

# How Fossils Are Dated

THE BOTANIC GARDEN OF SMITH COLLEGE

Current knowledge of the age of plant fossils is based on years of research dating the rocks in which fossils occur. Fossils are found primarily in sedimentary rock strata (layers) because the forces of heat and pressure involved in the generation of igneous and metamorphic rocks are not conducive to fossil preservation. Scientists commonly use a combination of relative and absolute dating methods to determine the age of a given stratum and the fossils it contains.

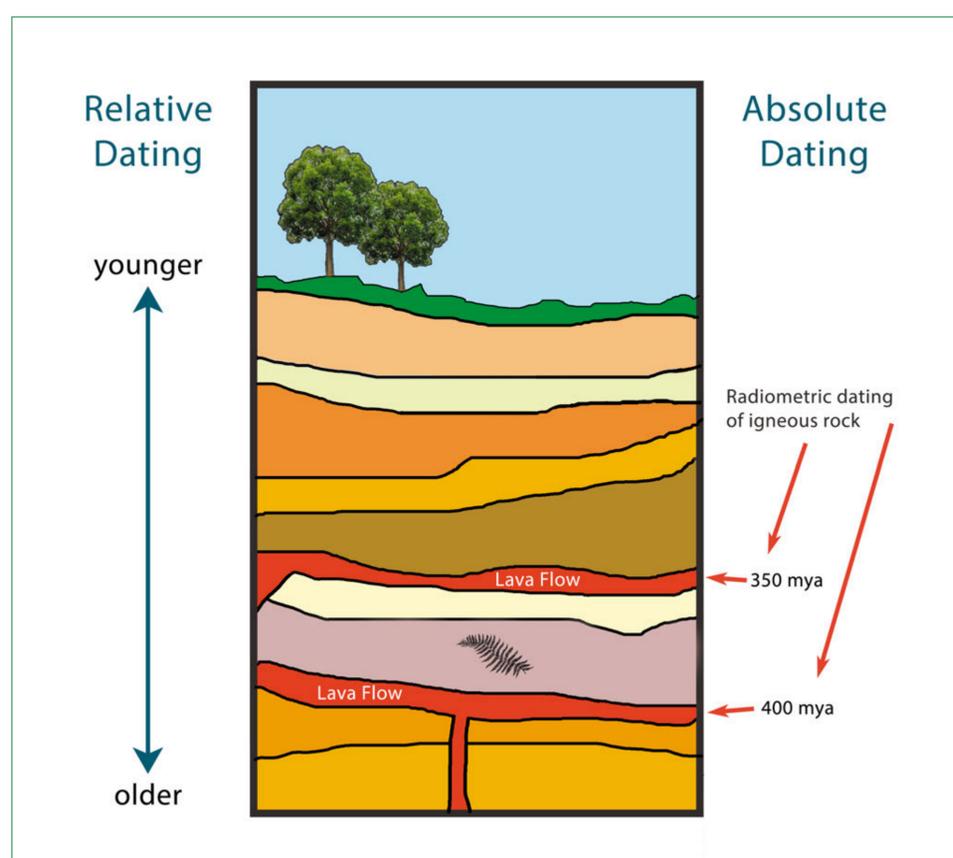
## RELATIVE DATING

Relative age — older or younger — is based on the location where a given fossil occurs in a layered sequence of sedimentary rocks. Fossils buried in the lower layers are older than those encased in the upper strata, which were formed by more recent deposits.

Once particular fossils are identified and dated, they become useful in dating other rock strata containing those same fossils or in providing relative dates for the layers above and below.



The uppermost layer of the Grand Canyon, the Kaibab Formation, is about 250 million years old. Thus, any fossils found in the layers below would be older than 250 million years.



Igneous rock (red) is interlayered with sedimentary strata in a geologic cross section. Radiometric dating methods yield dates for the igneous layers and relative dating methods are used for the sedimentary layers. The two lava flows above and below a fern fossil found in the gray layer indicate that the fern lived between 350 and 400 mya (million years ago).

## ABSOLUTE DATING

Radiometric dating methods are used to determine a rock's precise age using radioactive elements that naturally occur in certain minerals. For an igneous rock, the clock starts from the time that the mineral grain crystallized from the cooling molten magma. Through analysis of the amount of breakdown of the radioactive elements in the mineral, using known rates of decay, one can determine the age of the igneous rock layer that contains the mineral. Numerical dates for sedimentary layers are usually determined through their relationship to igneous rocks.