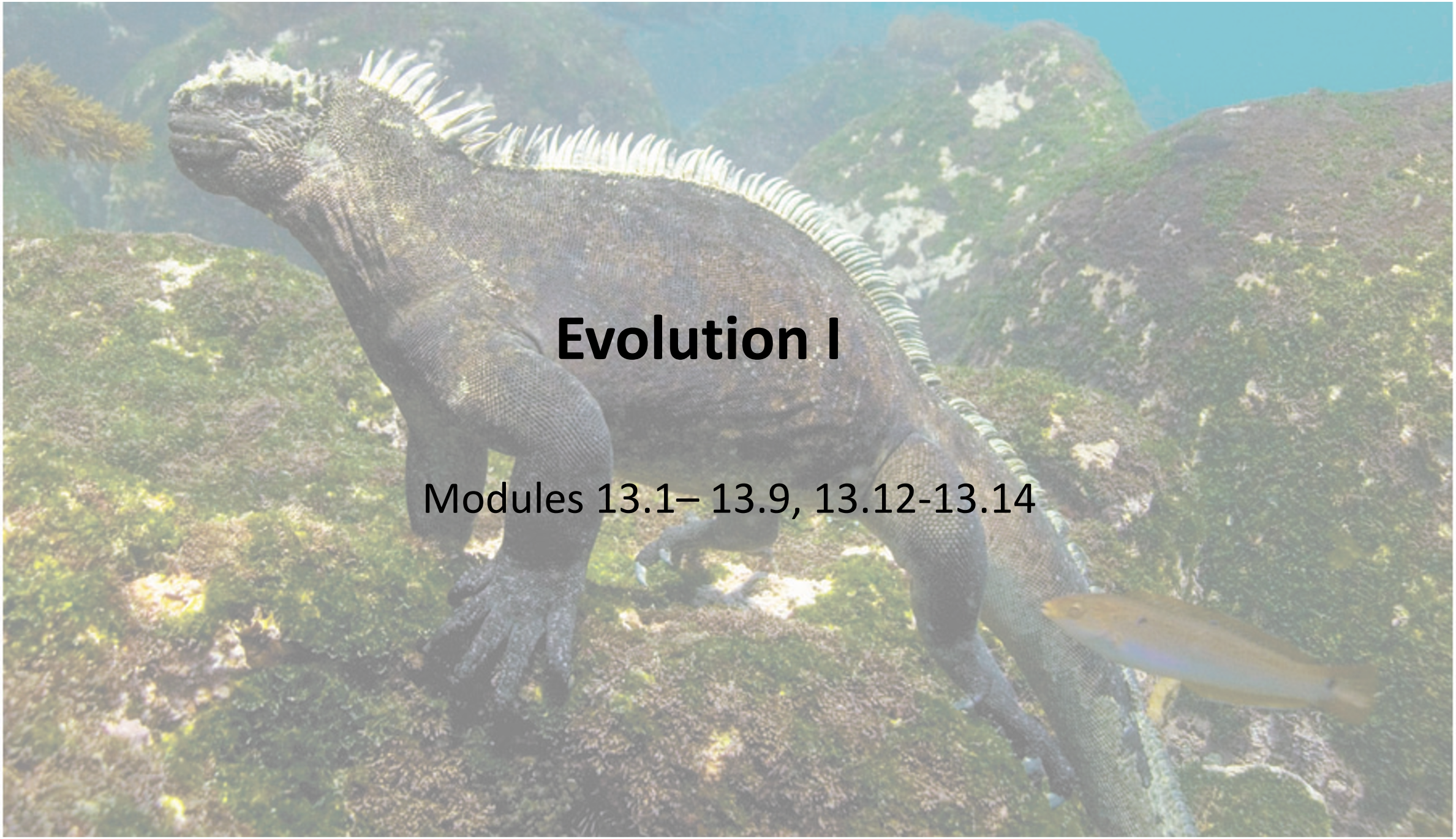

Evolution I

Modules 13.1– 13.9, 13.12-13.14

Learning objectives

1. Name and describe the three main mechanisms of evolution
2. Discuss two ways sexual reproduction speeds up natural selection
3. Explain why individuals cannot evolve
4. Describe what is meant by phenotypic plasticity
5. Explain why evolution is not “intelligent design”
6. Discuss the relevance of homologous characters, shared common ancestors, and clades for evolutionary hypotheses

Evolutionary biology is the study of evolutionary processes contributing to the diversity of life






Darwin's Theory of Evolution

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Present day species are descendants of common ancestors that still share some traits with those species ("Descent With Modification")

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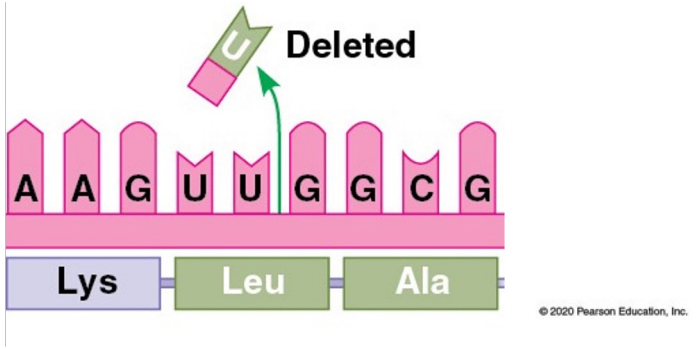

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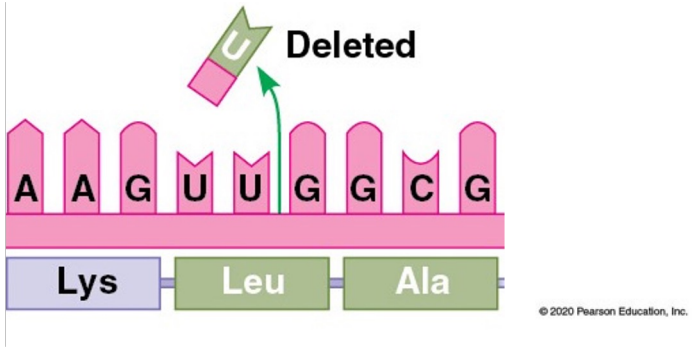

Natural selection is one evolutionary mechanism

Adaptation:
An inherited trait that enhances an organism's ability to survive and reproduce

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Peppered moth

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Process by which individuals having specific inherited traits are more likely to survive and reproduce than individuals lacking those traits

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By Martinowksy, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=1855638

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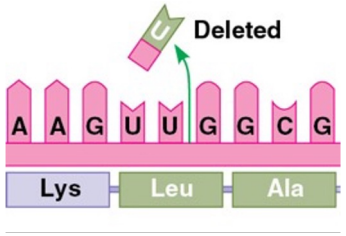

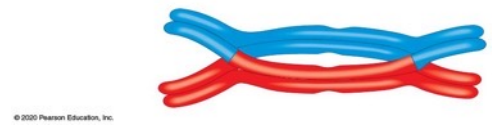

A few key points about natural selection

Spider plant with clone

By Jamzze - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=96087209

1. Sexual reproduction speeds up natural selection

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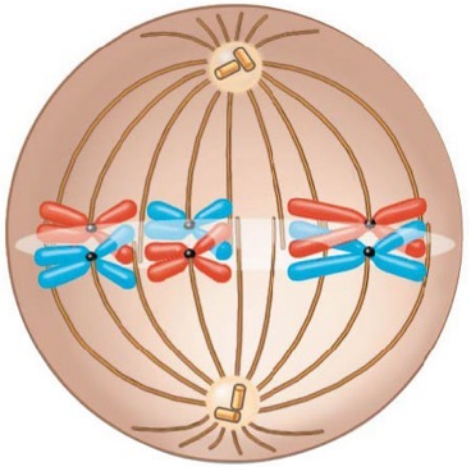

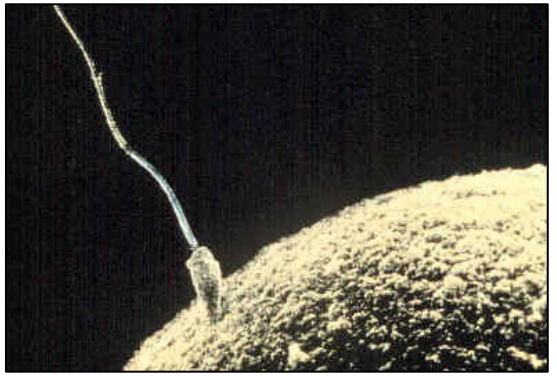

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2. Individuals do not evolve, populations evolve

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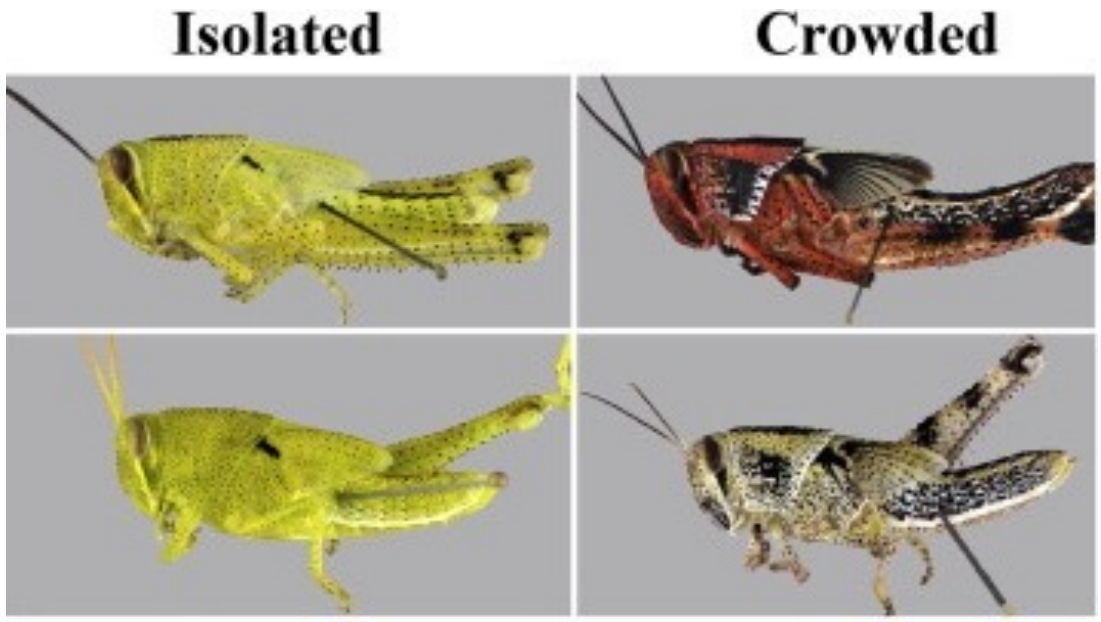

