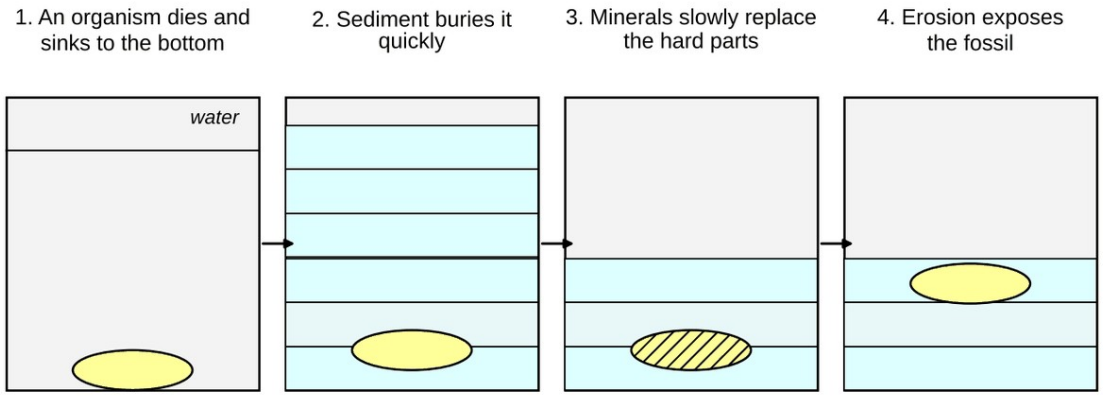
Essential Question

What can fossils and rock layers tell us about the history of life?

Fossil Evidence

How Fossils Form

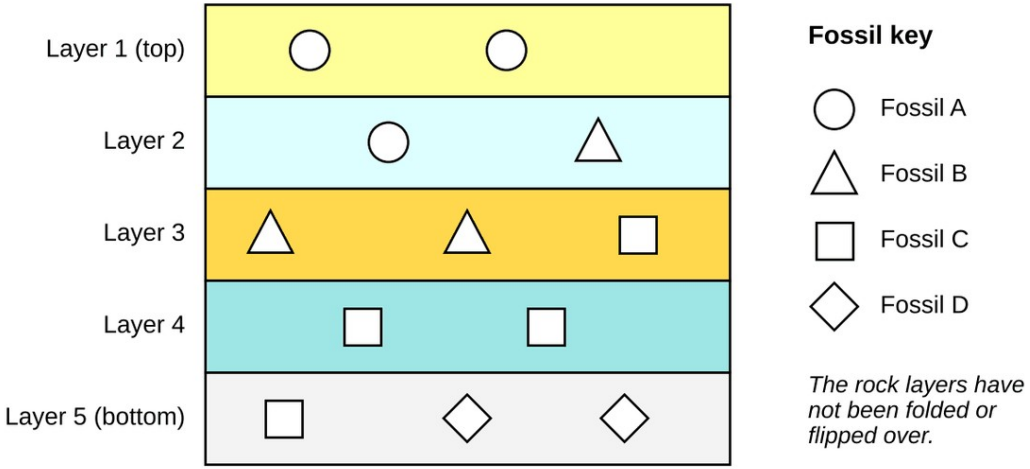
- Fossils are preserved remains or traces of organisms
- Quick burial in sediment helps preservation
- Minerals slowly replace hard parts
- Bones, teeth, and shells fossilize best



Hard parts (bones, teeth, shells) fossilize best. Most organisms never become fossils.

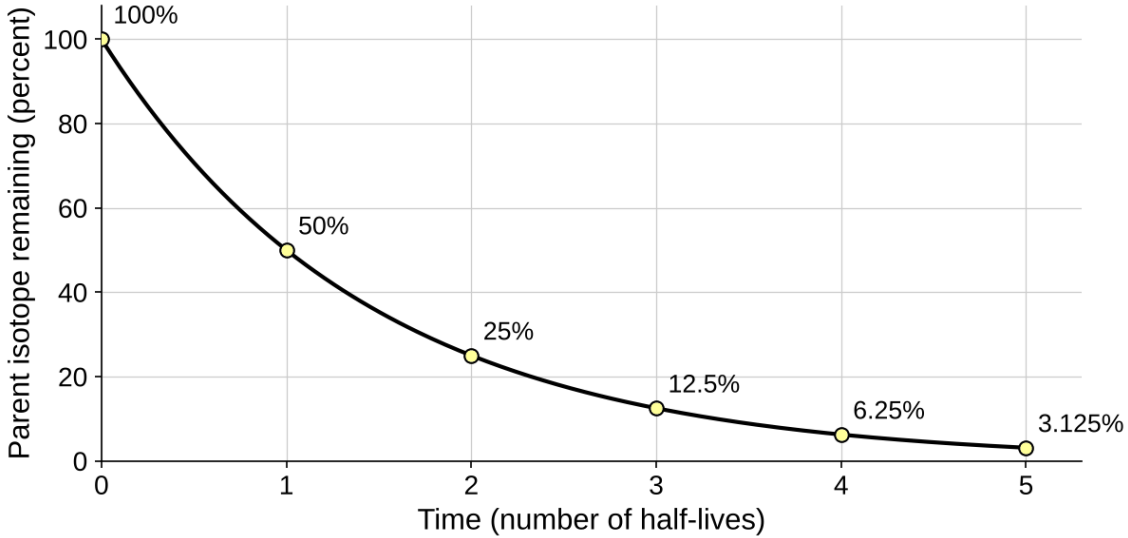
Reading Rock Layers

- Sediment settles in layers, called strata
- Older layers lie below younger layers
- Fossils in a layer lived at about the same time
- Layers show the order of events



