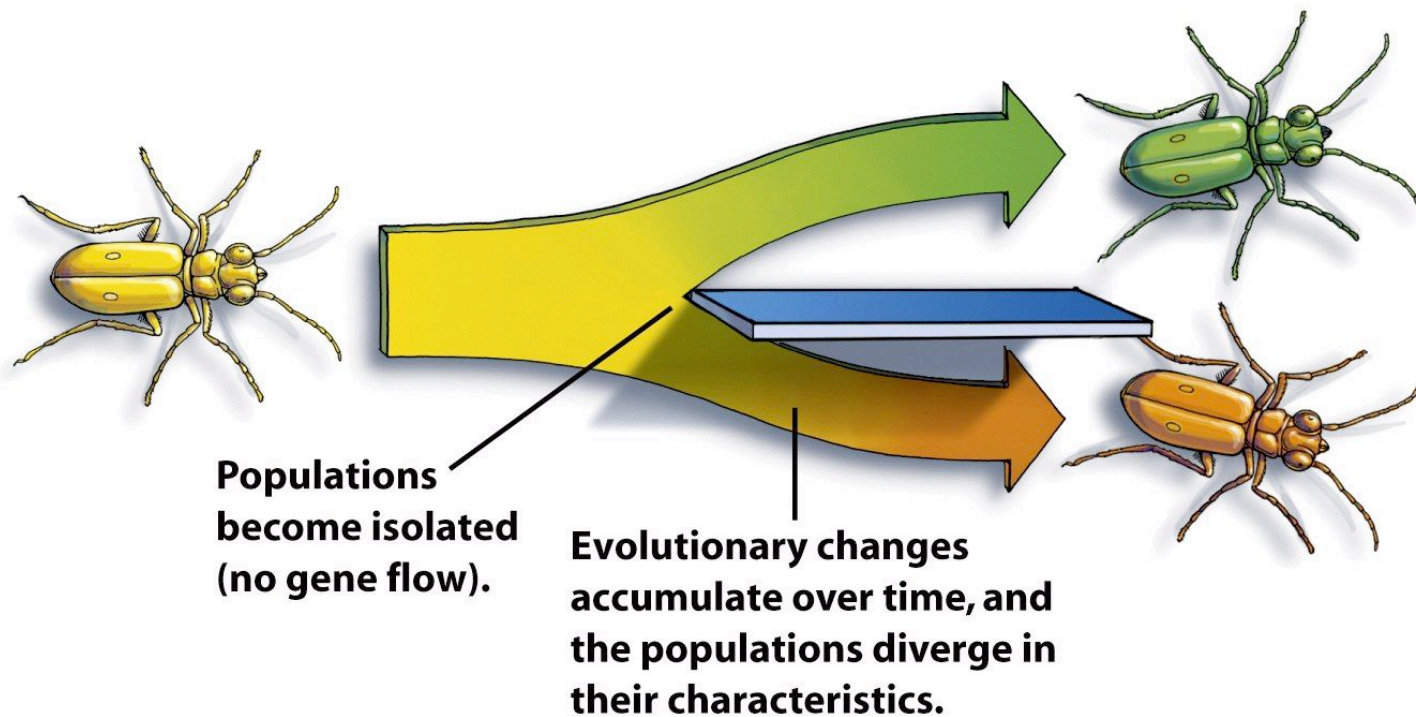


Species and evolution

Speciation

- Divergent evolution



Speciation

- Divergent evolution

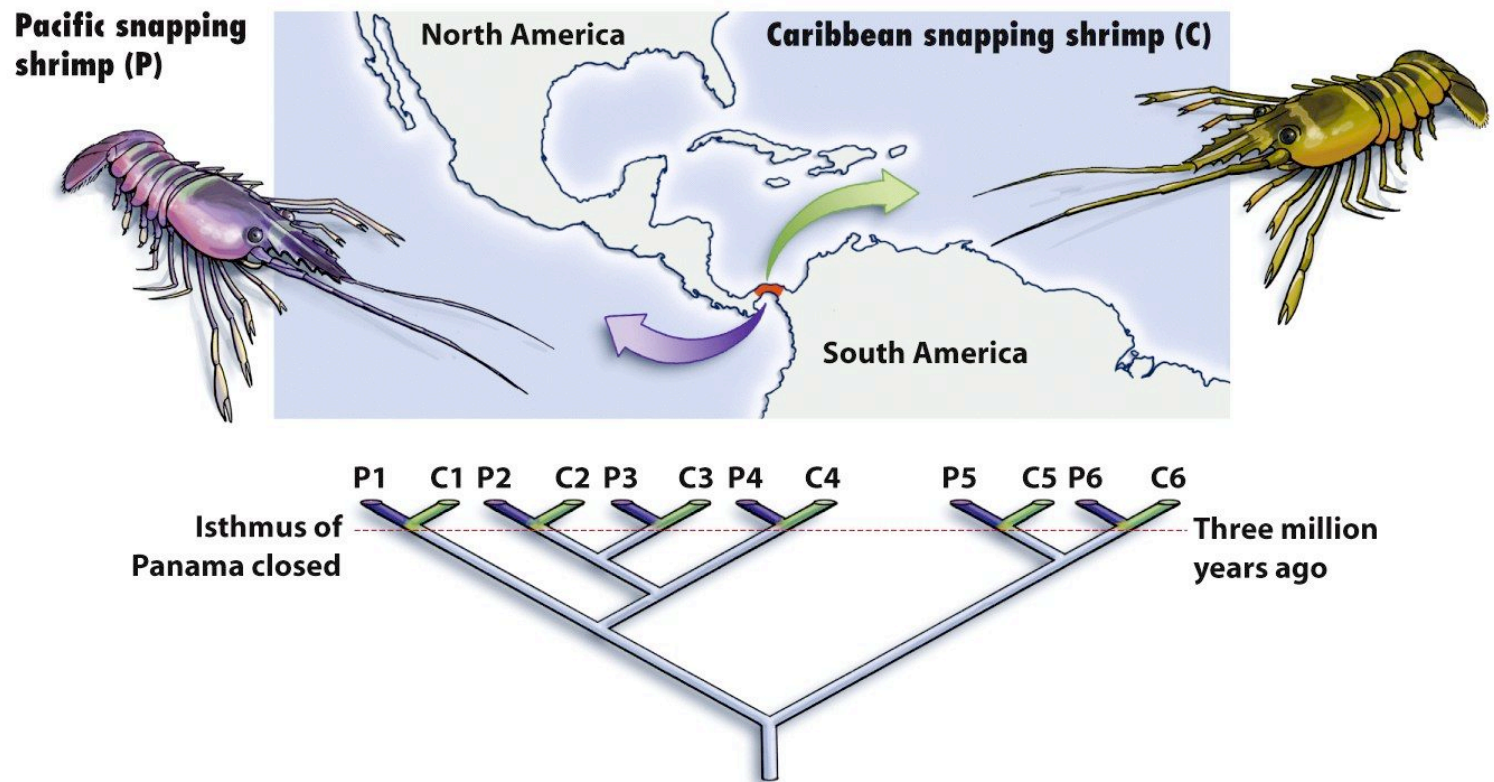


Figure 11-7 Biology: Science for Life, 2/e
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Homology

- Homology
 - Any characteristic...
 - Genetic
 - Morphological
 - Developmental
 - Biogeographic
 - ...that is shared by common descent