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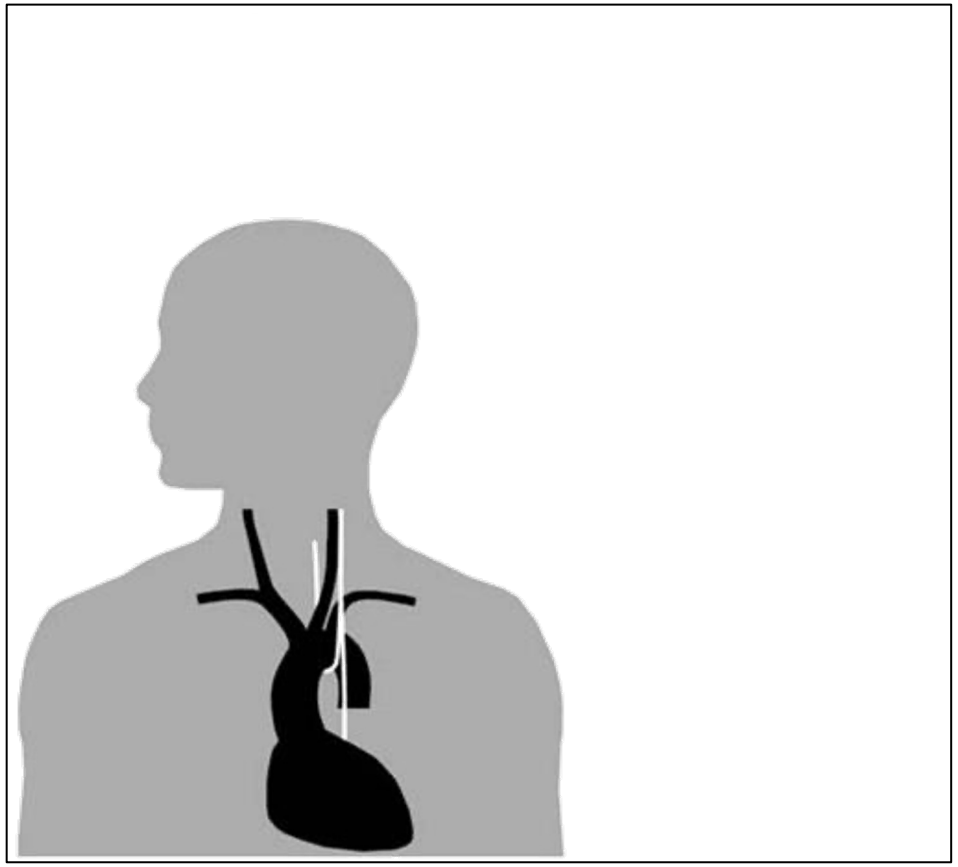
A few key points about natural selection

Recurrent laryngeal nerve



Mathew J. Wedel "A Monument of Inefficiency: The Presumed Course of the Recurrent Laryngeal Nerve in Sauropod Dinosaurs," Acta Palaeontologica Polonica 57(2), 251-256, (20 May 2011). https://doi.org/10.4202/app.2011.0019

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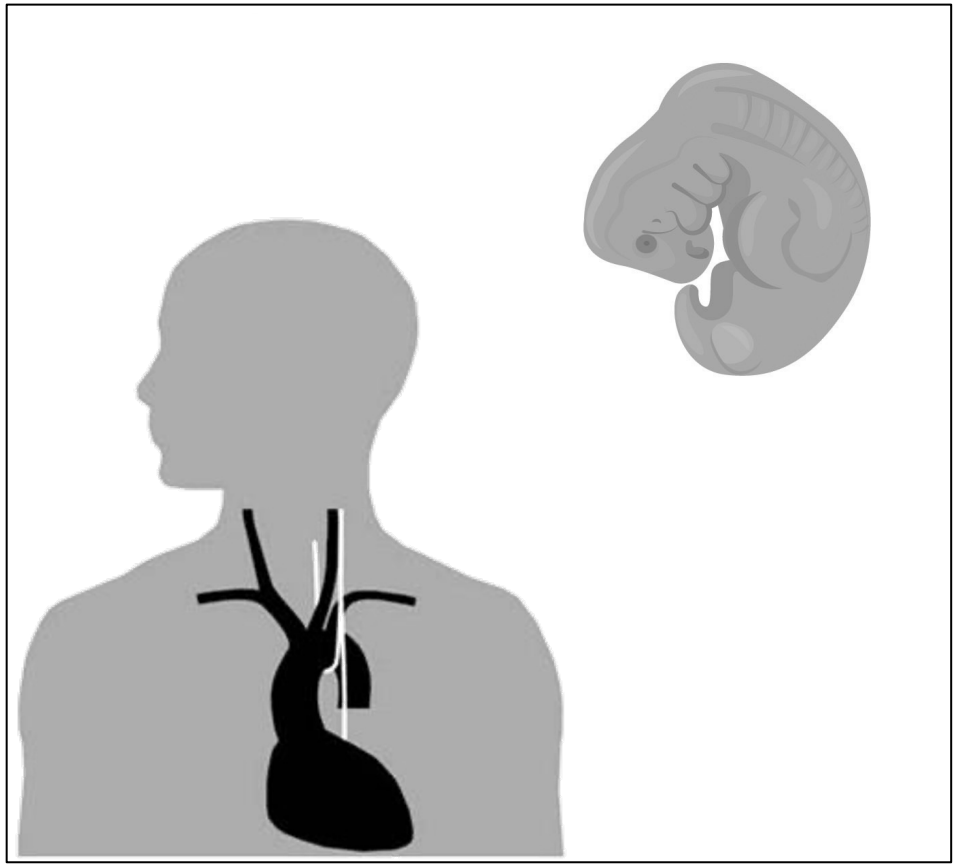

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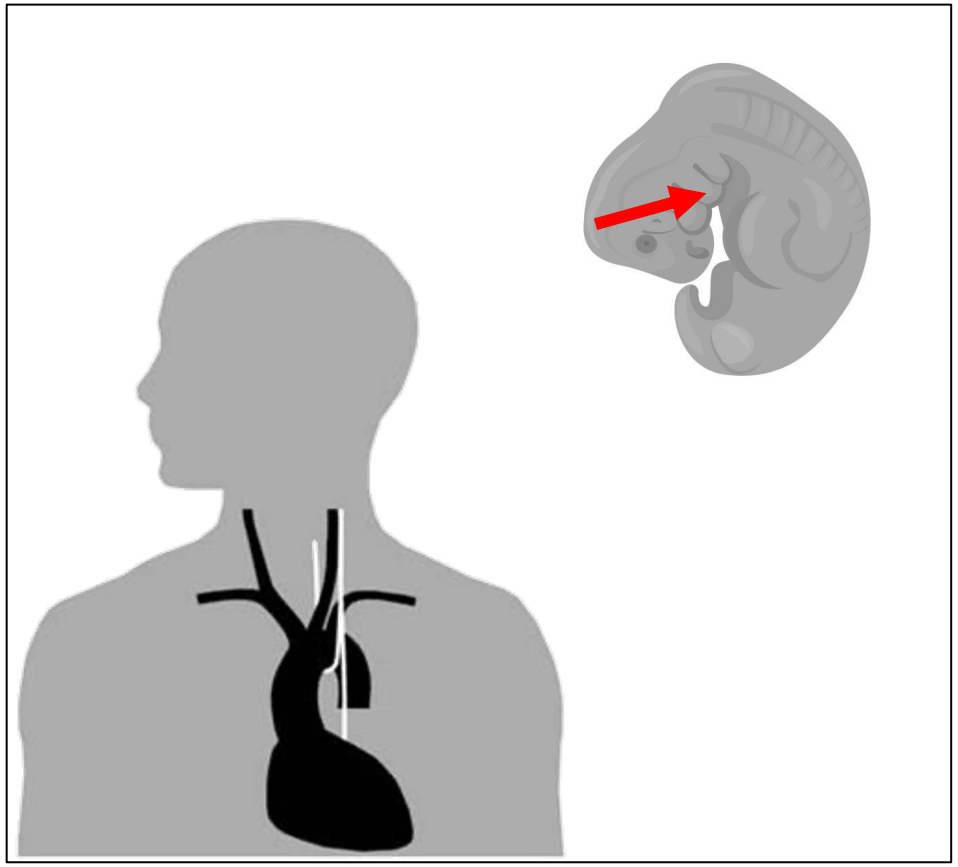

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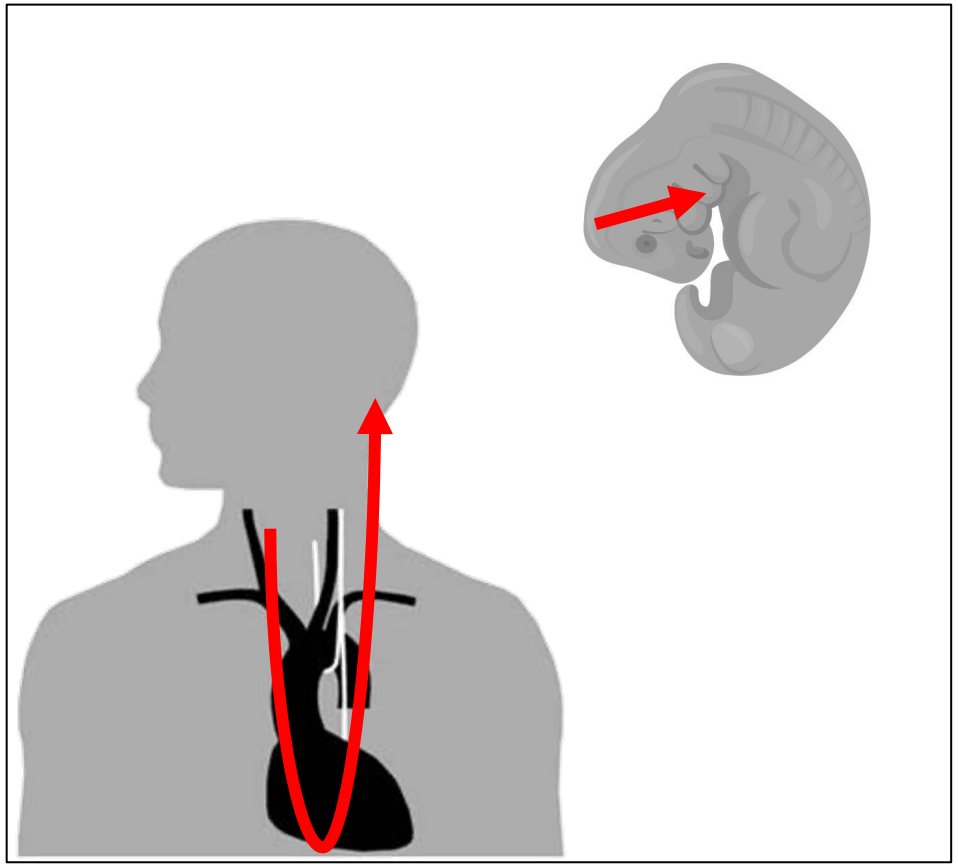

