Week 6
BIO-1306 - Biology 2 – ICB textbook

Hello and Welcome to the weekly resources for BIO-1306 - Biology 2 – ICB textbook!

This week is Week 6 of class, and typically in this week of the semester. your professors are covering these topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout of the semester.

We also invite you to **look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester**.

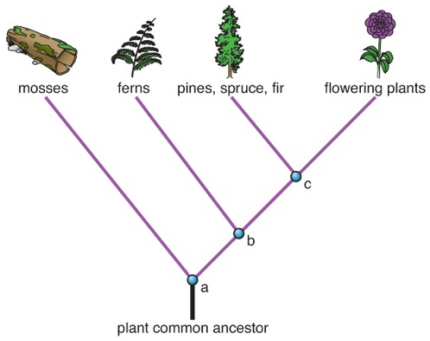
If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

***Keywords*:** *Common ancestor, Darwinian hypothesis, Phylogenetic tree, Human evolution*

TOPIC OF THE WEEK: Evolution from a Common Ancestor

This week we will look into chapter 20 and think about two main topics: **1. Descent with modification** and **2. Where, when and from what ancestors did humans evolve?**

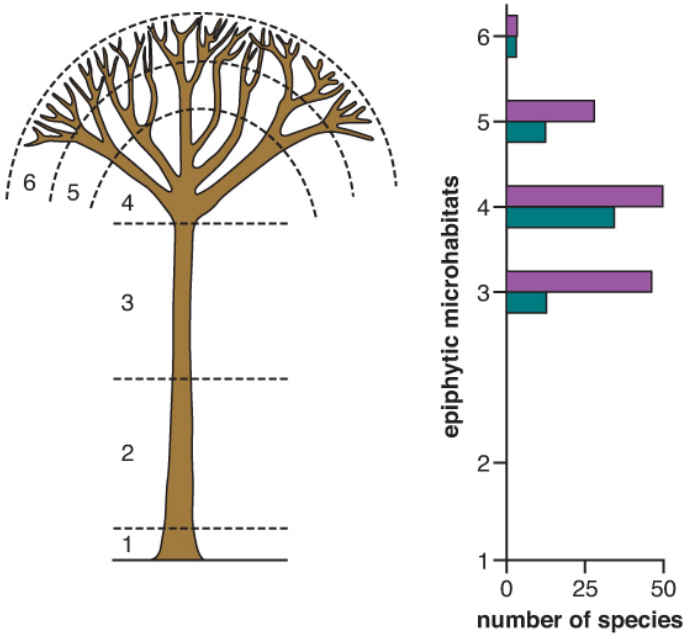
- Common ancestor → The species that many others species evolved from.
- Lineage → All the species that have evolved from the common ancestor
    - Species in a lineage differ from each other and the common ancestor due to **variation** over time, BUT all species in a lineage have **common characteristics.**
- Evolutionary tree → Visualizes the hypothesized evolutionary relationships among groups of species



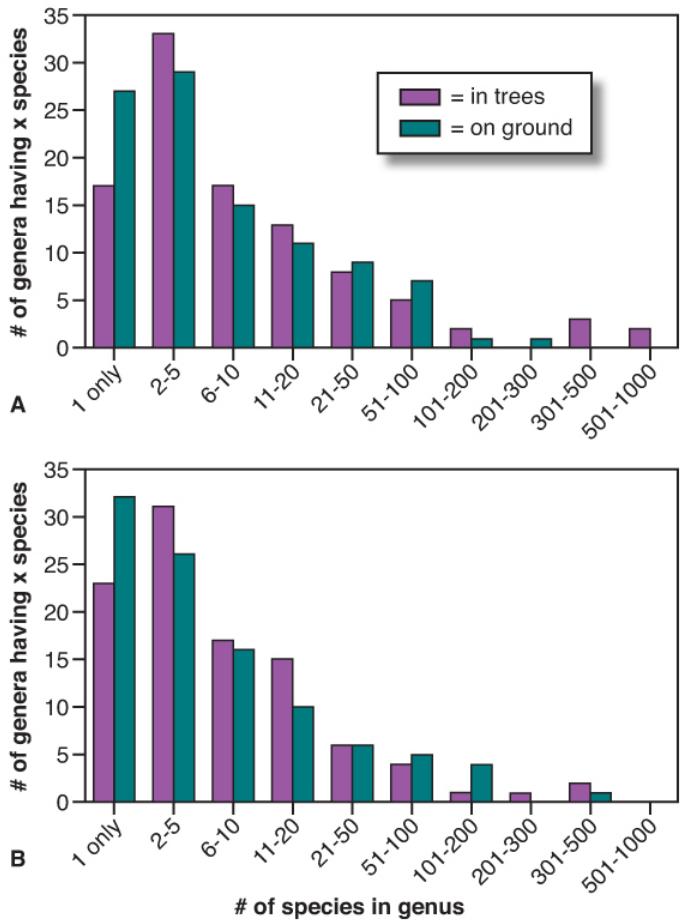
HIGHLIGHT #1: Adaptive Radiation

To provide an example about how **adaptive advantages** in some individuals lead to the emergence of more species, let's look at the Gravendeel study on orchids. Researchers compared species diversity in orchids and non-orchid plants living in trees to related plants living on the ground.

