

Reflections

Seeding and branching out: sixty years of a laboratory for plants in archaeology

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Seeding and branching out: sixty years of a laboratory for plants in archaeology

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Abstract

Current refurbishment of the archaeobotany laboratory and integration of its extensive reference collections are underway. In addition to archaeobotanical remains, there are more than 20,000 accessions of modern reference specimens, mainly seeds, fruits and wood. The history of how these collections have grown is summarised, starting with the first phase when Geoffrey Dimbleby was Professor of Human Environment (1964–79), and during which Cecilia Western built up reference collections of wood. A second phase dates from the 1980s and 1990s with Professor David Harris and Archaeobotany Lecturer Gordon Hillman, who undertook research, fieldwork and teaching, especially in relation to agricultural origins and Near Eastern seeds. Jon Hather's research complemented this with his work on tubers, woods and tropical nuts. The third phase, since 2000, has seen accessions added from broader geographical origins and including wood and seeds, as well as phytoliths, 'plant fibre samples' and historic British cereal samples.

Keywords: archaeobotany; reference collection; herbarium; seeds; wood

Introduction

The archaeobotany laboratory at the UCL Institute of Archaeology has been a centre for research and teaching for just over 60 years. During this time, through the efforts of generations of researchers, the comparative collections of modern botanical specimens as well as ancient archaeobotanical assemblages have grown, and now include material from across six continents, including seeds, wood, pollen, phytoliths, tubers (parenchyma tissues), leaves, fibres and resins. Current work is part of the Institute's A3RC project, supported by UK Research and Innovation's (UKRI) Research Infrastructure for Conservation and Heritage Science programme, and aims to improve curation and access to our collection. In this article, we assess the breadth and utility of archaeobotany collections as well as reflect on more than six decades of research history. Our collections



Figure 1 Examples from the modern botanical reference collection, from top left (clockwise): examples of seed collection drawers from the Near Eastern collection, pollen slides, wood thin sections, husk phytoliths from einkorn wheat (*Triticum monococcum*), pollen of dorset heath (*Erica ciliaris*) and seeds of cornflower (*Centaurea cyanus*)

are especially rich in carpology (seeds and fruits) and woods, and also includes a range of other categories (Figure 1).

Much archaeobotanical research focuses on sorting seed, grain and chaff remains from flotation samples for which the carpological collections provide essential reference material for aiding taxonomic identification. Wood charcoal is also studied, but requires a different approach to anatomical characterisation at higher magnification. Thin sections prepared from modern woods are essential for wood identification criteria, and in some cases are supplemented by charcoal made in controlled furnace conditions. Other sets of thin section slides include those of pollen and phytoliths, the latter extracted mainly from leaves and husks (Figure 1, lower right and centre). In total our collection has more than 20,000 accessions with a majority of fruits and seeds, especially from the Near East (Figure 2). Over 2,500 slides include a large proportion of phytoliths, pollen and wood thin sections.

Our seed collection is stored in plastic boxes arranged taxonomically in drawers (Figure 1, upper left; Nesbitt et al. 2003). These are organised into different regional sub-collections, such as Western Asia, Europe, the Americas, a broader global collection and a number of more taxonomically focused collections such as millets, pulses, rice and rice weeds. Many woods and vegetative organs are represented by prepared slides, including some charred examples, and in the case of the rich wood collection, we have small wood blocks awaiting thin sectioning.

