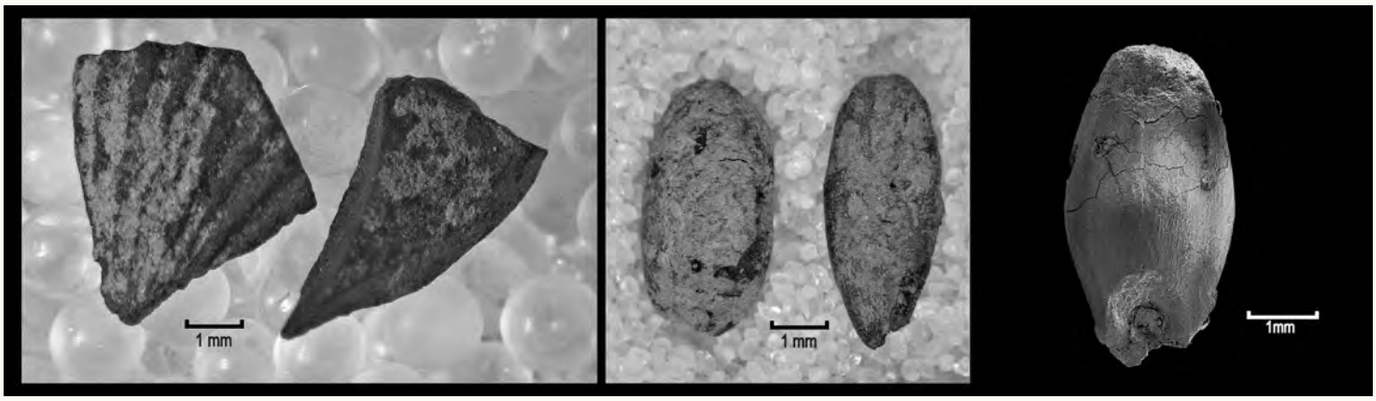
THIRTY YEARS A-GROWING: ENVIRONMENTAL ARCHAEOLOGY IN IRELAND

Meriel McClatchie describes the development of a vibrant area of research.

Archaeology Ireland began to be published in 1987, and in its very first edition readers encountered the concept of 'environmental archaeology'. Mick Monk wrote an insightful article entitled 'Science and archaeology: an introduction', wherein he highlighted a wide variety of environmental remains 'not often generally considered archaeological', such as plants, charcoal, wood, pollen, animal bone and Mollusca. He suggested that 'the study of such remains is becoming increasingly vital to archaeological work and requires the adoption of a more rigorous approach by archaeologists, as well as important interchanges between the hard sciences (physical, chemical and biological) and archaeology'. Environmental archaeology had become a vibrant area of research in Ireland by 1987, but it may surprise readers to learn that its origins stretch back several centuries.

Scientific studies of ancient environmental remains from Ireland began to be undertaken in the late seventeenth century, when Molyneaux investigated extinctions of megafauna, including the giant Irish deer. A notable study from the nineteenth century was by Sir William Wilde (father of Oscar Wilde), who published a paper in the first edition of the *Proceedings of the Royal Irish Academy* about a vast collection of animal bones discovered near Dunshaughlin, Co. Meath, at what we now know to be Lagore crannog. During the early to mid-twentieth century more extensive studies were undertaken, often by natural scientists—zoologists, botanists and scholars of Quaternary sciences—rather than archaeologists. It was recognised that a collaborative approach would encourage consideration of the human stories behind these remains, which led to the establishment of the Committee for Quaternary Research in 1933 under the direction of the National Museum of Ireland. This group undertook detailed pollen studies at archaeological sites of interest, and a survey of early occurrences of cereal macro-remains followed. Visiting scholars from Denmark, such as Jessen and Helbaek, were particularly influential, inspiring successive generations of Irish-based researchers. It was not until the 1970s and 1980s that environmental archaeology