Homologies

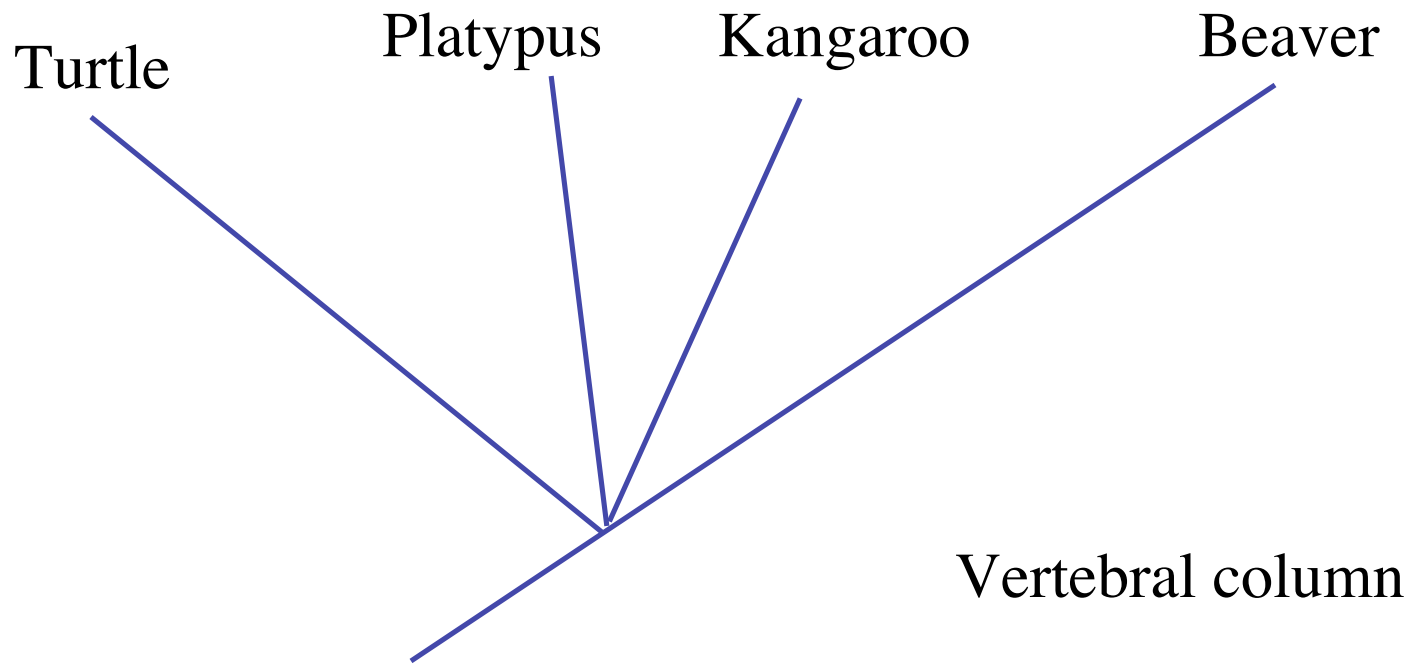
Turtle

Platypus

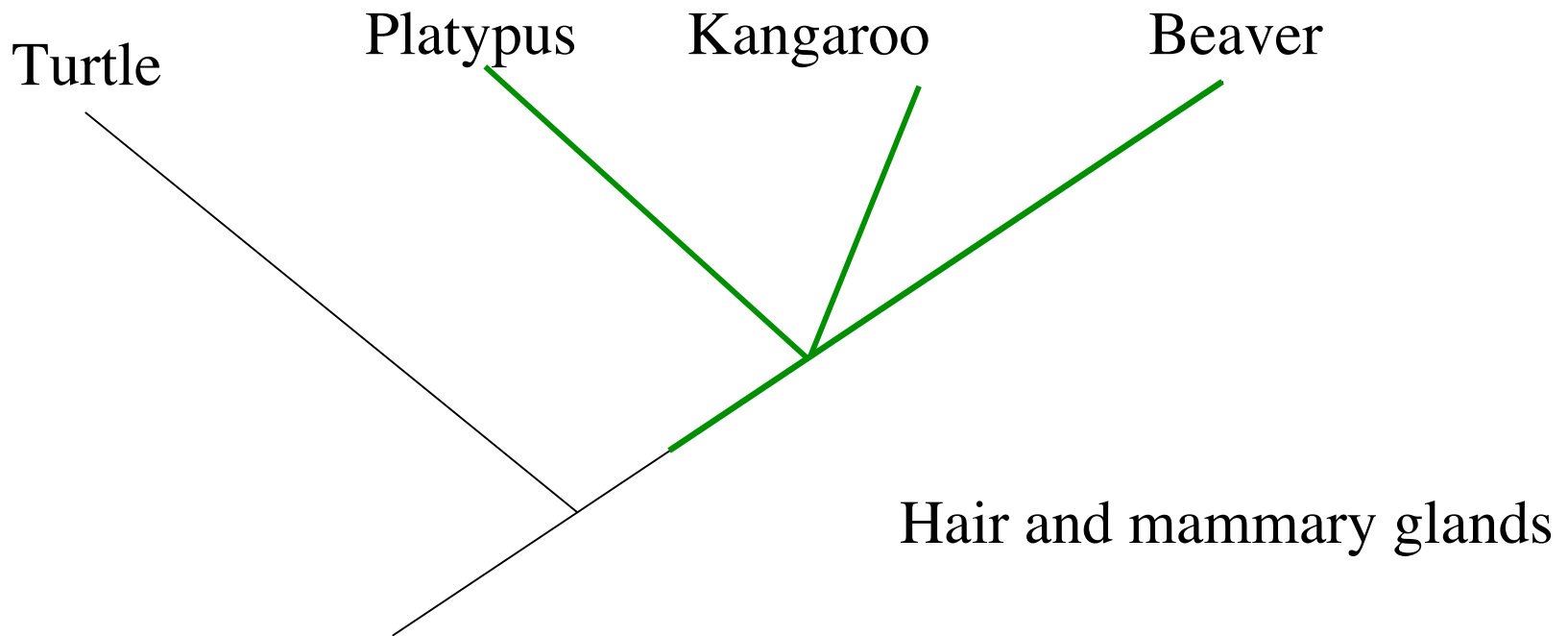
Kangaroo

Beaver

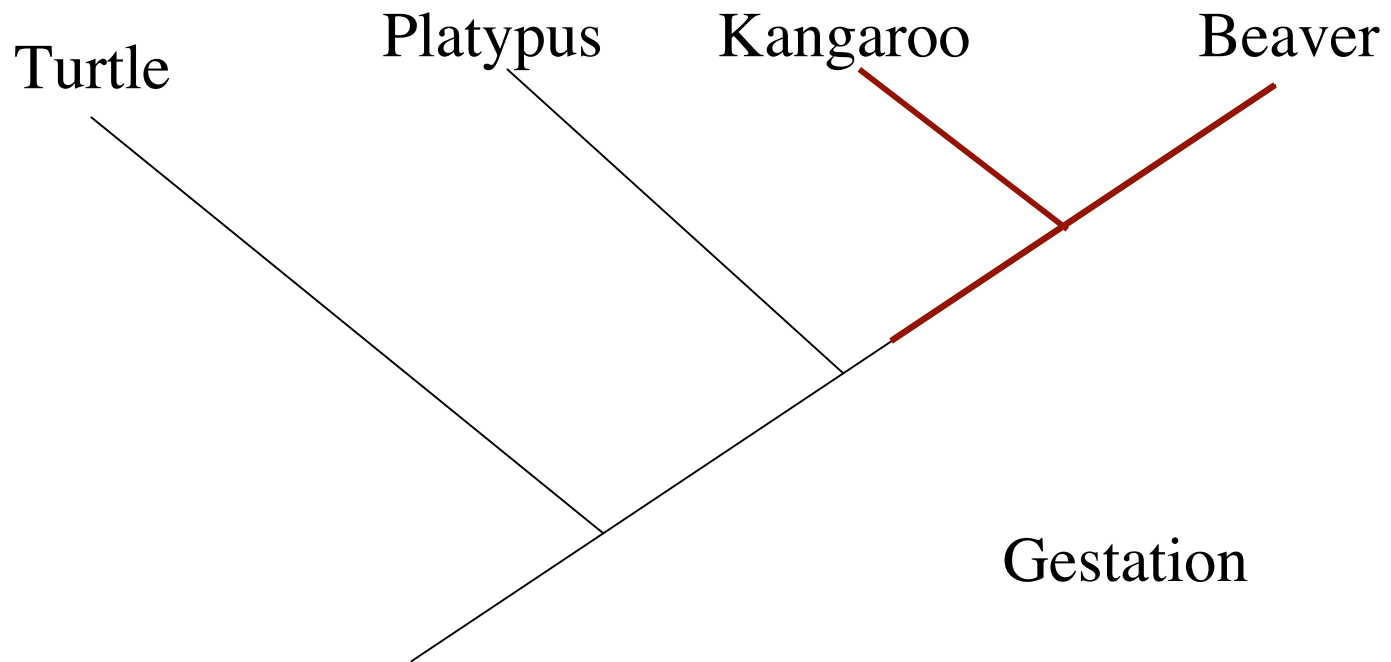
Homologies



Homologies



Homologies



Homologies

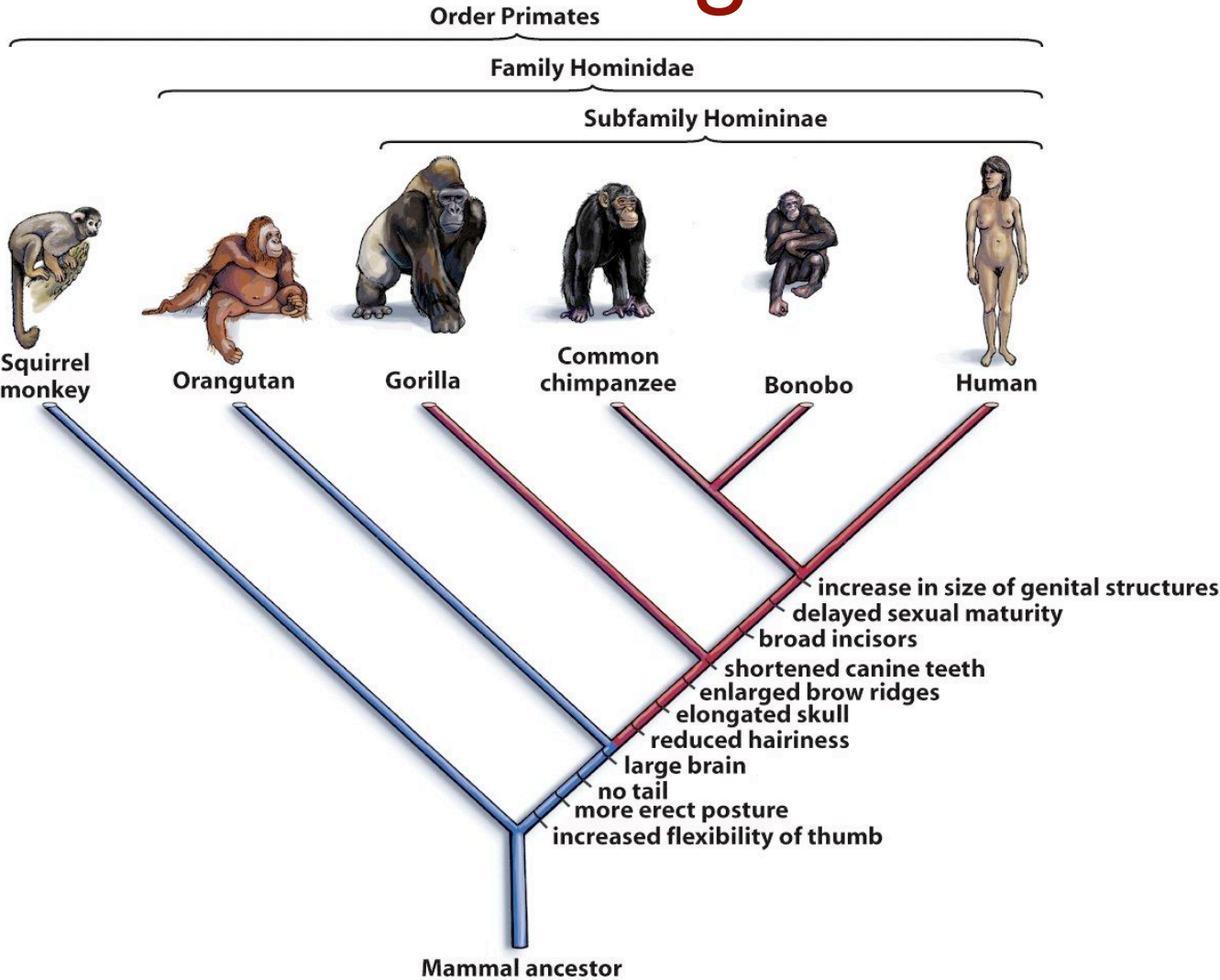
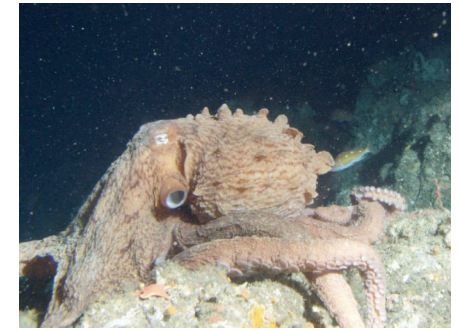


Figure 9-11 Biology: Science for Life, 2/e
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Homologies and classification

Domain
Kingdom
Phylum
Class
Order
Family
Genus
species

Classification



	Human	Blue Whale	Giant octopus
• Domain	Eukarya	Eukarya	Eukarya
• Kingdom	Animalia	Animalia	Animalia
• Phylum	Chordata	Chordata	Mollusca
• Class	Mammalia	Mammalia	Cephalopoda
• Order	Primates	Cetacea	Octopoda
• Family	Hominidae	Balaenopteridae	Octopodidae
• Genus	<i>Homo</i>	<i>Balaenoptera</i>	<i>Enteroctopus</i>
• species	<i>sapiens</i>	<i>musculus</i>	<i>dofleini</i>