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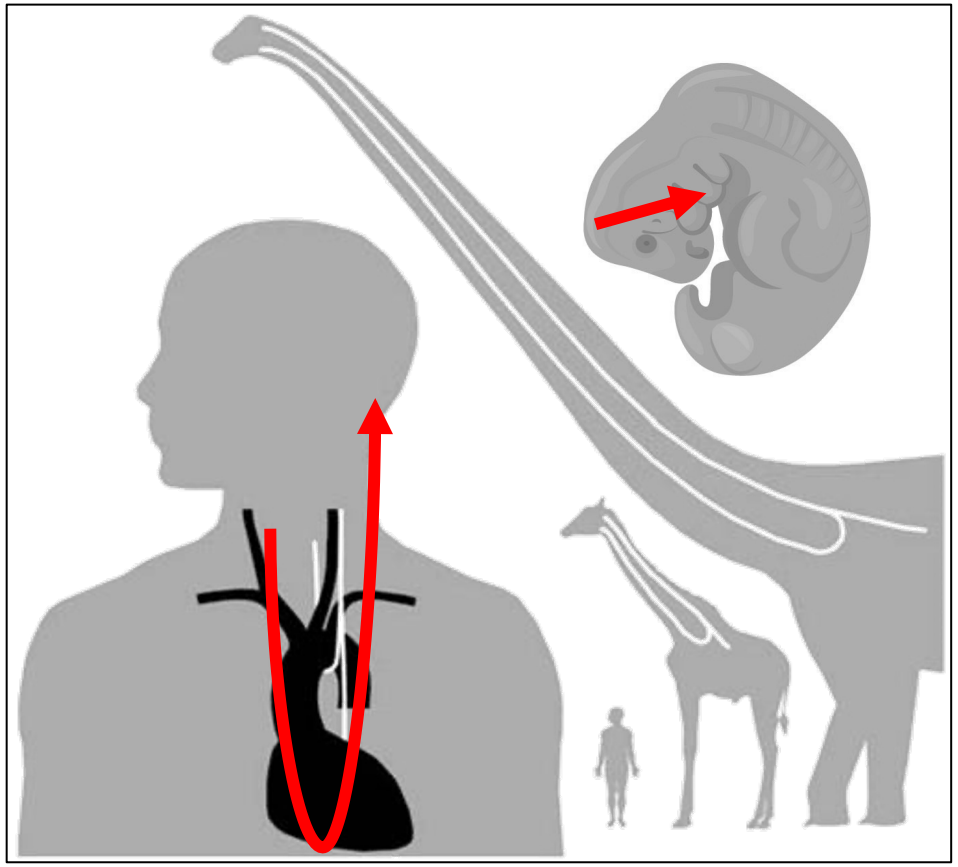

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Other mechanisms of evolution

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Genetic drift:
Change in allele frequencies from one generation to the next due to chance

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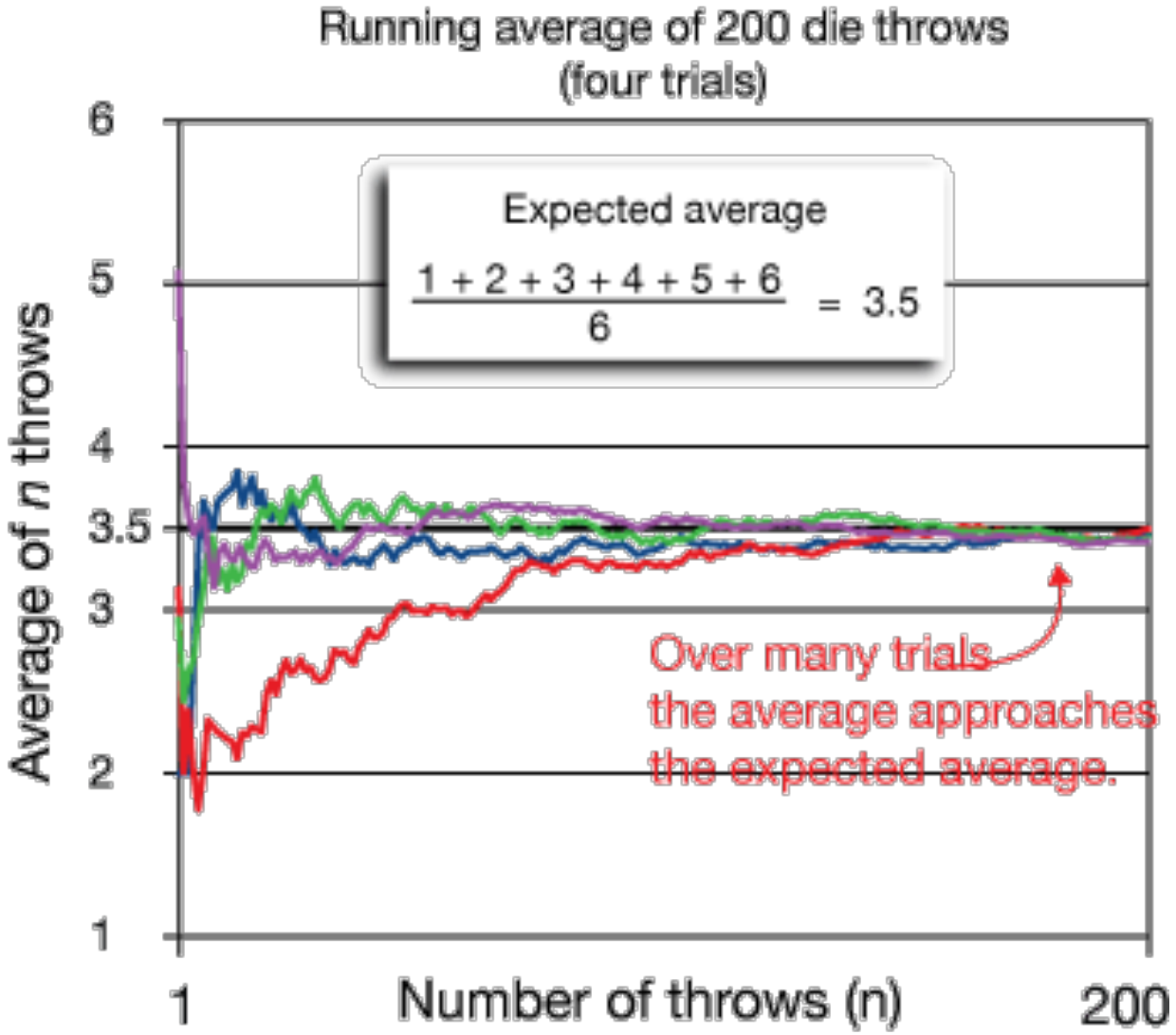

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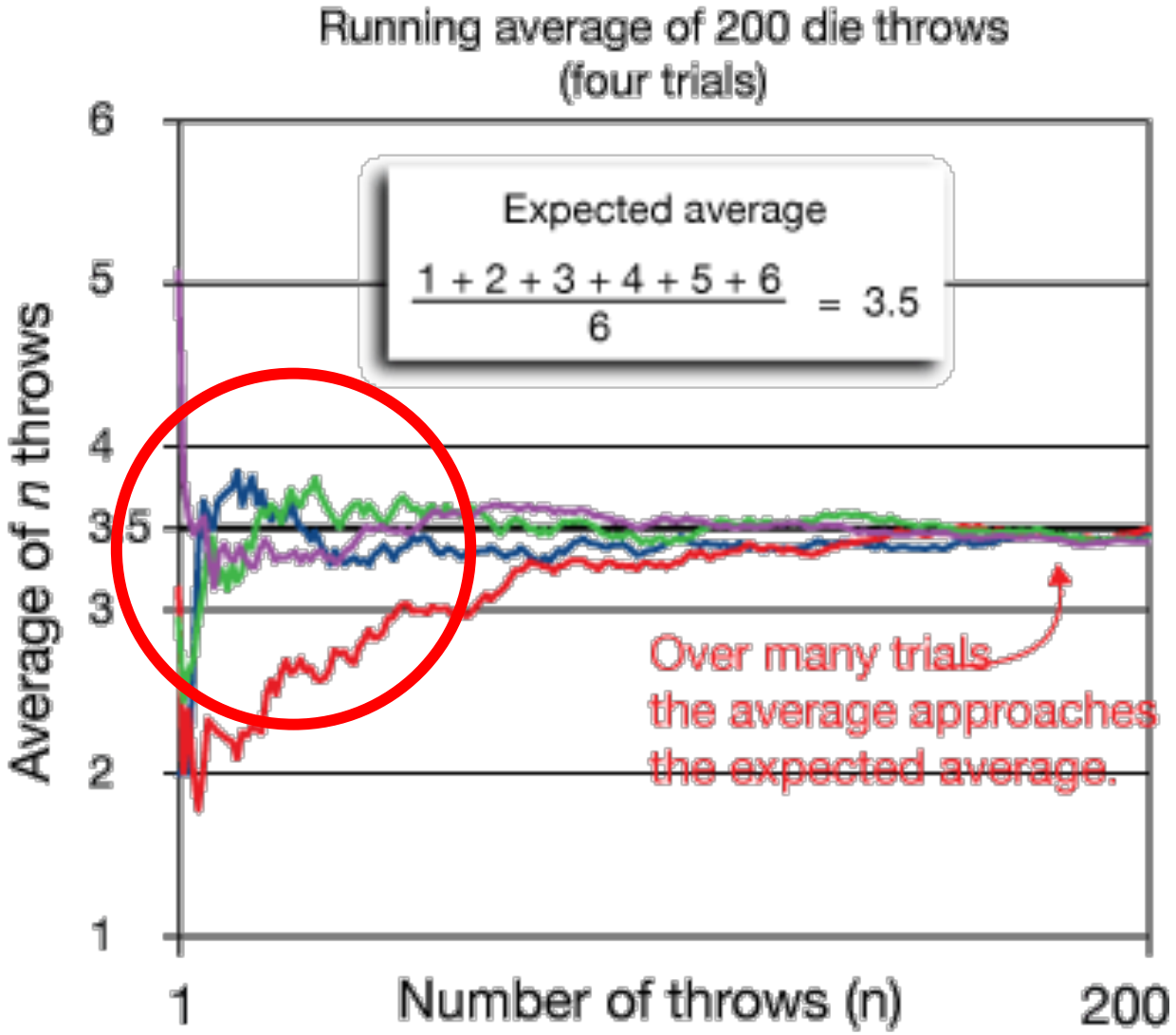

