

Tracing Evolution

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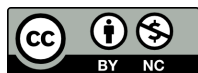
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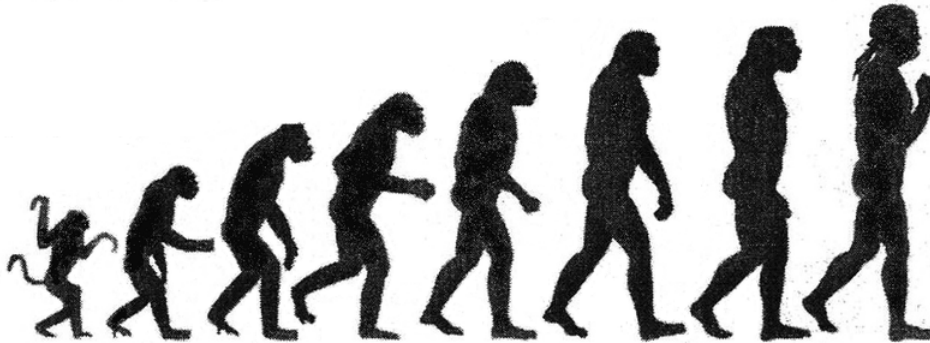
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CHAPTER 1

Tracing Evolution

- Explain the rate of evolution.
- Describe an evolutionary tree.



Can you watch evolution happening?

Usually evolutionary changes occur at a very slow pace. Human evolution took millions of years. However, sometimes evolution can also happen quite quickly.

Tracing Evolution

How fast is evolution? Can you actually see evolution happening within your lifetime? Usually evolution takes a long time. So how can we visualize how it has happened?

Rates of Evolution

How long did it take for the giraffe to develop a long neck? How long did it take for the Galápagos finches to evolve? How long did it take for whales to evolve from land mammals? These, and other questions about the rate of evolution, are difficult to answer.

The **rate of evolution** depends on how many of an organism's genes have changed over a period of time. Evolution is usually so gradual that we do not see the change for many, many generations. The rate of evolution also depends on the generation time of a particular species.

Not all organisms evolve at the same rate. Humans took millions of years to evolve from a mammal that is now extinct. It is very difficult to observe evolution in humans. However, there are organisms that are evolving so fast that you can observe evolution! A human takes about 22 years to go through one generation. But some bacteria go through over a thousand generations in less than two months. Some bacteria go through many generations in a few days. And sometimes a bacterial generation is as fast as 20 minutes! We can actually trace their evolution as it is happening.

Evolutionary Trees

If evolution can take a very long time, how can we visualize how it happens? Charles Darwin came up with the idea of an **evolutionary tree** to represent the relationships between different species and their common ancestors

(**Figure 1.1**). The base of the tree represents the ancient ancestors of all life. The separation into large branches shows where these original species evolved into new species.

The branches keep splitting into smaller and smaller branches as species continue to evolve into more and more species. Some species are represented by short twigs spurting out of the tree, then stopping. These are species that went extinct before evolving into new species. Other “Trees of Life” have been created by other scientists (**Figure 1.1**). If the evolutionary tree went back far enough to begin with the first living organism, what type of organism would that be? Animal, plant, fungi protist, or none of those?

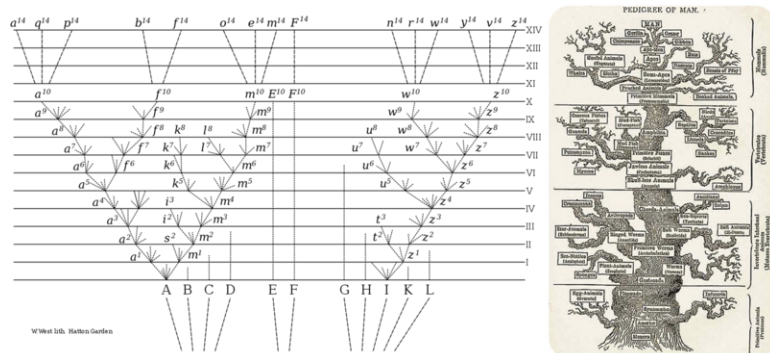


FIGURE 1.1

Darwin drew this version of the “Tree of Life” on the left to represent how species evolve and diverge into separate directions. Each point on the tree where one branch splits off from another represents the common ancestor of the species on the separate branches. Scientists have drawn many different versions of the “Tree of Life” to show different features of evolution. The Tree of Life on the right was made by Ernst Haeckel in 1879.

Summary

- Evolution is usually so gradual that we do not see the change for many, many generations.
- An evolutionary tree can be drawn to visualize the relationships between different species and their common ancestors.

Explore More

Use the resource below to answer the following questions.

- **Richard Dawkins: Why are there still Chimpanzees?** at <http://www.youtube.com/watch?v=wh0F4FBLJRE> (1:47)
1. Are we descended from chimpanzees? Explain your answer.
 2. When reading an evolutionary tree, what does it mean if two species are very close on the tree?
 3. What does it mean if two species are very far apart on a tree?
 4. What five species comprise the Great Apes?

Review

1. How fast is evolution?
2. What is the purpose of an evolutionary tree?
3. Who came up with the idea for the evolutionary tree?

References

1. Charles Darwin; Ernst Haeckel. [Drawing of the Tree of Life, an evolutionary tree](#) . Public Domain