

EUG XI



Symposium BG03

Advances in the Study of
Human Evolution and Dispersal

Convenors

Mark Collard
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BG03 Human Evolution and Dispersal

Thursday PM Session

BG03 : THpm21 : G3 Ancient DNA Research in Palaeoanthropology

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The retrieval of the first authentic Neanderthal DNA sequence from the type specimen from the Feldhofer Grotte by Krings et al. in 1997 was a milestone in the field of ancient DNA research. Since then, some more Neanderthal sequences have been published and one might speculate whether we are already on the way to Neanderthal population genetics. A significant improvement of DNA extraction techniques and PCR technology made such triumphs possible.

Ancient DNA is highly degraded and present only in minute amounts in a sample. A major concern is the authenticity of deduced DNA sequences. In particular, this is an issue in studies aimed to retrieve sequences from hominid remains. Usually, fossils have been handled by humans and the genetic experiments will be conducted by humans; hence, there is an extraordinary risk of contamination of samples with contemporary DNA that might be indistinguishable from the authentic one. In fact, it turned out that contamination of samples with contemporary human DNA is the rule rather than the exception and the very sensitive PCR is likely to amplify the contaminating DNA instead of the authentic DNA.

In my presentation I will summarize the state of the art of ancient DNA research with a particular focus on the impact of such studies on our understanding of human evolution. Furthermore, I will discuss the "criteria of authenticity" developed over the ensuing years in order to prevent dubious claims that might threaten the credibility of the field.

Krings M, Stone A, Schmitz RW, Krainitzki H, Stoneking M & Pääbo S, *Cell*, **90**, 19-30, (1997).

BG03 : THpm22 : G3 The Pattern and Timing of the Colonization of Europe by Modern Humans

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Abundant fossil evidence indicates that modern humans evolved outside of Europe. Despite nearly a century and a half of research across many parts of the continent, there is no evidence for the arrival of anatomically modern humans in Europe before ca. 40 ka. At sites including Vogelherd where early European modern humans have been recovered, their skeletal remains are found in association with Aurignacian artifacts that are characterized by innovative lithic and organic artifacts and abundant examples of art and ornament that go far beyond the range of variation documented among the material culture of indigenous Neanderthals (Bolus & Conard, 2000; Churchill & Smith, 2000).

The distribution of dates for the most convincing evidence for the Aurignacian and early Upper Paleolithic suggests that *Homo sapiens sapiens* arrived in Europe around 40 ka. The best evidence for this early phase of occupation comes, broadly speaking, from the Circum-Mediterranean area and the upper reaches of the Danube Valley (Richter et al., 2000). The observation that many very early and also very rich Aurignacian sites are well documented in the Swabian Alb, suggests an early settlement of this area which led to the elaborate cultural developments documented at sites including Sirgenstein, Vogelherd, Hohlenstein-Stadel and Geißenklösterle. These sites, among other important finds, have yielded the earliest artworks and musical instruments known from Europe. The *Kulturpumpe* model describes several potential mechanisms to explain these cultural innovations (Conard & Floss, 2000). Following this initial appearance of modern humans, Neanderthals and anatomically and culturally modern people coexisted in often spatially separate regions until ca. 25-30 ka when the last Neanderthals died out in the most peripheral parts of Europe.

This paper provides new dates for the Aurignacian of the Swabian Alb and archaeological analyses to test the hypotheses that the "Danube Corridor" and the Mediterranean coast provide the two key routes for the colonization of Europe. Ecological and chronological data testing the *Kulturpumpe* model will also be provided.

Bolus M & Conard NJ, *Quaternary International*, (2000).
Churchill SE & Smith FH, *Am. Journ. of Physical Anthrop.*, **112**, (2000).
Conard NJ & Floss H, *Archäologisches Korrespondenzblatt*, **30**, (2000).
Richter D, Waiblinger J, Rink WJ & Wagner GA, *Journ. of Archaeol. Science*, **27**, (2000).

BG03 : THpm23 : G3 Biogeographic and Cultural Change in Europe from the Last Glacial Maximum to the Early Holocene

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In the millennia following the establishment of modern humans and the replacement of Neanderthals in Europe around 30 ka, Upper Paleolithic populations were confronted with several major climatic shifts. With the Last Glacial Maximum around 20 ka, an obvious depopulation occurs in northern, central and eastern Europe. In this period the Solutrean arises in southwestern France and extends to the southern edge of the Paris Basin and across the Iberian Peninsula. Following the Solutrean an uninterrupted sequence of human occupation is documented in southwestern France from the Magdalenian to the Azilian and into the Mesolithic. In the central and eastern Mediterranean, the Epigravettian persists in various forms until the end of the Pleistocene.

