



## **The Role of Culture in Early Expansions of Humans (Frankfurt and Tübingen)**

### **Annual Report for 2013**

In the last 2 million years, the genus *Homo* spread from Africa to Asia and Europe in several waves of migration. While the habitat for australopithecines, early humans and other animals was limited by natural conditions, cultural achievements over the course of humanization permitted new ways of adapting to the environment. The Research Center "The Role of Culture in Early Expansions of Humans" (ROCEEH) asks the pivotal question: When, where, and in what form did the interplay of changing environmental conditions, biological evolution and cultural development allow the genus *Homo* to move beyond the behavioral niche of a large African ape? How did *Homo* succeed in expanding not only culturally, but also into ecologically defined niches beyond Africa? The project aims to reconstruct the spatio-temporal and phylogenetic expansion of the various hominin species, the expansion of ecological environment as well as the expansion of cultural capacities between 3 million and 20,000 years before present, while shedding light on their causal relationship. Particular attention is paid to the development of human capacities for cultural activities, their backgrounds and actual occurrences. Archaeological excavations in Africa, Asia and Europe deliver this important information. At the core of the project is the interdisciplinary, web-based database known as ROAD (ROCEEH Out of Africa Database) with complete GIS functionality. ROAD unifies geographical data about localities with information on the stratigraphical structure of layers and the archaeology contained therein. In addition, information on human fossil history, climate, as well as flora and fauna, is assimilated and then used to model early human habitats. The results are integrated into a digital atlas detailing the development of humans and environment on the basis of geographical information systems (GIS).

Started in 2008 and projected to run for 20 years, ROCEEH is an interdisciplinary research project at the interface between natural and cultural sciences. This far-reaching, international, scientific research is carried out by a team of archaeologists, paleoanthropologists, paleobiologists, geographers and database specialists situated at the Senckenberg Research Institute in Frankfurt and the University of Tübingen.

**Members of the Scientific Commission:** regular members of the Academy, Karl Fuchs, Hermann H. Hahn (chairman starting 2013), Lothar Ledderose, Joseph Maran, Ekkehard

Ramm, Volker Sellin (chairman until 2013); Prof. Dr. Ofer Bar-Yosef (Cambridge, USA), Prof. Dr. Manfred Ehlers (Osnabrück), Prof. Dr. Bernhard Eitel (Heidelberg), Prof. Dr. Wulf Schiefenhövel (Andechs), Prof. Dr. Mark Stoneking (Leipzig), Prof. Dr. Elisabeth Vrba (New Haven), Prof. Dr. Zvi Ben-Avraham (Haifa)

**Heads of the Research Center:** in Frankfurt, Volker Mosbrugger, Prof. Dr. Friedemann Schrenk; in Tübingen, Nicholas Conard, Prof. Dr. Volker Hochschild.

**Research staff:** in Frankfurt, Dr. Knut Bretzke (administrative coordinator), Priv.-Doc. Dr. Angela Bruch, Claudia Groth, Priv.-Doc. Dr. Miriam Haidle (project coordinator), Dr. Christine Hertler, Dipl.-Biol. Ericson Hölzchen (starting Aug. 1, 2013), Dipl.-Biol. Rebekka Volmer (until Jun. 30, 2013); in Tübingen, Prof. Dr. Michael Bolus, Dipl.-Inf. Zara Kanaeva, Dr. Andrew Kandel, Maria Malina, Dr. Michael Märker, Dipl.-Geol. Geraldine Quénéhervé (until Dec. 31, 2013).

**Guests of the Research Center in 2013:** Dr. Maia Bukhsianidze (Tbilisi, Georgia), Dr. Ivan Gabrielyan (Yerevan, Armenia), Dr. Frédéric Jacques (Kunming, China), Davor Löffler (Berlin, Deutschland), Anneke Madern (Leiden, the Netherlands), Kathryn Manalo (Tarragona, Spain), Guillermo Rodríguez-Gómez (Burgos, Spain), Roberto Rozzi (Rome, Italy), Dr. Vitaly Usik (Kiev, Ukraine)

### **Focus topic**

In ROCEEH's sixth year of research, the Research Center focused its efforts on further developing its theoretical basis from the previous years, expanding its scope into related disciplines and employing practical applications. Progress was made on our conceptual model of systemic development called "Becoming Human," which links the model of the "Expansion of Ecospace" with the "Tübingen Model of the Expansion of Cultural Capacities" (all researchers involved). Building upon the Tübingen Model, ROCEEH was also able to propose a developmental perspective in the course of human evolution for the property of cumulative culture based on Tomasello's concept of shared intentionality (Haidle, Bolus). Parallel to the types of expansion contained in the Tübingen Model, the Research Center developed an additional model to address the types of socially transmitted information observed during the evolution of humans. Differences between cultural performances and cultural capacities were examined using the example of the simplification of behavior observed in the Paleolithic record of Tas-

mania. By considering the spatial expansions of the genus *Homo* into Wallacea during the Lower Pleistocene, into the Sahul during the Upper Pleistocene, and into the Pacific islands during the Holocene, the Research Center observed differences in the cultural capacities of these apparently similar events – that is, the diachronic expansion of humans onto hitherto unoccupied islands that lack connections to the mainland (Haidle).

