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# The Role of Culture in Early Expansions of Humans



Searching for Paleolithic evidence in the Arabian desert



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## THE ROLE OF CULTURE IN EARLY EXPANSIONS OF HUMANS

### Editorial

With this sixth issue of the ROCEEH newsletter, we continue discussing the important theoretical concepts of ROCEEH. The first article focuses on the problem of assessing “the role of culture”. Then, we present an overview of research in two main corridor areas – the Arabian Peninsula and the East African Rift. Finally, we report on ROCEEH’s Sino-German symposium.

#### Assessing “The role of culture” – a complex challenge

Studying the changing role of culture is a major task of the ROCEEH research program – a task that is more complex and challenging than expected. First of all, there is no overriding definition for the concept of “culture”. The concept of culture was developed in the 19th century as a synonym for civilization, and today, hundreds of definitions exist. Most of them were established by social and cultural scientists based on the cultural expressions of modern human societies. Other researchers with an ethological perspective emphasize the social transmission of information, as opposed to genetic inheritance, and find culture in some animal species. However, both of these perspectives concentrate on living

organisms and their directly observable behavior. How can we study culture in the paleoanthropologically oriented framework of ROCEEH, where the focus on cultural evolution extends over millions of years, and where evolutionary and other processes affect this development?

ROCEEH developed a framework of cultural evolution which brings together the various cultural performances of animals, extinct hominin species and modern humans. To escape from the narrow discussion about the absence or presence of “culture” in one species or another, we propose the investigation and discussion of cultural perfor-

At which stage does culture begin: With bird songs, a 35,000 year old mammoth ivory figurine, or the ability to construct large monuments? (Photos: Mindaugas Urbonas, Hilde Jensen/University of Tübingen, Joi Ito)

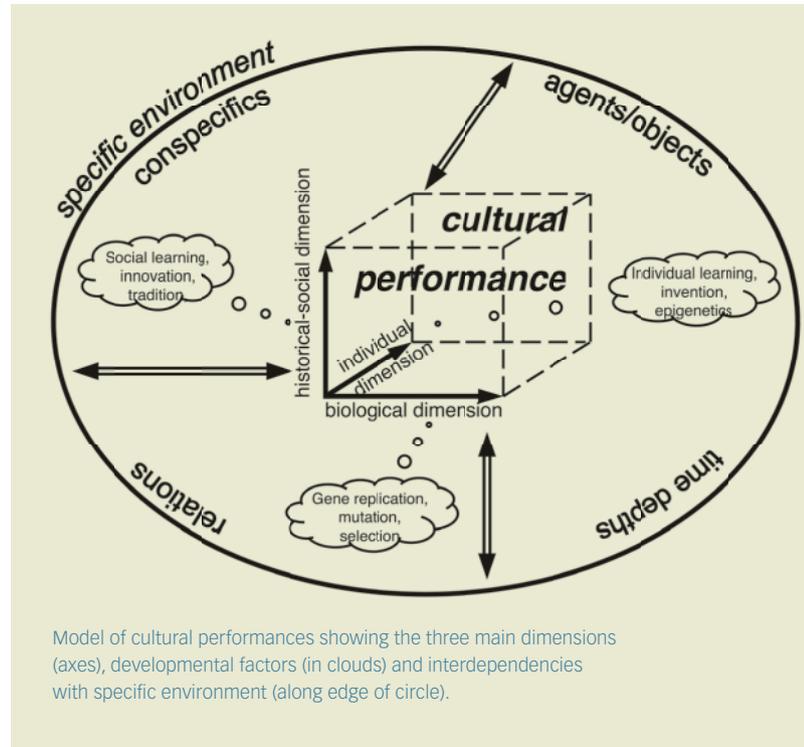


manances and cultural capacities, both of which have the potential to change and develop. Three main dimensions define the structure of cultural expressions or performances. The three axes are biological, historical-social and individual, each with its own developmental factors and interdependencies on the specific environment. The theoretical construct of cultural capacities can be deduced from empirically observed cultural performances that come from archaeological assemblages, as well as in the sets of behaviors of living organisms. While cultural performances represent the actual sets of cultural attributes expressed by an individual, a group or a population, cultural capacities represent the potential range of cultural performances of a species at a given time. Cultural capacities cannot be directly observed, but instead must be deduced from the sum of quasi-contemporaneous and conspecific performances. At the symposium “The Nature of Culture” in 2011 (see ROCEEH Newsletter 5/2011) seven steps of expansion were identified and debated. The first three – capacities for socially transmitted information, capacities for tradition and capacities for basic culture – can also be observed in some animal species today. In human evolution four more levels were proposed based on the archaeological record as the key source of evidence.

