# **Age Determination**

When archaeologists discover something, perhaps the most important thing they can do is find out how old it is.

Determining the age of an artifact or specimen can give them a better understanding of what was happening in the world at that time-what species existed and what the weather was like, for example. But finding the age of an artifact that is thousands or millions of years old is not a simple task. For this reason, archaeologists have developed a number of ways — to determine the age of a specimen, including faunal association, floral analysis, and radiometric dating.

One way of determining the age of an organism is through faunal association. Because most animal species exist for only a certain period of time, this method examines the remains and determines what species it is. This gives archaeologists an approximate idea of when the animal was alive. For example, in 1926, archaeologists found stone projectile points, which are human-made, pointed tools that were often used as weapons, and bison\* bones together in Folsom, New Mexico, a very small village in the southwestern United States. Prior to this discovery, archaeologists believed that humans had only been living in this area for 3,000 to 4,000 years, but after scrutinizing the bones from the bison and determining what species it was, they concluded that humans had actually inhabited that region for at least 10,000 years. Although it cannot provide a very precise date, the faunal association method can give a general idea of the time period in which a particular species existed.

Floral analysis methods can help determine a more precise age. One floral analysis method is called dendrochronology, a technique that can provide almost an exact date for when a tree existed. Dendrochronology measures the growth rings on a horizontal cross-section of a tree, which form each year that the tree is alive, often exhibiting certain characteristics based on the weather during the year the ring forms. For example, if the weather is too cold, the tree ring might not even fully form. In order to date a tree based on its rings, archaeologists first look at the outermost ring, which is the most recent, and determine when the tree was cut down by comparing it to the rings from other trees with known cutting dates.

Usually, for trees of the same species, there is an overlap where the rings are very similar, allowing the scientists to give a tree an exact cutting date. From there, the scientists essentially count the rest of the rings backwards, going toward the center of the tree. Dendrochronology is an accurate method; archaeologists can usually determine the age of a tree to the year, and sometimes, even to the season. For instance, archaeologists examined a Bristlecone pine tree, and by counting its rings estimated its age to be at least 4,862 years old, though its actual age was probably closer to 5,000 years old, making it one of the oldest trees in the world.

A third dating technique frequently used by archacologists is radiometric age determination. Specimens analyzed using this technique all have radioactive isotopes in them. Isotopes are groups of atoms that have the same chemical element.

In order to determine the age of a specimen using this technique, some information is needed. First, archaeologists should determine the number of the radioactive isotopes present before the specimen began to decay, Second, they should determine how much of the isotope remains. And finally, they need to know the rate of decay. Usually, the first criterion is impossible to determine immediately, but if archaeologists have the other two pieces of information, they can get an accurate date for the specimen by counting backwards based on the rate of decay, as with dendrochronology. Radiometric testing can be used on most organic materials, such as bone, wood, shells, and seeds. This method has been used to determine the Earth's age, but is most commonly applied to find the age of rocks.

Of the three methods mentioned here, none in particular is more valuable than another. Often, archaeologists use these methods in conjunction with one another to provide a more complete and accurate picture of the time period in which a specimen first existed.

# **The Cultural Impact of the Printing Press**

Today, books are readily available and can be acquired easily. However, prior to the 1400s, making a book was a very complicated process, so books were only available to the wealthy and to religious and educational institutions. But by the mid-1400s, there was a growing population of educated, middle-class people, and they wanted books. A man named Johannes Gutenberg answered this call by inventing the printing press, which had a profound effect on society, allowing the spread of new ideas and information that was previously unavailable to the masses.

Before Gutenberg's printing press, books were either handwritten or printed using hand-carved wooden blocks. Both processes were time-consuming and costly, and the final products weren't widely available, partially because so few were made and partially because they were extremely expensive. In 1424, the library at Cambridge University in England had only 122 books, each one worth the equivalent of the land for an entire farm. By the 1450s, Gutenberg's press, which utilized technologies that had previously been available in Asia, changed that. He made durable metal molds of letters, which could be reused, and rather than using water-based ink, he used oil-based ink, which lasted longer. His new technology eventually spread throughout Western Europe and by the early 1500s, there were printing presses in 2,500 European cities.

The immediate impact of the printing press was that it made millions of books available at a much lower cost. Books were available to a wider variety of people, and the demand for them was only growing. Previously, most books had been religious in nature and commonly written in Latin, but with the creation of the printing press, there were books about a variety of subjects in a variety of languages. Literature, such as Chaucer's The Canterbury Tales, a work of fiction that is known for having standardized the English language, became popular. Travel, philosophy, art, poetry, and even romance were also common subjects.

In addition, the dissemination of more books caused a shift in how stories were passed on. Previously, stories were told orally, so there was a lot of variation depending on who was speaking. But with books, people no longer had to memorize stories. Histories could be preserved and stories were told more accurately because there were fewer differences from book to book. Moreover, the stories weren't just spoken aloud. Private, leisurely reading became an increasingly popular pastime.

The wider availability of books had a great cultural impact, providing the driving force for both the scientific revolution and the Renaissance, which began in the 14 century. The Renaissance was a time of great intellectual and cultural change, during which new ideas in philosophy, art, literature, and politics became very important. The printing press served to advance those ideas and make intellectual achievement available to members of any social class. For example, the texts of the ancient Greeks and Romans, known as the "classics", had been largely ignored before the invention of the printing press because they conflicted with the views of the religious organizations that did most of the printing, However, after the invention of the printing press, anyone could make books, so these works, which hadn't been seen in almost 2,000 years, became hugely important to Renaissance scholars.

Similarly, the printing press is also credited with helping greatly in the establishment of a cohesive scientific community.

Previously, scientists were seldom able to combine or verify their research with that of other scientists because of geographic differences; however, with the creation of the printing press came the creation of scholarly journals, which reached a variety of locations, so they were able to spread new ideas and research very quickly.

Because they had the methods and processes available to them, scientists were better able to test the work of others themselves and verify that it was, in fact, true. They could easily alter and improve upon previous experiments and broadcast their results to a huge audience. In addition to creating new and more accurate information, this also gave importance to the concept of authorship, something that was not a concern in the era before the printing press. Since more people were seeing the information, knowing who was responsible for it became more important.