Right: **Fig. 1—Experimental harvesting of cereals using a composite sickle (bone and lithics).**



Above: **Fig. 2—Charred plant macro-remains: hazelnut shell (left), emmer wheat grains (centre) and scanning electron micrograph of barley grains (right).**

Below right: **Fig. 3—David Stone, Ph.D student at the UCD School of Archaeology, processing soil samples at an excavation in Azerbaijan, August 2017.**

became a routine aspect of archaeological excavations, coinciding with a time when people with training in archaeology began to lead investigations of environmental remains. Although scholars with a deep knowledge of biological systems were certainly an asset, the emergence of practitioners with a strong background in archaeology encouraged more human-focused studies. A wider variety of remains was also studied more regularly, including insects and wood and charcoal remains.

A snapshot of environmental archaeology from 1987

By the time of Monk's paper in the first edition of *Archaeology Ireland*, environmental archaeology in Ireland was flourishing. A strong community of workers had emerged, encouraged by the establishment of the Man and Environment Work Group. Researchers explored human–environment interactions through laboratory and experimental investigations of preserved plants, wood and charcoal, animal and fish bone, Mollusca, insects and sediments (Fig. 1). Ireland was producing research of international significance. The hugely influential master tree-ring chronology was established at Belfast by Baillie, Pearson and Pilcher, based largely on the remains of ancient Irish oaks. This enabled calibration of radiocarbon dates by linking radiocarbon dating with dendrochronology. Ireland also developed strengths in pollen analysis from its many bogs and lake deposits, tracking changes in vegetation history through the Holocene. O'Connell's work on prehistoric agricultural practices was significant, revealing how fields that now have acidic soils were previously used for crops, while Cooney and Keeling investigated associations between burial sites and high-quality agricultural soils.

Previously, archaeological excavations were led by research institutions and state bodies, but from the 1980s developer-funded excavations played a prominent role in initiating environmental investigations. In zooarchaeology, McCormick and Butler produced new findings on dairying in early medieval Ireland. The use of plants in everyday life at Hiberno-Norse and medieval Dublin was explored by Mitchell and Geraghty. Publication of an enormous developer-funded project, *Archaeological excavations on the Cork–Dublin gas pipeline* (edited by Cleary, Hurley and Twohig), disseminated many important findings, including evidence for the crops and animals of Ireland's very first farmers at Tankardstown, Co. Limerick. It was these developer-funded excavations that would stimulate the majority of environmental analyses over the next three decades.

Changing methods, work practices and research priorities

Since the publication of Monk's article in 1987, many of the core lines of investigation in environmental archaeology have remained the same, although refinements have enabled more robust and nuanced insights. Practitioners investigate the plants being grown and collected; the fauna being raised, hunted, gathered and fished; the resource management strategies employed by farmers and hunter-gatherers; the variety of foods being consumed; the use of materials in crafts; and the local and regional environments within which people created their worlds (Fig. 2). The key principles and methods involved in these approaches were outlined comprehensively in *Environmental archaeology in Ireland* (2007), edited by Murphy and Whitehouse. While many investigations focus on taphonomy, economy and ecology, there is

an increasing tendency to consider social and ideological aspects of human society. Environmental analyses are no longer relegated to appendices but instead are at the core of excavation reports and carefully drawn upon in archaeological narratives. Multi-disciplinary projects are increasingly being undertaken. An example is the Lisheen Archaeological Project at Derryville Bog, Co. Tipperary, during the 1990s, which involved excavation and a wide variety of environmental analyses—pollen, peat stratigraphy, wood, insects, peat humification, testate amoebae and plant macrofossils. This approach offers an extraordinarily multi-faceted view of how past societies organised themselves and interacted with their local environments.

