

PROJECT TITLE: Biomolecular and zooarchaeological approaches to the detection of aquatic resource processing in prehistoric Central Europe.

DTP Research Theme(s): Changing Planet, Living World

Lead Institution: University of Bristol

Lead Supervisor: Professor Richard P. Evershed, University of Bristol, School of Chemistry

Co-Supervisor: Professor Alan K Outram, University of Exeter, Department of Archaeology

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Project keywords: Neolithic, archaeology, zooarchaeology, ancient diet, freshwater / marine resources, lipids, molecular biomarkers, mass spectrometry, ¹⁴C dating.



(L) Bottle-shaped container from the Neolithic site of Eythra © Landesamt für Archäologie Sachsen. Photo by J. Lipták. (R) Fish bone assemblage from a Middle Neolithic site. Photo by Alan Outram.

GC-q-TOF at the NERC NEIF facility hosted by the OGU, University of Bristol. Photo by Lucy Cramp.

Project Background

The onset of farming in the Near East ca. 12,000 years ago and its spread to mainland Europe completely reshaped the subsistence strategies of prehistoric communities. However, despite this profound shift towards domesticates, and away from hunting-fishing-gathering, detailed knowledge about this Neolithic trajectory in Central Europe remains fragmentary, including the possibility for a continued role of aquatic resources alongside livestock-keeping. Studies of faunal remains and the stable isotope make-up of human bone collagen provide insights into continued aquatic resource consumption in the Neolithic. In addition, evidence for aquatic product processing can be detected through the highly sensitive identification of specific chemical compounds trapped in pottery vessels during cooking. The contrasting picture already seen in Neolithic aquatic resource exploitation in the Atlantic archipelagos, the Baltic and Southeast Europe points to distinct ecological, demographic and cultural influences upon ancient dietary practices. A similar approach to Central Europe will fill a significant gap in our knowledge of the trajectory to farming in this crucial region.

Project Aims and Methods

This multidisciplinary PhD project will assess the use of aquatic resources by the earliest farmers from Central Europe. It will use zooarchaeological and biomolecular approaches applied to archived collections of faunal bones and pottery lipid extracts, respectively. The student will collate and integrate published and unpublished faunal records for the study region to assess the presence of aquatic faunal remains. Where possible, faunal collections curated in museums will be visited to supplement the dataset (under the supervision of Professor Alan Outram, zooarchaeologist at the University of Exeter). The University of Bristol-based archive of archaeological pottery lipid extracts will provide animal fats from archaeological sites across Neolithic Central Europe. A selection will be screened for aquatic biomarkers using state-of-the-art chromatographic and spectrometric methods at the University of Bristol (under the supervision of Professor Richard Evershed; Drs Lucy Cramp and Melanie Roffet-Salque).

These complementary approaches will allow assessment of aquatic resource use by the earliest farmers of Central Europe for the first time. Selected lipid extracts will be ^{14}C -dated at the new Bristol Radiocarbon AMS facility using our novel method for the dating of lipids in pottery sherds. This will directly date patterns of subsistence at sites where other dateable materials are poorly preserved. The student will be encouraged to lead on the selection of lipid extracts for analysis, and to pursue their own research directions as the project progresses, including additional analytical methodologies. Opportunities to study material abroad will be assessed given sanitary restrictions.

Candidate requirements

Candidates should possess a good degree in a relevant subject area, such as a 2:1 or higher in chemistry, archaeology or a related discipline aligned to the studentship. We welcome and encourage student applications from under-represented groups. We value a diverse research environment.

Training

This interdisciplinary project means that the student will become a member of the Organic Geochemistry Unit (OGU), School of Chemistry, and Department of Anthropology and Archaeology, at the University of Bristol, and of the Department of Archaeology at the University of Exeter. The OGU hosts the Bristol node of the national NERC NEIF facility with state-of-the-art analytical facilities specialised in the development and application of linked gas chromatography (GC) and liquid chromatography (LC) and mass spectrometry (MS) techniques to research modern and ancient environments. Training on analytical methods (GC-FID, quadrupole GC-MS, GC-q-TOF, GC-C-IRMS, prep-GC, ^{14}C dating) will be provided at the University of Bristol. Training on the characterisation and integration of faunal evidence will be provided at the University of Exeter, which has a dedicated research centre for Human-Animal-Environment Bioarchaeology (HumAnE) and an extensive fish bone reference collection. Trips to local museums from Central Europe to be considered where possible (but are not essential). Close collaboration with archaeologists and zooarchaeologists from the region of study is to be expected. The supervisors will help the student establish these links.

Background reading and references

Cramp, L. J. E. et al. 2014. Immediate replacement of fishing with dairying by the earliest farmers of the northeast Atlantic archipelagos. *Proceedings of the Royal Society B* **281**: 20132372.

Outram, A. K. and Bogaard, A. 2019. *Subsistence and society in Prehistory: new directions in economic archaeology*. Cambridge, Cambridge University Press.

Casanova, E. et al. 2020. Accurate compound-specific ^{14}C dating of archaeological pottery vessels. *Nature* **580**:506-10.

Salque, M., et al. 2013. Earliest evidence for cheese making in the 6th mill. BC in northern Europe. *Nature* **493**: 522-5.

Useful links

<http://www.bristol.ac.uk/chemistry/courses/postgraduate/>

NERC GW4+ DTP Website:

For more information about the NERC GW4+ Doctoral Training Partnership please visit

<https://www.nercgw4plus.ac.uk>

Bristol NERC GW4+ DTP Prospectus:

<http://www.bristol.ac.uk/study/postgraduate/2021/doctoral/phd-great-western-four-dtp/>

How to apply to the University of Bristol:

<http://www.bristol.ac.uk/study/postgraduate/apply/>

The application deadline is Friday 8 January 2021 at 2359 GMT.

Interviews will take place during week commencing 8th February 2021.

General Enquiries:

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