Classification

- Comparative anatomy

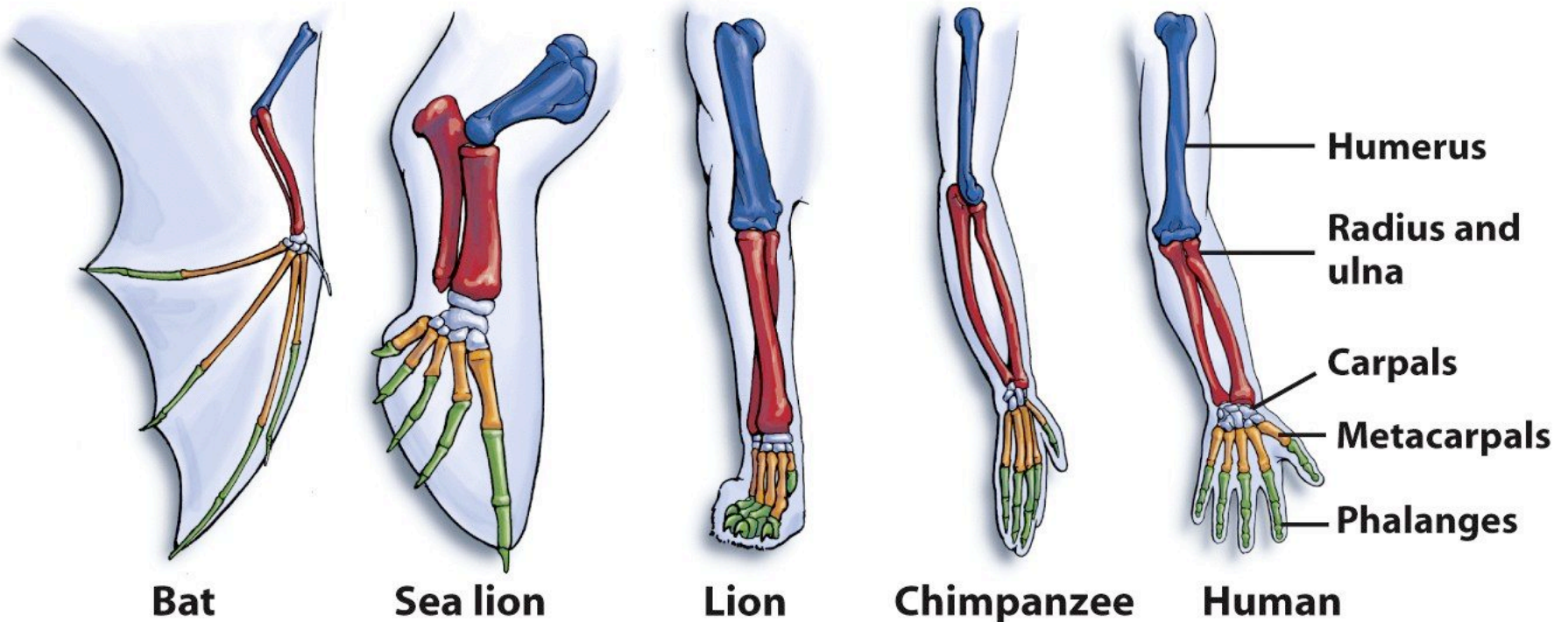


Figure 9-12 Biology: Science for Life, 2/e
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Classification

- Comparative anatomy
 - Vestigial traits
 - Traits that are functional in one species, but non-functional in another

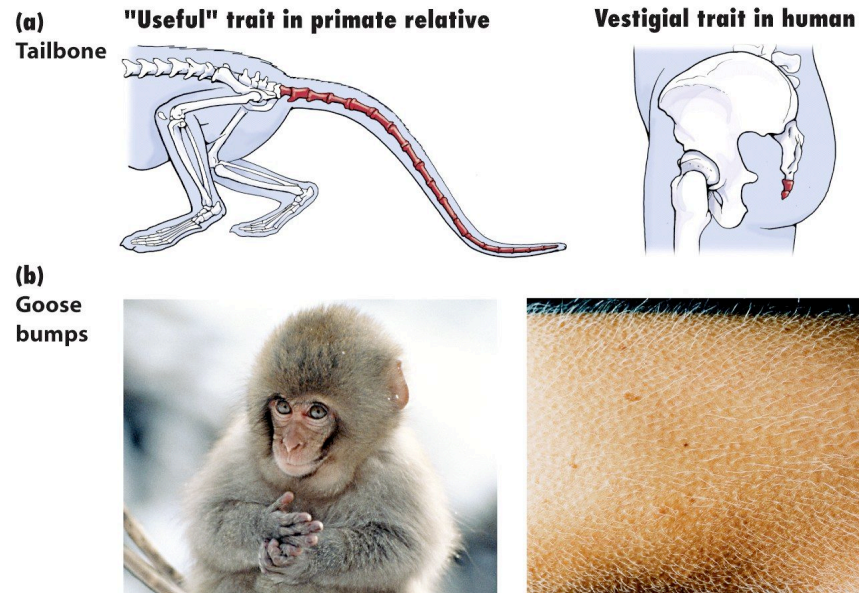


Figure 9-13 Biology: Science for Life, 2/e
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Classification

