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# CONFERENCE

# HUMAN Michael Petraglia NOV. 8-10, 2016 DISPERSALS IN THE LATE PLEISTOCENE

Interdisciplinary Approaches Towards Understanding the Worldwide Expansion of Homo sapiens



Achim Brauer Helmholtz Centre Potsdam, GFZ - German Research Centre for Geosciences, Germany

Rapid climate and environment changes of the last glacial-interglacial cycle recorded in lake sediments

The role of past climate and environmental change for the evolution of mankind is object of a controversial debate and a grand challenge for science today and in future. A major task for palaeoclimate research in this respect is to provide robust proxy data for deciphering both gradual and abrupt climate changes and their environmental impacts. This is achieved by exploiting natural geoarchives like ice cores, speleothems and sedimentary records. This presentation will discuss the potential of lacustrine sediment records for climate reconstruction, because these archives provide information directly from the human habitat. Sediment deposition in lakes generally is characterized by high sedimentation rates that allows us to reconstruct climate changes at high time resolution. In case of annually laminated (varved) lake sediments, even seasonal resolution is obtained enabling detailed reconstruction including decadal-scale variability and the dynamics of abrupt changes. This presentation will provide a brief introduction to the nature of seasonal deposition in lakes and the climate signals that can be deduced from these sediments. Another aspect to be discussed is the dating of lake sediment records, which is of crucial importance to relate climate proxies to archaeological information. Two examples from the last glacial-interglacial climate cycle from the Dead Sea and from Lake Monticchio in southern Italy will be shown. A main focus of the discussion will be on abrupt climate changes at the demise of the last interglacial about 110 ka ago.



Alison S. Brooks George Washington University, Smithsonian Institution, USA

#### Dispersals and reversals: The Eastern African evidence from the Late Pleistocene

Eastern Africa's boundaries include those regions bordering the Rift Valley, from the Horn to the Mozambique border and westward through the Great Lakes with both Africa's highest mountains and lowest depressions, as well as a wide range of rainfall regimes. The area supports the world's richest terrestrial mammal biomass, and thus the greatest potential populations of large mammal predators, including humans. Our species, Homo sapiens, likely emerged in Africa in a Middle Stone Age (MSA) context well before the Late Pleistocene (LP). In eastern Africa, industries lacking large cutting tools (LCT's) but containing specific forms often associated with the MSA appear prior to 310 ka. Sites with LCT's continue in several localities after 300,000, suggesting a diverse cultural mosaic rather than lineal cultural evolution or simple replacement. LP records in the region also exhibit variable patterning. Characteristic behaviors reflected early in the archaeological record included long-distance raw material transport, pigment use, and manufacture of small, likely hafted armatures for projectile weapons. Like the Acheulean-MSA transition, the MSA-LSA transition is diverse, gradual and not always directional. Some similarities in both hominin morphology and artifact assemblages with adjoining regions of Eurasia may imply a complex history of possible exchanges.



Andrew Cohen University of Arizona, USA

#### Comparative Mid-Late Pleistocene environmental records from Africa, Eastern Europe and Western Asia covering the last 400ka and their implications for human dispersal

Testing hypotheses concerning the role that environmental, and specifically climate change, may have played in enhancing or limiting the dispersal of Homo sapiens depends fundamentally on the

quality, time resolution and continuity of those paleorecords upon which the hypotheses rest. Over the past decade it has become increasingly clear that environmental change in Africa has not occurred in lock-step between regions, and that the changes we observe, especially those related to precipitation, vegetation and water resources on which hominins depend, did not occur in lock step with the high latitude glacial-interglacial cycles. Understanding how landscapes changed in ways that would have influenced human dispersal therefore requires a regional network of continuous records, collected from key, representative areas. Such a network is increasingly becoming available through the analysis of high quality sediment drill cores, collected from lakes and ocean basins along or surrounding likely dispersal pathways.

In this talk I will summarize the current status of core records available for synthesizing this environmental history, and how that network is likely to be improved in the near future. I extend the discussion to well before the formal Middle/Late Pleistocene boundary (125ka) to provide a longer comparative context for the early Late Pleistocene dispersal of modern Homo sapiens. The advent of specialized lake coring tools used during drilling starting in the early 2000s has vastly improved the quality of sample material available to earth scientists to reconstruct regional climate histories, and the careful archiving and standardized analysis and core handling that is now routine insure intercomparability of records, in turn permitting more sophisticated time series and break point analyses to be conducted. High resolution core records are showing several intervals of heightened environmental instability over the last 400ka, and that much of the extreme instability occurs over millennial scale (i.e. sub-orbital) time scales. Furthermore, high resolution studies are showing that vegetation (particularly forest cover) has responded in non-linear ways to climate change. Models of human dispersal will need to incorporate these types of 100-200 generation time scale instabilities and nonlinearities in vegetation and water resources that early humans would encounter moving from one climate zone to another, as well as the varying seasonality that would accompany these changes. Critical spatial gaps in our network record are likely to remain unfilled because of the geography of appropriate sedimentary basins. However, the number and placement of records now or soon to be available has the potential to vastly improve our understanding of the environmental challenges and opportunities humans would have faced in dispersing not only from Africa to Eurasia but also within the African continent.



