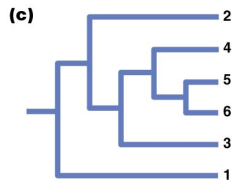
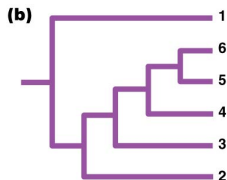
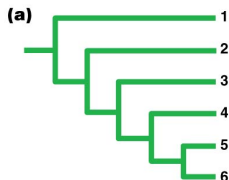
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# Activity: which of these things is not like the others?



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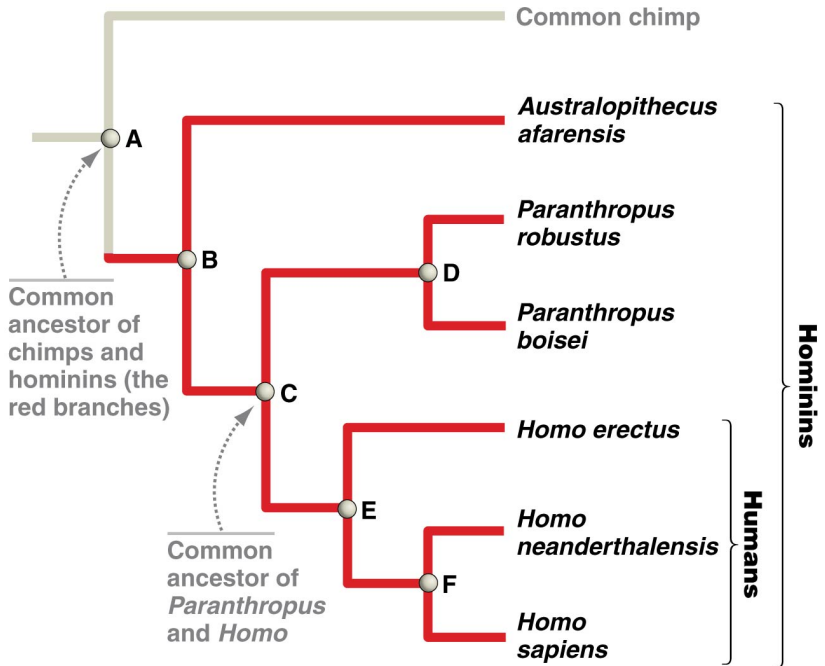


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  - ▶ One way to think about cladistic vs. phenetic analysis is that phenetic analysis treats derived and basal characters equally

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  - ▶ The common ancestor (characteristics of the common ancestor are called **basal** or **ancestral** characters).
    - ▶ What if our flight example was ostriches, hawks, and sparrows?
      - ▶ \* No evidence for similarity between hawks and sparrows
  - ▶ A **derived** character is a character not shared by the common ancestor of the group that we are currently thinking about
  - ▶ One way to think about cladistic vs. phenetic analysis is that phenetic analysis treats derived and basal characters equally

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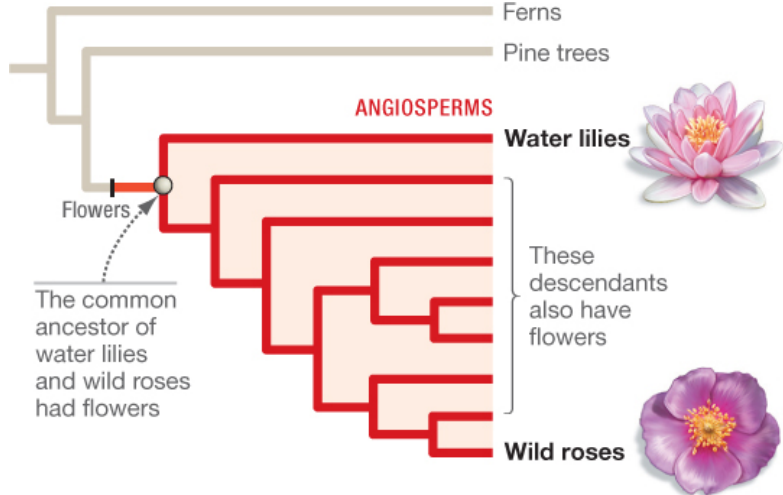
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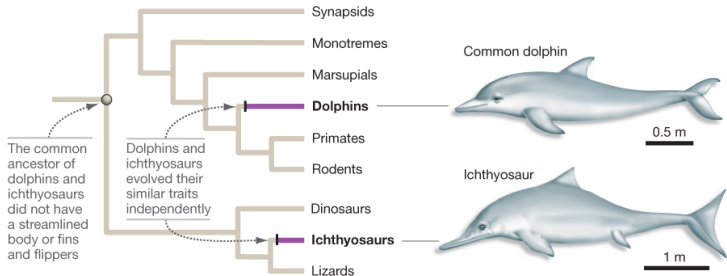