In addition to an evolutionary concept of cultural capacities, the changing role of cultural expressions in the interaction with the specific environment forms a central question of ROCEEH. The typical ways of handling archaeological data do not reach far enough. The primary archaeological data is site specific and descriptive, and research often ends here. Comparative and developmental analyses focus mainly on a particular technological or behavioral status at a specific time in order to highlight differences with earlier or later periods.

General parameters that allow us to follow the development from earliest cultural expressions to sophisticated performances are rare. To meet the project’s aims, ROCEEH needed to develop methodological approaches for comparative analyses which are able to bridge different time slices, sites, regions and technologies with quantitative elements that can be linked to ecological and geographical analyses.

Steps have been taken to develop general parameters. We already apply systematic coding of tool behavior in cognigrams and effective chains to assess cognitive differences in the problemsolution distance and conceptual complexity of tool behavior. The comparison of these codings forms the basis of the identification of different levels of cultural capacities. We developed another parameter to quantitatively compare different cultural performances: The tool diversity or specialization approach. We discussed both methodological approaches, cognigrams and tool diversity, in the ROCEEH newsletter 4/2011. A third path, the quantitative and qualitative assessment of innovative behavior, is currently being tested in an associated DFG project with focus on



differences in the MSA technocomplexes of southern Africa. Regine Stolarczyk, a doctoral candidate at the University of Cologne, will concentrate on the further development of basic concepts to make the approach broadly applicable.

Miriam N. Haidle

### Studying the Arabian corridor: field work at Jebel Faya, Emirate of Sharjah, UAE

Despite Arabia’s central geographic position for human expansions out of Africa, our knowledge about Pleistocene human history on the Arabian Peninsula remains limited. This is due to the difficulties in finding archaeological deposits from this critical time period in secure contexts. Stratified archaeological sites of Pleistocene age are rare, in particular sites containing more than one archaeological layer. Hence tracing cultural developments through time is almost impossible. Although many surface finds are arguably of Pleistocene age, it is difficult to incorporate such finds into a chronological framework without stratigraphic context.

In 2003, a team from the University of Tübingen led by Prof. Hans-Peter Uerpman discovered the site FAYNE1 on the eastern flank of Jebel Faya situated in the interior of the Emirate of Sharjah, UAE on the Oman Peninsula. In a cooperative effort between the Directorate of Antiquities of Sharjah’s Department of Culture and Information and the Tübingen team, nine excavation campaigns revealed lithic assemblages representing a time depth of 130,000 years. For the first time in Arabia, the archaeological sequence of FAYNE1 allowed us to establish a relative and absolute cultural chronology of the Paleolithic based on stratified



The situation of FAY-NE1 (Photo: K. Bretzke)



Excavating deep stratigraphies on the Arabian Peninsula (Photo: K. Bretzke)

finds. Despite an increase in archaeological field work in southern Arabia during the last years, FAYNE1 still remains the most important archaeological site of Pleistocene age on the Arabian Peninsula. Key results from the first phase of excavation and analysis were published in *Science* (Armitage et al. 2011).

The importance of this site to ROCEEH lies in its geographic position and its well dated archaeological sequence. The site is situated along the so called 'Southern Dispersal Route' from the Horn of Africa to Arabia. Of even greater

importance is the fact that the site is located beyond an important geographic barrier, namely the Rub' al Khali desert and its southern extension, the Wahiba Sand Sea in Central Oman. Compared to the marine barriers of the Bab al Mandab and the Strait of Hormuz, the interior deserts of Arabia present a more formidable obstacle to human expansion. Passage through this barrier is possible only during small windows of favorable climatic conditions. With the finds from FAYNE1, we now have dated evidence for human settlement beyond this barrier. Thus, the pattern of human presence on the Oman Peninsula can be studied at Faya and contrasted with the pattern of geographic barriers in South Arabia.