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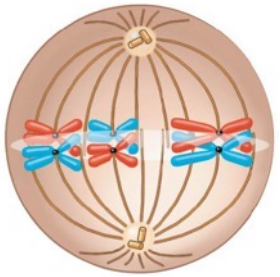
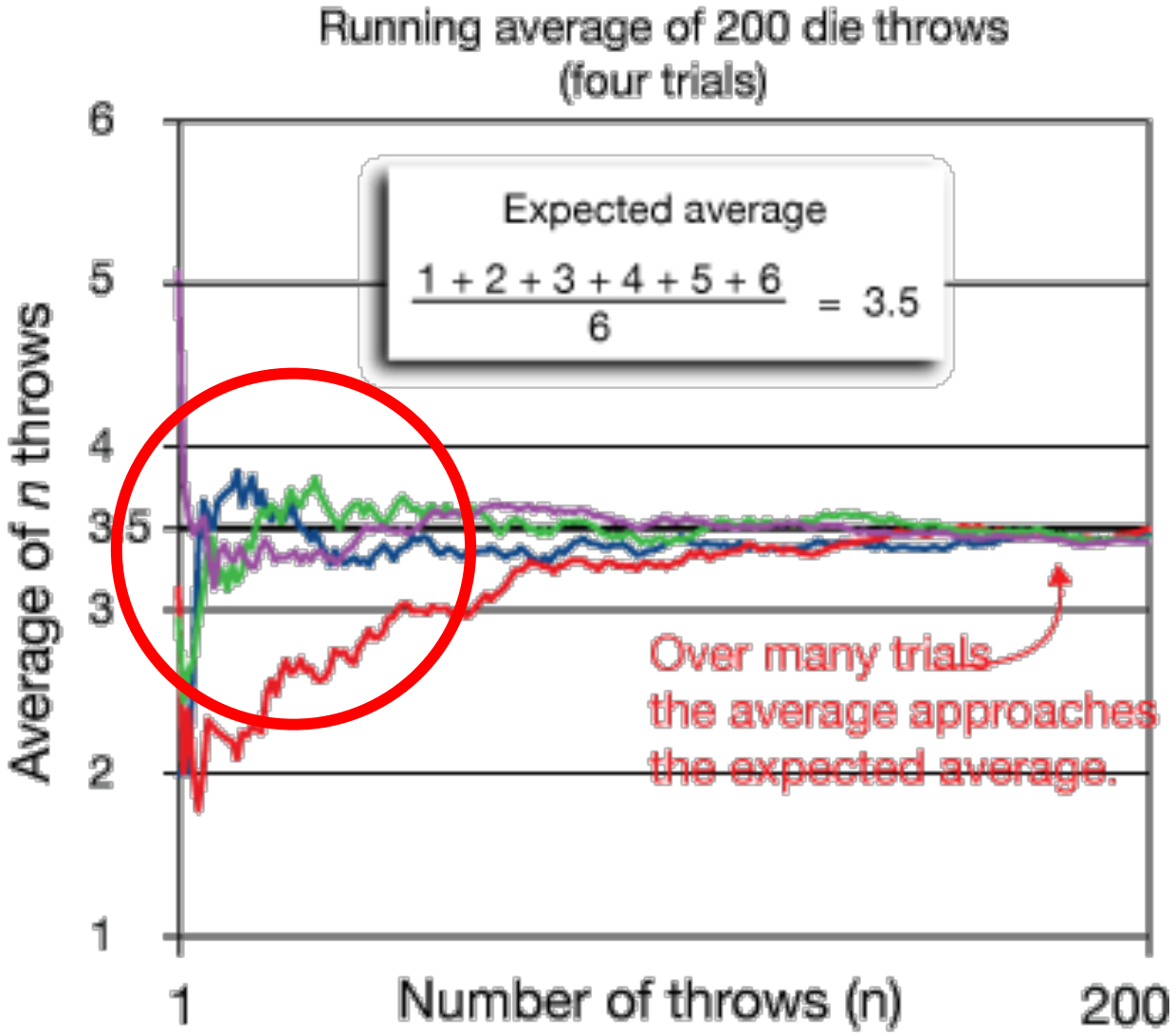
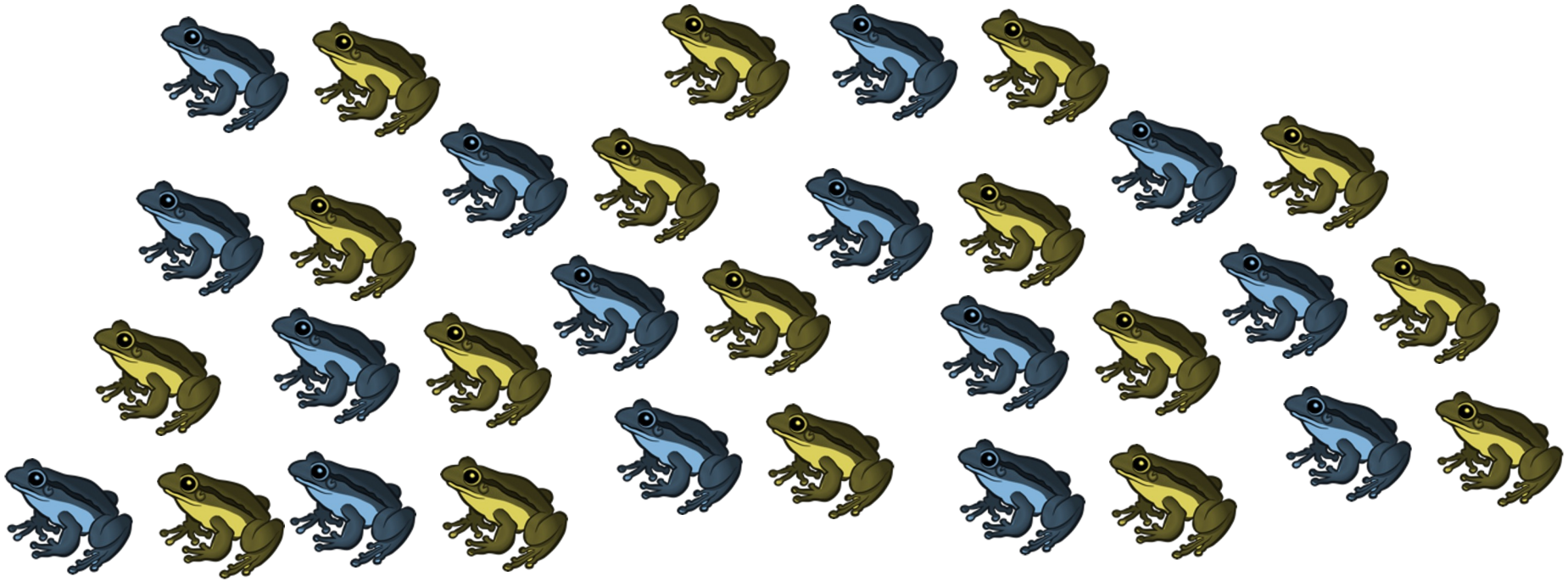




Evolution by genetic drift



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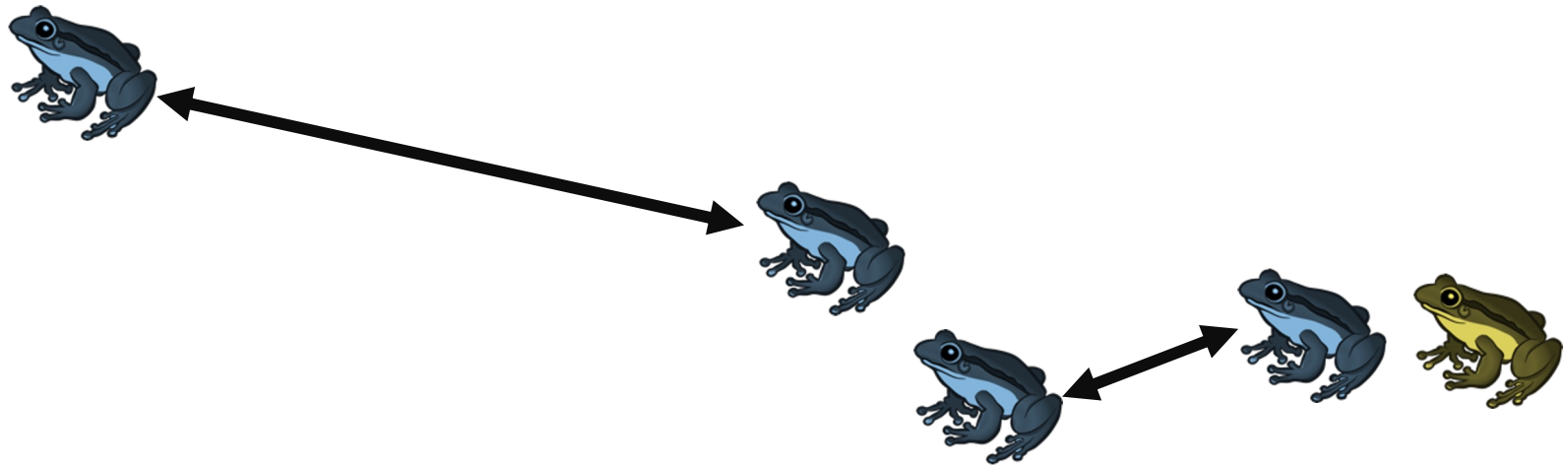

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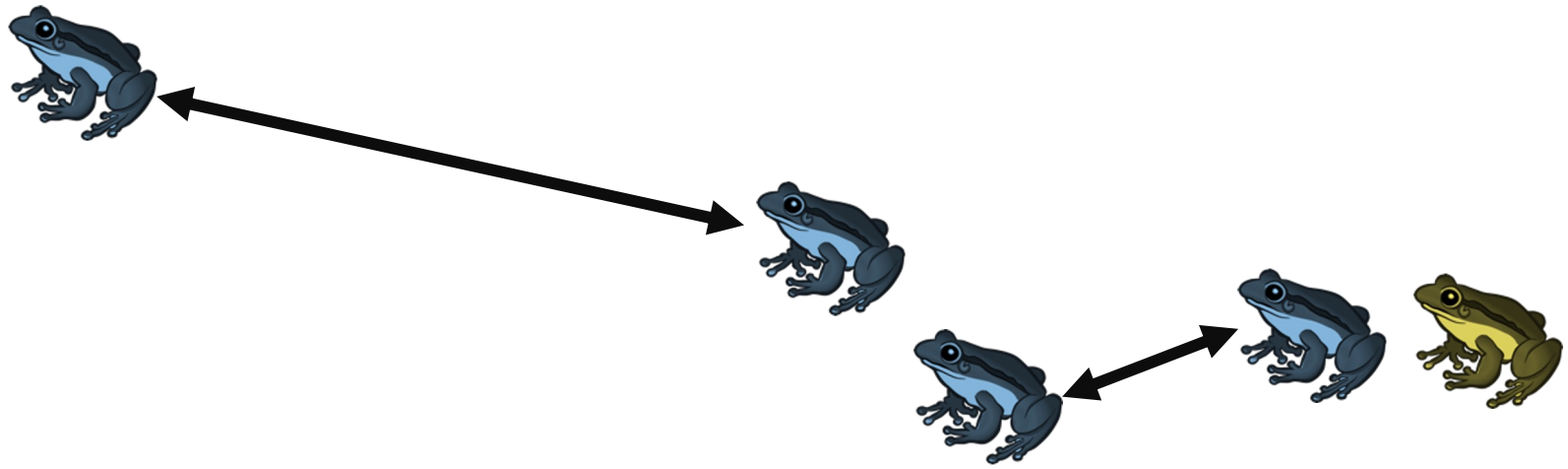