**Nicholas John Conard** University of Tübingen, Germany

How and when modern humans expanded their range into western Eurasia

This paper reviews results from the speaker's excavations in South Africa, Syria, Iran and Germany to address the questions of how and when modern humans expanded their range across western Eurasia. The presentation examines the timing of movements out of Africa and discusses the nature and tempo of cultural evolution and the contexts in which behavioral hyperplasticity evolved in our species. This research documents how innovative behavioral repetoires contributed to the extinction of archaic hominins and spread of modern humans.



Katerina Douka University of Oxford, UK

Dating human dispersals and extinctions across Eurasia using advanced chronometric approaches

Over the last decade, great new developments in radiometric dating (C-14, Luminescence, ESR, U-series), as well as measurement precision and Bayesian statistical analysis of the results, have led to significantly improved chronological frameworks for the Late Pleistocene. Europe, the best investigated continent when it comes to the Palaeolithic record, has seen huge advances. Over a 100 Middle and early Upper Palaeolithic European sites have been (re-)dated by our team since 2005 and the new results offer important insights in long and fiercely debated topics, such as the timing and nature of Neanderthal extinction, the tempo of modern human expansion and the possibility of overlap, acculturation and gene flow between the two groups in the continent.

Asia, on the other hand, lags behind both in terms of density of excavated sites as well the quality of its record, mainly dominated by pockets of well-investigated sites amongst "deserts" where few or no data is available. The situation is changing there too, with several new investigations focusing on both the discovery and excavation of new localities as well as their precise and accurate dating. Our team, under the auspices of the ERC-funded "PalaeoChron" project, is currently undertaking dating work in several Asian regions with the main focus being the development of a concise and reliable chronological framework comparable to other parts of the world.

In this talk, I will present aspects of the group's recent work in Europe and Asia, will summarise major new results and will demonstrate how the combination of several scientific dating methodologies and other lines of evidence (aDNA, material culture, stratigraphic information, palaeoclimate) is the way to overcoming major limitations surrounding our understanding of the Palaeolithic world.



Nicholas Drake Kings College London, UK

Late Pleistocene environment and hominin dispersals in North Africa



#### **Dominik Fleitmann** University of Reading, UK

#### Timing and nature of Pleistocene pluvial periods in Southern Arabia

Speleothems (stalagmites, stalactites and flowstones) from Arabia are a rich archive of terrestrial palaeoclimate. To determine the timing and nature of Pleistocene and Holocene pluvial periods in Southern Arabia, stalagmites from Mukalla Cave in Yemen and Hoti Cave in Northern Oman were studied in close detail. High precision Uranium-Thorium dating, carbon and oxygen isotope analysis of stalagmite calcite, hydrogen and oxygen isotope measurements of stalagmite fluid inclusion water as well as analysis of amino acids and lipid biomarkers provide information on the amount/source of precipitation and vegetation about both caves at the

time when the stalagmites were deposited. At both cave sites, stalagmite growth occurs only during peak interglacial periods when total annual precipitation exceeded 250-300 mm. Pluvial periods occurred at 330-300 ka, 245-230 ka, 209-195 ka, 129-120 ka, 105-100 ka, 80-78 and 10-6 ka before present (BP) (summarized in Fleitmann et al., 2011 and Rosenberg et al., 2013). Stalagmite deposition ceased during glacial periods. Of all pluvial periods in Southern Arabia, highest precipitation occurred during Marine Isotope Stage 5.5 (Eemian) between 129-120 and lowest during the early and middle Holocene. Stable isotope measurements of stalagmite fluid inclusion water, a direct proxy of precipitation above both caves, provide clear evidence for a monsoonal source of rainfall as a result of much stronger African and Indian monsoon activity and a northward displacement of the Intertropical Convergence Zone (ITCZ). Based on improved Uranium-series dating, pluvial appear to have lasted between 10,000 and 2000 years and were characterized by distinct millennial to decadal scale trends in precipitation. Furthermore, the presence of annual layers in some stalagmites suggests a highly seasonal climate, with wet summers and dry winters. Carbon isotopes and amino acids and biomarkers indicate the presence of C3 vegetation (trees and shrubs) during these pluvial periods. For the time interval between 130 and 65 ka BP, the proposed main period for human dispersal from Africa, three pluvial periods at 129-120 ka BP, 105-100 ka BP and 80-78 ka BP can be firmly established. Thus there were at least three time slots for the dispersal of Homo sapiens across the Southern Arabian Peninsula.