The Caucasus represented a geographical focus of 2013 (Bruch, Kandel, Hertler). In Armenia, the Research Center completed its reconstruction of the Pleistocene environment and prepared the results for publication. A highlight from the excavation of the Upper Paleolithic site of Aghitu-3 Cave included the discovery of one of the oldest sewing needles made of bone. In Georgia, field projects and data acquisition continued. The year was capped by an international workshop in Tbilisi on “The role of the Southern Caucasus on early human evolution and expansion – refuge, hub or source area?”

Additionally the Research Center worked on conceptualizing and generating a qualitative reference model to represent the ecospace of hominins in Southern and Sub-Saharan Africa, the eastern Mediterranean region, and the Caucasus, as well as East and Southeast Asia. The reference model was applied to the reconstruction of localities in Makuyuni (Tanzania), Akhal-kalaki (Georgia) and Lufeng (China), as well as other localities in Southern Africa and Southeast Asia. Building on this work, reconstruction of the ecospace of several hominin groups (*H. ergaster*, *H. erectus* and other Pleistocene hominins) began (Hertler). Environmental and landscape reconstruction in the Lake Manyara region of northern Tanzania (Hertler, Märker, Quénéhervé) and a project on the geomorphological processes in the Ethiopian Highlands (Märker) continued. This research allows us to estimate the potential of changes in cultural capacity of early humans for an expansion of habitat beyond subtropical environments starting two million years ago. Paleobotanical investigations of a drill core from the Baza Basin of Spain should allow us to reconstruct the vegetation and climate of the most important region for early hominin settlement on the Iberian Peninsula (Bruch). Field and material studies in Italy, southern Germany and Israel aimed to unearth evidence of the transition to modern cultural behavior (Bolus, Kandel, Malina, Märker). We expanded our study of changes in the habitat preferences of pre, early and classic Neanderthals in order to test whether cultural factors limited their expansion (Märker, Bolus). Finally, the field work on Upper Pleistocene expansions across the southern Arabian route continued near Jebel Faya in the United Arab Emirates of Sharjah (Bretzke, Märker).

In order to enhance the future performance of the ROAD database and integrate the results of the Research Center into a common platform, we investigated the concept of a virtual atlas and its technical feasibility. We also initiated the inclusion of paleogenetic studies with research applications to ROCEEH by sponsoring a one-day workshop. We also performed the first internal audit of our progress since the 2010 evaluation. A biannual newsletter providing current information on these themes can be accessed through ROCEEH's website ([www.roceeh.net](http://www.roceeh.net)).

### **Field Work**

In 2013 the staff of the Research Center conducted or participated in 11 field projects:

#### Africa:

- South Africa: Sibudu Cave (Conard: excavation and analysis of finds, 7 weeks)
- Tanzania: Makuyuni, Lake Manyara (Märker, Quénéhervé: survey, data collection and project preparation, 16 days; Hertler: project preparation 10 days)
- Ethiopia: Melka Kunturé (Märker: 8 days)

#### Arabia:

- United Arab Emirates: Jebel Faya, Sharjah (Märker: Survey, hydrological measurement and stratigraphical investigation, 10 days; Bretzke, Kandel: excavation and survey, 3 weeks)

#### Levant:

- Israel: Sefunim (Kandel: excavation, 4 weeks)

#### Europe:

- Italy: Mugello (Märker: data collection, 10 days)
- Germany: Hohle Fels (Conard, Malina: excavation in Aurignacian to Magdalenian layers, 7 weeks)

#### Caucasus:

- Armenia: Aghitu-3 Cave (Kandel: excavation, 4 weeks)
- Georgia: West and South Georgia (Bruch: geological profile analysis and sampling as part of VW project, 3 weeks)

## **ROCEEH OUT OF AFRICA DATENBANK (ROAD) UND ROADWEB**

The ROAD system combines a PostgreSQL database with WebGIS libraries to enable full WebGIS functionality and includes map servers, Javascript and php scripts. ROAD is currently available to the public with limited user rights through the project website ([www.roceeh.net](http://www.roceeh.net)). Through the end of the year geographical, stratigraphical, paleoecological, archaeological and bibliographical datasets from 1944 assemblages at 1155 localities in Africa and Eurasia had been entered into ROAD. Several areas of ROAD were improved and updated in 2013. A new php software package now enables the uploading of images into ROAD. Sophisticated control of user rights allows users to determine settings for the remaining datasets, an advantage that will facilitate work with external users and cooperation partners alike. Improvements to the map module resulted in greater ease of use, increased flexibility with enhancements, as well as the ability to display graphically complex images. As part of the pilot version of the virtual atlas, a model was implemented that allows the simultaneous presentation of several thematically different maps, improved interactivity and simplified updates.