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**Figure 25.2 Homology: Similarities Are Inherited from a Common Ancestor.** Flowers in diverse plants, such as water lilies and roses, are homologous.



**Figure 25.3 Homoplasy: Traits Are Similar but Not Inherited from a Common Ancestor.** Dolphins and ichthyosaurs look similar but are not closely related.

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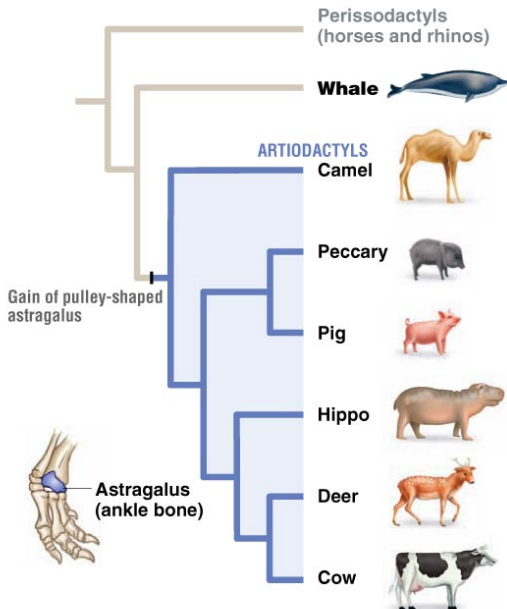
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**(a) Data set 1 (morphological traits):**  
**Whales diverged before the origin of artiodactyls.**





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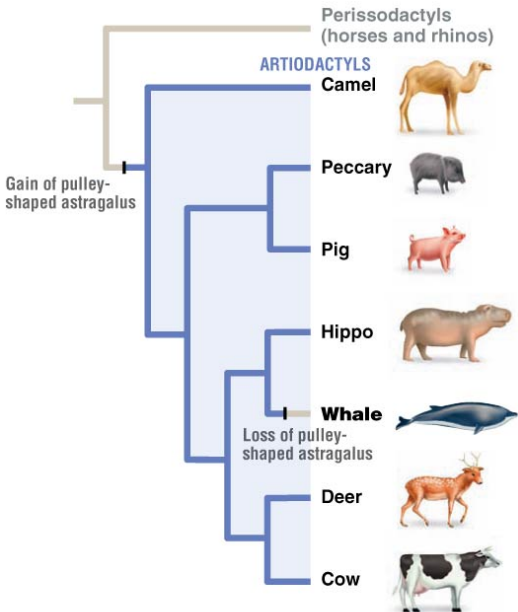
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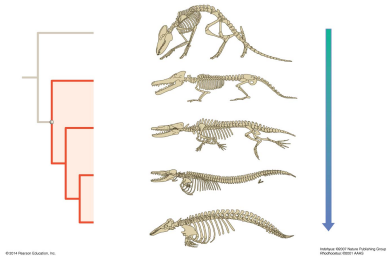
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**(b) Data set 2 (DNA sequences):**  
Whales and hippos share a common ancestor.