#### **References:**

Fleitmann, D., Burns, S.J., Pekala, M., Mangini, A., Al-Subbary, A., Al-Aowah, M., Kramers, J., Matter, A., 2011. Holocene and Pleistocene pluvial periods in Yemen, southern Arabia. Quaternary Science Reviews 30, 783-787.

Rosenberg, T.M., Preusser, F., Risberg, J., Plikk, A., Kadi, K.A., Matter, A., Fleitmann, D., 2013. Middle and Late Pleistocene humid periods recorded in palaeolake deposits of the Nafud desert, Saudi Arabia. Quaternary Science Reviews 70, 109-123.



Xing Gao Chinese Academy of Science, China

#### Human dispersal and adaptation in the Late Pleistocene in North China

North China witnessed several events of human dispersal and adaptation during the Late Pleistocene. As a result, hundreds of Paleolithic sites were left by different human groups and abundant human fossils and cultural remains were accumulated.

Hominids living in the early stage of the Late Pleistocene on North China are archaic *Homo* 

sapiens. This group emerged in the region in the late Middle Pleistocene and continued to survive all the way to ca. 40 Ka. After this group, inhabitant of this vast area became Homo sapiens sapiens or early modern humans. The relationship between archaic Homo sapiens and early modern humans in the region is currently under hot debate and two competing hypotheses, namely Out of Africa and Regional Continuity with Hybridization, have coexisted for decades. Before 40 Ka, Paleolithic industries in the region maintained basic characteristics of traditional simple small flake tools, with the increase of more-or-less systematic discoidal core reduction strategies at some sites. Around 40 Ka, Levallois-style core reduction and initial blade production emerged at a few sites, represented by the Shuidonggou Site in Ningxia and the Luotuoshi Site in Xinjiang. Around 25 Ka, microblade industries appeared abruptly and widely; at a few sites, such techno-complexes exhibited continued trend from blade technology. In Northeastern China, blade and microblade tools made of obsidian emerged in the late stage of the Late Pleistocene. In the meantime, small flake industries continued in North China, with the occurrence of new cultural elements, such as bone tools and ornaments. What are the dynamics behind such human dispersal and cultural diversity and change? New immigrants? Outside cultural influence? Adaptation to environmental change? The paper will probe into such issues and try to offer some hypotheses and interpretations.



Sabine Gaudzinski-Windheuser MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution and Johannes Gutenberg-University Mainz, Germany

#### Society and dispersal – the geographic expansion of Late Glacial societies

During the Last Glacial Maximum (LGM) at around 25-24,000 years ago,

vast areas of Eurasia became depopulated. Advancing glaciers and harsh, cold and dry climates in most high geographic latitudes had resulted in conditions that were hostile to life. Human populations as well as their hunted prey became regionally extinct and/or migrated into refugia further to the south where local populations were encountered. Northern and Central Europe were void of humans during the LGM, and some 10,000 years had to pass before there was a noticeable rise of temperatures at the beginning of the Late Glacial warming some 14,650 years ago. Against this background it had long been assumed (Bosinski, 1981) that the re-occupation of Central Europe had not been possible before the interstadial warming at the end of the last glacial.

Research at MONREPOS has shown, however, that Palaeolithic hunter-gatherers already and repeatedly tried to establish themselves in Central Europe soon after the glacial maximum (Terberger & Street 2002). The archaeological record also shows that early attempts to reoccupy Central Europe were not sustainable and finally failed, as can be deduced from the repeated, but only sporadic human presence in Central Europe during the interval between ca. 24,000 and 16,000 years ago, when humans explored the southern part of Central Europe (Baales & Jöris, 2006; Jöris & Street, 2014; Street et al., 2009).

It was not until 16,000 years ago that more sustainable and permanent re-settlement of Central Europe began. This is the expansion during the Late Magdalenian period of late Upper Palaeolithic hunter-gatherers who made their way from south-western Europe to Central Europe at around this time. From about 15,000 years onwards this process of expansion extends further into the newly deglaciated regions of northern Europe. Interestingly, the beginning of this expansion predates the climatic warming that started 14,650 years ago by more than 1000 years (Jöris & Street, 2014; Street et al., 2009). This expansion marks the fastest extension of human geographical range documented up to that point in time; its dynamics are only exceeded subsequently by the even faster first settlement of the Americas from 15-14,500 years onwards.