### **Project relevant conference contributions and lectures by research staff**

The Research Center organized a workshop on „The Role of the Southern Caucasus on Early Human Evolution and Expansion – Refuge, Hub or Source Area?“ together with Dr. David Lordkipanidze at the Georgian National Museum in Tbilisi from Oct. 15-20, 2013.

Furthermore, the project staff participated in 19 conferences, hosted three sessions, were lead or contributing authors in 30 lectures and presented 10 posters. They also introduced the project or their work six times at colloquia, lecture series and in the *Studium Generale*. They participated in a podium discussion and two radio reports, and offered two guided tours of archaeological sites and exhibitions.

### **Third Party Funding**

To complement the financing provided by the Academy, additional funds were sought for methodological development, regional investigation and visits from guest researchers and young academics. ROCEEH received additional support from the German Academic Exchange Service (DAAD), the German Research Council (DFG), the International Research Staff Exchange Scheme (IRSES) of the European Union, the Leibniz Association, and the Volkswagen Foundation.

## Teaching

In addition to their research activities, the staff strive to impart students with the benefits and results of their work and support graduate and postgraduate students in their qualifications:

- Lectures and seminars at the University of Frankfurt/Main: Angela Bruch, Christine Hertler, Rebekka Volmer
- Lectures and seminars at the University of Tübingen: Michael Bolus, Knut Bretzke, Miriam Haidle
- Supervision of students in field schools: Andrew Kandel, Maria Malina, Michael Märker
- Supervision of Master's, Diploma and Doctoral theses: Michael Bolus, Angela Bruch, Miriam Haidle, Christine Hertler, Andrew Kandel, Michael Märker
- Supervision of archaeotechnical trainees: Maria Malina

## Project relevant publications by research staff

A total of 25 project relevant publications appeared in 2013 in which the staff of the Research Center played a leading or contributing role:

1. Bolus, M. 2013. Aufbruch – Die Ausbreitung des modernen Menschen. In Ulmer Museum (ed.), Die Rückkehr des Löwenmenschen. Geschichte – Mythos – Magie. Ostfildern: Jan Thorbecke Verlag, 74-77.
2. Bolus, M. 2013. Mittelpaläolithische Spitzen. In H. Floss (ed.), Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit. 2., revised edition. Tübingen: Kerns Verlag, 273-280.
3. Bolus, M. 2013. Messer mit Rücken. In H. Floss (ed.), Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit. 2., revised edition. Tübingen: Kerns Verlag, 287-292.
4. Bolus, M. 2013. Blattförmige Schaber, Limaces, Blattspitzen. In H. Floss (ed.), Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit. 2., revised edition. Tübingen: Kerns Verlag, 309-326.
5. Bolus, M. 2013. Rückenmesser. In H. Floss (ed.), Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit. 2., revised edition. Tübingen: Kerns Verlag, 429-434.
6. Bolus, M. 2013. Schleifsteine mit Rille (Pfeilschaftglätter). In H. Floss (ed.), Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit. 2., revised edition. Tübingen: Kerns Verlag, 525-534.
7. Borrelli, P. Märker, M., Schütt, B. 2013. Modelling post-tree-harvesting soil erosion and sediment deposition potential in the Turano River Basin (Italian Central Apennine). Land Degradation & Development. DOI:10.1002/ldr.2214.

