

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

Annual report for 2010

Since 2008 the Research Center “The Role of Culture in Early Human Expansions” (ROCEEH) has made its home at the Senckenberg Research Institute in Frankfurt and the University of Tübingen. Projected to run for 20 years, 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 human ecologically defined niches beyond Africa? Some of the themes addressed by the project are theoretical: Which different concepts of expansion—for example, in geographic range or in behavioral potential—play a role in the early history of humanity? Which roles did culture play in early human expansions? How can large and heterogeneous datasets be summarized and systematically analyzed? Archaeologists, anthropologists, paleobiologists and geographers are working together on these universal, yet tangible questions with regard to individual localities to develop new models. Using artifacts, fossils and a Geographical Information Systems (GIS), ROCEEH’s goal is to reconstruct the source, course and causes of different expansion events in Africa and Eurasia between 3 million years ago and the Last Glacial Maximum, 20,000 years ago. At the core of the project is the interdisciplinary, web-based database know as ROAD (ROCEEH Out of Africa Database) with complete GIS functionality. Geographical data, chronological position and stratigraphical structure of localities are unified in ROAD, combined with datasets about human fossils, cultural materials, animal and plant remains, as well as derived data about climate, ecoprofiles and cognition.

Members of the commission: the regular members of the Academy Karl Fuchs, Lothar Ledderose, Joseph Maran, Ekkehard Ramm, Volker Sellin (Chairman); Prof. Dr. Ofer Bar-Yosef (Cambridge/Mass.), 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)

Head of the Research Center: Volker Mosbrugger, Prof. Dr. Friedemann Schrenk (Frankfurt), Prof. Nicholas Conard Ph.D. (Tübingen), Prof. Dr. Volker Hochschild (Tübingen)

Staff: in Frankfurt Dorothee Bauer, Dr. Angela Bruch, Priv.-Doc. Dr. Miriam Haidle (Project coordinator), Dr. Christine Hertler, Dipl.-Biol. Chidi Nwokeji, Patrick Schmidt M.A., Dipl.-Biol. Rebekka Volmer, in Tübingen Prof. Dr. Michael Bolus, Dipl.-Inf. Zara Kanaeva, Dr. Andrew Kandel, Maria Malina, Dr. Michael Märker, Dipl.-Geol. Geraldine Quénéhervé

Guests of the Research Center in 2010: Guest Prof. Paul Goldberg Ph.D. (Boston University; summer semester 2010). Dr. Stanila Iamandei, Dr. Eugenia Iamandei (Bucharest, Romania), Prof. Zhou Zhekun, Dr. Chen Wen-Yun (Kunming, China), Dr. Susan Keates (Oxford, Great Britain), Dr. Yaroslav Kuzmin (Vladivostok, Russia), Atrianus Mutungi B.A., Sixbert Mhagama B.A., Mandela Peter B.A. (Dar es Salaam, Tanzania), Dr. Anne-Marie Bacon (Paris, France), Dr. Maia Bukhsianidze (Tbilisi, Georgia), Prof. Dr. Suzanne Leroy (London, Great Britain), Dr. Anthony Marks (New Mexico, USA), Dr. Vital Usik (Kiev, Ukraine)

In its third year the Research Center dedicated itself mainly to a pilot study of ROAD that focuses on the Middle Stone Age of Southern Africa. In addition to field work in South and East Africa, the ROCEEH team remained involved in projects in Southwest Asia and Central and Southern Europe. In April commission member Prof. Wulf Schiefenhövel organized an internal ROCEEH Workshop “Modern Models of the Past. The Eipo, Highlands of West-New Guinea (Provinci Papua, Indonesia)” in Frankfurt/Main. Two other workshops on the current focal region of Africa served as platforms to exchange data and results with regional specialists and to expand the ROCEEH network (March in Addis Ababa, Ethiopia; November in Johannesburg, South Africa). ROCEEH continued to publish its biannual newsletter, releasing the 2nd and 3rd editions in 2010. In June ROCEEH began issuing a new series called “Map of the Month” (MoM) to illustrate the progress of its work and showcase new results. Newsletters and MoMs are available on the Research Center’s website (www.roceeh.net). In May, 2010 the Research Center underwent its first evaluation by international reviewers.

