

How old is it anyway: dating of fossils and sediments

Relative dating methods are used to indicate the general age of a given fossil or artefact and this kind of dating is used when it is not possible to directly date a fossil. This can be done in a number of ways, for example, the sediments containing the fossil may be dated, or a rough date may be obtained in some other way. For example, some groups of animals such as elephants and pigs underwent fairly rapid evolution, and the appearance of certain species in a fossil site can be used to indicate a rough age for the site or sediments containing those species (for such an example, see the information on the **Langebaanweg pigs**). The use of animals for dating fossil-bearing horizons is called biostratigraphy or biochronology.

Absolute dating Absolute dating is used when the sediments or fossil can be directly dated. There are numerous dating methods available, using a range of elements and isotopes, and more methods are always being developed. Here are some of the most commonly used dating methods in archaeology and palaeontology.

Radiometric dating: This manner of dating relies on the constant rate of decay of certain radioactive isotopes (Isotopes are one or more forms of an element differing from each other in atomic weight and in nucleus, but not in chemical properties) within a bone, tooth or sediment.

Radio carbon dating can only date organic material which is younger than 40 000 years, AMS (Accelerator Mass Spectrometry) dating can extend this back to 75 000 years ago.

Potassium is a very abundant element in the Earth's crust and about 0.01% of all potassium is the radio-active isotope ^{40}K . ^{40}K decays into ^{40}Ar at a known rate, and the ratio between the two isotopes can be used as an indication as to how old a rock or sediment, such as a tuff or layer of volcanic ash can be dated. Volcanic rocks and tuffs are common in east Africa and have allowed for the accurate dating of early hominid skulls, and in the case of the Laetoli footprints, evidence for the early bipedality of hominids.

Optically Stimulated Luminescence Dating (OSL) and other such similar dating methods work by counting electrons trapped by flaws in the microscopic structure of crystals. The electrons are freed as light and the amount of escaping light can be carefully measured to estimate the time elapsed since a grain of sand was last exposed to the sun before burial. This method has become so refined that single grains of sand can be dated (TT-OSL). This method can be used to date sediments to provide relative dates for the archaeology or fossils found within them, as it dates the time they became covered by sand, and directly dates the time the sediments were last exposed to light.