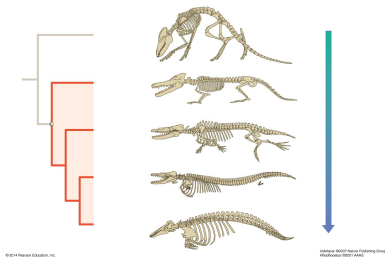


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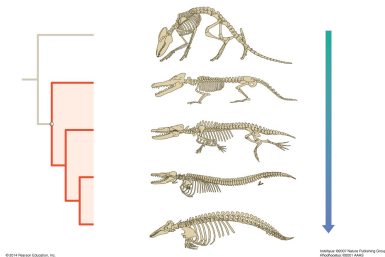
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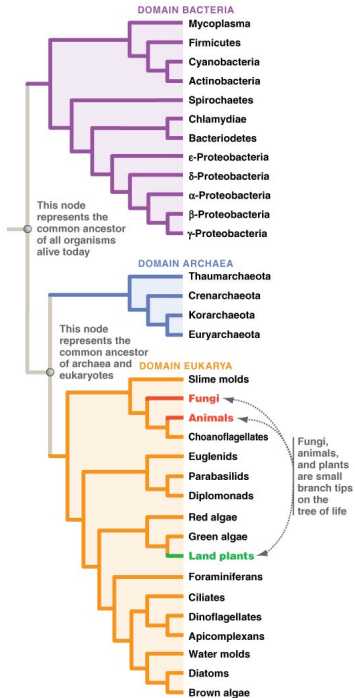
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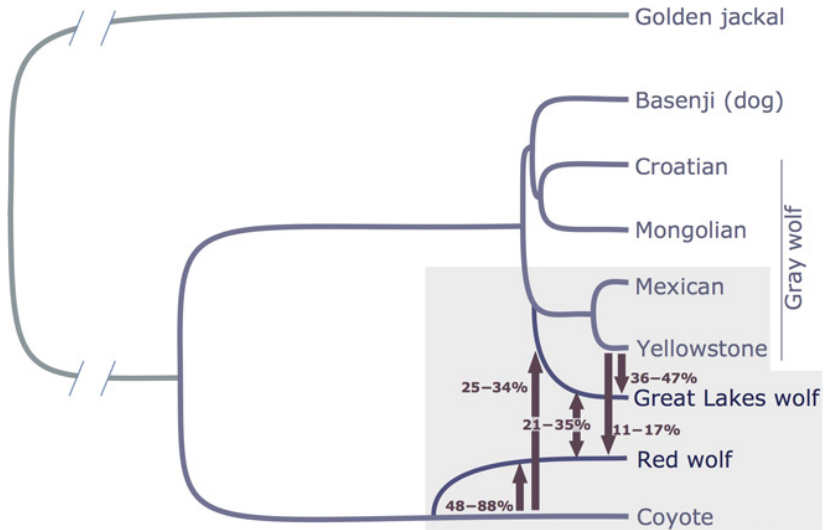
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**(a) Intact fossil (pollen)**