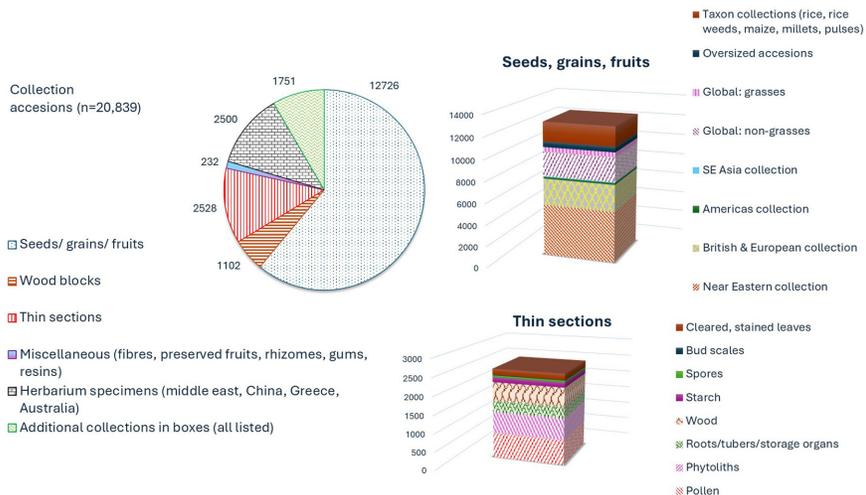


Figure 2 Charts indicating the quantities and proportions of reference collection categories, with more detailed breakdown of seed/fruit and thin section sub-categories

The first phase: the Dimbleby era (1964–79)

Geoffrey W. Dimbleby (1917–2000) was appointed as Professor of Human Environment from 1964 (to 1979), succeeding the famous archaeo-zoologist and geoarchaeologist Frederick Zeuner (Dimbleby 1998; Harris 2000; Sheldon 2002) (see Carroll 2025 in this volume). Dimbleby (1962) was an established palynologist, who had studied pollen associated with archaeological sites, and preserved in buried soils, that indicated how different vegetation had been during prehistoric occupations. Once at the Institute he broadened his range of research interest in plants and published general works on the nascent field of archaeobotany such as *Plants and Archaeology* (Dimbleby 1967), followed much later by the *Palynology of Archaeological Sites* (Dimbleby 1985). Among the students who studied with Dimbleby in the 1970s was George Willcox (1977), who pioneered some of the early systematic archaeobotany from rescue excavations of the Museum of London. During his tenure Dimbleby built up the reference collections for British and European pollen and seeds, aided by Joan Sheldon (2002), who worked at the Institute from 1948 to 1983, and a capable technician Mr Porter, who prepared slides of both pollen and seeds. Other material from more distant sites was already in the collection at this time, including a number of *Sorghum* accessions from across Africa, collected as part of the Snowden (1936) monographic work. The precise route by which the Snowden accessions were acquired is unclear, but they may be associated with work on a charred clusters of archaeological *Sorghum* from Abu Geili, which originated from the Henry Wellcome expeditions in Sudan (1911–14) and were identified and labelled by Dimbleby. Subsequently we were able to directly date this *Sorghum* to the first to third century AD (Fuller 2014).

Several bulk finds of cereals from Iron Age/Roman Britain also came into the collections in this period, from sites such as Roman Verulamium and Iron Age Cadbury. Ian Glover (1934–2018), who taught South and Southeast Asian prehistory at the Institute from 1970 (Castillo 2018) and pioneered the use of a flotation machine in Indonesia in

1973 (Castillo and Fuller 2010), had a particular interest in rice. He began a process of acquiring a comparative collection of rice landraces received from the International Rice Research Institute in 1977. Together with subsequent acquisitions, our collection of rice species and varieties now includes 614 accessions.

Cecilia Western (1917–2017) was working in the same era. She was a pioneer in archaeological wood charcoal research in the Near East (Fuller 2017); for example, from British excavations at Jericho (Western 1971). She collected extensively wood and herbarium materials across the greater Near East in the 1960s to early 1970s. After her retirement she bequeathed her extensive herbarium and modern wood collections to the archaeobotany laboratory in 1985.