We are continuing excavations at FAYNE1 in collaboration with Prof. Uerpmann and the Directorate of Antiquities to gain knowledge about the diachronic pattern of habitats, both suitable and unsuitable for humans, in the interior of the Oman Peninsula. Two aspects are important in this context: 1) the cultural and chronological relationship between the different lithic assemblages at the site and 2) environmental data from deposits containing cultural remains and those that do not. We are studying the environmental signal from the excavated deposits in collaboration with Adrian Parker from Oxford Brooks University. The chronology of the cultural remains from FAYNE1 is based on OSL dating by Simon Armitage from Royal Holloway University of London.

Due to its position beyond a significant geographic barrier and within an arid environment, the entire region around Jebel Faya is of critical importance for the study of human settlement in South Arabia and the understanding of processes connected with the expansions of humans.

During the 2012 field work we discovered two handaxes in a region neighboring Jebel Faya. These artifacts are the first evidence for Acheulean remains from the Oman Peninsula. In addition to previous finds of arguably Middle to Lower Pleistocene age closer to Jebel Faya, the recent finds suggest that humans occupied the entire region much earlier than is currently evident from the finds from FAYNE1. Given the presence of older material on the surface and the fact that parts of the excavation have not yet reached bedrock, the potential for finds from the Middle or even Lower Pleistocene still exists. In addition to the continuing excavations at FAYNE1, we will explore the region for other localities containing stratified archaeological material from Paleolithic periods.

Since February 2011 the physical geographers of ROCEEH conducted two major fieldwork campaigns. The aim of this study is to investigate the physiography of the area to reveal landscape evolution dynamics and the related hydrogeomorphological processes. In the next newsletter we will report on first results as well as on a joined ROCEEH workshop on the Djebel Faya area.

Knut Bretzke

## Changing landscapes: The East African Rift Valley Corridor

The East African Rift represents our primary source of information for understanding the dawn of human evolution prior to 2 million years. The rift system has a total length of more than 3,000 km, ranging from the Afar triangle in Ethiopia to the mouth of the Zambezi River in Mozambique. It consists of a series of connected basins, some of them with lakes. The rift valley contains long chronological sequences from a variety of environments. At present there are significant differences in climate with an impact on environments in East Africa along the rift valley. Following the rift system from north to south we see these alternating series of environments starting with the very arid landscapes of the Afar depression and the Omo and Turkana Basins, through the more humid environments in Naivasha and Nakuru Basins, followed by the arid environments in the Natron and Manyara Basins. The Eyasi Basin is more humid, while Olduvai Gorge, a nearby stress-induced fault running perpendicular to the main axis of the rift system in the west, is again arid. When was this patchwork of variable environments established? Are there indications that different hominin taxa selectively inhabited different kinds of landscapes? These questions are addressed by research projects in ROCEEH.

Changes in global circulation patterns advanced aridification in East Africa particularly after 5.0 Ma. By changing environments this process stimulated human evolution in East Africa. Until 3.0 Ma hominin taxa are attributed to the genus *Australopithecus* and their precursors. By then hominins were restricted to East Africa. The genus underwent taxo-

nomous diversification and encompassed at least four species in East Africa. Footprints and fossil specimens collected from Laetoli in a side branch of Olduvai Gorge represent the only undoubted occurrence south of the Turkana Basin. It is presently unknown whether taxonomic diversification also reflects processes of adaptive radiation. A study of pedogenic carbonates collected from Turkana Basin reports that C3 plants predominate, indicating an environment considerably more humid than at present. East African australopithecines inhabited a variety of environments. Around 3.5 million years ago, members of the genus *Australopithecus* reached South Africa and underwent a separate process of evolution leading to *Australopithecus sediba*. This dispersal appears to have been delayed for at least one million years with respect to evolutionary processes in East Africa. This may indicate that regardless of ecological variability in East Africa, an effective barrier existed between East and South Africa that prevented australopithecines from dispersing into South Africa at an earlier point in time.

