

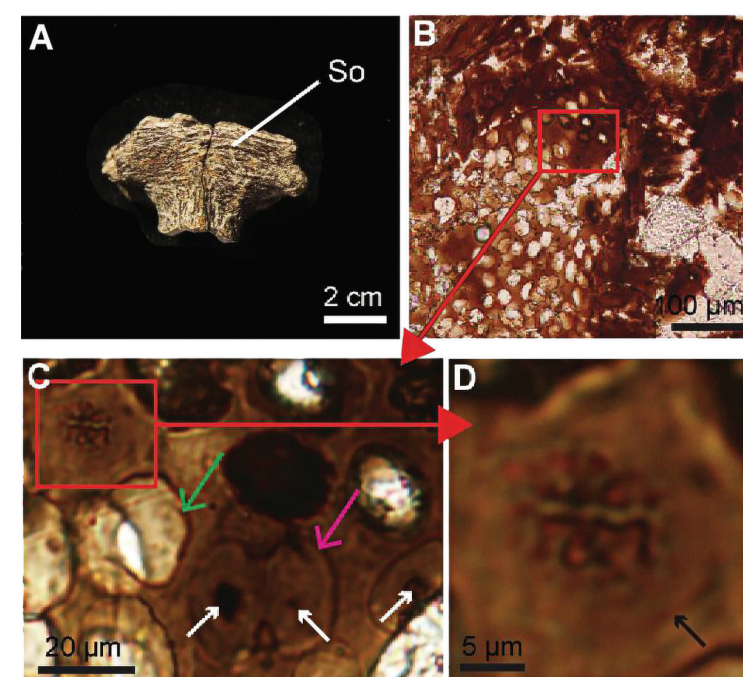
Questions on Deep Time

“**Deep Time**” is the commonly accepted belief that life has existed on Earth for billions of years. Most commonly, the dates are inferred from ratios involving unstable radioactive isotopes (atoms) in rocks. However, there are other observations from the geological record that do not fit with deep time, and indicate a shorter chronology.

Five lines of evidence that raise questions about the accuracy of radioisotope dates are illustrated in the display case.

1. Preservation of Biomolecules

Various kinds of biomolecules, and even cells and soft tissues, have been found in fossils. The image at right shows two bone cells (osteocytes) from the bone of a dinosaur, *Hypacrosaurus*. Measured decay rates of biological material show that delicate biomolecules do not survive through millions of years.



Successive magnifications of dinosaur osteocytes with chromosomes and DNA preserved.

Image: Alida M Bailleul, Wenxia Zheng, John R Horner, Brian K Hall, Casey M Holliday & Mary H Schweitzer, CC by 4.0

2. Layering of Sediments

Seafloor animals normally burrow through the sediments and completely overturn them faster than they accumulate, so layers tend to homogenize. Distinct layering of sediments suggests the rock layers were deposited without any long interruption.



Evidence of bioturbation in a rock from Perú

Image: Raúl Esperante, GRI

3. Flat Sedimentary Gaps

Any surface on Earth will undergo either deposition or erosion over time. When layers said to represent millions of years are missing in an area, the gap must be due to erosion or prolonged non-deposition. But if there is no evidence of either erosion or surface alteration, it appears the layers were deposited in rapid succession, and there were no intervening “millions of years.”



The arrow points to a sedimentary gap of a supposed 14 million years in the Grand Canyon.

Image: dnak, CC by 2.0

4. Rocks & Erosion Rates

At present rates of erosion, the continents would be eroded to sea level in about ten million years. This would remove the record of older deposits and expose the basement rocks. Yet an abundant record of fossil-bearing rocks supposed to be hundreds of millions of years old still persist.



Bedded layers of sediment in Bolivia. Erosion has removed some but not all the sediments.

Image: Raúl Esperante, GRI

5. Stasis in Fossils

Fossil species typically persist without change (stasis) through stratigraphic layers claimed to represent millions of years. Many modern species are observed to change in minor ways in a few generations when the environment changes. What kind of environment could remain unchanged for millions of years to account for stasis? Stasis is easier to explain in a short chronology.



The extinct 3-toed horse, *Miohippus*, is found through sediments claimed to represent several million years.

Image: BLM, Public domain