The Harris and Hillman years (1980s–90s)

For nearly two decades, archaeobotany grew in the Harris–Hillman era. After Dimbleby's retirement in 1979, David Russell Harris became Professor of the Human Environment, a post he would occupy between 1980 and 1998. He supported an Arts and Humanities research grant that funded Gordon Hillman (1943–2018) to continue research on Abu Hureyra (a site in Syria) plant remains. Hillman became a Lecturer from 1983 and ultimately Reader in Archaeobotany (Fuller 2018; Shennan and Clout 2017; Thomas 2014). During this time, an MSc in Archaeological Science was founded that focused on archaeobotany in alternate years. Harris had collected plants in Greece as part of archaeological and paleoenvironmental survey projects (for example, Harris and Vita-Finzi 1968), and these herbarium collections came with him to the Institute. Further pressed plants were added from tropical northern Australia in the 1970s and 1980s, resulting from Harris's research on the Torres Straits Islands, of particular interest as a southern limit of traditional vegetational cultivation just north of the Australian continent of hunter-gatherers (Harris 1995). Charlotte Herxheimer began a PhD supervised by David Harris on the ethnobotany of Chinese gardens, adding Chinese specimens to the herbarium (*Times Educational Supplement* 2001).

Gordon Hillman brought with him a particularly large collection from Turkey, where he had been based for about five years at the British Institute of Ankara (Fuller 2018, 2022; Hillman 2003). While there he pioneered the ethno-archaeology of crop processing, the study of weed flora associated with cereal husbandry and the more accurate taxonomic identification of archaeological wheat remains, for example spikelet forks and rachis remains. Our diverse collection of wild and domesticated wheat varieties includes 434 accessions. Much of this reference material was essential to study the rich archaeobotanical samples from Epipalaeolithic and Neolithic Abu Hureyra, where Hillman had carried out archaeobotanical flotation as part of a project in 1972–3 with Andrew Moore (2009). Additional collecting, both for seeds and herbarium specimens was carried out in Syria, including on a research trip by Hillman together with Harris and Sue Colledge in 1983 during which they travelled across the eastern steppic regions as well as spending time in villages further to the west (Figure 3). The increase in archaeobotanical students with research projects from Peru and Egypt, to Spain and Jordan all contributed to the collections. Of particular note are the increased numbers of grasses from the Near East that were added by Mark Nesbitt (2006), who made extensive collections during his project on improving identification criteria.

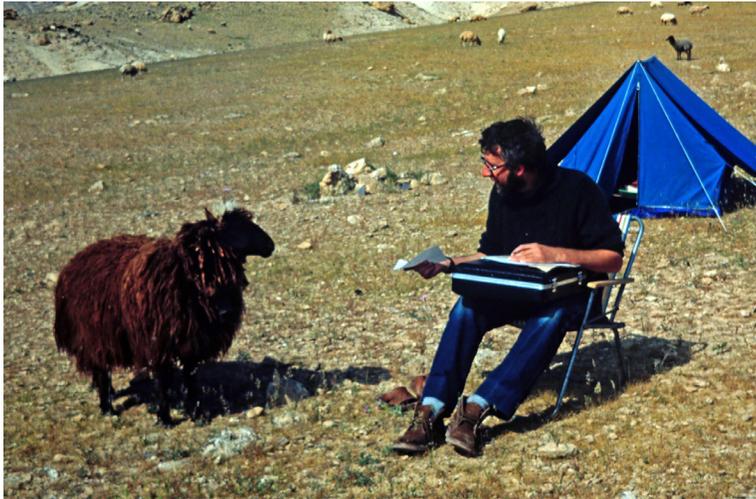


Figure 3 Gordon Hillman camping in Syria while on a botanising and collecting expedition in 1983 (Source: Sue Colledge)

The challenge of identifying tuber foods used by hunter-gatherers and potential root crops began to be addressed in this period through the work by Jon Hather (1993; 1994; 2000a) who worked on European material, later collecting in the Philippines, Cook Islands and New Guinea. He contributed important new methods for the archaeobotany of tubers, and produced many anatomical thin sections, as well as whole and fragmentary charred tubers. During his collecting trips in the Pacific, he also gathered numerous tropical nuts and fruits, from *Pandanus* ‘fingers’ to *Terminalia* ‘almonds’ that are part of our ‘oversized’ accessions (Figure 4). Subsequently Hather (2000b) worked on expanding reference material for north-west European woods and he developed a simplified identification manual for archaeological wood. During his doctoral research on Holocene waterlogged plant remains from the Lower Thames, Andrew Fairbairn compiled a small collection of cleared leaves from common British species (Figure 4, top left).