During the course of Late Glacial expansion, new and supraregional social networks spread across the newly settled regions of Central Europe, allowing for the permanent occupation of this vast area. These social networks are borne by a homogenous mindscape and systems of values (Gaudzinski-Windheuser, 2015) that connected groups and individuals over large distances (Gaudzinski-Windheuser & Jöris, 2015; Langley & Street, 2013; Street et al., 2006).

#### **References:**

Baales, M., Jöris, O., 2006. Wandel von Klima und Umwelt an Mittelrhein und Mosel gegen Ende der letzten Eiszeit. Zur Chronologie und Lebensweise später Jäger und Sammler im nördlichen Rheinland-Pfalz. Berichte zur Archäologie an Mittelrhein und Mosel 10 (zugl. Trierer Zeitschrift, Beiheft 29), 2005, 9-43.

Bosinski, G., 1981. Gönnersdorf. Eiszeitjäger am Mittelrhein. Schriftenreihe der Bezirksregierung Koblenz 2 (Bezirksregierung Koblenz, Koblenz). Gaudzinski-Windheuser, S., 2015. The public and private use of space in Magdalenian societies: Evidence from Oelknitz 3, LOP (Thuringia, Germany). J. Anthropol. Archaeol. 40, 361-375.

Gaudzinski-Windheuser, S., Jöris, O., 2015. Contextualising the female image – symbols for common ideas and communal identity in Upper Palaeolithic societies. In: Coward, F., Hosfield, R., Pope, M., Wenban-Smith, F., (Eds.), Settlement, society and cognition in human evolution. Landscapes in mind (Festschrift Clive Gamble) (Cambridge University Press, Cambridge), 288-314.

Jöris, O., Street, M., 2014. Eine Welt im Wandel. Die späteiszeitliche Besiedlungsgeschichte des Rheinlandes im Kontext von Klima und Umwelt. In: LVR-Landesmuseum Bonn (Ed.), Eiszeitjäger: Leben im Paradies? Europa vor 15000 Jahren (Nünnerich-Asmus, Mainz), 13-27.

Langley, M., Street, M., 2013. Long range inland-coastal networks during the Late Magdalenian: Evidence for individual acquisition of marine resources at Andernach-Martinsberg, German Central Rhineland. J. Hum. Evol. 64, 457-465.

Street, M., Gelhausen, F., Grimm, S., Moseler, F., Niven, L., Sensburg, M., Turner, E., Wenzel, St., Jöris, O., 2006. L'occupation de bassin de Neuwied (Rhénanie centrale, Allemagne) par les Magdaléniens et les groupes à Federmesser (aziliens). Bull. Soc. Préhist. Franc. 103, 753-780.

Street, M., Jöris, O., Sirocko, F., 2009. Das Magdalénien und der Beginn der späteiszeitlichen Expansion (16.000-14.700 BP). In: Sirocko, F. (Ed.), Wetter, Klima, Menschheitsentwicklung. Von der Eiszeit bis ins 21. Jahrhundert (WBG, Darmstadt), 88-92.

Terberger, Th., Street, M., 2002. Hiatus or continuity? New results for the questions of Pleniglacial settlement in Central Europe. Antiquity 76, 691-698.



**Huw Groucutt** University of Oxford, UK

#### An Arabian perspective on the dispersal of Homo sapiens out of Africa

Fossil, genetic and archaeological data are consistent with a late Middle Pleistocene origin of Homo sapiens in Africa, but how did our species spread to the rest of the world? Factors such as a lack of research in vast areas of southwest and south Asia and a paucity of hominin fossil material mean that understanding the spatial and temporal character of dispersal into and through Asia has remained elusive and much debated. Fieldwork in Arabia over the last ten years has revealed rich

archaeological, palaeontological and palaeoenvironmental records which add significant new data to these discussions. Multiple human occupations over at least the last 500,000 years can be correlated with dispersals into Arabia during periods of improved climate. In this paper I will focus on several recently identified sites in Saudi Arabia dating to the early Late Pleistocene (MIS 5). These suggest that Homo sapiens dispersed into Arabia in association with an intensified African monsoon system. As well as being significant in explaining the character of the Arabian archaeological record, these sites show that Arabia played an important role in the Out of Africa story.