They tested the hypotheses that *living aboveground promotes species diversity,* so they randomly selected 100 genera of orchids that live in trees and 100 genera of orchids that live on the ground. The following bar graphs show frequency distributions of orchids (A) and non-orchid plants (B) living above ground (purple) and on the ground (teal)



What do we see? The first diagram to the left shows the number of species in each epiphytic microhabitat, which is basically how far from the ground those species live. **Notice that the number of species is the highest in levels 3 and 4, which show evidence of more diversity above the ground.**



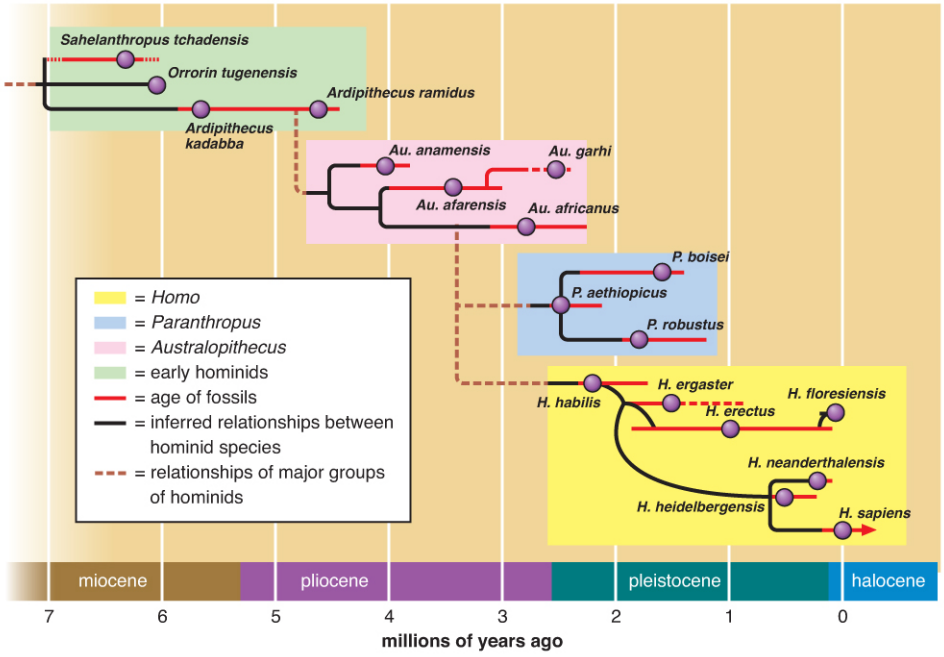
The frequency distributions shown below display more genera when the number of species is higher in each genus. Remember the levels of organization for phylogeny! A family has multiple genera, and each genus has multiple species. Therefore, the graphs show evidence that the genera with the most species are often the ones that take over with more individuals. **What's important to notice here, however, is that for both orchids (A) and non-orchids (B), genera with 2 – 20 species prefer to leave on trees (above the ground), whereas is there is only 1 species, then it's likely that they live on the ground.**

Another example of adaptation is provided by bacterial resistance to antibiotics. If you would like to give this example, please check out this 2-min video that students will also see in class:
https://www.youtube.com/watch?v=km6_d_1Ncgg

HIGHLIGHT #2: Comprehending an Evolutionary Tree

Humans, as any other species in the planet, are subject to the forces of evolution and can also be traced back to a common ancestor. The species with this common ancestor are grouped into a classification known as **HOMINIDS**. This group includes some non-human primates, like gorillas, and both extinct and living humans. A group of researchers discovered fossils in Chad, central Africa, that dated back between 6 and 7 million years ago. This was the skull of ***Sahelanthropus tchadensis***. This is thought to be the common ancestor of all hominids.