In the period between 3 and 2 million years, evidence from lake deposits in the different basins indicates the establishment of alternating types of landscapes. Between 2.6 and 2.5 million years there are signs of large freshwater lakes in the Middle Awash region in Ethiopia and the Central Kenyan Rift, while other basins in between show arid periods without lake formation. Around 2 million years ago, the first representatives of the genus *Paranthropus* appear in South Africa, while members of the genus *Homo* experienced a significant expansion beyond the former sub-Saharan boundaries of their initial distribution area. There are signs of hominin presence in the Caucasus around 1.8 Ma, on the Sunda Shelf



Hominid beds at Olduvai. The outcrop right of center illustrates the sequence. Bed I – light gray deposits on the valley floor; Bed II – grayish deposits at the valley walls; Bed III – dark red deposits at the top. Bed IV is recognizable as a white veneer on the left. (Photo: C. Hertler)



The Suguta River in the Suguta Valley. Outcrops in the background illustrate the sequence of deposits documenting environmental changes in the last million years. (Photo: C. Hertler)

around 1.6 Ma and in Mediterranean Europe from 1.4 Ma onwards. In Africa the following period until the appearance of *Homo sapiens* around 200,000 years ago is poorly represented because fossil evidence is extremely rare. Makuyuni in the Lake Manyara area represents one of a few find spots from this time. ROCEEH research is ongoing there (see Newsletter 2/2010 and 5/2011). In addition, we intend to expand our focus into the northern reaches of the eastern African Rift. We plan to study assemblages from localities in the Central and Northern Kenyan Rift in collaboration with Martin Trauth from the University of Potsdam.

In September 2011 Martin Trauth invited ROCEEH to visit localities in the Suguta Valley where lake deposits are dated between 1.2 and 0.8 Ma. The Suguta Valley is situated south of the Turkana Basin. Both valleys are presently separated by a geological barrier, but for most of the period between 1.2 and 0.8 Ma, the valleys were linked. At present the valley contains an alkaline lake fed by the Suguta River. The deposits encompass several layers with macrofossils of both fluvial and lacustrine provenance. The macrofaunal remains will be used to reconstruct lake dynamics during this crucial period in order to improve our understanding of early hominin environments in the eastern branch of the rift. The studies by ROCEEH scientists provide knowledge about an important episode in human evolution and help fill the gap between the first expansion beyond sub-Saharan Africa and the emergence of *Homo sapiens*.

Christine Hertler

## ROCEEH Sino-German Symposium

“Environment and Culture of Early Humans in China and Beyond”

Initiated by Li Cheng-Sen from the Academy of Sciences at Beijing and Volker Mosbrugger from the Senckenberg Research Institute and Natural History Museum/ROCEEH, the Sino-German symposium was held in Frankfurt am Main from February 27 to March 2, 2012. The meeting encompassed three days of scientific presentations and exchange, and two one-day field trips to the Messel fossil pit and the *Homo heidelbergensis* fossil site. The aim of the symposium was to gather information about previous approaches to the inter-disciplinary study of environment and culture, especially in China, and to evaluate the possibility of future Chinese-German projects with support from the Chinese-German Center for Science Promotion.

32 participants from China and Germany presented lectures on five topics:

- Early humans in China and beyond
- Dimensions of expansions
- Plio/Pleistocene environments in China and beyond
- Cultural development and environmental changes
- Extreme environments.

The talks of the first day focused on an introduction to paleoanthropological, archaeological and climatic aspects of Pleistocene human evolution in China, and fossil evidence for modern human dispersal into Asia. Participants discussed the different dimensions of expansion – of range, ecospace and cultural capacities – and their interdependencies on their way to becoming human. The second day was dedicated to assessing the influence of natural constraints on early human expansion and behavior. Data on climate variability and vegetation change were presented on various time scales, from different regions of China and on a larger scale for Asia, thus providing an overview on Plio/Pleistocene environments in China and beyond. Such climatic and ecological reconstructions and quantifications are crucial for understanding the influence of environmental changes on the cultural development of humans, as discussed during the second half of day two. The topics spanned from the early evolution of cultural modernity to the development of agriculture and the Loess Civilization. The theme of cultural development and environmental changes continued during the third morning session with a special emphasis on the colonization of extreme environments, such as the semi-deserts of Xinjiang (NW China), and the development of new lifeways, for example, agricultural and nomadic lifestyles.



