UNIVERSITY OF LINCOLN
JOB DESCRIPTION

JOB TITLE	Post-Doctoral Research Associate				
DEPARTMENT	Department of Geography				
JOB NUMBER	COS912	**GRADE**	7	**DATE**	Aug 2022
REPORTS TO	Distinguished Professor of River Systems and Global Change				

CONTEXT

We are seeking a Postdoctoral Research Assistant to join the 'Rivers of the Silk Roads: how water shaped societies and empires in Central Asia', Leverhulme Trust funded project. This is a fixed term post until 31st August 2025 and applicants should have expertise in remote sensing and hydraulic modelling. Applicants will be required from September 1st, 2022 (or very shortly after this date) to work with Professor Mark Macklin (University of Lincoln, UK) and Dr Willem Toonen (Vrije Universiteit Amsterdam, Netherlands)

The importance of Central Asia's Silk Roads to world history is well known. But what is not understood is the role that rivers in the region played in the development of nomadic and urban societies, and empires, particularly irrigation-based agriculture but also as water-rich corridors for pastoralists and travellers. Rivers of the Silk Roads is a novel and ambitious interdisciplinary project which uses state-of-the-art dating, hydraulic modelling and satellite imaging techniques, combined with archaeological investigations of ancient canal systems, to provide the first multi-millennial length reconstructions of changing water resources and water hazards along Central Asia's Silk Roads.

The PDRA will facilitate process-based connections between short- and long-term hydroclimatic change and the dynamics of regional flood-irrigation networks in each study area. Site based reconstructions will be made of flood regime changes in order to infer water availability for irrigation. Combined with a functional analysis of irrigation-canal networks, based on remote sensing and field investigations, agricultural yield will be modelled.

JOB PURPOSE

The Post-Doctoral Research Associate is responsible for conducting research on the project, as directed by the Principal Investigator, and is expected to operate with a significant degree of autonomy. S/he is not expected to operate as an independent researcher.

The post holder may be required to help supervise the work of more junior researchers.

KEY RESPONSIBILITIES

Literature Surveys

Undertake literature surveys and other investigations of the state-of-the-art, and prepare reports as required.

Programme of Research

Undertake a programme of research under the direction of the Principal Investigator, demonstrating a significant level of autonomy.

Lead in the production of high quality research outputs, including reports, papers and other publications of national/international standing.

Project Management

Perform project management activities, planning, scheduling, monitoring and reporting on progress of research projects.

Liaison and Networking

Identify and liaise with internal and external collaborators, and with colleagues in the Department, maintaining positive and effective working relationships.

Internal Research Activities

Participate in and help to organise internal research activities, including seminars, research meetings and conferences.

Continuous Professional Development

Undertake continuous professional development activities.

Grant Applications

Contribute to the production of grant applications.

Teaching Support

Engage in teaching support activities, up to a maximum of six hours per week, possibly including leading a small number of units (no more than two per annum).

Aid in the supervision of postgraduate research students.

In addition to the above, undertake such duties as may reasonably be requested and that are commensurate with the nature and grade of the post.

ADDITIONAL INFORMATION

Scope and dimensions of the role

The PDRA, supervised by Professor Macklin and Dr Toonen, will undertake two work packages.

WP1. Remote sensing and mapping of irrigation infrastructure, palaeochannels and canals, alongside ancient settlement distribution. Using high-resolution, gridded dataset of Earth's floodplains generated from Shuttle Radar Topography Mission, and declassified CORONA satellite images, the PDRA will map (GIS-aided visual interpretation) and then digitise canal networks and associated field systems. CORONA images (1960-1972; KH-4B) are easily accessible from the USGS EROS Archive, have high spatial resolution (1.8-2.7 m) and because these are amongst the earliest imagery available across Central Asia, they predate the considerable damage and loss of archaeological sites (including ancient canals and field systems) that has happened over the last 40 years as a result of agricultural and urban development. All data, including new and recorded archaeological sites, will be mapped and archived using ArcGIS with the intention of developing an open-access GIS that would be made available to researchers and heritage managers in both Central Asia and more widely. From these analyses the PDRA will establish the form and phases of irrigation infrastructure in each of the study areas, including quantitative information on canal system length and dimensions, as well as the total area of irrigated fields and how these developed and changed over time.

WP2. Hydraulic modelling of canal systems to assess the likely population size they could sustain based on irrigation-supported agricultural yield, and how this may have changed over time. The cross sectional area and slopes of canals for each phase of irrigation development will be surveyed and, using an appropriate roughness value derived from Manning's equation, their maximum flow carrying capacity calculated. To evaluate the performance of canal networks for different time periods, with respect the volume of flow and the areas of irrigated land that they could support, the PDRA will use the US Corps of Engineers Hydrologic Engineering Center's (2009) HEC-GeoRAS model. Average spring and summer flows from the feeder river systems based on gauged, tree ring and palaeohydrological estimates (determined from the dimensions of feeder channels contemporary with the phase of irrigation being modelled will be numerically routed through the canal system to evaluate the performance of the canal network. This will include determining if the feeder canal was able to supply all of the secondary canals simultaneously or if it was necessary to create a schedule of rotating water delivery. The PDRA will use the United Nations FAO "CROPWAT" software, to calculate the amount of water to grow staple cereal crops and vegetables that require irrigation, and compare this with estimated flows in canal systems for each time period.

Key working relationships/networks	
Internal	**External**
- Principal Investigator - Head of Research Centre - Head of School - Other research and academic staff within the school	- Research collaborators - Sponsors and clients

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PERSON SPECIFICATION

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Selection Criteria	Essential (E) or Desirable (D)	Where Evidenced Application (A) Interview (I) Presentation (P) References (R)
Qualifications:		
PhD or equivalent (good candidates may be accepted with a PhD pending, subject to publication record)	E	A
Extensive knowledge specific to project/area	E	A/I
Experience:		
Extensive experience of relevant research methods	E	A/I
Authorship of research outputs of national/international standing	E	A/I
Experience of research in specific project area	E	A/I
Teaching support	D	A/I
Skills and Knowledge:		
Ability to design, conduct and project manage original research in the subject area	E	A/I
Excellent written communication, including the ability to write reports and research outputs	E	A/I
Ability to prioritise own workload and work to specified deadlines under pressure	E	A/I
Ability to communicate complex subjects orally	E	A/I
Skills specific to project/area	E	A/I
Competencies and Personal Attributes:		
Flexible approach to workload	E	I
Ability to work on own and as part of a team	E	I
Enthusiasm and commitment	E	I

Essential Requirements are those, without which, a candidate would not be able to do the job. **Desirable Requirements** are those which would be useful for the post holder to possess and will be considered when more than one applicant meets the essential requirements.

Author	MM	HRBA	PC