ROCEEH Out of Africa Datenbank (ROAD)

The ROAD system combines a PostgreSQL database with Web-GIS libraries to enable full Web-GIS 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). The management system as well as all software components of ROAD were updated in September. At the beginning of 2010 a description of all tables in the database was added to the user handbook. The region of Southern Africa was chosen for the pilot study of Middle Stone Age locali-

ties dated between 29,000-191,000 years BP (MIS 3-6). Based on our experience with entry of archaeological, stratigraphical and paleoecological data, and after running the first analyses, we made improvements to the structure of ROAD by optimizing its user-friendliness and improving the operation sequences. Through year's end geographical, stratigraphical, paleoecological, archaeological and bibliographical data for a total of 427 localities have been entered, mainly in South and East Africa. Cooperation with the NEOTOMA (paleoecology) and NESPOS (archaeology, paleoanthropology) databases was intensified. Since June, 2010 the Map of the Month (MoM) on www.roceeh.net highlights the diversity of ROCEEH's theoretical questions, the analytical potential of current case studies, and maps on special topics. Zara Kanaeva developed a query for ROAD to serve as additional advertisement for ROAD. The simple interface allows different assemblage types, localities and their age range to be queried, while presenting the results in GoogleMaps or GoogleEarth. This function was placed online at the end of 2010 and can be accessed through ROCEEH's website (www.roceeh.net).

Data Collection and Field Work

Again in 2010 the staff of the Research center dedicated itself to supporting investigations in the field and reviewing collections, especially in the focal region of Africa. In South Africa Andrew Kandel made preparations for the planned 2011-2013 excavations at the Middle Pleistocene hominid site Hoedjiespunt, conducting topographical survey and a review of finds at the University of Cape Town and the Iziko South African Museum. Micromorphological investigations of the geology of Sibudu Cave and Diepkloof Rockshelter supported by the Research Center were carried out by Prof. Paul Goldberg and Prof. Chris Miller. In East Africa investigations at Makuyuni and in the region of Lake Manyara, Tanzania comprise a focal point that began in the previous year. Michael Märker and Geraldine Quénéhervé, together with Prof. Dr. Felix Mtalo and Dr. Preksedis Ndomba of the Water Management Department of Dar es Salaam University, studied modern processes of erosion, transport and deposition and collected data about the hydrology, climate, geomorphology and pedology of the region. At the same time, Patrick Schmidt gathered lithological data for calibrating remote sensing data. The soil samples he collected were then analyzed mineralogically using an infrared spectroscope and a polarizing microscope. The methods developed by Michael Märker in a pilot project of the DFG on the paleolandscape of the Sarno Basin before the eruption of Vesuvius in AD 79 were successfully applied in Tanzania to reconstruct paleotopography. Christine Hertler lead a several week campaign collecting Middle Pleistocene fossils around Lake Manyara. In addition she organized part of an transdisciplinary

summer school about tectonics, climate and evolution in Kenya and Tanzania under the guidance of Prof. Martin Trauth of the University of Potsdam.

In Armenia Angela Bruch, Christine Hertler and Dr. Maia Bukshianidze reviewed museum collections and conducted field reconnaissance in Yerevan, Sisian and the Vorotan Basin to assess the feasibility of a joint paleontological project as part of a grant through the Volkswagen Foundation. Together with Dr. Boris Gasparyan of the Armenian National Academy of Sciences, Andrew Kandel conducted survey in the Vorotan River Basin and continued excavation at the site of Aghitu-3 Cave begun in 2009. The excavation documented a total of seven Upper Paleolithic layers with a time depth of 20-30,000 BP. Based on the excellent find preservation, this site will deliver important new information about late cultural developments in this key region. In Syria Andrew Kandel helped lead a seven-week excavation campaign in the Middle Paleolithic layers of Wadi Mushkuna Rockshelter. Additionally, ROCEEH supported Knut Bretzke's participation in excavations at the Paleolithic site of Jebel Faya in the United Arab Emirates, as well as the analysis of lithic artifacts by Dr. Anthony Marks of Southern Methodist University and Dr. Vitaly Usik of the Ukrainian National Academy of Sciences. Finally, ROCEEH supported Saman Heydari, Elham Ghasidian and Mohsen Zeidi in their surveys, excavations and analysis of several Paleolithic archaeological sites in Iran.

Moving to ROCEEH's focal point in Southern Germany, Maria Malina led an eight-week field campaign in Hohle Fels near Schelklingen. She also provided oversight of the continuing excavation at Vogelherd, as well as the screening and sorting program for the excavated finds. Profiles and other field data from Hohle Fels were analyzed using GoCAD. Michael Bolus continued collecting data on the Middle Paleolithic and Aurignacian artifacts from Geißenklösterle. In addition, he collected data for the MoM about the precise coordinates of all known sites with Neanderthal fossils. Christine Hertler investigated Pleistocene cervids and bovids from Java, Indonesia in the Dubois Collection in Leiden, The Netherlands. Within the framework of a two-year exchange program with Italian universities in the DAAD's Vigoni Program, Michael Märker developed new methods to characterize soil erosion and landscape genesis in Sicily, methods that will have a direct application to ROCEEH in the future.

