Overview

This CASE studentship is envisaged as a PhD project that will involve a substantial component of training in techniques for studying geo-archaeological contexts for a range of archaeological periods in the post-glacial period, from late Upper Palaeolithic through later prehistory and into the middle and late Holocene. The overarching theme is the evidence from various sites and regions in Britain for differential adjustment to glacio-isostatic effects and the effects on archaeological deposits. This will involve comparison between different regions within the glaciated area, where there has been a suggestion that different crustal types have behaved differently, over and above the effect that different ice thicknesses and distance from ice centres will also have had. There is further scope for comparison between areas within and without the limit of the Late Devensian (= Last Glacial Maximum = Marine Isotope Stage 2) glaciation. The rationale for this is the suggestion that the isostatic uplift of the glaciated area has led to formation of a terraced landscape in which the earlier post-glacial valley-floor surfaces (and contexts) are now significantly elevated above modern drainage channels, in marked contrast to the unglaciated area, where MIS 2 and early Holocene deposits are generally to be found below the modern floodplain (Fig. 1).

Fig. 1 – Contrasting fluvial archives from outside and inside (respectively) the MIS 2 glacial limit. A – Lower Thames, east of London; B – Swale-Ure Washlands, north Yorkshire (from Bridgland & Westaway, 2014).

Fluvial contexts are thus of great significance. Following the end-Pleistocene deglaciation rivers had to re-establish drainage in a landscape modified and disrupted by the effects of LGM ice sheets. Once sea-level had risen in the Holocene, coastal sediment sequences become important for examining
geoarchaeological settings in relation to glacio-
isostatic re-adjustment, particularly along the NE
coast of England, which straddles the ‘hinge’ between
post-glacial subsidence and uplift (related to MIS 2 ice
extent) and has a wealth of archaeological remains of
different ages eroding out all along the North Sea
margin (Fig. 2). The CASE partner conducted the
North East Rapid Coastal Zone Assessment for
English Heritage and has mapping of all known sites in
a GIS from Whitby to the Scottish border (each site
scored for various risk categories to produce a top 10
of sites under threat). There is potential evidence for
the Storegga Tsunami at some of these localities
(Waddington et al., 2016).

Quarries will provide much evidence both for
geoarchaeology and readjustment following MIS2
deglaciation. The CASE partner undertakes much
archaeological work related to quarrying throughout
northern and parts of southern Britain and is looking
to develop geoarchaeological mapping as part of desk-
based assessment, including following through with
sediment coring, assessment and dating. Training in
such geoarchaeological approaches is key to rolling
out this methodology in the coming years. The CASE
partner will be undertaking extensive work at the
recently opened Killerby Quarry, in the Swale-Ure
near Bedale (N. Yorkshire). This landscape provides
an excellent study area where records can be tied
into broader regional and national records. Preliminary work has established the geoarchae-
ological potential of this area and includes multiple
wetland basins that contain environmental and
archaeological records dating back to the Post-glacial.
The MIS 2 glaciation invariably eradicated all previous
sedimentary evidence for earlier landscapes and
drainage systems, although buried pre-glacial valleys
plugged with glacigenic sediments can be found
beneath many rivers. The extent of post-glacial
incision by rivers in the glaciated area is recorded by
gorge reaches and terrace fragments, the latter
potentially datable by a variety of means. Obtaining
material for dating will be an integral part of the study
of geo-archaeological (and other) sites, potentially
making use of palynology, archaeological material,
radiocarbon dating and optically stimulated
luminescence (OSL) dating as means for
geochronology.

The project will be of relevance to issues and
knowledge of environmental change (including
anthropogenically induced change), environmental
management, hazard management (in connection with
environmental and relative sea-level change),
landscape and crustal evolution, biodiversity and
ecosystem change, and geodiversity. It will also be
relevant to issues and knowledge of archaeological
preservation, site taphonomy and the impact of
environmental change on human populations (e.g. the
direct effects of changing hydrology patterns, such as
from the 8.2 ka event and the storegga tsunami, as
well as by alluviation, colluviation and sand dune
accumulation).

Methodology

The student will use established methods to
investigate selected post-glacial fluvial and coastal
sequences and other sites in northern England and in
Scotland, with emphasis, where appropriate, on geo-
archaeological localities. S/he will undertake mapping
of deposits from satellite imagery followed by field
mapping and stratigraphical investigations. S/he will be
apply archaeological field methods and recording so as
to gain understanding in how geoarchaeological
mapping, stratigraphic investigation and dating can
intersect with, and help inform, broader archaeo-
logical research both in terms of method and
knowledge. Training will be provided as needed by
the supervisors and CASE partner. Depending on the
deposits encountered the student will adopt a dating
programme, making use of radiocarbon and OSL.
Other types of relative dating evidence will be
collected according to availability (pollen, plant
macrofossils, archaeological material) and will prove
valuable as a cross-check for the numerical
geochronology. These activities will fit well with the
programme of project work undertaken by the CASE
partner, with anticipated involvement of the student
in suitable projects. In conjunction with the CASE
partner there will be access to archaeological GIS
datasets (from the North East and North West rapid
coastal zone assessments as well as widespread aerial
photograph mapping of archaeological remains over
Durham, the North York Moors, parts of North-
umberland, Derbyshire, Staffordshire and Cheshire)
that can be integrated with geomorpho-logical data

Fig. 2 – Recording complex sediments grading from
bedrock, through tills to Holocene peats, dune sands and
palaeosols: Low Hauxley, Northumberland (see reading).
sets produced by the student. Thus part of the placement could involve integrating geomorphological, palaeoenvironmental and archaeological GIS data sets.

**Timeline**

**Year 1:** Finalising project objectives, reading and review of existing literature, mapping (including GIS analyses), fieldwork (beginning work experience on archaeological sites for geo-archaeological training; e.g. geoarchaeological mapping in relation to quarry sites and examining different archaeological associations in relation to their differing post-glacial landform histories), stratigraphic analysis.

**Year 2:** Dating analysis. Further fieldwork and completion of mapping and stratigraphic analysis. Internship with CASE partner (if not within Year 1). Initial interpretation.

**Year 3** - Completion of data analysis, presentation at conferences, submission of mapping and chronology papers.

**Year 3.5 (six months only)** - Thesis write-up, completion and submission of thesis, submission of palaeoenvironmental history and/or geo-archaeology paper.

**Training & Skills**

The student will receive training in all geomorphological mapping, stratigraphical logging and analytical/dating methods. S/he will also be trained in integrating findings with existing datasets. There will be full geoarchaeological training as part of work experience with the CASE partner. The latter will include training in commercial use of GIS to combine archaeological and geomorphological records and apply this to the planning process to help understand landscape histories and devise appropriate programmes of evaluation and recording work in advance of mineral extraction.

Supervisor Bridgland provides expertise in Quaternary science and geo-archaeological analyses, particularly (but not solely) in relation to fluvial environments. Supervisor Westaway provides further geological and Quaternary expertise, with emphasis on structural geology and interpretation of isostatic effects. Supervisor Waddington represents the CASE partner and provides vast archaeological and geo-archaeological experience and is currently writing the new version of the Minerals and Archaeology Practice Guide that will sit below the National Planning Policy Framework (NPPF). He will manage the student during the internship.

**References & Further Reading**


**Further Information**

Potential applicants are welcome to contact us for an informal discussion. Interested students should contact Prof David Bridgland, Dr Rob Westaway or Dr Clive Waddington.