

Archaeological methods to date the materials

[Environment](#), [Nature](#)



Archaeologists use a variety of methods to date the materials that they find during their excavations. These methods are based on various principles and each method has its own advantages and drawbacks as well. This paper attempts to understand the basic principles behind four dating methods used by archaeologists most frequently, namely- archaeomagnetism, obsidian hydration, radiocarbon dating and tree- ring dating.

The method of archaeomagnetism has been in vogue since the last thirty years or so. It is based on the principle of earth's magnetism and the fact that Earth's magnetism changes direction with time. When materials like hearths, kilns or other clay lined objects are heated to high temperatures, they record the existing magnetic field of the Earth and its direction. After this recording, if they are not used again, this direction and strength record in the object will remain unchanged.

Many years later, when this object is inspected, it will reveal the direction and strength of Earth's magnetism that existed when that object was last heated to a high temperature. This direction and strength will obviously be different from the present strength and direction as Earth's magnetism is changing continuously. From the existing magnetic data and calculations, the object can be dated.

The method of obsidian hydration is reliable and accurate. Literally, obsidian is a volcanic glass formed by rapid cooling of lava that contains more than 70% silicon. This method was explained by geologists Irving Friedman and Robert Smith. It can be used in two ways- for relative dating (i. e. finding which one out of two or more objects is older or younger) or for absolute

dating (only when parameters such as soil humidity and temperature are known).

This method is based on the principle that during the process of tool manufacturing, a fresh surface is formed on the obsidian. Originally, obsidian contains 0.2% water. When this obsidian surface is fractured, the water from the atmosphere begins to get absorbed into this obsidian surface. This causes the formation of a water-rich layer or hydration rind. The depth of this hydration rind goes on increasing with time and the water content also goes on increasing until it reaches the saturation limit of 3.5% water. Thus, the degree of hydration in the rind can easily be a measure of the age of the material.

The hydration rind formed can be recognized easily because of its distinct features. At the edge of the hydrating rind, there is an abrupt change in the optical properties of the two materials due to difference in water content. The refractive indices of the hydrated and unhydrated material are different from each other and hence the hydration rind can be spotted easily and dated to reveal the age of the object.

The method of radiocarbon dating is based on the principle of radioactive decay of Carbon-14. Naturally occurring carbon has two isotopes- C-12 and C-14. Directly or indirectly, every living thing exchanges C-14 with its environment. Plants take up atmospheric CO₂ during photosynthesis and take in C-14 and are also a source of C-14 for animals that eat them. After the living being dies, this exchange stops and the C-14 remaining in the body

begins to decay radioactively. After many thousand years, the amount of C-14 remaining in the fossilized body is an index of its age.

The radioactive decay of C-14 is an exponential decay. The differential equation involved in this decay process can be written as follows - where N is the quantity and λ is a positive constant called decay constant.

This equation can be solved and the solution can be written as - where C can be taken as the initial value of N .

The ' t ' in the above equation denotes the age of the material.

The technique of tree ring dating was devised by A. E. Douglass from the University of Arizona. It was noted that when moisture is available in plenty, the tree forms wide rings and when it is scarce, narrow rings are formed.

This dating technique is based largely on the principle put forward by James Hutton in 1785, called the ' uniformity in the order of nature '. This principle elaborates that the variations in atmospheric conditions present today are similar to those that were present in the past i. e. they follow the same pattern through time.

The climatic changes that occur in various geographical areas can be studied through dating the samples of old trees by this method. When the rings of this old tree sample are found to be overlapping or similar to that of a new tree, dating can be extended from that point into past. When samples are taken from very old, dead but standing trees, and the outer rings are compared with the inner rings of a living tree, the patterns of individual rings

will be found to overlap at some point. From this point of identical rings, the dating can be carried into the past.

These methods are used extensively and are extremely useful in the various excavational and archaeological work that is going on all over the world. Knowing the past can only improve the future and thus these techniques help us in this onerous task.

Greeting,

Would you please add a title to this essay. Would change the thing in red. Try to take these thing off and some of needs to be replaced in a sentace or something. It does not look right. I think my professor can tell which is the introuction. He or she might think I am making fun of them or something. Just please change it. Please make these corrections and send it as soon as possible. Make the essay also sound interesting as well for any reader who read this paper. Most important would you add a conclusion at the end please. No work cited is need. Please take off the work cited.