**Rainer Grün** Griffith University, Australia

## Microanalytical approaches for dating human fossils

As obvious as it sounds, if one want to know the age of a human fossil, it's best to date the human fossil itself. However, that usually did not go down well with the curators of human fossils, as it meant in the past that large chunks of fossil material disappeared in sample preparation procedures, sometimes with little to no chronological outcome. the yagrancies of establishing taphonomic

Dating associated materials is fraught with the vagrancies of establishing taphonomic relationships between the human fossils and the material that was actually dated.

We have developed new, least invasive methods for U-series and ESR dating, which have allowed the analysis of a large number of human fossils, partly rewriting the chronology of human evolution, particularly in SE Asia.



**Philipp Gunz** Max Planck Institute for Evolutionary Anthropology Leipzig, Germany

# Evolution and development of the modern human face and brain

A number of fossils from North, South, and East Africa document the early stages of our species, and fossils from the Levant document the presumed first wave of migration out of Africa. The exact place and time of our species' emergence remain obscure as large gaps in the fossil record and the chronological age of many key specimens make it difficult interpreting the evolutionary processes and population dynamics shaping the cranial diversity of modern humans.

Here we use 3D geometric morphometrics based on landmarks and semilandmarks to compare facial and endocranial shape in a worldwide sample of recent and fossil humans from Africa, Europe, and Asia.

Our data support a complex evolutionary history of our species involving the whole African continent. Regarding facial shape, we find that even the early H. sapiens specimens fall within the shape variation of recent modern humans. Endocranial shape, however, changes considerably within the Homo sapiens lineage.



John Hawks University of Wisconsin-Madison, USA

#### African population diversity and its relevance for human dispersals

As modern humans dispersed throughout the world, they encountered and mixed with populations with much greater genetic distinctiveness than any living humans today. This process is now relatively well documented by ancient DNA in Eurasia and Australasia due to the ancient DNA records of Neanderthal and Denisovan samples. Within Africa this process of contact and mixture between genetically differentiated populations also took place, evidenced by the evidence of population

mixture from genomes of some African populations today. The process began earlier, well before 100,000 years ago, and may have extended over a longer period of time. The evidence suggests that modern humans originated and began their dispersals within an African continental context equally or more genetically structured than Eurasia. However the fossil record of this population is very sparse, and it is not evident how archaeological distributions may relate to biological populations. Here I discuss the implications of this population structure for human dispersal and adaptability. The modern human phenotype originated as one well adapted for dispersal within a long-existing network of successful populations of potential competitors.



**Tom Higham** University of Oxford, UK

#### Identifying human fossil remains from Pleistocene Eurasia using collagen peptide mass fingerprinting

Palaeogeneticists have revealed greater than expected complexity in the hominin fossil record of late Pleistocene Eurasia prior to the expansion of modern humans (AMH) out of Africa. There appear to be at least three hominin groups present in Eurasia between 100,000-40,000 BP; Neanderthals, modern

humans and Denisovans. The latter are represented by only 4 tiny bones from the eponymous site. The genetic analysis and direct dating of human fossil remains is urgently required to fill in the gaps and understand more about the relationship between these groups, the frequency of their interactions and determine their spatial distribution. It is often difficult, however, to obtain permission to destructively sample precious fossils and usually the material has been consolidated and treated in order to preserve it, which can affect the reliability of scientific and analytical methods. In order to circumvent this we have been working to apply a novel collagen peptide mass fingerprinting method (ZooMS) to identify fragmentary hominin bone from large collections of bone remains that are unable to be identified archaeozoologically. We applied the method Denisova Cave (Russia). In the East Gallery of the site, where the Denisovan remains were found, over 135,600 bones were recovered between 2005-2013 but only 5.2% of the fragments have been identified. We reasoned that there must be other hominin material amongst this corpus of unidentified bone. By applying ZooMS we have managed to bone fragments with characteristic hominin peptide markers. We have obtained dates and genomic data from the samples. In this talk we will describe the methods applied and present some of the results.

This work forms a proof of concept for a new ERC-funded project called FIND (led by Katerina Douka) at the University of Oxford.



Yousuke Kaifu National Museum of Nature and Science, Japan

#### How Palaeolithic people crossed the ocean to the Japanese Islands >30,000 years ago: An experimental approach

The Ryukyu Islands are located in southwestern Japan. It is a 1200 km-long chain of comparatively small islands that spans between the Kyushu Island of Japan in the north and Taiwan in the south. The existing archaeological sites and human skeletal remains strongly suggest that many of these islands were suddenly occupied by early modern humans (Homo sapiens) some 35,000-30,000 years ago, most likely from both north and south by different groups of people. These first Ryukyu islanders had some

watercrafts because the current geomorphological, paleoceanographic, neontological, and paleontological data all support that the islands of Ryukyu have been isolated from the Asian continent at least during the Late Pleistocene (Kaifu et al., 2015: In Kaifu, Y. et al. eds., Emergence and Diversity of Modern Human Behavior in Paleolithic Asia. Texas A&M Univ. Press).