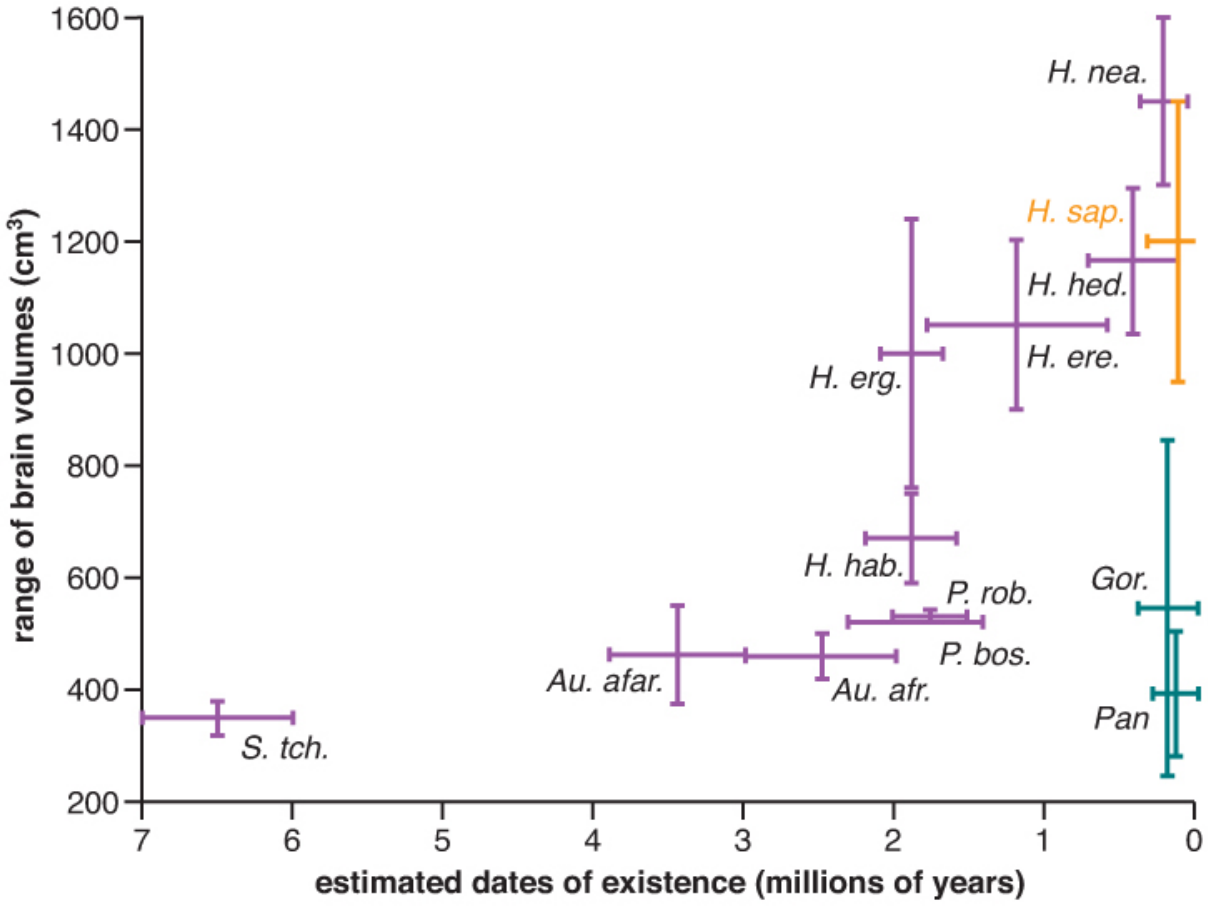
Now that you know how to read an evolutionary tree, let's see the one constructed for hominids. In this diagram, red lines represent the age ranges of each species and tan lines are possible relationships based on fossil evidence.



What does this show? This diagram helps us see the time ranges where *Homo sapiens* appeared in the picture, and how all *Homo* species evolved from other common ancestor genera. **It appears that the first *Homo* species (*H. habilis*) appeared between 2 and 3 million years ago**, with *Homo sapiens* being the only species that is currently living. Some researchers state that the emergence of *Homo sapiens* marked the beginning of the **Halocene**, though it would be more

accurate to point out that the species seems to have emerged near the end of the **Pleistocene**.

Let's look at one piece of human evolution across different hominids: brain volume. **In the chart at the bottom**, you can see a comparison of brain volumes as a function of time. Notice that the hypothesized common ancestor, ***S. tchadensis***., corresponds to the "Chad fossil", thought to live about 6.5 million years ago. As we get close to modern times, we see that **evolution favors increased brain volumes**, with *Homo sapiens* being one of the three non-extinct hominids and having the largest brain volume. It is very interesting to notice that there was one hominid species, *H. neanderthalensis*, which had a larger brain volume compared to modern humans, yet that species is extinct.



CHECK YOUR LEARNING:

1. What is the chief agent of decent with modification, according to Darwin?
2. What is the common ancestor of all Hominids?
3. What are the two *Homo* species that are closely related to living humans?

THINGS YOU MIGHT STRUGGLE WITH:

1. Comprehending phylogenetic trees and comparing species diversity.
    a. You can use this link from Khan Academy to get started with reading the phylogenetic trees: https://www.khanacademy.org/science/ap-biology/natural-selection/phylogeny/a/phylogenetic-trees

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Thanks for checking out these weekly resources!
Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring ! Answers to check your learning questions are below

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Answers:

1. Natural Selection
2. Sahelnthropus tchadensis
3. H. neanderthalensis and H. heidelbergensis