

Call for a PhD Scholarship - Technological choice and variability in prehistoric metalworking: a transdisciplinary investigation.

Newcastle University (UK) announces a call for a PhD scholarship on a project titled **Technological choice and variability in prehistoric metalworking: a transdisciplinary investigation**, funded by the AHRC Northern Bridge Doctoral Training Partnership as a Collaborative Doctoral Award. The partner organisation is ISIS Neutron and Muon Source, Rutherford Appleton Laboratory, STFC, UKRI.

Project Summary

This project investigates variability and social choice in prehistoric metalworking through an innovative transdisciplinary approach that integrates experimental archaeology, materials science, and a critical review of social studies on craft practice. The student will develop a novel understanding of artisan skill, sensory perception, communities of practice, and craft specialisation in prehistoric bronzeworking. The research will provide new insights into the social context of early European metallurgy, reassessing the enduring link between metallurgy and the rise of social complexity. Through this work, the student will acquire a unique transdisciplinary skillset that will significantly enhance their intellectual profile and employability.

Project Overview

Introduction and significance

This project aims to revolutionise our understanding of the socio-technological dimensions of craft practice through in-depth research on early bronzeworking. Archaeologists have long grappled with the perplexing technological variability evident in prehistoric bronze. For instance, Chalcolithic axes from the northern and southern Alps exhibit distinct working methods, while European Bronze Age swords display varying edge-hardening treatments, some more efficient than others. What accounts for such variability? Is it a reflection of regional preference for specific technological processes? Workshop traditions? Object customisation? Or the skill of individual bronzesmiths? To answer these questions, the student will investigate technological variability in Chalcolithic and Early Bronze Age (EBA) metalworking in Britain, c.2500-1500 BC. The study focuses on axes and daggers – two object categories that display considerable, yet understudied, intra-category variation.

The project is theoretically grounded in an original cross-fertilisation of archaeological and anthropological scholarship on perceptive categories – how smiths assess technological parameters through sensory experience – and technological choice, emphasising that human societies adopt technical behaviours for quintessentially social reasons. The student will explore these concepts through an innovative interdisciplinary approach bridging materials science, experimental bronzeworking, and social studies on craft practice. In so doing, they will acquire a unique transdisciplinary skillset that will significantly enhance their intellectual profile and employability.

Research questions

- Q1.** What is the degree of variation in annealing and work-hardening in Chalcolithic and EBA bronzes, and how does it vary regionally, over time, and within/across object categories?
- Q2.** How do scientific data about annealing and work-hardening translate into perceptive categories as revealed by experimental bronzeworking, e.g., through visual and aural clues?
- Q3.** Are there any spatial, chronological, or object-based data patterns that might indicate distinctive bronzeworking traditions and social choices? What do these patterns suggest about the social context of bronzeworking?

Research methods and project timeline

The research method encompasses: (1) a review of published microstructural data on Chalcolithic and EBA axes and daggers, providing a technological baseline for the research; (2) new metallographic and Neutron Diffraction (ND) analyses of objects; (3) reflexive bronzeworking experiments replicating the microstructures identified through (1) and (2); and (4) a critical reassessment of social studies on craft skill, choice, and perception.

Year 1: Metallography training at Newcastle and ND analysis at ISIS. These methods will reveal the technological processes behind metalwork microstructures. The student will also review the archaeological, anthropological, and microstructural literature.

Year 2: (A): At NU, analysis of metallographic samples of axes and daggers; (B) At ISIS, non-invasive ND analysis of 5 axes and 5 daggers loaned from a museum collection; (C) experimental bronzeworking under Dr Christina Clarke, to be seconded to NU; (D) metallography and ND analysis of the replicas and data comparison with the archaeological objects.

Year 3: Critical reflection on experimental practice, focusing on how scientific data translate into perceptive categories, informing a broader reassessment of the social context of metal technology.

Project outcomes

This project will establish a novel interpretative framework for understanding the interplay between metallurgical practice and social change in prehistoric Europe. By translating scientific data into sensorial craft practice, this research will illuminate the social context of prehistoric bronzeworking, focusing on smiths' skill, object customisation, communication among communities of practice, regional and super-regional connectivity, craft specialism, and metal-based social inequality.

Supervisory team

Supervisor #1: **Prof Andrea Dolfini**, School of History, Classics & Archaeology, Newcastle University.

Supervisor #2: **Dr Alasdair Charles**, School of Engineering, Newcastle University.

Partner Organisation supervisor: **Dr Antonella Scherillo**, ISIS Neutron and Muon Source, Rutherford Appleton Laboratory, STFC, UKRI.

External advisor: **Dr Christina Clarke**, Australian National University.

Value and duration of the award

Tuition fees paid at a rate equivalent to the UK home fee. For international students, Newcastle University will generously cover the difference between home and international fees through the university's Global Scholarships Scheme. Costs for relocating to the UK cannot be covered.

A yearly stipend paid in regular instalments. Awards increase every year, typically with inflation. As an indicator, the level for 2024/2025 is £19,237.

A contribution to research costs of £600 per annum. Additionally, award holders can apply to a Northern Bridge fund reserved to support primary research costs.

Duration of the award: 3.5 years full-time or 7 years part-time. Funding can be extended up to 4 years by undertaking a placement at the partner organisation or another non-higher-education institution. The maximum duration of a UK PhD is 4 years full-time (8 years part-time).

Eligibility criteria

Education and Professional qualifications. *Essential:* Master's degree in Archaeological Science, Heritage Science, or similar, or an MSc in a relevant science degree, e.g., materials science (Merit or Distinction, or international equivalent). ***Desirable:*** BA/BSc in Archaeology, Heritage Studies, or similar, or a BSc in a relevant science degree, e.g., materials science.

Research experience and training. *Essential:* Foundational knowledge of metallurgy and materials. ***Desirable:*** Background knowledge of later prehistoric Britain/Europe. Understanding of material characterisation techniques and metalwork microstructure, e.g., optical and scanning electron microscopy, metallography and neutron techniques.

Professional Practice. *Desirable:* Bronze casting and working experience. Other professional experience in any of the fields intersected by the project.

Interpersonal Skills. *Essential:* Excellent verbal and digital communication skills; teamworking; ability to deliver high-quality work to deadlines.

Other Criteria. *Essential:* Excellent written English; excellent numeracy; IT literate; independence; excellent time management. ***Desirable:*** An ability to work across disciplinary boundaries, especially humanities/social sciences vis-à-vis the natural/materials sciences.

How to apply

Expressions of Interest must include:

1. **A covering letter** stating the candidate's suitability for the project in no more than two sides of an A4 (minimum font size: 10 point). The first page should detail how the candidate meets the eligibility criteria, while the second page should discuss what they would contribute to the project, including any suggestions for improvement.
2. **A 2-page CV** (minimum font size: 10 point).
3. **Contact details of two referees.**
4. **Transcripts of previous qualifications in English** (with a breakdown of course grades, where possible).

Complete Expressions of Interest must be sent to andrea.dolfini@ncl.ac.uk as a single PDF or MS-Word document no later than **Monday 3rd February 2025**, midnight (UK time).

Shortlisted candidates are expected to be interviewed by videoconference on **Friday 7th March**.

NB: Please do not apply through the Newcastle University application portal at this stage.

Further information and contact details

For further details on CDA Scholarships, see <https://northernbridge.ac.uk/applyforstudentship/cda/>

For Newcastle Archaeology, please see <https://www.ncl.ac.uk/hca/about/archaeology/>

Please send informal enquiries to andrea.dolfini@ncl.ac.uk