Colonization of these islands was not easy. In some places, people had to voyage for a long distance without seeing lands; in other parts, they confronted strong ocean current. Because remains of watercrafts are unknown from Palaeolithic sites, some experimental approach would be necessary to restrict the type of the boat they used, and to understand the details of their challenges to the ocean. I here reports progress of our ongoing experimental voyage project entitled "Holistic reenactment project of the voyage 30,000 years ago", which was made possible by crowdfunding. The first round of the experiment done in July 2016 was a useful experience to learn about the amount and necessity of cooperative works as well as knowledge for successful ocean crossing, which are hard to recognize from archaeological remains.



Jed Kaplan University of Lausanne, Switzerland

#### Numerical modeling of hunter-gatherer population, dispersal, and influence on the environment in the Late Pleistocene

The expansion and dispersal of modern humans across Eurasia and into the Americas during the Late Pleistocene is one of the most important periods in the evolution of the earth system. Niche construction,

combined with megafauna extinctions and rapid climate change, set the stage for the development of the modern world. Despite its importance, the rate, pathways, and environmental impacts of the late Pleistocene human dispersals are poorly understood. To quantify the effects of these dispersals on the environment, and to better understand demographic development over the period, we implemented a new, computationally efficient numerical representation of human population dynamics and dispersal and incorporated this into a dynamic global vegetation model. This coupled model of human and natural systems simulates the way in which climate and other properties of the physical environment affected suitability for hunter-gatherer populations, while at the same time allowing humans to modify their local environment, i.e., niche construction, through the controlled application of wildland fire. Our model simulations show that humans could have had a substantial influence on their environment even during the Last Glacial Maximum, selectively using fire to promote more open and heterogeneous landscapes. This anthropogenic modification of the land surface facilitated further dispersal and increases in population, a positive feedback that ultimately accelerates the growth and spread of humans across the planet.



Johannes Krause Max Planck Institute for the Science of Human History, Jena, Germany

#### Genomic history of Upper Paleolithic Europeans

Little is currently known about the genetic history of ancient Europeans before the advent of agriculture ~8,500 years ago. Here we have analysed genome-wide data from 51 modern humans remains that span around 40,000 years of Eurasian prehistory. Over this time, the proportion of Neanderthal DNA decreased from 3–6% to around 2%, consistent with natural selection against Neanderthal variants in modern

humans. Whereas the earliest modern humans in Europe did not contribute substantially to present-day Europeans, all individuals between ~37,000 and ~14,000 years ago descended from a single founder population which forms part of the ancestry of present-day Europeans. A ~35,000-year-old individual from northwest Europe represents an early branch of this founder population which was then displaced across a broad region, before reappearing in southwest Europe during the last ice age ~19,000 years ago. During the major warming period after ~14,000 years ago, a new genetic component related to present-day Near Easterners appears in Europe. These results document how population turnover and migration have been recurring themes of European pre-history.



Andrey Krivoshapkin Institute of Archaeology and Ethnography, Russia

#### Middle to Upper Paleolithic transition in western Central Asia and dispersal of modern humans

Western Central Asia has recently been in the focus of archaeological research due to the fact that this vast territory may have served as a geographic bridge between Paleolithic populations in western and eastern Eurasia. Information accumulated during the past 20 years provides new insight into the regional Paleolithic sequence, particularly the nature and timing of the Middle-to-Upper Paleolithic transition. The earliest Upper Paleolithic

industries found in different parts of Eurasia are characterized by distinctive local characteristics superimposed on, or coincident with a set of common technological and typological features. The most important of these common features include a predominance of blades removed from cores exhibiting a combination of Middle Paleolithic (i.e., Levallois) and Upper Paleolithic features, a high index of platform faceting linked to core maintenance, a combination in tool-kit of retouched elongate Levallois points, large retouched blades and Upper Paleolithic tool types such as endscrapers and burins. The roughly contemporaneous appearance 50–40 ka of initial Upper Paleolithic complexes showing these common techno-typological features appears to signal some manner of ecological, or evolutionary change in human adaptations. Whether it is convergent behavioral evolution, or an event stimulated by the dispersal of one or more hominid populations is still unknown. The new evidences obtained from Paleolithic key-sites of Western Central Asia (Uzbekistan, Tajikistan, Kyrgyzstan) make possible to clarify the nature of biological and cultural interactions in the region in early OIS 3.



