The Palaeodeserts Project

Environmental Change and Hominin Occupation in the Arabian Peninsula

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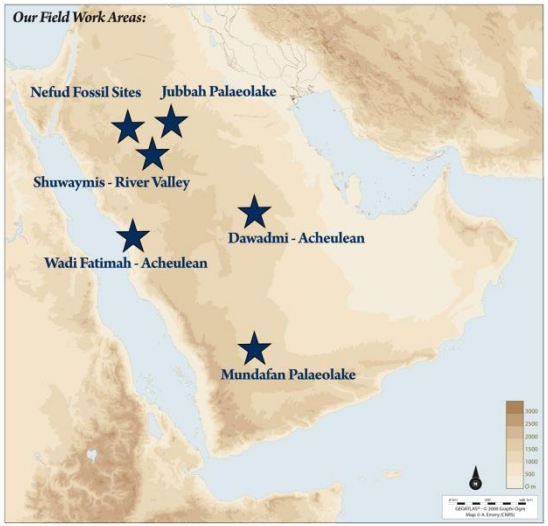


The evolutionary success of humans can be attributed to our ability to adapt to ever-changing environments. This reproductive and adaptive success is demonstrated by the 7 billion living humans, occupying nearly every corner of the globe. However, the expansion of humans is an evolutionarily recent development; fossil, genetic and archaeological evidence indicates that humans and our hominin ancestors frequently failed to adapt to climatic fluctuations, leading to demographic contractions and regional extinctions. Remarkably little is known about the history of these evolutionary successes and failures across vast regions of the world, including in the Arabian Desert - a critical biogeographical landbridge for hominins and other animals. Although poorly known, the Arabian Desert preserves spectacular Pleistocene and Holocene records, with considerable potential for elucidating evolutionary patterns and processes on a variety of spatial and temporal scales.

The PALAEODESERTS project sets forth a series of testable hypotheses to address the relations between humid and arid climatic periods and population expansions, contractions and extinctions. To address the hypotheses a bold interdisciplinary approach is taken, combining information from palaeoenvironmental studies, palaeontology, geography, geochronology, animal and human genetics, archaeology, rock art studies and linguistics. Examination of hominin and animal population histories provides a comparative framework to assess when, why and how novel cultural behaviours provided survival benefits to hominins. The PALAEODESERTS project will have a profound effect on our understanding of Arabia's place in the story of human evolution and, more broadly, on the relationship between environmental change, population history, and cultural innovations. This project is uniquely placed to understand our past and contextualise the present at a time when climate change is of considerable public and academic interest and concern.

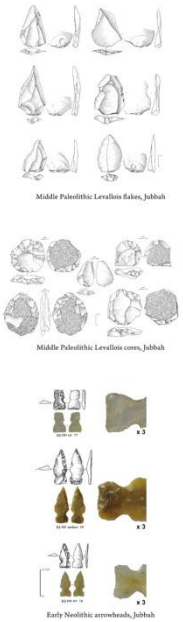

Acheulean handaxes from Nefud Desert


Mundafan Paleolake

Jebel Umm Sanman, Jubbah

Excavations at Jebel Qattar JQ-1 site

Neolithic rock art, Jubbah


Middle Paleolithic Levallois flakes, Jubbah

Middle Paleolithic Levallois cores, Jubbah

Early Neolithic arrowheads, Jubbah

The PALAEODESERTS Project is a five year (2012-2017) initiative funded by a grant of 2.35 m Euros (US $3m) from the European Research Council (ERC). Eight postdoctoral fellows and an international team of interdisciplinary specialists are investigating the evolutionary history of the Arabian Desert.

Interdisciplinary programme of testing of hypotheses pertaining to environments, biogeography and behavioural novelties in the Arabian Desert.

Dimension	Hypotheses	Studies
Temporal	**H1**. Hominin and animal range expansions are inextricably linked with wet phases in the Pleistocene and Holocene.	▪ Environmental records from existing marine cores, caves ▪ Multi-proxy environmental data from palaeolake records ▪ Chronometric ages on Palaeolithic and Neolithic sites ▪ Investigation of paleontological sites and dating ▪ DNA coalescence ages on historic animal populations ▪ Genetic coalescence ages on human populations ▪ Temporal analysis of rock art images and extinct epigraphic languages
	H2. Arid and hyper-arid periods resulted in population contractions, genetic bottlenecks, and extinctions.	
Spatial	**H3**. Hominin and animal settlement are linked with variations in physiogeography and palaeohyrology across the Arabian Desert.	▪ Satellite and GIS studies of terrain and palaeohydrology ▪ Plant community structure from palaeolake records ▪ Map Palaeolithic and Neolithic archaeological site distributions ▪ Map contemporary human DNA structure ▪ Map contemporary animal biodiversity ▪ Spatial analysis of ancient DNA biodiversity ▪ Spatial distribution of rock art themes and images ▪ Spatial variation in extinct Epigraphic inscriptions and languages
	H4. Hominins and animals migrated along specific dispersal routes across the Arabian Desert.	
Cultural	**H5**. Cultural innovations set hominins apart from boundary conditions in mammals.	▪ Map palaeontological and archaeological site ecosystem settings ▪ Comparative analysis of Acheulean, Middle Palaeolithic, Microblade, and Neolithic settings and artefact assemblage properties to investigate flexibility of mobility systems ▪ Analysis of stone tool designs, reduction, use and transport to examine the costs and benefits of cultural innovations ▪ Analyse rock art images, Epigraphic languages, raw material transport distances to understand social communication systems
	H6. Economic and social practices set Neolithic societies fundamentally apart from Palaeolithic populations.	

ACKNOWLEDGEMENTS

We thank HRH Prince Sultan bin Salman, President of the General Commission for Tourism and Antiquities, and Ali Ghabban, Vice President for Antiquities and Museums, Kingdom of Saudi Arabia, for permission to carry out this study. The PALAEODESERTS Project is primarily funded by the European Research Council (no. 295719), with additional support from the National Geographic Society and the Leakey Foundation.

Some of our partners:

PALAEODESERTS website: http://www.arch.ox.ac.uk/PALD.html