- Development
 - Embryonic and early development may show similarities

Sunflower



Figure 9-16b Biology: Science for Life, 2/e
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Maple tree



Figure 9-16a Biology: Science for Life, 2/e
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Classification

- Biochemistry
 - Protein sequences
 - DNA sequences

Comparing DNA sequences

Species A **ATTGCAACTGGTATCGAGGTTCTAC**

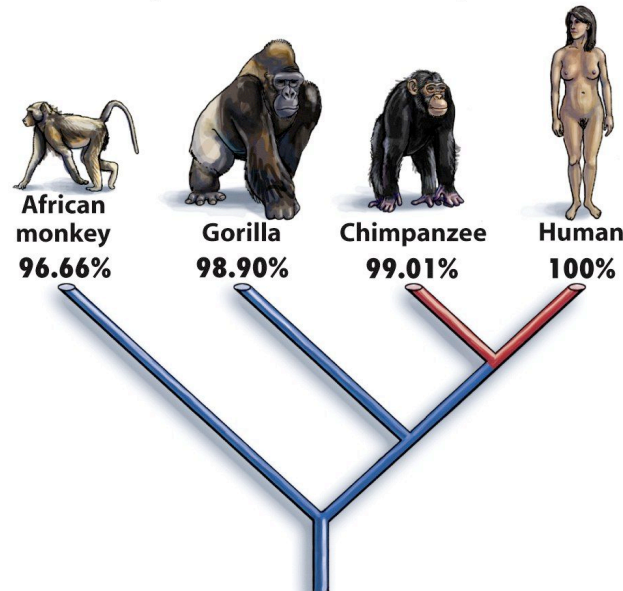
Close relative **ATTGC CACTGGAATCGAGGTTCTAC**

Distant relative **ATTGC CACTGGAATCGTGGTTC GAC**

2 differences in 25 nucleotides
 $2/25 = 8\%$ or
92% similarity

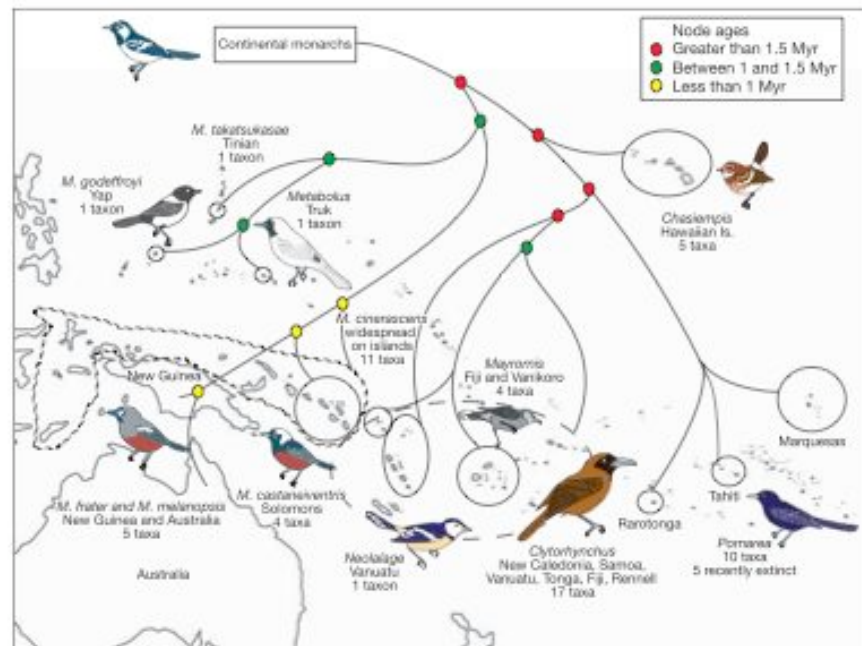
4 differences in 25 nucleotides
 $4/25 = 16\%$ or
84% similarity

Similarity to human DNA sequences



Classification

- Biogeography
 - Organisms that are closer together in space are likely more closely related than organisms far away from each other