**Julien Louys** The Australian National University, Australia

The long road to the green south: the Pleistocene Sumatran record and hominin dispersals in Southeast Asia



#### Andrea Manica University of Cambridge, UK

#### The role of climate in shaping human demography and migrations during the out-of-Africa expansion

The timing and tempo of the expansion of Anatomically Modern Humans out of Africa have been argued to be governed by changing climatic conditions that opened and closed key gateways to different regions. However, whilst genetics has played a key role in determining the timing of expansion waves, causative climatic factors are

mostly invoked without any formal testing. In this talk, I will discuss the key dispersal events of Anatomically Modern Humans that have been associated with climatic changes, and discuss how genetic, archaeological and climatic information can be formally integrated in a quantitative fashion to study their interaction, and better understand the processes by which our species expanded to colonise the whole globe.



Shannon McPherron Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

#### The age of the Homo sapiens fossils from Jebel Irhoud (Morocco) and the origins of the Middle Stone Age

Jebel Irhoud (Irhoud), Morocco, contains stratified archaeological deposits best known for yielding abundant late Pleistocene hominin remains associated with a Levallois

based Middle Stone Age stone tool assemblage. Taxonomically these fossils have been generally considered primitive forms of *Homo sapiens* but were dated to a relatively recent age. However, the uncertain find location and dosimetric environment of the key fossils has limited the accuracy of their age estimates. New excavations were initiated in 2004 on the complete, intact section remaining from the late 1960s excavations. These excavations resulted in the discovery of additional hominin fossils associated with Middle Stone Age assemblages containing numerous heated flints suitable for thermolumiscence (TL) dating. In addition to new TL dates for the sequence, based in part on new dosimetric data, we also recalculated the uranium series/electron spin resonance age for a tooth from the Irhoud 3 hominin mandible. These new ages are consistent with one another and with the faunal and micro-faunal assemblages. The fossils and stone tools are substantially older than previous age estimates. Here and in a companion presentation, these results and their implications for the emergence of our species and of the Middle Stone Age are discussed.



**Sue O'Connor** The Australian National University, Australia

## Modern Human colonisation of Wallacea: recent results from Alor, Pantar and Kisar Islands.

In the vast oceans separating continental Sunda and Sahul are more than 17,000 islands that make up the Wallacean Archipelago. Lying to the east of Huxley's Line the smaller islands are characterised by unbalanced and extremely depauperate terrestrial faunas but support some of the world's most biodiverse marine ecosystems. While permanently inhabited today, the size of many of these islands would seem to preclude permanent habitation in the

absence of agriculture or animal translocation/husbandry. Here we discuss recent excavation results from three small islands in Eastern Indonesia, Alor, Kisar and Pantar and examine whether their archaeological records suggest sustained or episodic occupation throughout the Pleistocene.



**Svante Pääbo** Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

#### Of Neandertals, Denisovans and Modern Humans

Our research group develops methods to retrieve DNA from ancient remains in

order to study the genetic history of past populations and species. I will discuss insights about modern human origins and early history gained from studying the genomes of Neandertals and Denisovans, the closest extinct relatives of present-day humans, as well as older hominin remains from Sima de los Huesos in Spain.



#### Jürgen Richter University of Cologne, Germany

#### "The Archaeology of Migrations": The challenging case of Homo sapiens

Migrations of human populations are difficult to trace by archeological methods, and technological and typological evídence cannot alone attest the earliest occurrences of Homo sapiens. Thus, recent research of the CRC 806 "Our Way to Europe" has concentrated on the understanding of contextual areas of population dynamics, i.e. areas and times of earliest occurrence, demographic growth and retreat of early Homo sapiens.

Research has perticularly been focused on North East Africa around 200,000, 130,000 and 60-40.000 B.P. and the Near East and the Balkans around 60-40,000 B.P., and as a comparative case, Morocco and Iberia were also included in the CRC's archaeological, geological and paleolimnological investigations. The contribution will communicate first results of the CRC 806 programme.



**Eleanor Scerri** University of Oxford, UK

#### Inferring Late Pleistocene hominin demography in the Green Sahara and surrounding regions

Mounting evidence, including some of the oldest examples of technological regionalization and 'symbolic' material culture with early Homo sapiens fossils, is highlighting the North African Middle Stone Age (NAMSA, ~250-25 thousand years ago [ka]) as a key area for human origins research. The geographic situation of North Africa and an increased understanding of the wet/dry climatic pulses of the Sahara Desert also

suggest that North Africa played a strategic role in continental-scale evolutionary processes by modulating human dispersal and demographic structure. In this paper, the behavioural material culture perspective is shed on questions of population structure and demography in the Green Sahara. As shall be seen, technological variability in the NAMSA can be broadly divided into three chronological stages featuring very different spatial, morphological and technological characteristics in shifting environmental contexts. Determining how well this line of evidence matches the biological records from fossil and genetic data, and to what degree it emphasizes different aspects of the evolutionary process represents a promising new avenue of research.