Analysis of ancient DNA from environmental remains is providing fascinating new insights into the evolutionary history of plants and fauna, highlighting their role in trade and exchange networks. Isotope analysis (measuring the ratio of certain isotopes of chemical elements in bones and seeds) is an exciting innovation, providing insights into human and animal diets, management strategies, seasonality, mobility and palaeoclimates. Detailed analysis of residues (surface and absorbed) is another approach that has yielded rewarding results, identifying molecular traces of lipids (such as fats, oils and waxes) preserved in ceramic vessels. Improved microscopy, including scanning electron microscopy, is enabling examination at an extraordinarily detailed level. Recovery methods have also improved: the sieving of soil samples is often undertaken to recover smaller zooarchaeological remains, such as fish and bird bone, ensuring that these important categories of fauna are not under-represented. Some aspects of environmental archaeology remain rather underdeveloped, however, such as geoarchaeology

One of the most important developments in Ireland since 1987 relates to radiocarbon dating and the development of Accelerator Mass Spectrometry (AMS) dating at the ^{14}CHRONO Centre in Belfast, one of the world's leading high-precision radiocarbon laboratories. Back in 1987, if an archaeologist wanted to date charred remains, approximately 10g of material was required by most laboratories for a single date, which translated into around 1,000 cereal grains—a rare find. The quantity of material required for dating had an inevitable effect on the number and nature of samples that could be selected for dating. Wood charcoal was more readily available but it could impose an 'old-wood effect' on dates, because certain species of trees can grow for hundreds of years. The development of AMS dating means that a much smaller quantity of material is now required—only 10mg, which can equal just one cereal grain. This has resulted in better targeting of short-lived materials for dating. Belfast has also led research into dendrochronology—achieving extraordinarily precise dates for wooden trackways—and tephrochronology, exploring ancient Icelandic tephras (volcanic ashes) that drifted into our lakes and peat bogs, providing a useful chronological marker.

These refinements in chronology have enabled researchers to develop detailed insights into changing climates, environments and food strategies through time. We are now able to engage in 'big data' approaches, drawing upon evidence from the many thousands of excavations undertaken during the economic boom, especially from road and other infrastructural projects. Recognising the potential of this new dataset, a Heritage Council document, *Research needs in Irish archaeology* (2006), highlighted the knowledge contribution that could be made, and funding was made available via INSTAR to support projects with 'big data' environmental archaeology at their core, including 'Cultivating societies: assessing the evidence for agriculture in Neolithic Ireland', 'WODAN: developing a wood and charcoal database for Ireland' and 'Settlement and landscape in later prehistoric Ireland—seeing beyond the site'. Several Ph.D theses and postdoctoral fellowships focused on environmental archaeology have been completed in recent years and, together with outputs from major research projects, Irish environmental archaeology is now on the world stage through publication of findings in leading academic journals. Workers trained in Ireland are also taking their skills abroad (Fig. 3), further strengthening Ireland's international reputation.

Right: **Fig. 4—Examining plant remains under the microscope.**

Within Ireland, major conferences focused on environmental archaeology have been organised—most recently in 2016—and workers continue to play a key role in the UK-based Association for Environmental Archaeology, the largest organisation of environmental archaeologists in the world. The nature of the work—often alone at a microscope and in the laboratory—means that individual workers can become quite isolated (Fig. 4), but an engaged community approach has been promoted by inspiring teachers such as Hall and Monk. A variety of work groups have been established in recent years, including the Irish Archaeobotany Discussion Group, the Irish Wood Anatomists Association, the Irish Zooarchaeology Working Group and the Irish Palaeoecology and Environmental Archaeology Network. Several of these work groups have joined forces recently to establish the Environmental Archaeology in Ireland work group, which provides a forum where practitioners can discuss and share results, build professional relationships, seek solutions for problems, establish strategies for development of the profession and take part in public events, such as Archaeofest, showing what environmental archaeologists do in a fun and engaging way. These collaborative approaches are key to helping environmental archaeologists to face the future with confidence and develop new insights into more of the 'big' questions, including biodiversity, food security, societal resilience and wider human–environment interactions.