Analysis

Besides collecting primary data in the field, in collections and from literature, ROCEEH has also dedicated itself to addressing theoretical questions and creating new, derived datasets. Parallel to

ROAD's pilot study, ROCEEH is placing an analytical focus on the Middle Stone Age of South Africa with the goal of attaining a more precise view of the ecological and cultural characteristics of the Howieson's Poort industry. Angela Bruch ran the first climate reconstruction based on paleobotanical remains from Sibudu Cave. Christine Hertler compared faunal turnovers with climatic changes in two regions along the South African coast that are separated by the Hottentots-Holland Mountains. Michael Bolus examined potential cultural differences using typology and technology to characterize the diversity of archaeological assemblages. Miriam Haidle, together with Dr. Marlize Lombard, University of Johannesburg, analyzed the cognitive basis for simple spears, composite tools (spears with points) and complementary tool systems (bow and arrow), the latter of which are first postulated to appear during the Howieson's Poort. The utilization of different terms for "expansion", for example in a purely geographic sense, or with the meaning of extending the trade potentials of hominids represents another way that ROCEEH focuses on theoretical aspects.

Evaluation

In May, 2010 the Research Center underwent its first evaluation in two phases in Tübingen. The reviewers included the paleoanthropologist Prof. Dr. Leslie Aiello, president of the Wenner-Gren Foundation (New York), the paleoanthropologist Prof. Dominique Grimaud-Hervé (Paris) and the archaeologist Prof. Dr. Iain Davidson, University of New England, Armidale, Australia.

Project Relevant Conference Contributions, Lectures by Research Staff

In 2010 the Research Center organized a two-day workshop on "Paleoenvironmental reconstructions and methodologies" in Addis Ababa, Ethiopia and a two-day workshop on "Hominid environment, ecology and dispersal in South Africa" at the Bernard Price Institute and the Institute for Human Evolution in Johannesburg, South Africa. In addition the project staff participated in 17 conferences, organized one symposium, were contributing authors in 21 lectures and presented two posters. They also introduced the project or their work eight times at colloquia, lecture series and in the "Studium Generale".

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 post-graduate students in their qualifications:

- Lectures and seminars at the University of Frankfurt/Main: Christine Hertler
- Lectures and seminars at the University of Tübingen: Michael Bolus, Miriam Haidle

- Lectures and seminars in the framework of the International Erasmus Mundus Master's Program "Quaternary and Prehistory" at the Institute Paléontologie Humaine, Paris: Christine Hertler
- Lectures and seminars "Transdisciplinary Summer School on Tectonics, Climate and Evolution in East Africa" in Kenya and Tanzania: Christine Hertler
- Lectures and seminars in the framework of the International Summer School "Soil Erosion in the Mediterranean" in Sicily: Michael Märker and Geraldine Quénéhervé
- Lectures and seminars in the framework of the Master's Course "Geomatics" at the Overseas Agronomic Institute in Florence, Italy: Michael Märker
- Lectures and seminars in the framework of a Master's Module of the EU Asia Link Integrated Water Resources Management/Integrated River Basin Management (IWRM/IRBM) in Zhengzhou, China: Michael Märker
- Supervision of Master's, Diploma and Doctoral theses: Michael Bolus, Angela Bruch, Miriam Haidle, Christine Hertler, Andrew Kandel, Michael Märker
- Supervision of archaeotechnician apprentices: Maria Malina
- Planning of the Erasmus Mundus Master's Program "Landscape Reconstruction and Human Evolution" joint project with the Universities of Palermo, Italy and Southampton, Great Britain: Michael Märker, with assistance from Angela Bruch, Christine Hertler and Miriam Haidle

Project Relevant Publications by Research Staff

A total of 28 project relevant publications appeared in 2010 in which the staff of the Research Center played a contributing role:

- Agnesi, V., Angileri, S., Cappadonia, C., Costanzo, D., Märker, M. & E. Rotigliano 2010. Multivariate analysis of gully erosion processes: Susceptibility assessment and temporal validation in a watershed of north-central Sicily, Italy. *Slope Processes and Matter Movement. Proceedings of IAHS Workshop on Water Erosion. Moscow, 20.-23.10.2010. Lomonossov University, Department for Geography, Moscow, 6-10.*
- Akkiraz, M.S., Akgün, F., Utescher, T., Bruch, A.A., & V. Mosbrugger 2010. Precipitation gradients during the Miocene in Western and Central Turkey as quantified from pollen data. *Palaeogeography, Palaeoclimatology, Palaeoecology*, available online 21 May 2010, doi: 10.1016/j.palaeo.2010.05.002
- Bolus, M. 2010. Die Neandertaler – Leben und Ausbreitung einer erfolgreichen Menschenform. *Jahrbuch der Heidelberger Akademie der Wissenschaften für 2009*, 402-403.

