

Identify the key reference and data resources that you use in your specialism to ensure that your work is properly informed, and critically evaluate their accessibility, currency, reliability, and relevance. (40%, 3,000 words or equivalent)

Introduction

At the most basic level, the aim of the environmental archaeologist is to elucidate and examine the different ways in which past peoples interacted with both their immediate and distant surroundings. Such interactions can vary in purpose and execution, temporally and geographically. This relationship can manifest in many ways, often yielding a rich and varied dataset of materials that may be examined by the environmental archaeologist. Understanding how past (and present) behaviours compare to wider trends or narratives can further our understanding of this relationship. Archaeology, in both its commercial and academic instances, has borne witness to a hybridisation of sorts, between itself and a select few earth sciences. The discipline benefits from hundreds (if not thousands) of years of study in adjacent fields, often warranting the creation of an appropriate subdiscipline. These disciplines (such as archaeobotany and zooarchaeology) have become part of the archaeological mainstream, whereas some (such as anthracology) remain somewhat niche. As a result of this variation, the resources that may be used for their study vary widely.

Defining and using resources

In all areas of archaeological study, there are key references and data resources that inform ongoing and future works. The form of these varies and is often determined by their means of publication and subsequent accessibility. Some of these works are restricted to traditional publication as (or within) physical volumes, whereas,

particularly in recent years, others are more readily available and accessible in a digital format. As we will discuss, the technological advances of the twenty-first century have the power to affect which resources are readily available to the user, with open access to such sources becoming increasingly influential. Regardless of access, the most foundational sources are those that aid the individual in maintaining and improving their archaeological knowledge while supporting a steady flow of communication and data sharing between individuals and organisations. It is because of this duality that both key references and data resources are vital in keeping the environmental archaeologist informed, ensuring that no individual specialist works within their own bubble.

Key references serve as a source of comparison for the user, assisting them in building and maintaining archaeological knowledge. The most obvious type of archaeological knowledge built by key references is knowledge of diagnostic criteria, allowing environmental archaeologists to assess and record an incoming assemblage. Key references for environmental archaeologists also exist as sources of insight and guidance, informing the user on the most appropriate means of undertaking environmental investigation and assessment. Key references that serve as guides to niche facets of environmental archaeology are becoming increasingly common, particularly if they may be of use to those who encounter and excavate environmental material in the field. As the specialist assesses the end product of this excavation, a holistic view of it is essential to understanding and improving it. There is work to be done on the standardisation of environmental archaeology through such sources, with many references being borrowed from adjacent scientific disciplines to both benefit and detriment.

Alternatively, data resources communicate the findings from projects and sites. These findings can be presented through quantitative and qualitative means and can be available in physical and digital formats. Data resources often present both forms of data and may also be of use as a reference to an environmental archaeologist.

Presenting quantitative data alongside qualitative data allows for its efficient reuse and interoperability, providing insight into the excavation and assessment as a whole. There are a number of ways of presenting such data that are common in environmental archaeology, as we will examine. Data sharing is an evolving process within archaeology, one that is still heavily dictated by accessibility. Within archaeology, peer to peer knowledge sharing is common though often restricted by commercial and academic competition. Alongside matters of copyright in publication, these issues can prove to be particular obstacles for data and general knowledge sharing within archaeology. For many environmental archaeologists, learning from physical references is the first stage in building specialist knowledge.

Physical key references

Often the first physical key reference that the environmental specialist encounters is that of the reference collection. These collections are physical libraries of specimens typically identified to species level, serving as a point of comparison for an incoming assemblage recovered from an archaeological context. Such references are foundational in building and maintaining specialist knowledge, helping the user to develop a holistic understanding of specimens and the taphonomic processes that may have affected them. This allows the user to understand the lifespan of the recovered specimen, from its recovery in excavation, to its use before its deposition, and to eventual deposition. This is particularly important in understanding how different

preservation conditions affect environmental remains, allowing the specialist to better identify specimens from a variety of sites. While there are many useful handbooks in identifying such a variety of conditions, they are best understood through careful comparison and experience.

It should be noted that the physical reference collection is also inaccessible for many, often dissuading prospective specialists from gaining the required knowledge. This issue of access goes some way to explain the dearth of new specialists in archaeology. The existence of such collections is reliant upon their proper storage and maintenance in order to be of use to future specialists; this is done through counteracting the negative effects of light and humidity. Seeking guidance from archaeological archivists to best achieve this is wise. An effort must also be made to ensure that the labelling of specimens within the physical collection is accurate and current. Physical collections of recent creation typically adhere to species nomenclature that is sanctioned by the International Association for Plant Taxonomy (Turland *et al.* 2018), using species that are based upon a genus name (IAPT 2018, 18.1). While some embrace this standardisation, others default to old-fashioned terminology, such as the use of the term *Pomoideae* instead of the IAPT-sanctioned term *Maloideae*. Due to the geographical variation of plant species, many environmental archaeologists working in Britain prefer country-specific sources for nomenclature conventions (Stace 2010). In my experience, many environmental archaeologists view themselves exclusively as archaeologists and not scientists, providing insight into such stubborn idiosyncrasies. A more detailed level of standardisation throughout environmental archaeology would not only ensure the longevity of a physical resource but also provide much-lacking order to the discipline.