Participants of the ROCEEH Sino-German Symposium

In the final discussion the participants expressed their conviction that the interdisciplinary topic of the symposium should be studied in further detail focusing on three main subjects:

- Range expansion of early Homo – Environmental and cultural constraints during the time from 2 Ma to 50 ka;
- Environment and culture of Homo sapiens with temporal focus 50 to 10 ka; and
- Diversification of subsistence – Development of agriculture and the expansion into extreme environments after 10 ka.

The first draft of a joint cooperative research project was outlined and included various disciplines from the sciences and humanities, for example, archaeology, paleoanthropology, paleontology, genetics and social sciences. Special emphasis has been placed on the reconstruction of environmental factors as a basis for assessing the influence of ecology on human evolution.

Angela Bruch

### Forthcoming

- **ROCEEH Workshop: "Qualitative and Quantitative Landscape Reconstruction at Stone-Age sites in the Eastern Arabian Peninsula (UAE)"** by Michael Märker, Joachim Eberle, Volker Hochschild and Hans Peter Uerpmann **(20 June 2012)** in Tübingen.
- **Volkswagen Foundation project workshop: "Early Pleistocene environmental changes in southern Caucasus – Reconstruction of climate and vegetation development in Armenia and Georgia at the time of early human expansion into Eurasia. State-of-the-art and perspectives of the project"** by Angela and Ivan Gabrielyan **(25–31 July 2012)** in Yerevan (Armenia).
- **Joint ROCEEH and NECLIME Symposium: "Quantifying Cenozoic vegetation? New developments in standardized approaches"** by Angela Bruch and Elena Vasio and **joint ROCEEH and NECLIME Symposium: "Into the Icehouse? Climate and vegetation change from the Pliocene to early Pleistocene"** by Torsten Utescher and Angela Bruch. **13<sup>th</sup> International Palynological Congress/ 9<sup>th</sup> International Organisation of Palaeobotany Conference (23–30 August 2012)** in Tokyo (Japan). (<http://wwwsoc.nii.ac.jp/psj3/en/index.htm>)
- **JROCEEH sessions "Databases on Cultural Heritage and their geographic visualization" and "GIS applications for the advanced exploration of pattern in archaeological data"** at **Computer Applications and Quantitative Methods in Archaeology (CAA)** by Michael Märker, Espen Uhleberg and Philip Verhagen **(25–28 March 2013)** in Perth (Australia). (<http://www.caa2013.org>)

### Who's who?

This issue: Michael Bolus



Michael Bolus at Okladnikov Cave in the Russian Altai. (Photo: Lee Hanyong)

Prof. Dr. Michael Bolus studied Prehistory at the universities of Cologne and Munich, specializing in Prehistory. After his Master's degree he finished his Ph.D. in Pre- and Protohistory at the University of Cologne in 1990 with a thesis on the settlement structures of the late glacial site of Niederbieber in the Middle Rhine region. For several years he worked as staff member and project director in the Preservation and Care of Field Monuments before he moved to Tübingen University in 1997 where he was Assistant Professor, project scientist, and lecturer at the Institute of Pre- and Protohistory and Medieval Archaeology until 2007. In 2001 he passed his habilitation for Pre- and Protohistory at the Faculty of Geosciences in Tübingen with studies on the transition from the Middle to Upper Paleolithic in central Europe. In January 2008 he joined the ROCEEH team as one of the project archaeologists, and in February 2009 he was appointed Adjunct Professor at Tübingen University. His research focus on the early settlement of Eurasia, the distribution and expansions of Neanderthals, the archaeology at the transition from Middle to Upper Paleolithic in Central Europe, early anatomically modern humans in Europe and their material culture, lithic technology in the early Upper Paleolithic of southwestern Germany and the concept of 'cultural modernity'.

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