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#### Analysing Australian genomes to learn about early modern human dispersal out of Africa

When and how modern humans left the African continent is still a debated question. Recently, three projects have

analysed new genetic data from modern populations in Papua New Guinea and Australia, which has provided new insights on this topic. I will present analyses from one of these publications (Malaspinas et al. 2016), and compare results with findings from the two other projects (Mallick et al. 2016, Pagani et al. 2016). Here, we used MSMC2, a novel computational framework to analyse the distribution of times to the most recent common ancestor along multiple sequences. We find that all non-African populations that we analysed, including Australians, experienced a very similar population bottleneck in the past, consistent with only one out-of-Africa migration for all extant non-African populations. At the same time, we find evidence that some African populations are more distantly related to Australians than to Eurasian populations, and we show that this result is robust to haplotype phasing errors and archaic introgression. We interpret our result as evidence for gene flow between some Africans and Eurasians after the initial split, which is also consistent with results from other population genetic methods. Our analysis suggests that in order to understand human dispersal out of Africa, we need to better understand ancient population substructure within Africa, which is an important direction for future research.



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# Recent discoveries at Denisova Cave and dispersal of the genus Homo in Asia

The multidisciplinary studies at Denisova Cave in the Altai have provided the evidence on the continuous development of the Paleolithic traditions over at least 280 ka and the onset of the autochthonous Upper Paleolithic culture in the chronological range about of 50 ka BP. At the same time, both stone and bone tool assemblages, as well as symbolic artifacts made of bone and ornamental stone, provide evidence for a rather high level of material and spiritual culture associated with people who inhabited the Altai region in the early Upper Paleolithic.

The data of the paleogenetic studies of the human fossils from the initial Upper Paleolithic strata at Denisova Cave that have been carried out in Svante Paabo's Lab at the Institute for Evolutionary Anthropology in Leipzig, reveal a formerly unknown hominin type that has been named as the Denisovan. The Denisovan population co-inhabited the Altai region with the easternmost Neanderthal population group. The Neanderthal population was defined through the genetic analysis of mt-DNA from the human fossils that were discovered in the Okladnikov, Chagyrskaya and Denisova Caves. Two distinct hominin groups inhabited the Altai about 50–40 ka BP. It is very likely that Neanderthals came to Altai from the western areas of Central Asia, and cultural roots of Denisovans can be traced in the lowermost layers of Denisova Cave. Means for life-sustaining activity of Denisovans were not inferior but in some aspects revealed superiority over behavioral traits of anatomically modern humans, who were their contemporaries and lived in other regions.

The recently obtained paleogenetic data have shown that the genome of modern humans contains from 1.5 to 2.1% of the Neanderthal genome, which fact suggest a gene flow between these two species at certain evolutionary stages. On the other hand, the indigenous Australians and Melanesians bear from 3 to 6 % of the Denosovan genome. Thus both the Neanderthals and Denisovans should be listed among the ancestors of the anatomically modern humans. These discoveries have make it possibly to forward a new hypothesis on the origin of the anatomically modern humans.

The new multi-regional model of human evolution is reliably supported by the archaeological data. If the local populations had been replaced by the anatomically modern humans migrating from Africa, the early Upper Paleolithic cultural phenomena should have been homogenous all over the earth. Yet, available early Upper Paleolithic archaeological materials from Africa, western parts of Eurasia, South Siberia and East Asia have shown significant distinctions. It testifies to the cultural, therefore genetic continuity in the prehistoric populations in each of the mentioned regions.



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#### Genomic perspectives on the colonization of Sahul

While genetic, fossil, and archaeological data all firmly support an African origin for modern humans, it is still not clear how many dispersals there were of modern humans from Africa, nor where they went to first. In particular, it has been proposed that the contemporary indigenous populations of Sahul (the combined Australia – New Guinea landmass), i.e. aboriginal Australians and Papuans, are descended from a migration from Africa that preceded the subsequent migration(s) from Africa of the ancestors of all other

non-African populations. Moreover, it is often assumed that following initial colonization, there were no further substantial migrations to Sahul until the Holocene. I shall discuss the latest genomic evidence, including insights from archaic admixture, that pertains to these and other questions concerning the colonization of Sahul.