

What are the differences between relative and absolute dating methods, and why is dating important for archaeology?

Archaeology is a historical science aimed at the discovery and understanding of past human behaviour through the study of material remains¹. An essential aspect of archaeology after the discovery of artefacts is to not only evaluate their purpose, but to also establish what time period it originated from. There are two broad approaches to dating artefacts: absolute dating and relative dating methods. Within these two approaches is a wide range of methods to achieving these, from dendrochronology and radiocarbon dating within absolute dating to typological sequences and stratigraphy within relative. These two different approaches produce different comparisons of time, and both have different uses in different circumstances.

Absolute dating methods provide more specific origin dates and time ranges, usually given in years, and the accuracy of these dates can depend on what method is used. In comparison, relative dating methods estimate whether an object is younger or older than other things found at the site². The first clear difference between these methods is what they achieve, with absolute methods offering specific stand-alone dates, whereas relative methods are contingent on other findings at the same site. This dramatically changes how these methods are used, as relative dating produces qualitative data, whereas absolute dating produces quantitative data. Relative dating uses the assumption of the Law of Horizontality, that the further down a layer is, the older it is, and the Law of Superposition, that dirt is in layers that build up sequentially³. If the deposit the materials are found within can be dated, it suggests that what is found within them was buried at this time also. By association, it means that the objects can not be more recent than the deposit itself and also reveals the latest date it could have been sealed in it. A

¹ Noble, W., 2015. "Archaeology". *The Canadian Encyclopedia*. [online] thecanadianencyclopedia.ca. Available at: <<https://www.thecanadianencyclopedia.ca/en/article/archaeology>> [Accessed 09 March 2022].

² Barone, F., 2021. *Relative and Absolute Dating Methods in Archaeology*. [online] Human Relations Area Files - Cultural information for education and research. Available at: <<https://hraf.yale.edu/teach-ehraf/relative-and-absolute-dating-methods-in-archaeology/>> [Accessed 10 March 2022].

³ Harris, E., 1979. "The Laws of Archaeological Stratigraphy". *World Archaeology*, 11(1), pp.111-117.

sequence of sealed deposits therefore gives a relative chronology for the time of burial of the objects found associated in those deposits⁴. This method is called stratigraphy. In contrast, radiocarbon dating within absolute dating has a greater scientific process and is the most commonly used method: the decay of the radioactive isotope Carbon-14 in any organic material found in archaeological deposits, such as wood, plants, textiles and human or animal remains is used to determine the age of the deposit⁵. By measuring the amount of Carbon-14 that remains in a sample of fossil material and comparing this to modern Carbon levels in standard material, an age can be inferred for the death of the organism⁶.

These methods produce different styles of dates, such as stratigraphy producing the date of when an item was stopped being used, and radiocarbon dating revealing the original date an item was created. A clear example of how these differ in application is through pottery; absolute dating can establish when a piece was created, whereas relative dating can show which styles of pottery were more popular and to what extent by the cross-examination of excavation sites. This pattern of increasing popularity followed by progressively lessening popularity is reflected in artefact frequencies across excavation sites. By recognising the stylistic change through time, archaeologists can construct relative chronologies and temporal frameworks based on cross-dating. However, this approach does not take possible lag time for a style to reach peak popularity at a new location into consideration, or regional variation, temporal disparity or cultural distinctions⁷. Radiocarbon dating of pottery solely identifies a date range that the pottery may have been created within, and is also subject to criticisms as the samples used that may have been contaminated or do not originate from when the piece was first created. Therefore, the different style of dating each method produces changes how the information will be applied to deepen the understanding of what is found. In order to identify the most accurate as possible period of an artefact, a combination of both absolute and relative methods must be used. An example of this would be the recent discovery of the oldest jewellery on record, dating back between 142,000 and 150,000 years in Essaouira, Morocco. The

⁴ Barone, *Op. cit.*

⁵ Barone, *Op. cit.*

⁶ Walker, M., 2013. *Quaternary dating methods*. Hoboken, N.J.: Wiley.