Genetic drift generally
decreases genetic variation

Evolution by genetic drift

Bottleneck event:
A drastic reduction in population size causing the surviving population to be unrepresentative of the original population

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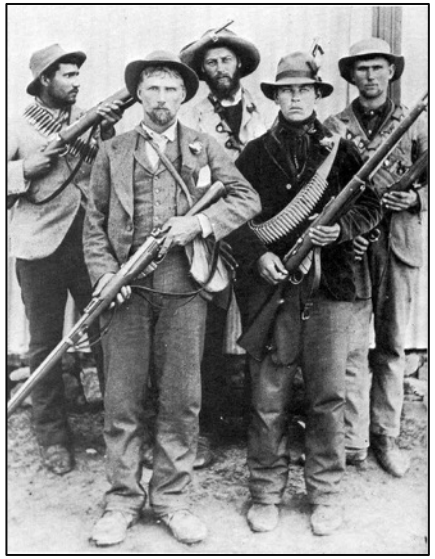

Afrikaner Dutch colonists

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Immigration introduces new alleles, **emigration** removes alleles

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Canada geese

Biologists use “trees” to visualize evolution

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Phylogenetic tree:
Branching diagram that represents a hypothesis about the evolutionary history of a group of organisms

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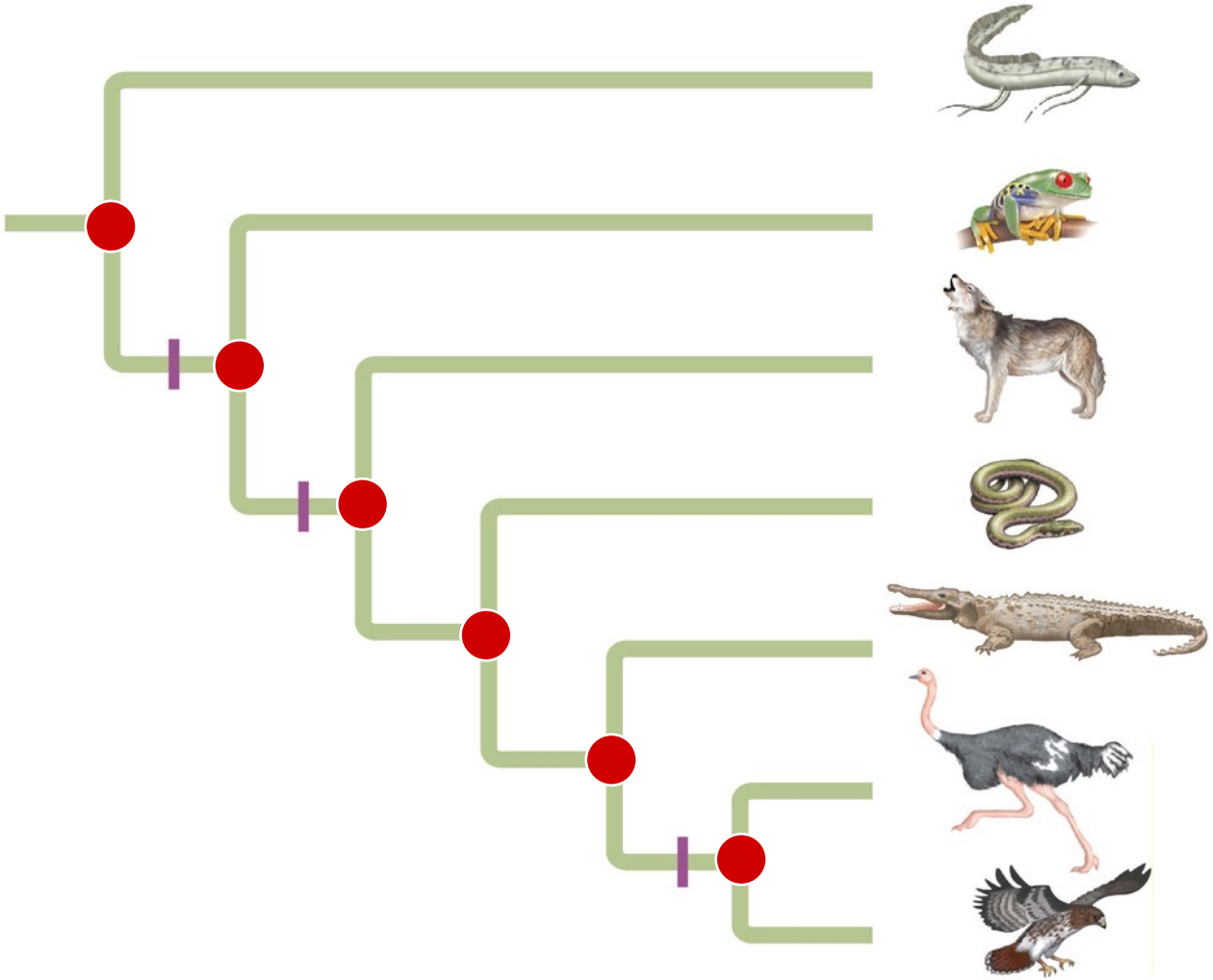

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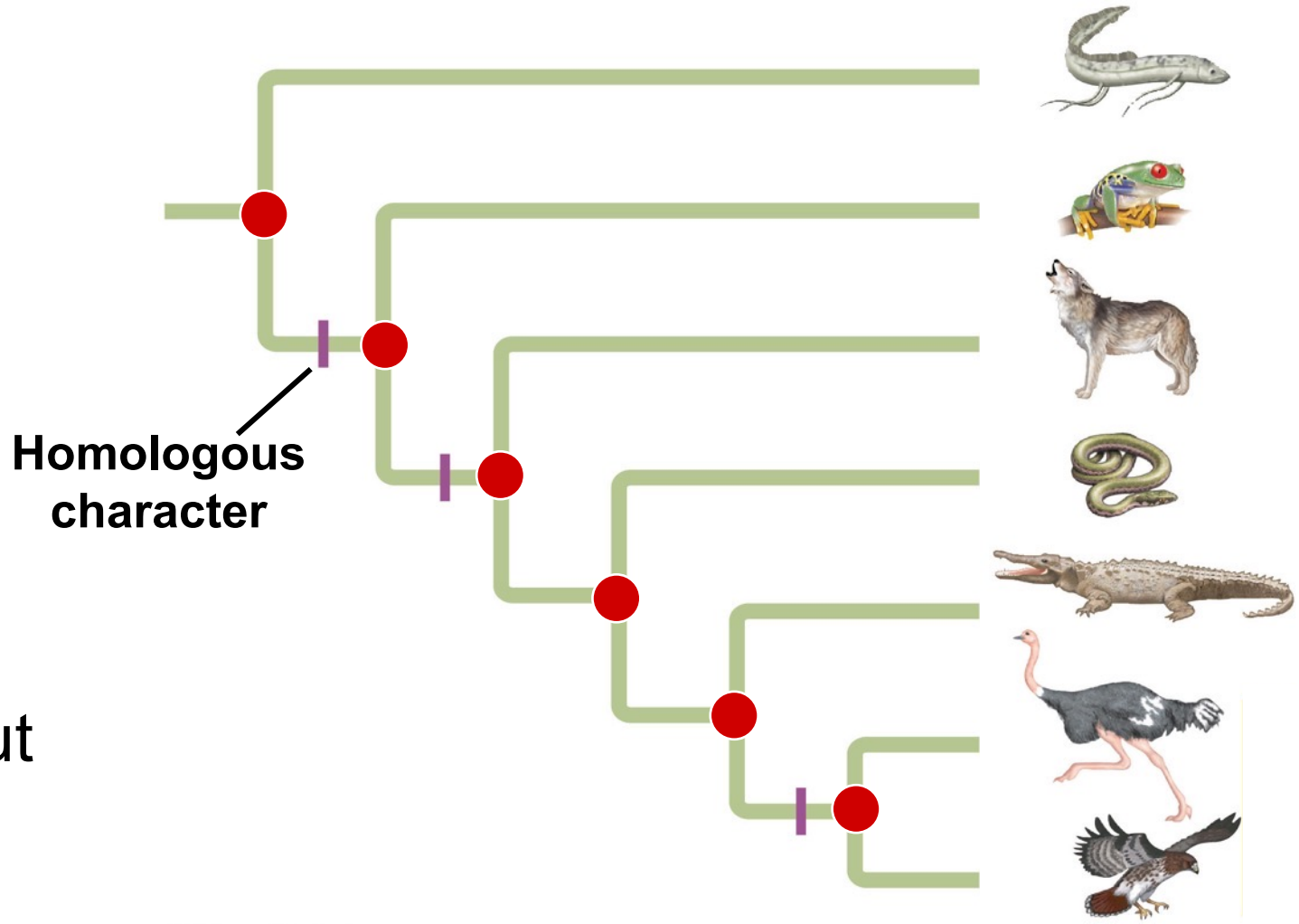

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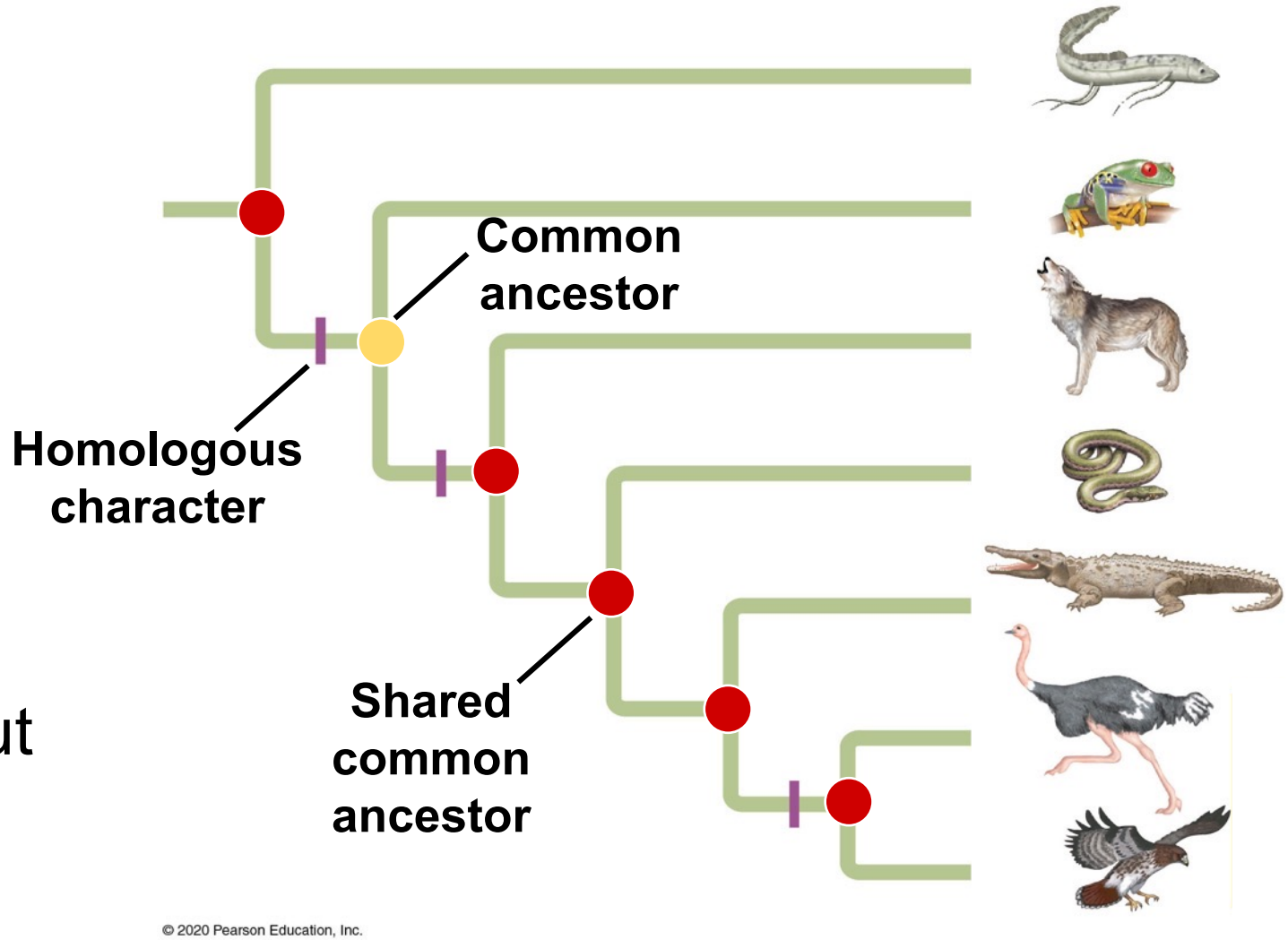

