



Press Release

Oldest hominin possibly lived in Europe

Scientists find 7.2 million year old pre-human remains in the Balkans – New hypothesis about the origin of humankind

Tübingen, 23 May 2017

The lineages of chimpanzees and humans may have split several hundred thousand earlier than hitherto assumed, according to an international research team headed by Professor Madelaine Böhme from the Senckenberg Centre for Human Evolution and Palaeoenvironment at the University of Tübingen and Professor Nikolai Spassov from the Bulgarian Academy of Sciences. The researchers investigated two fossils of *Graecopithecus freybergi* with state-of-the-art methods and came to the conclusion that they belong to pre-humans. Their findings and their new theory, published in two papers this week in the journal *Plos One*, further indicate that the split of the human lineage occurred in the Eastern Mediterranean and not – as customarily assumed – in Africa.

The present-day chimpanzees are humans' nearest living relatives. Where the last chimp-human common ancestor lived is a central and highly debated issue in palaeoanthropology. Researchers have assumed up to now that the lineages diverged five to seven million years ago and that the first pre-humans developed in Africa. According to the 1994 theory of French palaeoanthropologist Yves Coppens, climate change in Eastern Africa could have played a crucial role. The two studies of the research team from Germany, Bulgaria, Greece, Canada, France and Australia now outline a new scenario for the beginning of human history.

Dental roots give new evidence

The team analyzed the two known specimens of the fossil hominid *Graecopithecus freybergi*: a lower jaw from Greece and an upper premolar from Bulgaria. Using computer tomography, they visualized the internal structures of the fossils and demonstrated that the roots of premolars are widely fused. "While great apes typically have two or three separate and diverging roots, the roots of *Graecopithecus* converge and are partially fused – a feature that is characteristic of modern humans, early humans and several pre-humans (*Ardipithecus* and *Australopithecus*)", says Madelaine Böhme.

The lower jaw, nicknamed 'El Graeco' by the scientists, has additional dental root features which suggests that the species *Graecopithecus*

Public Relations Department
Dr. Karl Guido Rijkhoek
Director

Antje Karbe
Phone +49 7071 29-76788
+49 7071 29-76789
Fax +49 7071 29-5566
karl.rijkhoek[at]uni-tuebingen.de
antje.karbe[at]uni-tuebingen.de

www.uni-tuebingen.de/aktuell

**Senckenberg Gesellschaft für
Naturforschung**
Press Contact

Dr. Sören Dürr
Leitung

Judith Jördens
Telefon +49 69 7542 1434
judith.joerdens[at]senckenberg.de

pressestelle[at]senckenberg.de
www.senckenberg.de/presse

freybergi might belong to the pre-human lineage. “We were surprised by our results, as pre-humans were previously known only from sub-Saharan Africa,” says Jochen Fuss, a Tübingen PhD student who conducted this part of the study.

Furthermore, *Graecopithecus* seems to be several hundred thousand years older than the oldest potential pre-human from Africa, the six to seven million year old *Sahelanthropus* from Chad. The research team dated the sedimentary sequence of the *Graecopithecus* fossil sites in Greece and Bulgaria with physical methods and got a nearly synchronous age for both fossils – 7.24 and 7.175 million years before present. “It is at the beginning of the Messinian, an age that ends with the complete desiccation of the Mediterranean Sea,” Böhme explains. David Begun, a co-author of this study from the University of Toronto, adds: “This dating allows us to move the human-chimpanzee split into the Mediterranean area.”

Environmental changes as the driving force for divergence

As with the out-of-East-Africa theory, the evolution of pre-humans may have been driven by dramatic environmental changes. The team led by Madelaine Böhme demonstrated that the North African Sahara desert may have been originated more than seven million years ago. The team concluded this based on geological analyses of the sediments in which the two fossils were found. Although geographically distant from the Sahara, the red-colored silts are very fine-grained and could be classified as desert dust. An analysis of uranium, thorium, and lead isotopes in individual dust particles yields an age between 0.6 and 3 billion years and infers an origin in Northern Africa.

Moreover, the dusty sediment has a high content of different salts. “These data document for the first time a spreading Sahara 7.2 million years ago, whose desert storms transported red, salty dusts to the north coast of the Mediterranean Sea in its then form,” the Tübingen researchers explain. This process is also observable today. However, the researchers’ modelling shows that, with up to 250 grams per square meter and year, the amount of dust in the past considerably exceeds recent dust loadings in Southern Europe more than tenfold, comparable to the situation in the present-day Sahel zone in Africa.

Fire, grass, and water stress

The researchers further showed that, contemporary to the development of the Sahara in North Africa, a savannah biome must have formed in Europe. Using a combination of new methodologies, they studied microscopic fragments of charcoal and plant silicate particles, called phytoliths. Many of the phytoliths identified derive from grasses and particularly from those that use the metabolic pathway of C₄-photosynthesis, which is common in today’s tropical grasslands and savannahs. The global spread of C₄-grasses began eight million years ago on the Indian subcontinent – their presence in Europe was previously unknown. “The phytolith record provides evidence of severe droughts, and the charcoal analysis indicates recurring vegetation fires,” says Böhme. “In summary, we reconstruct a savannah, which fits with the giraffes, gazelles, antelopes, and rhinoceroses that were found together with *Graecopithecus*,” Spassov adds.