Radiometric Dating

- Radioactive isotopes decay at a fixed rate
- Half-life: time for half of an isotope to decay
- Carbon-14 half-life: 5,730 years
- Older rocks use isotopes with longer half-lives



Fossil Evidence

Transitional Fossils

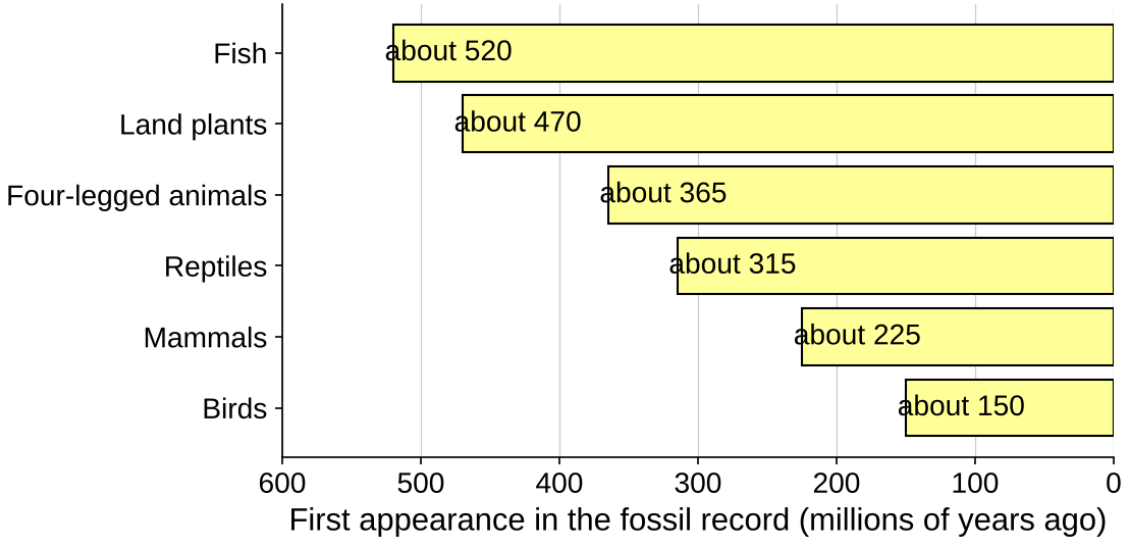
- Transitional fossils show traits of two groups
- They fit between ancestors and descendants
- Predictions from evolution can be tested

Fossil	Age (millions of years)	Traits	Links these groups
Tiktaalik	about 375	Gills and scales like a fish, plus a neck and wrist-like bones in its fins	Fish and four-legged animals
Archaeopteryx	about 150	Feathers and wings like a bird, plus teeth, claws, and a long bony tail like a dinosaur	Dinosaurs and birds
Ambulocetus	about 49	Four legs for walking like a land mammal, plus whale-like ear bones and skull	Land mammals and whales