**(b) Compression fossil (leaf)**



**(c) Cast fossil (bark)**



**(d) Permineralized fossil (tree trunk)**



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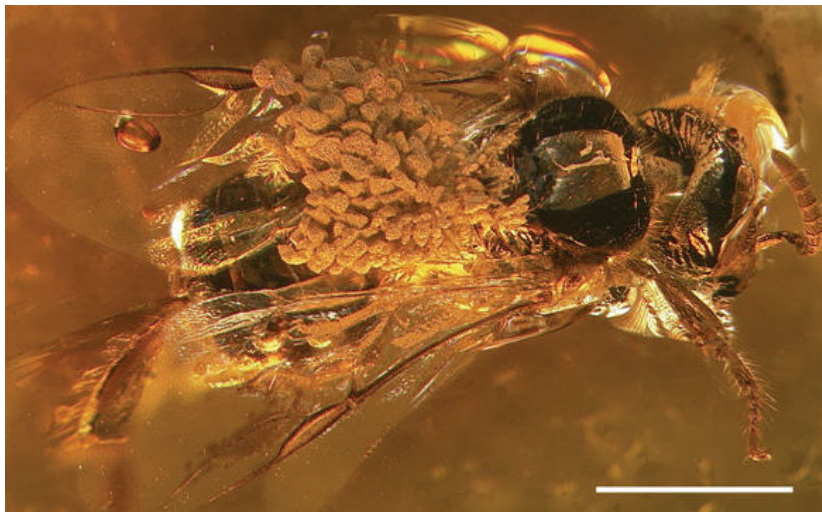
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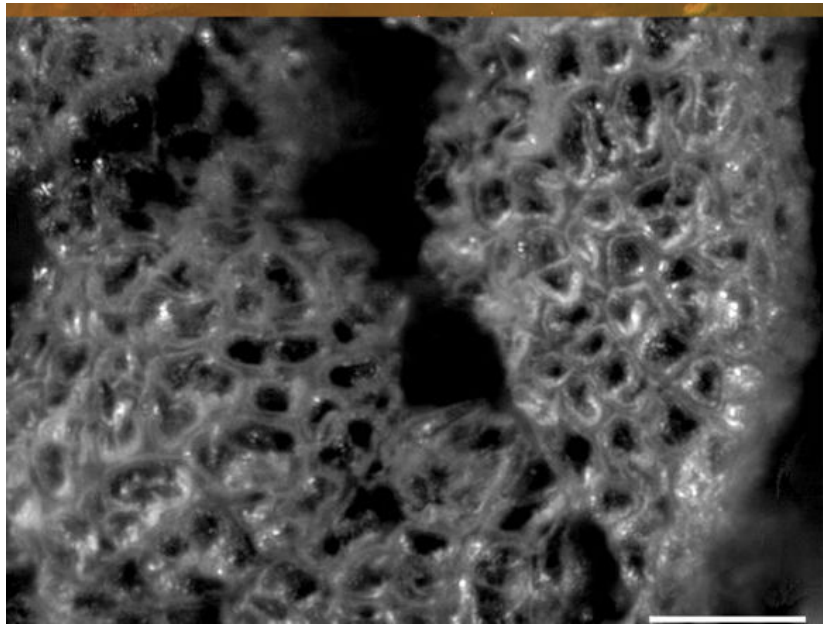
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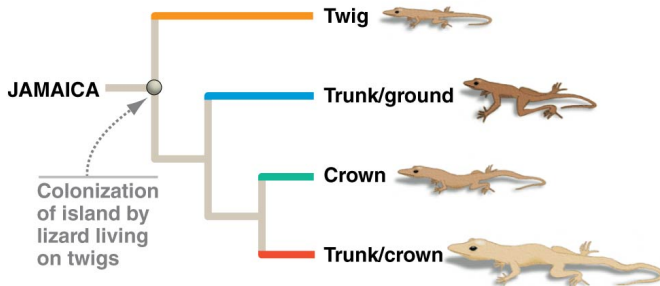
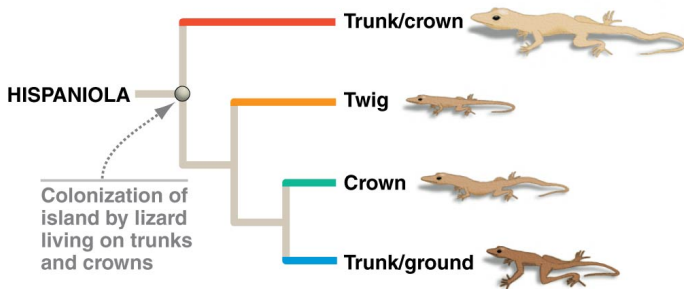
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**(c)** The same adaptive radiation of *Anolis* has occurred on different islands, starting from different types of colonists.



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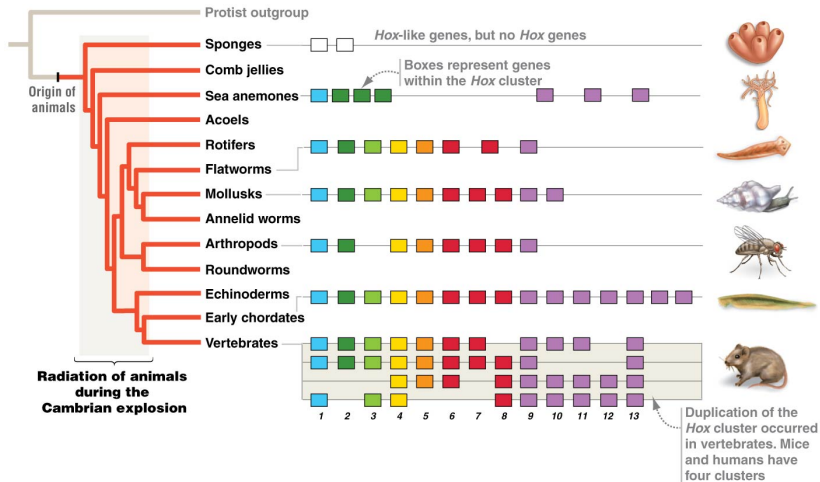
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# Hox genes

- ▶ **Hox genes** are involved in determining the identity of different body parts
- ▶ Taxa with simpler body structures tend to have fewer hox genes
  - ▶ Phylogenetic comparisons provide important evidence that hox genes were involved in evolution of complex body plans
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# Outline

## Phylogeny

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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