Due to this lack of standardisation in environmental archaeology, there are very few physical references of use beyond that of the reference collection. Some physical textbooks may be used to aid species identification, particularly if they describe unusual diagnostic criteria or provide memorable identification techniques. In my experience, physical references can often be highly detailed and thus useful, perhaps due to their traditional use as textbooks for academic study. However, it is because of this that many physical volumes are expensive and unaffordable for many, often falling out of print as a result. Many archaeological units hold a small library of such key references and make them available to staff, though these collections are often limited to publications by that company or out of date editions.

Physical references in environmental archaeology often exist in the form of training sessions or peer to peer knowledge sharing. Records of these are not always kept yet they are important as it is the means through which many specialists build their knowledge. There appears to be an increasing movement (especially by larger archaeological units) to record the details of such training for future replication. During these training sessions, physical reference collections are often used to help the trainee create a diagnostic knowledge. This is undoubtedly due to the low cost of creating such a reference collection though handouts of physical key references that may be otherwise inaccessible. In recent years, such references (particularly those borrowed from the earth sciences) have undergone a degree of digitisation. It is often the case that digitisation allows such works to be more regularly updated than their physical counterparts, dependent only upon their long-term preservation to protect their

accessibility. Some physical resources have even been supplanted by their digital versions in recent years.

Digital key references

There are two main forms of digital reference which are of use to the environmental archaeologist: those which inform specialist analysis and those which assist standardised practice. Many resources of the former are often digital versions of the physical reference collection or textbook, using the diverse means of presentation that this digitisation allows. In recent years, there have been varying attempts to present such information through the means of online encyclopaedias. More traditional yet digitised encyclopaedias (such as Jacomet [2006]) use the likes of high-resolution scientific diagrams and scale drawings. Some of these may be difficult to present otherwise, sometimes using the likes of extensive microscopic technology to create these. There have been attempts by the University of Sheffield and Historic England respectively to compile such digital references for environmental archaeology (Charles *et al.* 2009; Historic England 2011), yet they have failed to account for the long-term preservation of the resources listed.

Digital references are becoming increasingly available in the form of online navigable and interactive reference collections, often the digital counterpart of aforementioned physical textbooks. When properly maintained and relevant, such resources allow the user to be informed by both current and ongoing scientific research. This is often the case when such resources are created and maintained by academics and their associated organisations, as is the case with the InsideWood database (North Carolina State University 2025) and the Wood Anatomy of Central European Species website

(Schoch *et al.*, 2004). It should be noted that there is a wider pool of digital references to choose from when they have been created by a substantial scientific discipline, such as resources created by wood anatomists used for charcoal analysis. Some zooarchaeological references (particularly in analysing teeth) can be borrowed from veterinary science. However, subsections such as archaeobotany benefit more from references specific to archaeology for insight into taphonomic processes, though their digital forms are not typically well-maintained or accessible. This is evidenced by the complete degradation of the Paleobot.org project, which once aimed to provide open access to high quality archaeobotanical reference collections for all (Warinner *et al.*, 2011). This effort has barely left a digital footprint fifteen years on. The lack of maintenance of these references appears to be specific to archaeology, most likely due to issues relating to allocation of resources such as cost or time, particularly as many are maintained by volunteers or working professionals with limited time. Perhaps this is due to the preference of physical key references by many environmental archaeologists, regardless of their implications of accessibility and availability.

Efforts to create digital references for standardised practice within environmental archaeology have been variable, mostly being exclusively available in digital formats. As explicit environmental standards separate from the guidance given to finds analysis have not been given by the Chartered Institute for Archaeologists (CIfA 2014, 3), such guidance must be found elsewhere (though these are difficult to enforce as general industry standards). Historic England has produced many digital guides that instruct the user on the appropriate excavation, handling, and processing of a variety of environmental remains (Historic England 2010; Baker and Worley 2019; Carruthers and

Smith 2020). Alongside these specific guides, the organisation also provides a digital handbook to all matters of environmental archaeology which has been revised through multiple editions (Campbell *et al.*, 2011). Using resources such as these helps to provide a holistic understanding of environmental archaeology, but this use is reliant upon well-informed and accurate use and application. There is not a formal body that guides this use, and there is still work to be done in providing standardisation (in both its physical and digital formats) to practices within environmental archaeology.

Physical data resources

There are many different physical iterations in which data (and knowledge in general) may be presented and shared within environmental archaeology. It is of note that many environmental archaeologists learn their specialist knowledge through in-person training sessions with mentors, learning to create datasets by using key references as aforementioned. In my experience of such training sessions, the trainee learns how to identify specimens in a way that creates quantitative data (such as a count of the number of different species of archaeobotanical remains present in a given sample) before being expected to create or contribute towards qualitative data (such as describing these trends or contributing to further works that may seek to explain such patterns). Feedback sessions between trainers and trainees help to better understand collaboration patterns and communication styles. Many environmental archaeologists attend the meetings of working groups, such as the Archaeobotany Work Group (AWG). Such groups discuss points of concerns or topics of note in order to best maintain and further the discipline. Such groups help to select and maintain key references, with minutes of meetings often being made available in digital formats. This communication

is a vital source of data for environmental archaeologists and is vital in bettering physical (and digital) project outputs.