Between ca. 22 and 14 ka only a few indications of human occupation are present in northern and central Europe at sites including Wiesbaden-Igstadt, Grubgraben and Stranska Skala. Thereafter, starting with the fully developed Magdalenian, improved environmental conditions supported a far greater population density across much of Europe. In northern Europe the Hamburg, Federmesser and Ahrensburg cultures represent regional variants in cultural development during the terminal Pleistocene. These and other cultures document specific populations' ability to find technological and other social-cultural solutions to problems they faced during the major climatic fluctuations before the onset of universally warmer conditions in the early Holocene. Finally, during the early Holocene further changes in lithic technology and other aspects of the material culture are documented in connection with the spread of more forested conditions and with the advances of populations into the most northern latitudes of Europe.

BG03 : THpm24 : G3 Inferences about Raw Material Selection and Hominid Behavior Based on Sourcing of Basaltic Artifacts from the Geshen Benot Ya'aqov Archaeological Site, Israel

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Previous geochemical studies have demonstrated that the raw material used to manufacture lithic tools can provide important information about prehistoric peoples and their behavior. We have used a non-destructive, energy-dispersive X-ray fluorescence approach to study the relationship between basaltic artifacts found at the Middle Acheulian archaeological site of Geshen Benot Ya'aqov in Israel and natural materials from the surrounding region. In particular, we compared the geochemical signatures of flakes, bifaces and giant corestones with those of volcanic rocks from nearby outcrops. Our data suggest that the corestones were collected from nearby locations and were actively utilized at the site as a source for flakes. On the other hand, most of the bifacial artifacts appear to come from specific volcanic outcrops that are located more than 1 kilometer from the Geshen Benot Ya'aqov site. We infer that bifacial blanks were transported back to the site from these more distant

locations and then re-worked there. The differences in source between the corestones and flakes on the one hand, and the bifacial artifacts on the other clearly indicates that there was conscious selection of raw material for biface production. This behavior pattern implies that the hominids at the Geshen Benot Ya'aqov site had extensive knowledge of their surrounding environment, were capable of making acute observations, could make subtle distinctions between materials with similar appearances, made specific choices of raw materials, had considerable mobility in the region around the site, were physically capable of carrying large objects, and made plans and stockpiled raw material. All of these cognitive mental abilities were contributing to hominid behavior over 750,000 kya.

BG03 : THpm25 : G3 Humans in the Russian Arctic Nearly 40,000 Years Ago

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It has been a common view that Arctic areas were not colonized by humans until the final stage of the Last Ice Age some 13-14,000 yr BP. However, ongoing investigations within the framework of the Russian-Norwegian research project "Palaeo Environment and Climate History of the Russian Arctic" (PECHORA) shows that humans had crossed the Polar Circle much earlier. Here we report excavation results from two Paleolithic sites in Russia: Mamontovaya Kurya and Byzovaya. At the site Mamontovaya Kurya, which is located at the Usa River close to the Polar Urals, we have uncovered a few stone artifacts, animal bones and a mammoth tusk with human-made marks from strata covered by thick Quaternary deposits. The tusk was radiocarbon dated to around 36-37,000 yr BP; three other dates of mammalian bones from the same layer yielded similar ages. The Byzovaya site is situated on the eastern bank of the Pechora River, some 300 km to the SW of Mamontovaya Kurya. Nearly 400 artifacts and more than 4000 animal bones (mainly mammoth) have been unearthed during several excavations of this site. A series of 13 radiocarbon dates from the find-bearing layers have yielded ages in the range 26-29,000 yr BP with a mean of around 28,000 yr BP.

A pressing question is whether the pioneers who lived in these northern landscapes were members of the ancient Neanderthal population (*Homo sapiens neanderthalensis*) or newcomers from the south (*Homo sapiens sapiens*). Even though we did not find any skeletal remains the stone working technology found in the Byzovaya material suggest that modern humans visited this site. However, whether the person who inflicted the marks on the tusk from Mamontovaya Kurya, nearly 10,000 years earlier, belonged to the same human lineage as the residents from Byzovaya is unknown. If he was a modern who descended from temperate areas as predicted by the "Out of Africa" hypothesis, then the Russian Arctic was occupied by this human species shortly after the first newcomers entered Europe. On the other hand, if he was a Neanderthal, then these humans expanded much farther north than hitherto assumed, implying that their stage of cultural development was not a barrier for colonization.