Twenty-first century expansion

The start of the twenty-first century was not only a time of transition in the lab, but also one of curation and consolidation, followed by gradual growth into new regions and new kinds of material. David Harris (1930–2013) and Gordon Hillman (1943–2018) both retired from the Institute in 1998, but they remained active and continued to provide research advice for several years; Jon Hather left in 2001. The extensive seed collection that Hillman collected was catalogued and integrated with ecological information from the flora of Turkey and Hillman’s own collecting notes made in the field. The collection was rehoused in plastic boxes in ordered drawers replacing old, stoppered glass tubes. The European seed collections, dating back to the time of Dimbleby, were catalogued in similar fashion. This gargantuan effort took two full years (1999–2001) of work from Sue Colledge and Mary Anne Murray. Whereas the seed collections had previously been housed



Figure 4 From top left (clockwise): examples of leaf clearings (of bracken and ivy), a selection of oversized reference items, tuber of taro (*Colocasia esculenta*) charred under controlled conditions and various oversized collections on display (prior to refurbishment)

in Room 306 at the Institute, subsequent refurbishments allowed space for well-ordered seed cabinets to be relocated to Room 313, the current laboratory, where they were united with collections of wood, tubers and cleared leaves that had been stored separately, largely uncatalogued, in Hather's office. Efforts at cataloguing the wood reference collections by Eleni Asouti and the rehousing of oversized fruits and Pacific tubers took place at this time. Much of this work was supported directly from the Institute under the leadership of then Director Peter Ucko (1938–2007).

Dorian Fuller started as Lecturer at UCL in January 2000. At that time, he was working in India and Sudan, and he brought small additional collections from these areas as well as accessions of tropical millets and pulses that formed the core of crop taxa collections that continued to expand. To complement the extensive European and West Asia seed collection, a 'global collection' was compiled to include material added from other regions. Work on phytoliths was carried out from this time. The lab was reorganised as a teaching space alongside all the collections, and Fuller taught his first MSc practical in archaeobotany in 2000/1. The number of MSc and PhD students studying archaeobotany increased in this, and the subsequent decade, and efforts were made to source more modern reference materials relevant to these projects, with increasing additions from tropical Asia and Africa and the New World. This accounts for extensive collections of tropical pulses such as *Vigna* spp. (329 accessions), which include such crops of mung bean, cowpea and adzuki bean, 132 *Sorghum* accessions and 157 *Panicum* accessions, including millet crops and many wild grasses.

A quasi-global collection of wood blocks has been acquired from numerous sources. A research grant focused on South India not only enabled the collection of many new archaeobotanical samples, but also funded work on developing a wood reference collection from across the key vegetation zones of southern India. Slides were prepared and described by Eleni Asouti, which formed the core of a manual on the trees and woodlands of South India (Asouti and Fuller 2008). Further wood collections were obtained from the Philippines and Uganda, in the latter case by Meriel McClatchie while on fieldwork with Andrew Reid. We were also given additional duplicate material from Kew Gardens that included wood from many parts of the former British Empire, such as collections made by the forestry department of British Malaya, or once used by the Metropolitan Police. The latter included additional plant products such as resins.

The Early Rice project, which comprised three large research programmes funded by the Natural Environment Research Council (NERC) (Fuller 2020; Fuller and Weisskopf 2011) on reconstructing past rice cultivation ecologies in India, Southeast Asia and south China, brought in many more rice samples (mostly from germplasm banks), weeds of rice and making of slides of phytoliths. Central to this project research was also the collection of modern soil phytolith assemblages from different cultivated and wild rice ecologies. Such phytolith slides represent ecological assemblages rather than individual species. The processing and documentation of these phytoliths was a team effort in which the work of Alison Weisskopf (1960–2018) was paramount (Fuller 2018). Current NERC-funded research on Enset (*Esnete ventricosum*, the ‘Ethiopian false banana’), a key staple crop of southern Ethiopia (Castillo et al. 2025), has allowed Cristina Castillo to prepare replicate samples from across all parts of Enset plants and several other banana species.