⁷ Bonsall, C., Cook, G., Manson, J. and Sanderson, D., 2002. "Direct dating of Neolithic pottery: progress and prospects". *Documenta Praehistorica*, 29, pp.47-59.

piece was dated using stratigraphy of the Bizmoune cave, which estimated its date to around 142,290 years ago, which is based on uranium-series dating, a form of radiometric absolute dating⁸. This discovery is significant in archaeology as it is believed to be the earliest known evidence of a widespread form of non-verbal human communication and a way for people to express their identity with their clothing, a trait which has continued through thousands of generations of humans. The combination of both absolute and relative dating is what made this discovery possible and exhibits that despite the differences in how dates are evaluated and used, both are essential to archaeology as a science.

Dating is essential in archaeology as it allows us to place finds in correct relation to one another, and to understand what was present in the experience of any human being at a given time and place⁹. It allows us to trace the origins of regions, cultures and religions in comparison to modern times, and gives us a deeper understanding of the development of the contemporary world. By establishing the date something originated from to create a chronology of events using artefacts gives them greater historical significance as it shows direct causation to what followed. This is especially useful in religion, where the use of dated artefacts to establish how religious beliefs developed helps modern philosophers to determine their usefulness in the modern day. The discovery of the Indus Valley civilisation in present-day Pakistan and parts of northern India answers many questions about modern Hindu beliefs that had previously been unaccounted for by the Vedic Era. It was dated from 2600 BCE to 1900 BCE and is the earliest known urban culture of the Indian subcontinent, and estimated to be twice the size of Egypt and Mesopotamia at the same time. The Indus Valley civilisation, or the Harappan civilisation, is believed to have had vast indirect influence through its trading links with Indus artefacts found in the Arabian Gulf, West and Central Asia, and across much of India¹⁰. The use of dating the artefacts found is what reveals the importance of the Indus Valley. By tracing artefacts found globally back to the Indus River during the

⁸ Sehasseh, E. et al, 2021. "Early Middle Stone Age personal ornaments from Bizmoune Cave, Essaouira, Morocco". *Science Advances*, [online] 7(39). Available at: <<https://www.science.org/doi/10.1126/sciadv.abi8620>> [Accessed 10 March 2022].

⁹ Grajetzki, W. and Quirke, S., 2000. *Digital Egypt for Universities*. [online] Ucl.ac.uk. Available at: <<https://www.ucl.ac.uk/museums-static/digitalegypt/>> [Accessed 10 March 2022].

¹⁰ Jamison, I., 2006. *Hinduism*. Deddington: Philip Allan Updates.

Harappan civilisation's time period shows how large its influence was and what types of items were produced and exported. It establishes an entirely new period in Hindu and Indian history and the rise and fall of different eras, creating a chronology of the Indus Valley to the Vedic Era to modern day Hinduism that previously had not been anticipated. If archaeological dating had not taken place, this timeline would not have been established and the origins of the world's oldest religion would have been lost permanently. This shows that dating is important for archaeology as it can have enormous cultural and religious significance in practise.

Dating key events also allows us to link key events and civilisations throughout history to not only create chronology in local areas but on a global scale also. The absolute dating of certain major events like natural disasters provides a precise marker point in time that can be extremely useful to examine human and environmental interactions around that time period. The radiocarbon dating of the Thera volcano on the island of Santorini in Greece has allowed archaeologists to form a timeline linking ancient Egypt, Greece, Turkey and Mediterranean societies to a specific point in time. This gives further evidence to support historical chronologies such as calendars and other written documents. By having the ability to directly link the contemporary time measurements to modern years, artefacts and buildings found closely related can also be dated to their original contexts. Additionally, the dating of the eruption of Thera has cultural significance to these ancient cultures as the one of the largest volcanic eruptions ever witnessed and appearing in many mythological tales. The dating of this eruption not only allows us to form a chronology of the real human past, but also a chronology of the stories left behind. A well-established chronology in one country may be used to date events in neighbouring and wider countries that lack their own historical records, as the use of trade means that artefacts can be found far from the place of their original creation¹¹. Examples of this are such of Egyptian objects, some with inscriptions allowing them to be accurately dated in Egyptian terms, occur at various sites outside Egypt, thereby helping to date the contexts in which they are found. The importance of an exact date for the