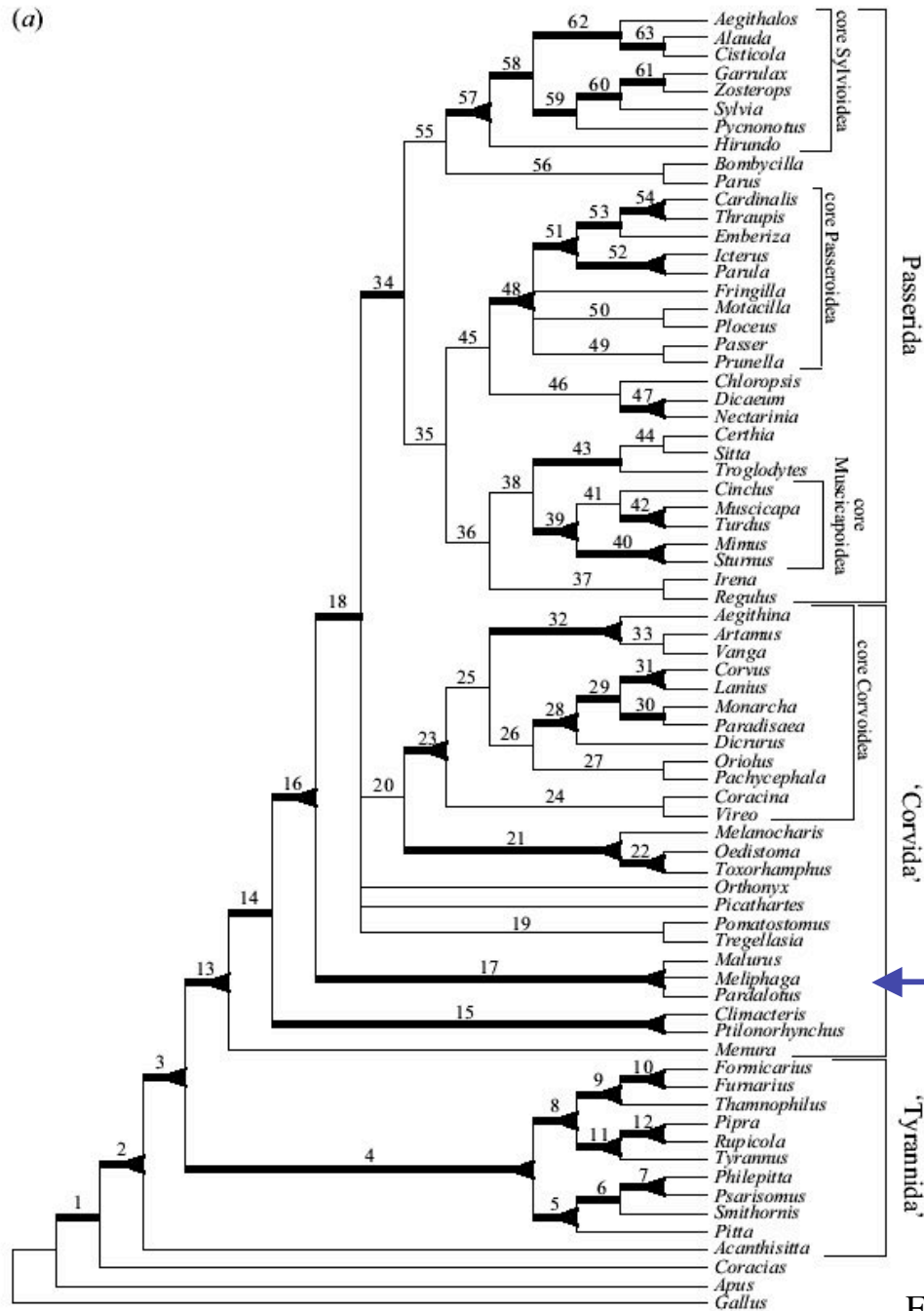
Classification

- Use information from many different sources
 - What if they don't all agree?

Classification

- Using homologies
 - Parsimony
 - Use the simplest hypothesis that can explain the facts
 - Minimize # of evolutionary changes
 - The best explanations use traits as homologies
 - Generally use many traits to create trees
 - Consensus trees
 - Retains all splits found in most all the most parsimonious trees
 - Some lineages unresolved, because other trees disagree on split

(a)



Classification

Bird genera

Based on DNA
sequences at 2 genes

Consensus tree- based
on 27 trees

Unresolved branch

From Barker *et al*, 2002