Over the years several small grants from the Institute and UCL supported the expansion and digitisation of collections. For example, the creation and digitisation of a core phytolith reference collection by Emma Karoune née Harvey, around 2006, and the digital photography of a core set of seeds for teaching purposes, prepared by Ayelen Delgado Orellana in 2020/1.

Old treasures and future research

As the collections have become more completely catalogued, we have either acquired or rediscovered material and have thus recognised a number of treasures within the collections. This has really come about as a result of nearly a decade of volunteer effort by Sue Colledge to catalogue thousands of modern reference materials previously stored in boxes, drawers and cupboards.

Of note is our fibre reference collection rich in bast fibres, including many wild tree bast fibres from the tropics, notably from India (Figure 5). While certain standard textile fibres had for a long time been used for teaching conservation studies, inventories of Institute stores found additional materials from the India Museum, a discontinued museum of the British East India Company that showcased products from India in the nineteenth century. When the museum closed in 1879, some materials made their way to the British Museum, the Victoria and Albert Museum and Kew Gardens. The bast fibre that we have

includes raw fibres, traditional rope segments made from these fibres and sometimes woven cloth. Clearly, they were among the material that went initially to Kew Gardens, where taxonomic designations were added or checked. How and why these samples came from Kew to our Institute is unclear, but these are now available for study and as reference material in our archaeobotanical collections, a timely addition given the recent launch of a joint Centre for Plant and Fibre Archaeology with Zhejiang University in China (June 2025), which aims to promote more research on such plant uses in the past.

Also among the highlights of the collection are many archaeobotanical assemblages studied in the past that offer new opportunities for re-study; for example, using updated identification criteria, digital imaging, morphometrics or other new techniques. These include flotation assemblages from James Mellaart’s work at Çatalhöyük in the 1960s, various Syrian projects in the 1980s and South Indian projects carried out in the early 2000s, among many others. Of particular note, however, are materials that are among the earliest archaeobotanical collections in the UK, associated with the work of J. R. B. Arthur who worked in southern England from the 1940s to 1970s. These were received in 2023 as a donation from the stores at Fishbourne Roman Palace that include modern specimens (235 taxa), both from Britain and Turkey, as well as small collections of ancient grains from 80 sites, such as those of a Roman corn-drying oven at Downton, Wiltshire (Arthur 1963). Several of the archaeological specimens of cereal grains and chaff are from sites mentioned by Hans Helbæk in his seminal 1953 publication ‘Early crops in Southern England’, in which he acknowledged the collections of J. R. B. Arthur.



Figure 5 Examples from the fibre reference collection (above): sack of sunn hemp (*Crotalaria juncea*), from Bengal India, with a scanning electron microscope (SEM) view of the same fibres; (below left): string made from tree bast of *Hardwickia binata*, collected in Cuddapah, India, 1886; spun threads of ramie (*Boehmeria nivea*) from India, with a SEM view of these fibres (Source: C. Castillo)

Conclusion

Overall, these collections provide valuable material, both for reference and for teaching practical archaeobotany. It is also available research material for reinvestigation. Archaeological plant samples are irreplaceable as they represent contexts destroyed through excavation. Many modern comparative materials are also unique and represent crop varieties no longer likely to be grown, such as emmer and einkorn wheats collected by Gordon Hillman in central Turkey in the 1970s. Currently, we are improving our catalogues, storage and accessibility to enhance research work with these old seeds. Among our future aims we hope to digitise some of our reference specimens, as well as integrate our catalogues with national repositories.

Funding

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