SEAHA CENTRE FOR DOCTORAL TRAINING IN SCIENCE AND ENGINEERING IN ARTS HERITAGE AND ARCHAEOLOGY

SEAHA Studentship:

Learning from nature: evaluating site-based conservation approaches to mitigating climatic risks to earthen heritage sites in N W China.

Justification: Earthen heritage sites are found widely across many parts of the world and pose many conservation challenges. Large concentrations of earthen sites are found along the Silk Roads, such as in arid NW China where many heritage sites contain earthen remains (usually rammed earth with some mud brick). These ruins are deteriorating rapidly, often in response to climatic hazards such as storms, and the Chinese authorities are worried about their resilience in the face of future environmental change. The major forms of deterioration on these ruins are gullies, cracks, sapping, collapses and scaling. Consolidants, grouting and wooden bolts, as well as supporting earthen buttresses have all been trialled as potential conservation methods with mixed success. After many years of work studying the deterioration and conservation of such heritage sites, in collaboration with the Getty Conservation Institute and other partners, researchers from the Dunhuang Academy have recently started to collaborate with the University of Oxford to investigate the use of site-scale, natural approaches (such as planting for windbreaks and management of runoff) to preventive conservation.

Research questions: The overall aim of the project is to investigate the potential of site-scale, nature-based approaches to protecting earthen sites in arid NW China from climatic risks, such as wind and rain storms. The research questions are:

1. To investigate the microclimatic and environmental conditions of one earthen site more fully and relate them to deterioration patterns using field survey and monitoring.
2. To investigate whether site-based approaches to modify damaging runoff, wind and salts are feasible using modelling and experimentation.
3. To investigate the robustness of site-based approaches in the face of ongoing environmental change using modelling.

Research methodology: The project will use a combination of field survey and monitoring, experimentation and modeling, with modeling forming the core component. In stage 1, to address research question 1, a detailed monitoring system will be set up and run in collaboration with researchers at the Dunhuang Academy and the student will carry out field survey of deterioration and environmental conditions during a short site visit. Suitable sites have already been located during a pilot visit by Heather Viles in Summer 2015. In stage 2, to address research question 2, the student will use cellular automata based modeling methods (already developed by Richard Bailey and others) and the data collected in stage 1 to simulate the effects of various mitigation strategies (e.g. planted windbreaks, drainage lines) on one or more of the following environmental threats: wind flow, runoff and salt dynamics. To address research question 3, in stage 3, the student will run *in silico* modeling experiments using down-scaled climatic data to simulate the impact of predicted climatic changes on the mitigation potential of site-based preventive conservation methods that have been found to be potentially successful in stages 1 and 2 of the research. The student will benefit from the expertise in the School of Geography and the Environment, University of Oxford on monitoring and modeling environmental conditions and predicting climatic risks in arid areas, as well as the long-term experience of researchers in the Getty Conservation Institute and the Dunhuang Academy in understanding and managing the deterioration of earthen remains. The Dunhuang Academy acts as the 'industrial partner' in this project as they have management

and presentational responsibilities for heritage sites in NW China (eg the Mogao caves world heritage site).

Supervision:
Academic supervisors – Professor Heather Viles and Dr Richard Bailey, University of Oxford
Heritage supervisor – Dr Tom Learner, Getty Conservation Institute, USA
Industrial supervisor – Wang Xudong, Dunhuang Academy, China

Academic entry criteria: We welcome students with any good science or engineering undergraduate qualifications, including geography, earth or environmental science, conservation science or archaeology. Experience and/or aptitude for modeling is essential.

Training path: The first year of this four-year studentship constitutes an MRes degree at UCL. Following successful completion of the MRes, the student will be registered for doctoral research at the University of Oxford for years 2-4 of the SEAHA scholarship and will be part of the environment stream. Specialist training will be required in computer programming, modeling and handling large datasets.

Funding: The SEAHA Studentship will cover home fees plus an enhanced stipend of up to £17,690 per year (to be confirmed at point of offer) for eligible applicants (http://www.seaha-cdt.ac.uk/opportunities/eligibility-criteria/), and a substantial budget for research, travel, and cohort activities. Funding for fieldwork in NW China is provided by the Dunhuang Academy/Royal Society. The award will be subject to a Grant Agreement between UCL, University of Oxford, Getty Conservation Institute and Dunhuang Academy.

How to apply:
Your application should include:

- A substantial covering letter (2-3 pages) including:
  - a clear explanation of your motivation for applying for this project
  - a description of your residency status and eligibility for funding according to the information provided at: http://www.seaha-cdt.ac.uk/opportunities/eligibility-criteria/, or how you intend to sponsor your studies if not eligible for funding
- A short research proposal (max. 2000 words) based on the information provided above
- A full CV
- Two academic references (names, postal and email addresses)
- Proof of meeting the UCL English language proficiency requirements where necessary. For SEAHA candidates, an advanced level certificate is normally required (details of English language proficiency requirements can be found at: http://www.ucl.ac.uk/prospective-students/graduate/life/international).

Applications should be sent by email directly to the Centre Manager: manager@seaha-cdt.ac.uk

Application deadline: Thursday 30th June 2016.

UCL Taking Action For Equality.