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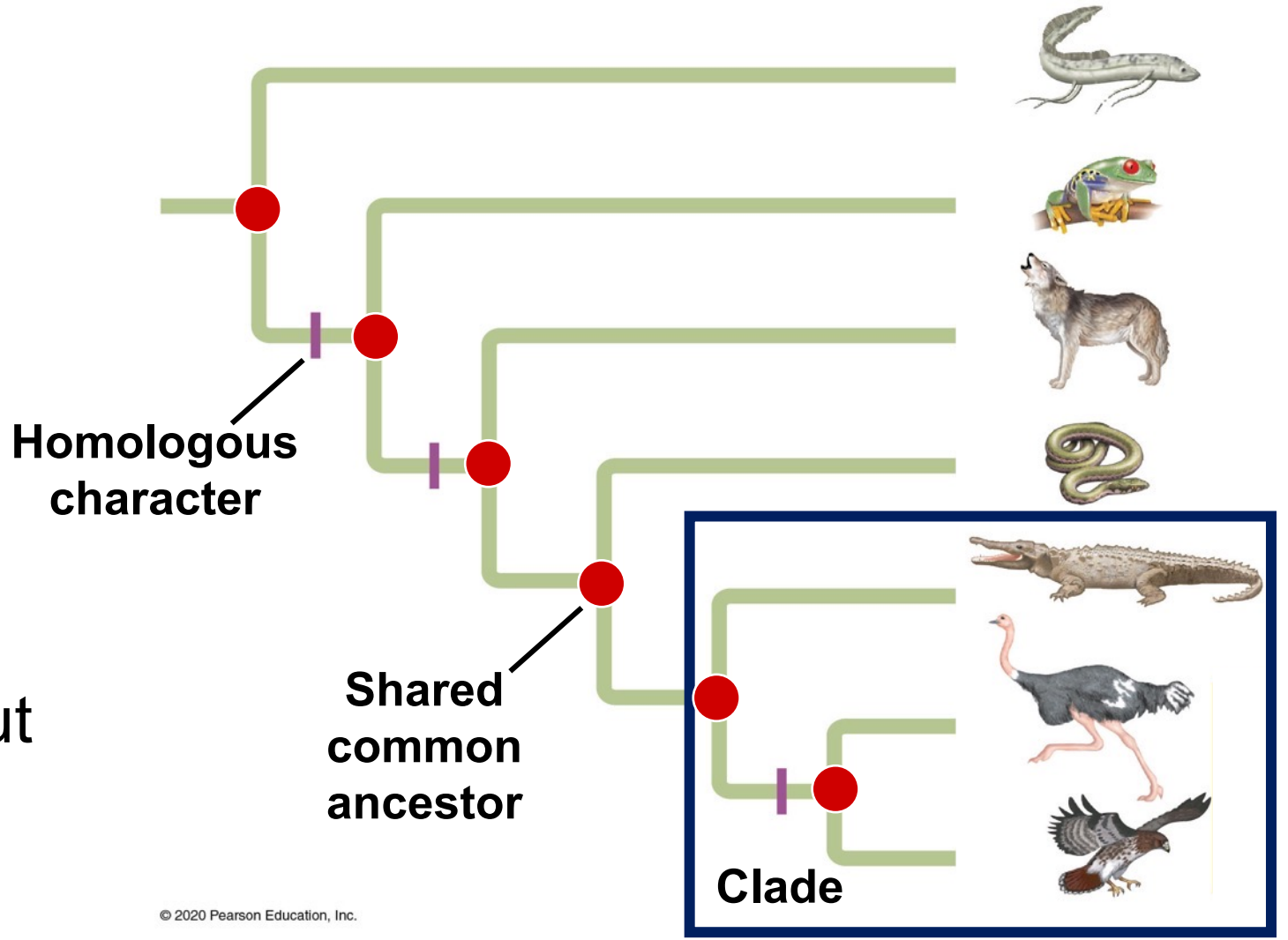
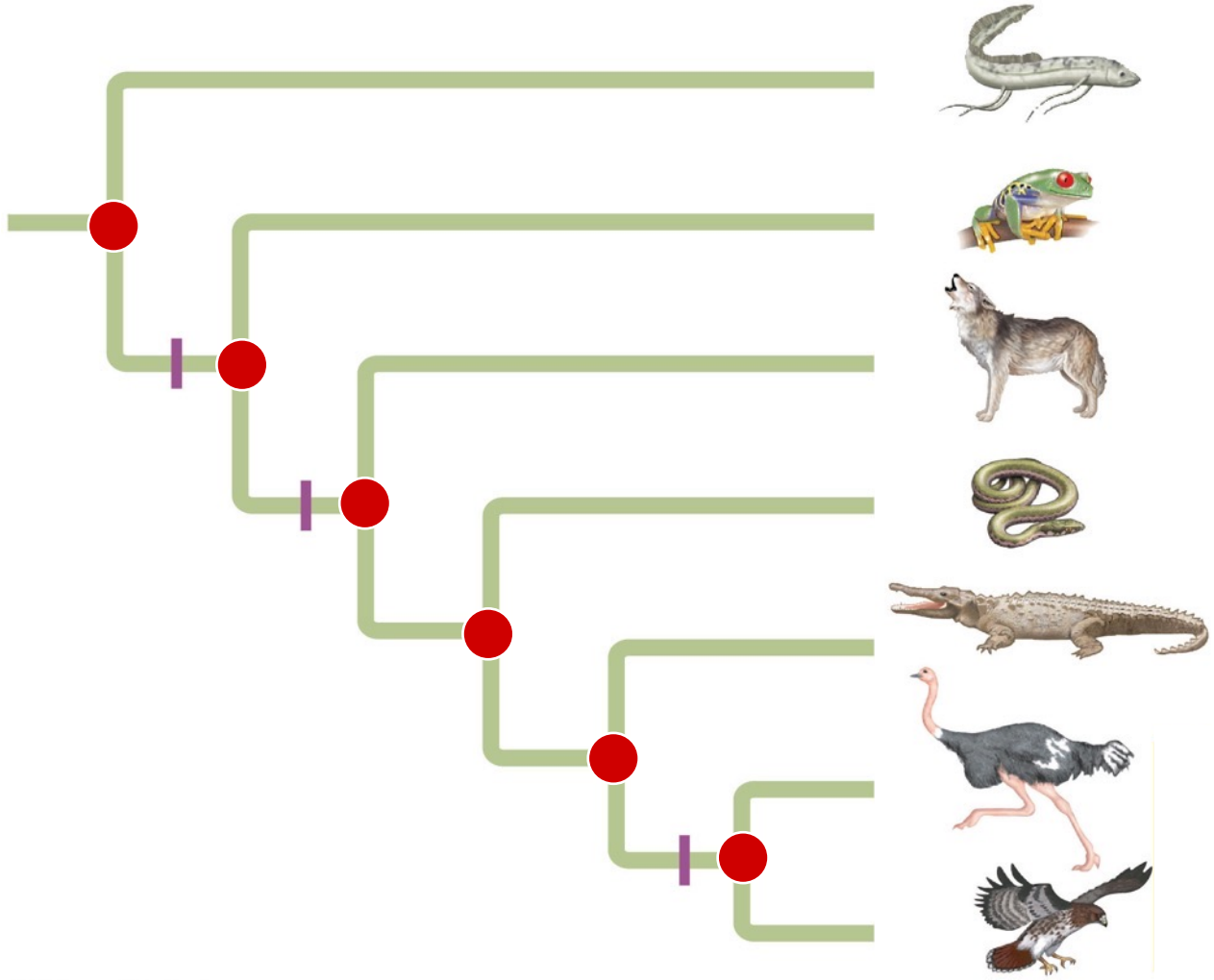


Lines of evidence for evolutionary hypotheses

Fossil:
Preserved remnant of an organism that lived in the past



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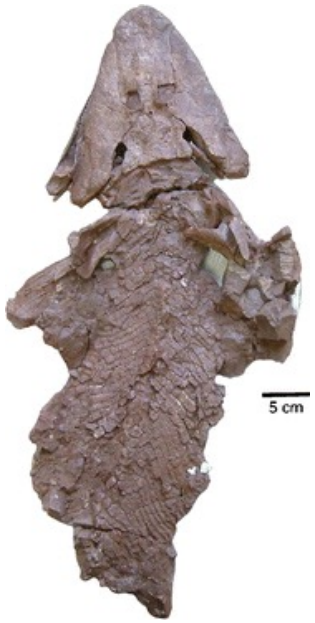
***Tiktaalik roseae*, an extinct fossilized animal, might have been ancestral to tetrapods**