- Bolus, M. 2010. Continuity or Hiatus? The Swabian Aurignacian and the Transition to the Gravettian. In: Neugebauer-Maresch, C. & L. Owen. (Eds.). *New Aspects of the Central and Eastern European Upper Palaeolithic. Methods, chronology, technology and subsistence.* Mitteilungen der Prähistorischen Kommission 72. Verlag der Österreichischen Akademie der Wissenschaften, Wien, 139-150.
- Bruch, A.A., Utescher, T., Mosbrugger, V. & NECLIME members 2010. Precipitation patterns in the Miocene of Central Europe and the development of continentality. *Palaeogeography, Palaeoclimatology, Palaeoecology*, available online 15 October 2010, doi: 10.1016/j.palaeo.2010.10.002
- Conard, N.J. & M. Bolus 2010. Flötentöne auf der Schwäbischen Alb. Die Ursprünge der Musik in Baden-Württemberg. In: Helfert V. & F.T. Lang (Eds.). *Musik erleben in Baden-Württemberg. Von der Steinzeitflöte zum Elektronikstudio: das Musikland Baden-Württemberg.* Staatsanzeiger-Verlag, Stuttgart, 8-9.
- Conard, N.J. & M. Malina 2010. Neue Belege für Malerei aus dem Magdalénien vom Hohle Fels. *Archäologische Ausgrabungen Baden-Württemberg 2009.* Theiss Verlag, Stuttgart, 19-22.
- Conard, N.J., Malina, M. & M. Zeidi Kulehparech 2010. Neue Kunst und erste Einblicke in ungestörte Schichten am Vogelherd. *Archäologische Ausgrabungen Baden-Württemberg 2009.* Theiss Verlag, Stuttgart, 23-26.
- Conard, N.J., Masri, M., Bretzke, B., Napierala, H., & A.W. Kandel 2010. Modeling Middle Paleolithic land use in the Damascus Province, Syria. In: Conard N.J. & A. Delagnes (Eds.). *Settlement Dynamics of the Middle Paleolithic and Middle Stone Age, Vol. III.* Kerns Verlag, Tübingen, 123-144.
- Della Seta, M., Märker, M., Vergari, F. & M. Del Monte 2010. Process-based assessment of erosion dynamics in the upper Orcia Valley, Southern Tuscany, Italy: A new semi quantitative integrated approach. *Proceedings of IAHS Workshop on Water Erosion.* Moscow, 20.-23.10.2010. Lomonossov University, Department for Geography, Moscow, 54-58.
- Gutmann, M., Hertler, C. & F. Schrenk 2010. Der Mensch als Gegenstand der Paläoanthropologie und das Problem der Szenarien. In: Gerhardt, V. & J. Nida-Rümelin (Eds.). *Evolution in Natur und Kultur.* de Gruyter, Berlin, 135-162.
- Haidle, M.N. & A.F. Pawlik 2010. The earliest settlement of Germany: Is there anything out there? *Quaternary International* 223-224, 143-153.