“The incipient formation of a desert in North Africa more than seven million years ago and the spread of savannahs in Southern Europe may have played a central role in the splitting

of the human and chimpanzee lineages,” says Böhme. She calls this hypothesis the *North Side Story*, recalling the thesis of Yves Coppens, known as *East Side Story*.



El Graeco (*Graecopithecus freybergi*) lived 7.2 million years ago in the dust-laden savannah of the Athens Basin. Painting by artist Velizar Simeonovski according to scientific instructions of Madelaine Böhme and Nikolai Spassov (view from El Graeco’s place of discovery, Pyrgos Vassilissis, to the southeast over the plain of Athens and under a reddish cloud of Sahara dust; in the background: Mount Hymettos and Mount Lykabettos).

Painting: Velizar Simeonovski, Chicago



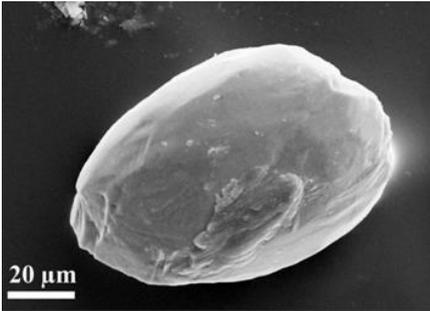
Lower jaw of the 7.175 million year old *Graecopithecus freybergi* (El Graeco) from Pyrgos Vassilissis, Greece (today in metropolitan Athens)

Photo: Wolfgang Gerber, University of Tübingen



7.24 million year old upper premolar of *Graecopithecus* from Azmaka, Bulgaria.

Photo: Wolfgang Gerber, University of Tübingen



Electron microscope image of a dust particle rounded by eolian transport. It originated in the Sahara desert and was found in 7.2 million year old sediments in Greece.

Photo: Ulf Linnemann, Senckenberg

Publications:

Jochen Fuss, Nikolai Spassov, David Begun, Madelaine Böhme: Potential hominin affinities of *Graecopithecus* from the late Miocene of Europe. *PLOS ONE*, <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0177127>

Madelaine Böhme, Nikolai Spassov, Martin Ebner, Denis Geraads, Latinka Hristova, Uwe Kirscher, Sabine Kötter, Ulf Linnemann, Jerome Prieto, Socrates Roussiakis, George Theodorou, Gregor Uhlig, Michael Winklhofer: Messinian age and savannah environment of the possible hominin *Graecopithecus* from Europe. *PLOS ONE*, <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0177347>

Contact:

Professor Madelaine Böhme
University of Tuebingen
Senckenberg Center for Human Evolution and Palaeoenvironment (HEP Tuebingen)
Phone +49 7071 29-73191
m.boehme@ifg.uni-tuebingen.de
www.paleo.uni-tuebingen.de

Professor Nikolai Spassov
National Museum of Natural History Sofia, Bulgarian Academy of Sciences
nspassov@nmnhs.com

Professor David Begun
Department of Anthropology, University of Toronto, Canada
 [begun@chass.utoronto.ca](mailto: begun@chass.utoronto.ca)

The University of Tübingen

The University of Tübingen is one of eleven universities given the title of excellent under the German government's Excellence Initiative, and ranks well in international comparisons. Tübingen is one of the world's foremost locations for neuroscientific research. Along with translational immunology and cancer research, microbiology and infection research, and molecular plant biology, it makes Tübingen a cutting-edge center of research in the Life Sciences. Further areas of core research are in Geoscience and Environmental Science; Archaeology and Anthropology; Language and Cognition; and Education and the Media. More than 28,400 students from Germany and around the world are currently enrolled at the University of Tübingen, enjoying a broad spectrum of some 300 different study programs.

Senckenberg Nature Research Society

To study and understand nature with its limitless diversity of living creatures and to preserve and manage it in a sustainable fashion as the basis of life for future generations – this has been the goal of the Senckenberg Gesellschaft für Naturforschung (Senckenberg Nature Research Society) for 200 years. This integrative

“geobiodiversity research” and the dissemination of research and science are among Senckenberg’s main tasks. Three nature museums in Frankfurt, Görlitz and Dresden display the diversity of life and the earth’s development over millions of years. The Senckenberg Nature Research Society is a member of the Leibniz Association. The Senckenberg Nature Museum in Frankfurt am Main is supported by the City of Frankfurt am Main as well as numerous other partners. Additional information can be found at www.senckenberg.de.

200 years of Senckenberg! 2017 marks Senckenberg’s anniversary year. For 200 years, the society, which was founded in 1817, has dedicated itself to nature research with curiosity, passion and involvement. Senckenberg will celebrate its 200-year success story with a colorful program consisting of numerous events, specially designed exhibitions and a grand museum party in the fall. Of course, the program also involves the presentation of current research and future projects. Additional information can be found at: www.200jahresenckenberg.