

Carbon 14 dating applied to objects of Art: some elements of understanding

Carbon 14 dating concerns organic materials from living organisms (wood, textiles, ivory, seeds, teeth, bones, shells ...). It allows to determine the moment of the death of the organism which corresponds to the cut down of the tree, the plant or the death of the living being.

For authentication purpose, it is possible to know the maximum age of an object corresponding, for instance, to the cut down of the tree that provided the wood, and to evaluate its accordance with the presumed antiquity of the sculpture.

This is a complementary approach to the stylistic study of works: it provides objective information that comes support (or refute) the point of view of the expert.

Principle

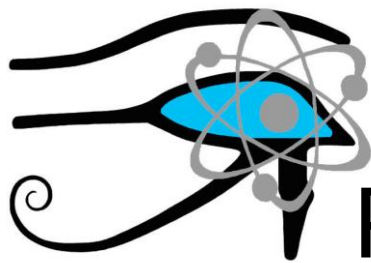
Carbon 14 (or radiocarbon) is a natural radioactive element naturally found in all living beings and its concentration decreases in a dead body according to a well-known process. Indeed, during an organism's life, the relative concentration of carbon 14 in it is constant because of respiration, nutrition, photosynthesis or other interaction with the biosphere. At its death, all exchanges stopping, the concentration of radioactive carbon-14 decreases due to a reduction by half every 5,570 years.

To measure the residual content of C14 determines the time elapsed since the death of the organism (C14 Age expressed in years).

Measurements

A fragment or a sample of some tens of milligrams (typically less than 30 mg for wood and fibers) is vaporized. Then the concentration of carbon 14 is determined using a mass spectrometer (which allows the separation of the atoms according to their mass and their valence), in comparison with standard measurements.

Procedures for calibration and taking into account of possible reservoir effects (for organic matter of marine origin) lead to **transform the raw age (expressed in years BP) into intervals of calendar dates (expressed in BC or AD, and associated with different probabilities).**



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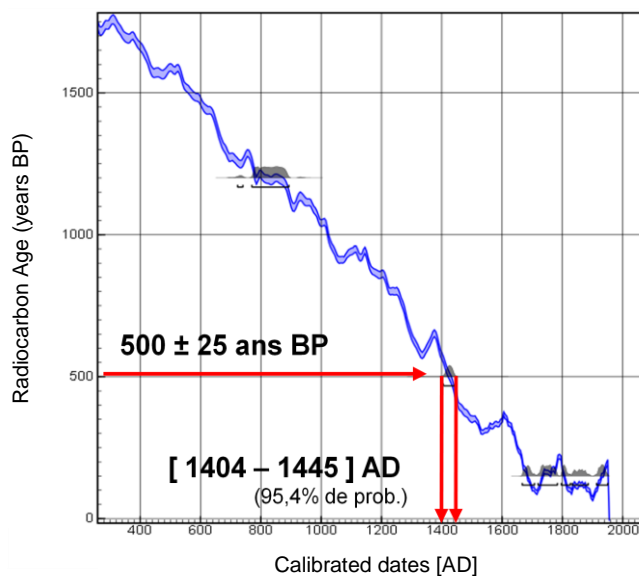
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Two examples

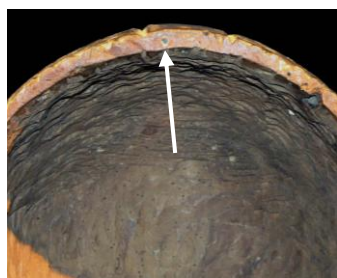


**Wooden sculpture, Africa
presumed from 15th – 16th centuries AD**

Measuring the concentration of residual carbon 14 from a small sampling of the constituent wood of the piece shows that it was cut down **500 ± 25 years BP ago, that correspond to the range [1404 – 1445] AD.**

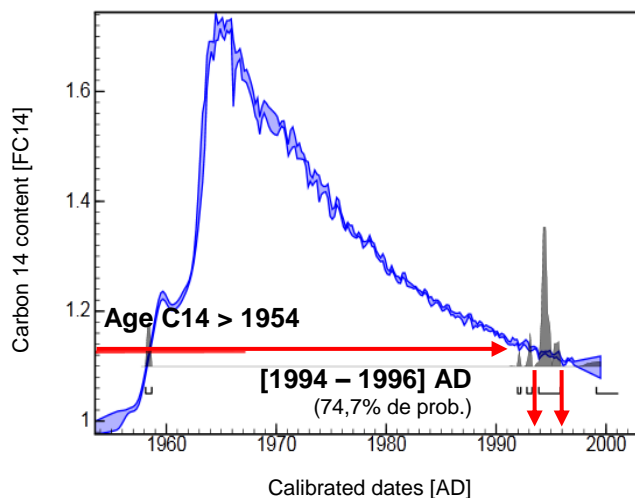


This result confirms the attribution style of the sculpture.



**Wooden mask, Africa,
presumed from 19th century AD**

The constituent wood of the object has grown after the nuclear tests performed in the atmosphere during the 1950's, and most likely in the mid-1990's.



The object has been shaped in a modern wood.

