

*A History of Existing Life*TM

ADDITIONAL NOTES FOR TEACHERS

Phylogenetic trees are the framework and organizing structure for evolution. This tree provides a big picture visual that's easier to follow than the usual phylogenetic diagram in order to illustrate with impact key concepts of evolution.

- **Geological time and the timing of events** in earth's history, including mass extinctions. Add a dinosaur picture to illustrate their relationship to birds, how extinct organisms would fit on the tree (branches off the tree), and how much current life has been living, evolving and surviving since long before dinosaurs evolved!
- **Unity of life - common ancestry and relatedness** - Start with any two organisms and walk backwards, and eventually you will reach a common ancestor. The more recent the common ancestor, the more closely related those two species are to each other.
- **Diversity of life - change through time & speciation** - speciation events, due to natural selection and other mechanisms, are shown with every branching.
- **Character traits** - the tree shows both widespread ancestral traits (DNA in nucleus) and distinguishing derived traits (feathers). Easy to see that a character trait can be ancestral or derived, depending on where you're looking (hair is derived for mammals and ancestral for cats).
- **Patterns** - adaptive radiation (mammals filling niches after extinction of non-avian dinosaurs), convergent evolution (wings) and co-evolution (pollinators and flowering plants).
- **Classification** - what is a clade? show why and how classification needs to incorporate phylogeny (for example birds are within "reptiles", "protists" and "fish" are not a clade).
- Game type questions provide **interaction** with the concepts, and can point out fun cool facts! For example "What living group are horseshoe crabs most closely related to?"
- **Dispel misconceptions** such as "ladder thinking" (for example the typical graphic showing apes to humans) and show that no current living species is descended from another living species.
- **Nature of science** - update the tree with results of new research studies and fossil finds! This shows the testing and predicting concepts of science, and illustrates the increased use of phylogenetic trees as essential tools in many biology disciplines.