8. Bretzke, K., Armitage, S., Parker, A., Walkington, H., Uerpmann, H.-P. 2013. The environmental context of Paleolithic settlement at Jebel Faya, Emirate Sharjah, UAE. *Quaternary International* 300, 83-93.
9. Clark, J.L., Kandel, A.W. 2013. The evolutionary implications of variation in human hunting strategies and diet breadth during the Middle Stone Age of southern Africa. *Current Anthropology* 54(S8), S269-S287.
10. Conard, N.J., Bretzke, K., Deckers, K., Hillgruber, F.K., Kandel, A.W., Masri, M., Napierala, H., Riehl, S. & Stahlschmidt, M. 2013. Natufian lifeways in the eastern foothills of the Anti-Lebanon Mountains. In O. Bar-Yosef & F.R. Valla (eds.), *Natufian foragers in the Levant. Terminal Pleistocene social changes in Western Asia. Archaeological Series 19. Ann Arbor: International Monographs in Prehistory*, 1-16.
11. Conard, N. J., Malina, M. 2013. Grabungen in Schichten des Moustérien und Gravettien im Hohle Fels bei Schelklingen. *Archäologische Ausgrabungen Baden-Württemberg* 2012, 78-83.
12. Conoscenti, C., Agnesi, V., Angileri, S., Cappadonia, C., Rotigliano, E., Märker, M. 2013. A GIS-based approach for gully erosion susceptibility modelling: a test in Sicily, Italy. *Environmental Earth Sciences* 70, 1179-1195.
13. Conoscenti, C., Angileri, S., Cappadonia, C., Rotigliano, E., Agnesi, V., Märker, M. 2013. Gully erosion susceptibility assessment by means of GIS-based logistic regression: A case of Sicily (Italy). *Geomorphology* 204, 399-411.
14. Garofoli, D., Haidle M. N. 2013. Epistemological problems in cognitive archaeology: an anti-relativistic proposal towards methodological uniformity. *Journal of Anthropological Sciences* 92, 7-41.
15. Haidle, M. N. 2013. Aber Mama, alle haben einen Faustkeil! Zur Entwicklung kultureller Kapazitäten. In H. Fink & R. Rosenzweig (eds.), *Das Tier im Menschen. Triebe, Reize, Reaktionen. Münster: mentis*, 25-39.
16. Haidle, M. N. 2013. Die Evolution kultureller Kapazitäten - paläoanthropologische Ansätze. In T. Breyer, G. Etzelmüller, T. Fuchs & G. Schwarzkopf (eds.), *Interdisziplinäre Anthropologie. Leib – Geist – Kultur. Schriften des Marsilius-Kollegs* 10. Heidelberg: Winter, 171-193.
17. Haidle, M. N. 2013. Oldowan und andere frühe Geröllgeräte- bzw. Abschlagindustrien. In H. Floss (ed.), *Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit. 2., revised edition. Tübingen: Kerns Verlag*, 159-166.

18. Hertler, C., Bruch, A.A., Märker, M., 2013. The earliest stages of hominid dispersal in Africa and Eurasia. In I. Ness & P. Bellwood (eds.), *The Encyclopedia of Global Human Migration*. Malden, MA and Oxford: Wiley-Blackwell.  
DOI:10.1002/9781444351071.wbeghm802.
19. Kandel, A.W., Conard, N.J. 2013. Stone Age Economics and Landuse in the Geelbek Dunes. In A. Jerardino, A. Malan & D. Braun (eds.), *The Archaeology of the West Coast of South Africa*. British Archaeological Reviews International Series 2526, Cambridge Monographs in African Archaeology 84. Oxford: Archaeopress, 24-49.
20. Kandel, A.W., Noback, M.L., Slizewski, A. 2013. Second Annual Meeting of the European Society for the Study of Human Evolution. *Evolutionary Anthropology* 22, 157-158.
21. Kirscher, U., Gabrielyan, I., Scharrer, S., Bruch, A.A., Kuiper, K., Bachtadse, V. 2013. High resolution magnetostratigraphy and radiometric dating of Early Pleistocene lake sediments from Southern Armenia. *Quaternary International*.  
DOI:10.1016/j.quaint.2013.06.010.
22. Napierala, H., Van Neer, W., Kandel, A.W., Peters, J., Uerpmann, H.-P. & Conard, N.J. 2013. Fish in the Desert? The Younger Dryas and its influence on the paleoenvironment at Baaz Rockshelter, Syria. In O. Bar-Yosef & F.R. Valla (eds.), *Natufian foragers in the Levant. Terminal Pleistocene social changes in Western Asia*. Archaeological Series 19. Ann Arbor: International Monographs in Prehistory, 73-82.
23. Soler, J., Soler, N. Agustí, B., Bolus, M. 2013. The Gravettian calvaria of Mollet III cave (Serinyà, NE Iberian Peninsula). *Journal of Human Evolution* 65, 322-329.
24. Vorpahl, P., Dislich, C., Elsenbeer, H., Märker, M., Schröder, B. 2013. Biotic controls on shallow translational landslides (2013) *Earth Surface Processes and Landforms* 38/2, 198-212.
25. Will, M., Parkington, J.E., Kandel, A.W., Conard, N.J. 2013. Coastal adaptations and the MSA lithic assemblages from Hoedjiespunt 1 in the Western Cape, South Africa. *Journal of Human Evolution* 64, 518-537.