Fossil Evidence

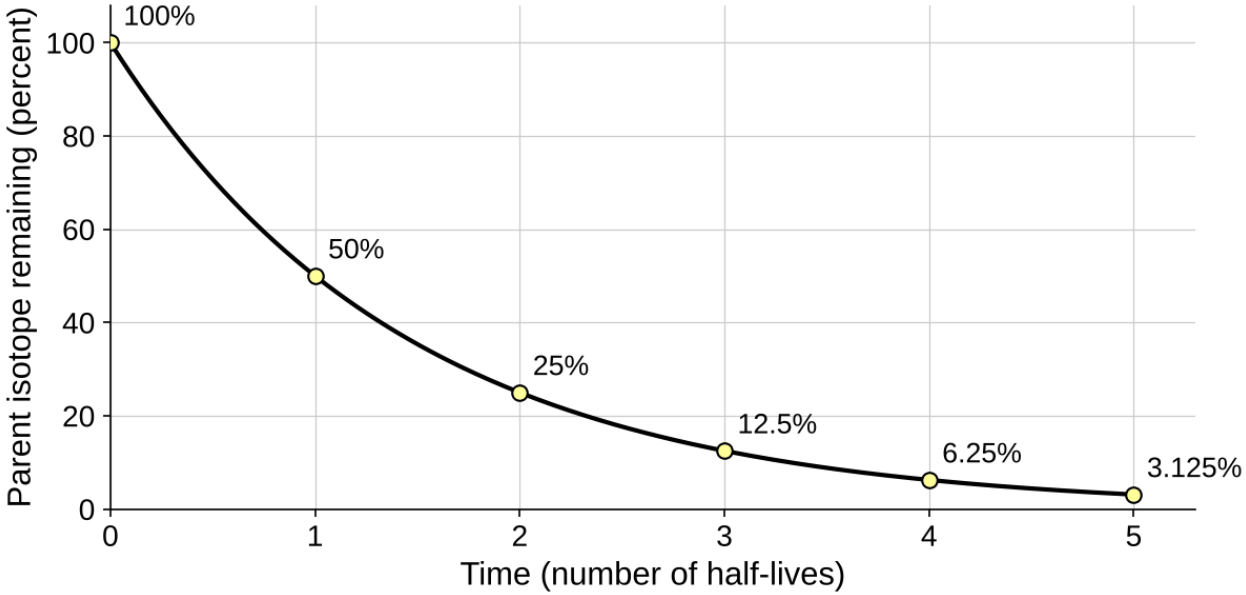
The Order of Life

- The fossil record shows life changing over time
- Simple organisms appear before complex ones
- New groups appear in a predictable order



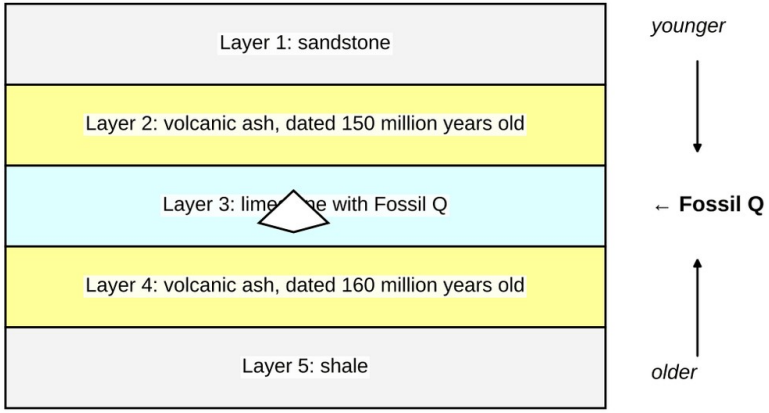
Example: How Old Is the Bone?

A bone fragment contains 12.5% of its original carbon-14. The half-life of carbon-14 is 5,730 years. How old is the bone?



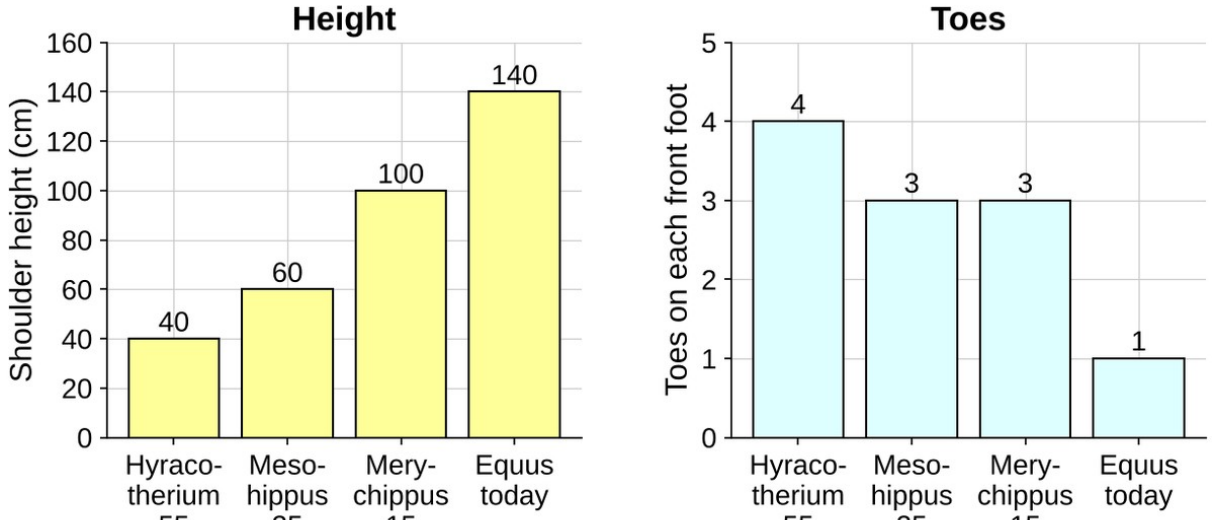
Example: Dating a Fossil Between Two Layers

Fossil Q is found in a limestone layer between two layers of volcanic ash. Radiometric dating shows the upper ash is 150 million years old and the lower ash is 160 million years old. (a) What is the age of Fossil Q? (b) Why can't carbon-14 be used to date Fossil Q?



Example: Horse Ancestors

The graphs show approximate data for four horse ancestors. (a) How many toes did Hyracotherium have on each front foot? (b) How much did the shoulder height increase from Hyracotherium to Equus? (c) What does the pattern show?



Name and age (millions of years ago) of each ancestor. Values are approximate.

Fossil Evidence

Big Ideas

- Fossils form when hard parts are buried and mineralized
- Older rock layers lie below younger ones
- Half-life: time for half an isotope to decay
- Transitional fossils link groups
- The fossil record shows groups in order of appearance