¹¹ Renfrew, C. and Bahn, P., 2020. *Archaeology: Theories, Methods and Practice*. London: Thames & Hudson.

history of the Eastern Mediterranean by use of the Thera eruption has been metaphorically pointed out by Peter M. Warren¹², who compares the importance of an exact date for the history of the Eastern Mediterranean as of equal importance to the false correlation of UK Prime Ministers to other foreign leaders, such as a false identification of Margaret Thatcher's relationship with German Chancellor Otto von Bismarck rather than Chancellor Helmut Kohl. For future archaeologists, this would make no appropriate historical and political reconstruction accurate unless the chronological relationship was correctly determined. This highlights the importance of dating in archaeology for developing even basic understandings of the context of the time period and how essential it is to not only have a chronology of one area, but to be able to align chronologies cross-culturally to develop deeper understanding of how society has developed and evolved over time.

New methods of dating allows archaeologists to deepen understanding of the prehistoric periods and the very early origins of civilisations. Through increasingly advanced radiocarbon dating methods, it allows for the discovery of the past that may have been lost permanently due to the lack of written records from periods that predate even the most basic forms of writing. Whereas artefacts from the Roman period onwards can be dated accurately using relative dating, earlier sites, such as the earliest Neolithic farmers in England, this is more difficult because the kinds of artefacts like pottery found are often less distinctive and have no coins or historical records to give context to the discovery. The new method of radiocarbon dating the fatty acids left behind in pottery rather than radiocarbon dating bones or other organic materials found buried nearby to establish a relative age allows for more accurate dating of pottery artefacts, to even within a human life span. The chronology of pottery found in Shoreditch forms a better understanding of London's prehistory, and appears to indicate that around 5,600 years ago the area of Shoreditch High Street was used by established farmers who were likely to have been linked to the Continental Europe migrant groups from 400 years earlier that are believed to have been the first to

¹² Kutschera, W., 2020. On the enigma of dating the Minoan eruption of Santorini. *Proceedings of the National Academy of Sciences*, [online] 117(16), pp.8677-8679. Available at: <<https://www.pnas.org/doi/10.1073/pnas.2004243117>> [Accessed 10 March 2022].

introduce farming to Britain¹³. This new method of radiocarbon dating also inadvertently revealed that these established farmers ate cow, sheep or goat dairy products as a central part of their diet, and furthered this new method's remarkable contribution to archaeology. The results from this site are also a prime example of where pottery survives in circumstances that other organic materials do not, so using this revolutionary new method will unlock important information about the prehistoric past. Dating not only directly gives understanding of the time period artefacts are from, but also develops the context of the period and the significance the artefacts had to contemporary society.

Therefore, dating is important to archaeology as it allows archaeologists to establish both local and global chronologies from all historical periods and can also be used to expand understanding of the context of the time. Both relative and absolute dating methods are utilised simultaneously to achieve this, despite their differences in application and style of timeframe. The aims of archaeology, to discover and understand past human behaviour, are ultimately achieved through the essential usage of dating and its various approaches.

¹³ Evershed, R., 2020. *Revolutionary new method for dating pottery sheds new light on prehistoric past*. [online] Bristol.ac.uk. Available at: <<https://www.bristol.ac.uk/news/2020/april/dating-pottery-technique-.html>> [Accessed 10 March 2022].

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