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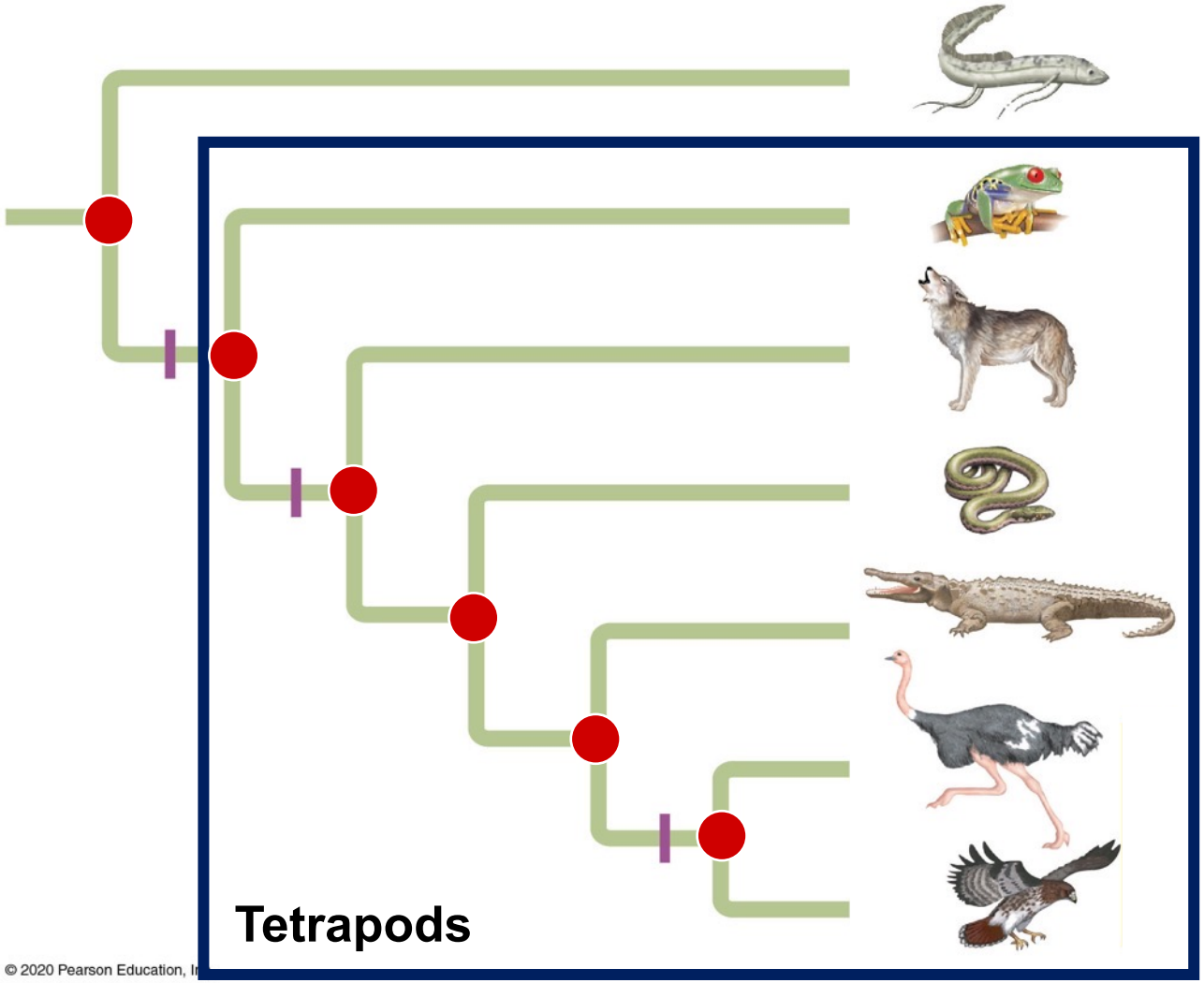

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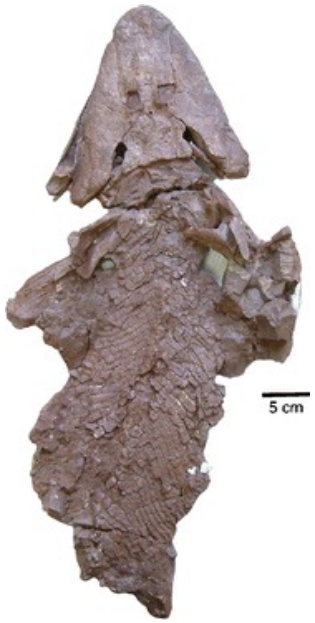

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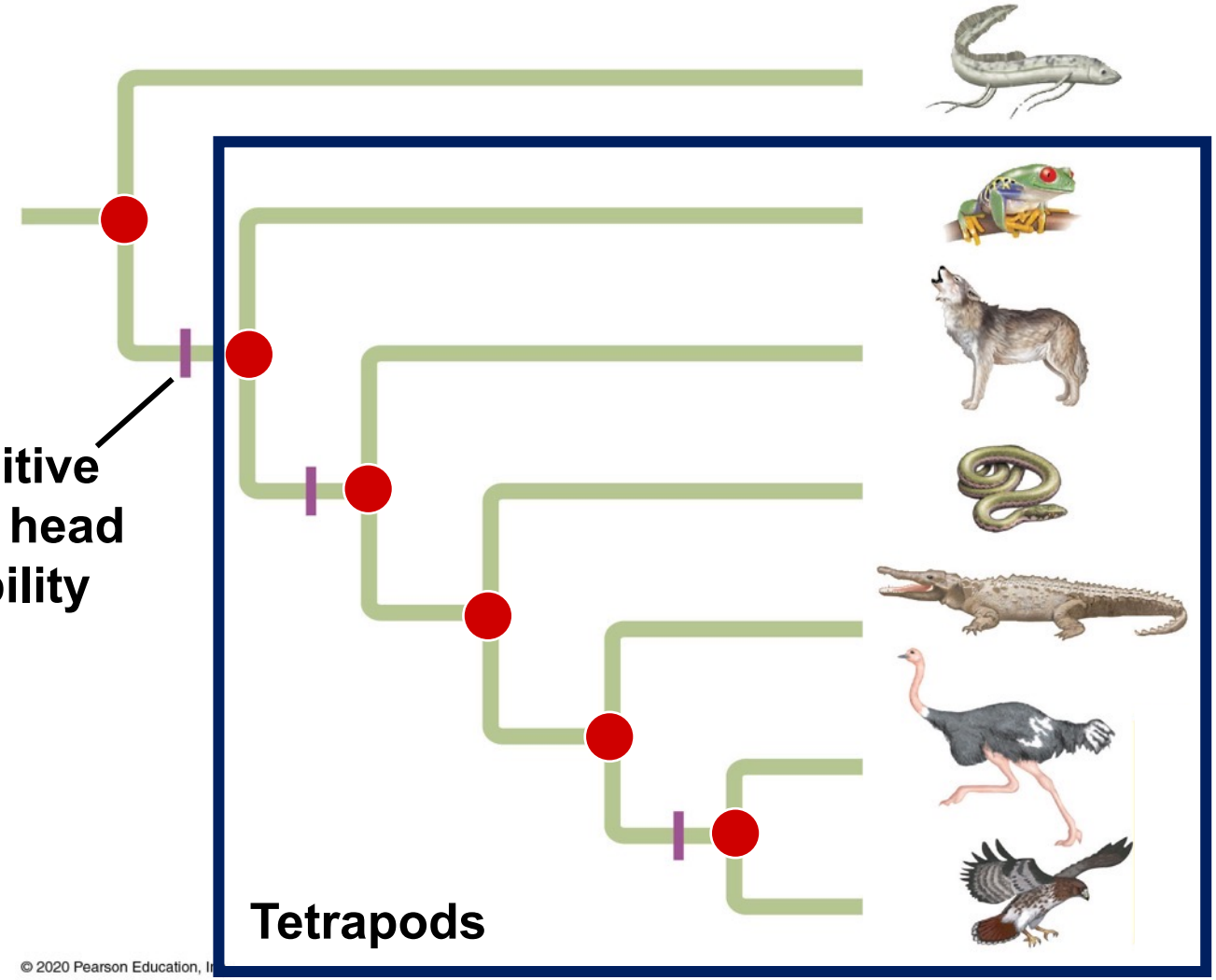
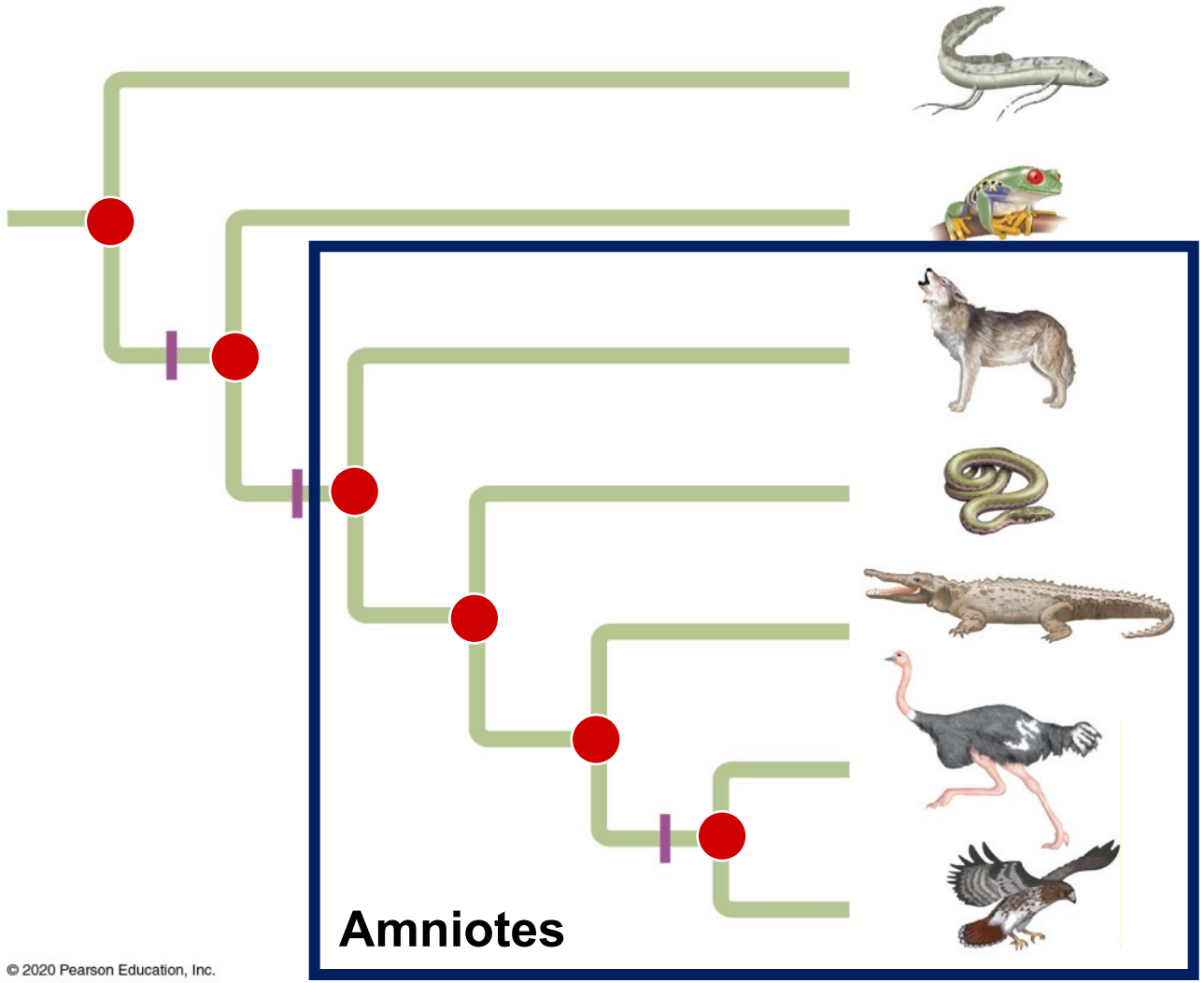