Physical project outputs are a valuable data resource to environmental archaeologists, particularly when in-person data sharing is not possible. On-site data recording, while increasingly becoming digital for many commercial units, is often physical or reliant upon physical methods in order to be accurately recorded. Alongside environmental processing and specialist assessment reports, a physical dataset on a company level is generated. Physical data resources differ in how they may share such a dataset, often depending upon the relevance of the findings. Small sites with minimal findings may have once been relegated to the physical pages of local archaeological societies, rendering them difficult to find by those who may benefit from them in later years. In recent years, significant sites are still published through the means of a physical site monograph. Such resources are valuable qualitative data resources for their high-resolution photographs, accurate reconstructions, and thematic analysis. However, due to the size of a dataset or for copyright reasons, they do not often contain rich quantitative data, unless it is partial and included as an appendix. Due to the level of research required, the publication of site monographs can be a lengthy process, often meaning that the data that may be extracted from them is not accessible to ongoing research. The availability of site-specific data is becoming increasingly bettered by grey literature libraries and other digital data resources.

Digital data resources

From this, the advantages of sharing large datasets within archaeology is evident. There has been varying movement within different scientific communities to create

(occasionally open access) databases, with archaeology often borrowing from these adjacent scientific disciplines as aforementioned. Some online resources (archaeological and otherwise) seek to provide such databases, though many of these pertain more to site metadata (SEAD 2025) or bibliographies (EAB 2025) than results themselves, likely due to copyright reasons. ArboDat+ is a promising if still imminent attempt at an archaeobotanical database, though it has its own accessibility issues (it will not be a free service). The Archaeobotany Working Group (Pelling 2023, 3) identified the possible implications of importing varied nomenclature into such software.

Resources allocated to transposing and modifying key words and terms (either in their spelling or formatting) may undermine the useability of such a database, particularly as many other useful databases are rarely free to use (Open Context 2025). It is undoubtable that open access data resources are favourable to the environmental archaeologist, yet their use is complicated by these matters of accessibility.

Grey literature libraries, such as the library hosted by the Archaeology Data Service (ADS 2025), are becoming increasingly accessible and relevant data resources for environmental archaeologists. These are a vital resource in informing future works, most notably as their use allows for future synthesis and better aids a holistic view of a theme or region. Adhering to such a system also helps incoming data to be more easily incorporated into regional research frameworks. As sites of all types of significance are present through grey literature libraries, the dataset that may be extracted is highly accurate and representative. This also allows for future projects to be better informed, with the likes of a more accurate sampling strategy allowing for more efficient sample taking. Synthesis using a large number of resources such as these can be an exhaustive if rewarding process in recognising and understanding patterns and trends, though it

should be noted that there are very few Big Data projects specific to environmental archaeology. For some, their application to environmental archaeology may not be as obvious.

Big Data projects can be of particular use to the environmental archaeologist when they provide filters and settings that facilitate the extraction of relevant data, particularly as environmental data is not often explicitly detailed in research with a thematic or regional focus. This extraction requires a degree of inference from the user in determining which project may be of use, as is the case with the Rural Settlement of Roman Britain project (Allen *et al.*, 2018). This resource is of particular use to environmental archaeology as it details the evidence for the rural economy (agriculture) of the period. Even this project requires time to extract environmental data as the filter of “plant remains” is nebulous. The field of environmental archaeology would benefit greatly from specific Big Data projects compiling relevant data, yet scanty resources do not often allow such undertakings. Adjacent disciplines to archaeology may once more provide insight in this instance, such as the many open access publications created by the Past Global Changes (PAGES) project (PAGES 2025). If Big Data projects specific to environmental archaeology cannot be created, many British archaeological Big Data projects would benefit from including more concise terminology for navigating environmental datasets.

Conclusion

Though there is a wealth of varied resources available to inform the archaeologist, very few are specified or of use to the environmental archaeologist. Many archaeological resources are neither. Using resources from adjacent disciplines is difficult, yielding

disadvantages alongside the many advantages. Their accurate use is dependent upon the user having enough knowledge to extract relevant information where possible while understanding that which separates biological specimens from their archaeological counterparts. There is much that can be done to lessen the disadvantages, but this is not possible without the proper allocation of resources to do so. This is a luxury that commercial archaeology in particular does not always allow. Regardless, it is evident that collaboration within all aspects of archaeology is incredibly important. Robust and reliable data resources and references are highly valuable, and if they cannot be shared between colleagues, they are useless. If the aim of the environmental archaeologist is to understand the changing relationship between humans and their environment over time, one cannot gain an accurate understanding if their knowledge or analysis is too localised or limited in general. There is much work to be done in breaking down such barriers to knowledge sharing in environmental archaeology, and limitations should not hinder the dissemination of useful research. Active work in lessening their impact is required.

Word count: 3157

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