- Haidle, M.N., Bolus, M., Bruch, A.A., Hertler, C., Kandel, A., Märker, M., Conard, N.J., Hochschild, V., Schrenk, F. & V. Mosbrugger 2010. The Role of Culture in Early Expansions of Humans – A New Research Center. *Quaternary International* 223-224, 429-430.
- Haidle, M.N. 2010. Working memory capacity and the evolution of modern cognitive capacities - implications from animal and early human tool use. *Current Anthropology* 51/S1, Working memory: beyond language and symbolism, Wenner-Gren Symposium Supplement 1, 149-166.
- Kern, A., Harzhauser, M., Mandic, O., Roetzel, R., Ćorić, S., Bruch, A.A. & M. Zuschin 2010. Millennial-scale vegetation dynamics in an estuary at the onset of the Miocene Climate Optimum. *Palaeogeography, Palaeoclimatology, Palaeoecology*, available online 22 July 2010, doi:10.1016/j.palaeo.2010.07.014
- Märker, M., Bachofer, F., Queneherve, G., Hertler, C., Sanaane, C. Giemsch, L. & H.Thiemeyer 2010. Modelling the spatial distribution of Paleontological sites in the Makuyuni region, Tanzania. In: Melero, F.J., Cano, P. & J. Revelles (Eds.). *Fusion of Cultures. Abstracts of the XXXVIII Conference on Computer Applications and Quantitative Methods in Archaeology*, Granada, 147-150.
- Märker, M., Della Seta, M. & F. Vergari 2010. Prediction of soil erosion and mass wasting processes in Southern Tuscany using gradient boosting. *Proceedings of IAHS Workshop on Water Erosion*. Moscow, 20.-23.10.2010. Lomonosov University, Department for Geography, Moscow, 66-71.
- Märker, M., Pelacani, S. & B. Schröder 2010. A functional entities approach to predict soil erosion processes in a small Plio-Pleistocene Mediterranean catchment in Northern Chianti, Italy. Accepted by *Geomorphology*, available online 26. October 2010 DOI: 10.1016/j.geomorph.2010.10.022.
- Märker, M. Roskopf, C.M. & P. Aucelli 2010. Erosion processes mapping using data mining technologies: The Rivo Basin example, Molise, Central Italy. *Proceedings of IAHS Workshop on Water Erosion*. Moscow, 20.-23.10.2010. Lomonosov University, Department for Geography, Moscow, 71-75.
- Märker, M., Schmidt, P., Hochschild, V. & Z. Kanaeva 2010. Spatial assessment of early human expansions using GIS and Database techniques: Examples from Southern Africa. In: Melero, F.J., Cano, P. & J. Revelles (Eds.): *Fusion of Cultures. Abstracts of the XXXVIII Conference on Computer Applications and Quantitative Methods in Archaeology* 67-70.

- Märker, M., Soto Bauerle, M.V., Arriagada-Gonzalez, J. & C. Paz Castro 2010. Geomorphologic mapping using terrain analysis and mineral detection based on Aster data in the Atacama region, Northern Chile. *Geografia Fisica e Dinamica Quaternaria*.
- Micheels, A., Bruch, A., Eronen, J., Fortelius, M., Harzhauser, M., Utescher, T. & V. Mosbrugger 2010. Analysis of heat transport mechanisms from a Late Miocene model experiment with a fully-coupled atmosphere-ocean general circulation model. *Palaeogeography, Palaeoclimatology, Palaeoecology*, available online 2 October 2010., doi: 10.1016/j.palaeo.2010.09.021
- Mishra, S., Gaillard, C., Hertler, C., Moigne, A.-M. & T. Simanjuntak 2010. India and Java: Contrasting records, intimate connections. *Quaternary International* 223-224, 265-270.
- Napierala, H., Kandel, A. & N.J. Conard 2010. Small game and the shifting subsistence patterns from the Upper Paleolithic to the Natufian at Baaz Rockshelter, Syria. In: Maskour, M. & M. Beech (Eds.). *Archaeozoology of the Near East IX. Proceedings of the ninth international Symposium on the Archaeozoology of southwestern Asia and adjacent areas, Al Ain, U.A.E., Sept. 2008*
- Schmidt, P., Märker, M. & ROCEEH Team 2010. Spatial assessment of early human expansions using ROAD: An Example from Southern Africa Multidisciplinary Integrative Georelational Database for Spatio-Temporal Analysis of Expansion Dynamics of Early Humans. In: Curdt, C. & G. Bareth (Eds.): *Proceedings of the Data Management Workshop, 29.-30.10.2010, University of Cologne, Germany. Kölner Geographische Arbeiten, H.90, 113 - 117.*
- Utescher, T., Bruch, A.A., Micheels, A., Mosbrugger, V. & S. Popova 2010. Cenozoic climate gradients in Eurasia - a palaeo-perspective on future climate change? *Palaeogeography, Palaeoclimatology, Palaeoecology*, available online 7 October 2010, doi: 10.1016/j.palaeo.2010.09.031
- Vogel, S. & M. Märker 2010. Reconstruction of the pre-Eruption AD 79 Paleo-topography and Paleo-environment of the Sarno River Basin (Italy) using Stratigraphical Core Drillings and Data Mining Technologies. *Geomorphology*, 115 (1-2), 67-77.
- Yao, Y.F., Bruch, A.A., Mosbrugger, V. & C.S. Li 2010. Quantitative reconstruction of Miocene climate patterns and evolution in Southern China based on plant fossils. *Palaeogeography, Palaeoclimatology, Palaeoecology*, available online 18 April 2010, doi:10.1016/j.palaeo.2010.04.012