Lines of evidence for evolutionary hypotheses

Homology:
Similarity in characters resulting from shared common ancestry



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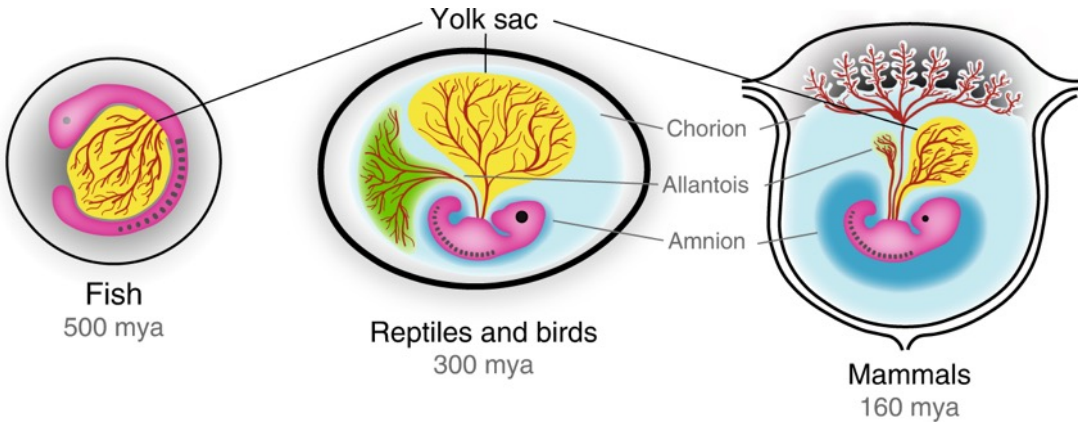
https://doi.org/10.1038/s41467-020-17575-w



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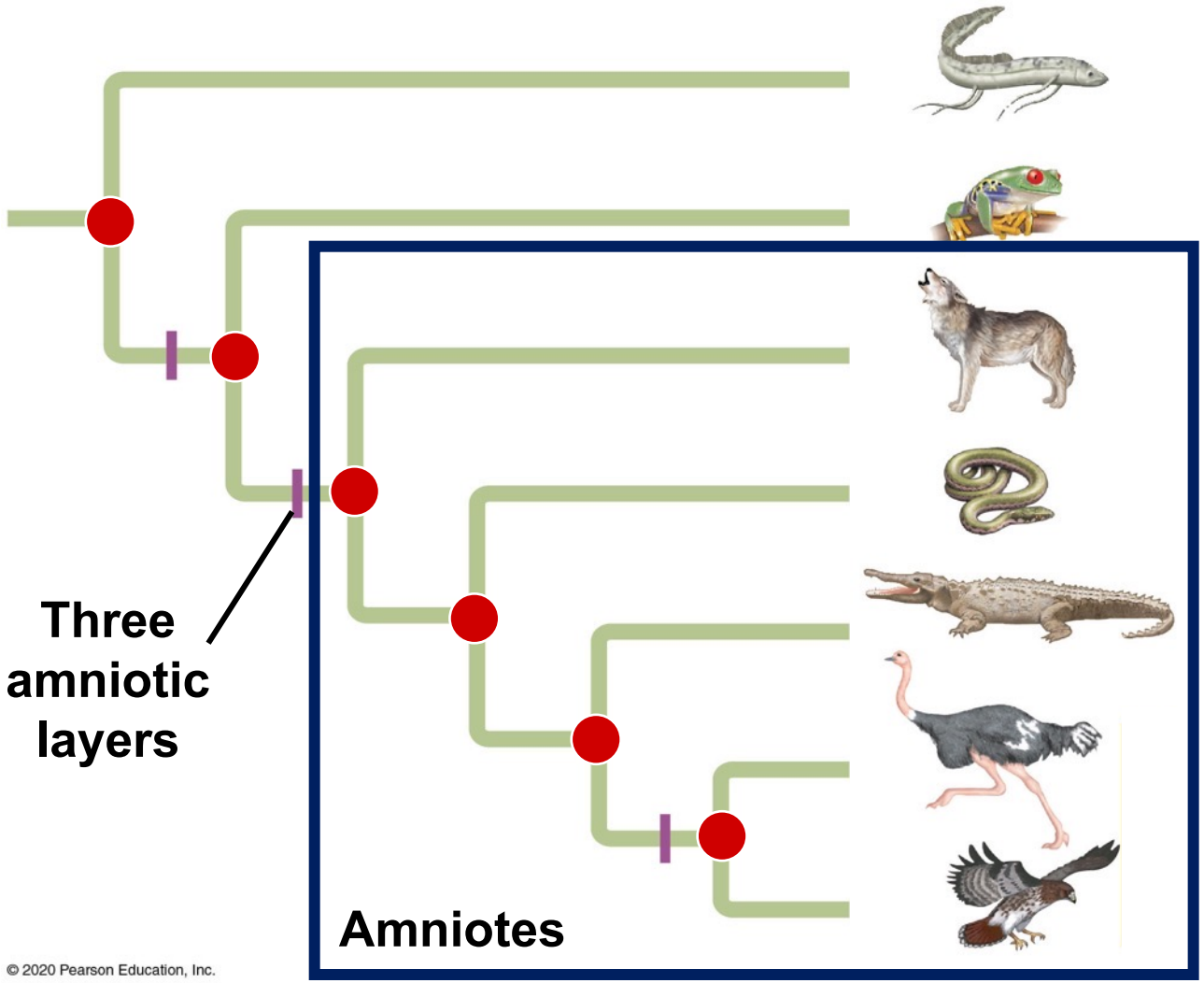
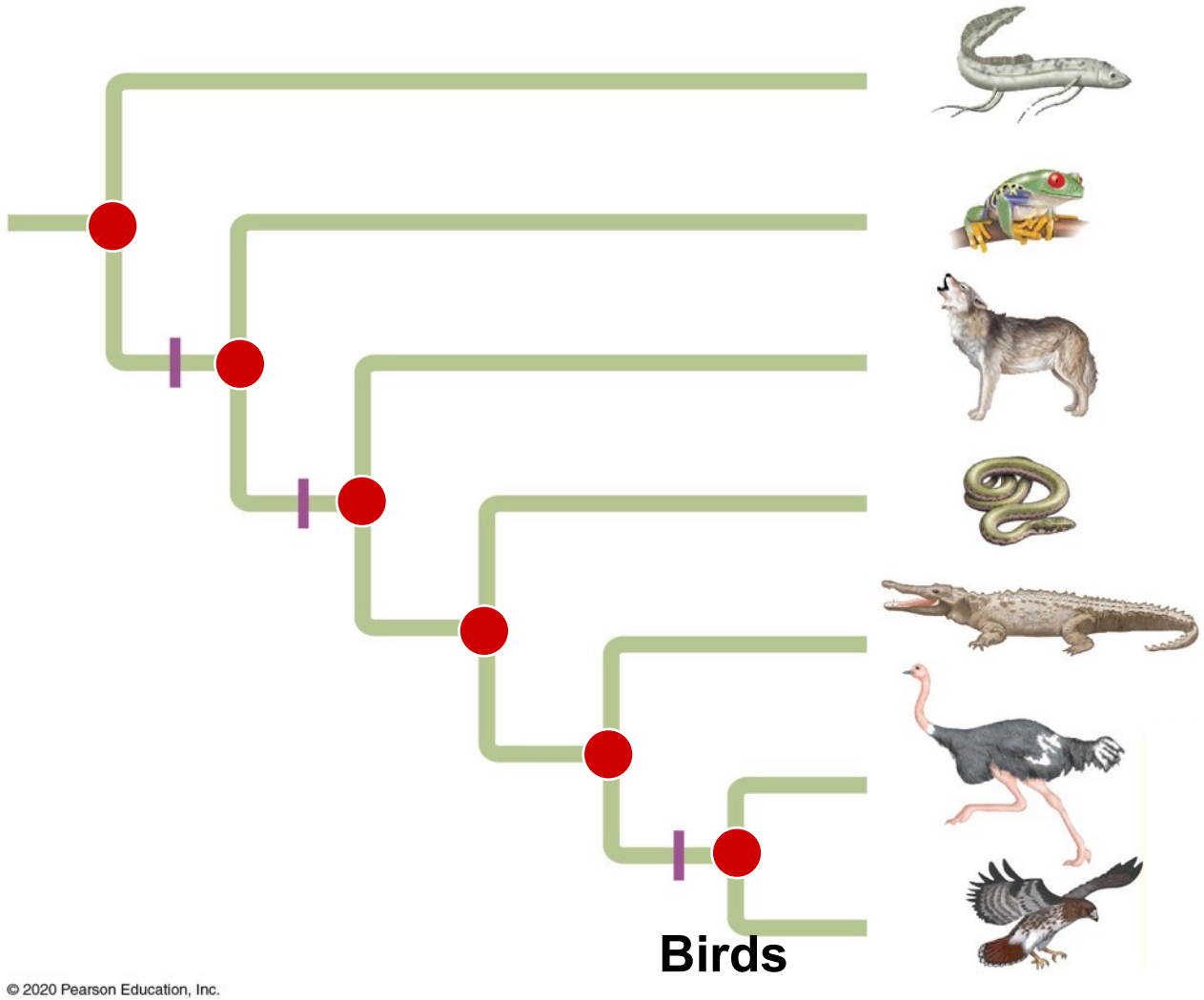


Lines of evidence for evolutionary hypotheses

Molecular homologies are similarities in DNA sequences due to shared common ancestry



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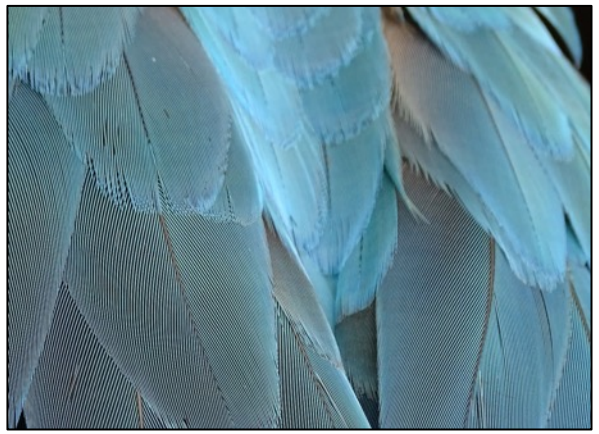

Birds have genes that code for specific ß-keratin proteins found in feathers

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