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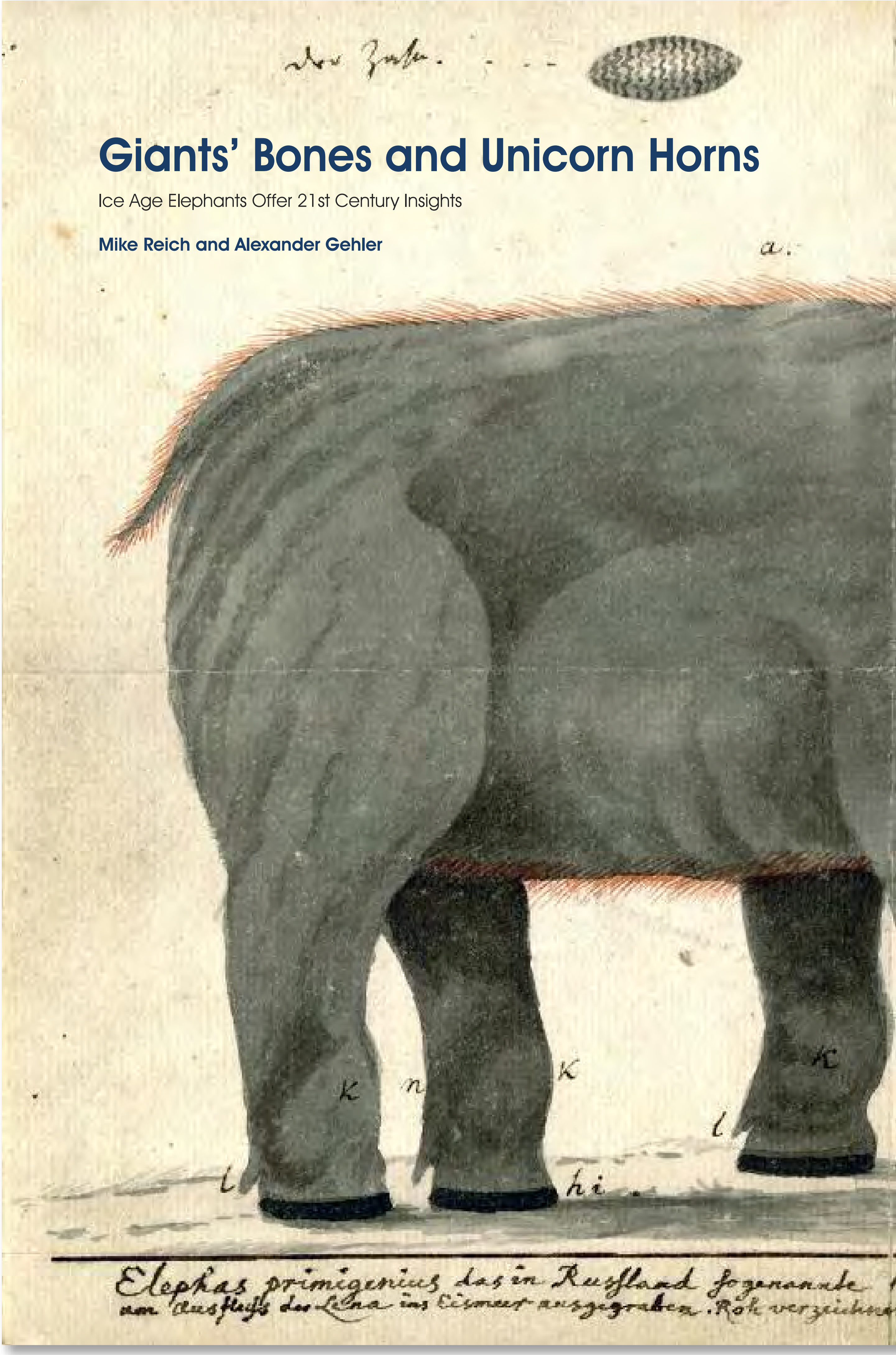
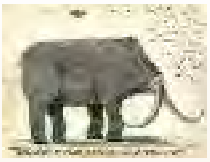
Giants' Bones and Unicorn Horns

Ice Age Elephants Offer 21st Century Insights

Mike Reich and Alexander Gehler



The Georgia Augusta's collections are home to numerous original specimens and valuable findings from the early days of research into large Ice Age-era mammals such as the woolly mammoth, the woolly rhinoceros and the giant deer. Although they were unearthed and described more than 200 years ago, scholars in the natural sciences and humanities still frequently refer to them for their research.



The world's first reconstruction drawing of a mummified mammoth carcass – the so-called 'Adams or Lena mammoth' – discovered by the Tungus (Evenk) Osip Šumakov in the Lena Delta in the summer of 1799 and excavated by the German-Russian botanist Johann Friedrich Adam (1780–1836) in August 1806. The drawing was made on site in 1805 by the merchant Roman Boltunov from Yakutsk and taken by Adams, along with the segmented corpse, to the *Kunstkamera* (today the Museum of Anthropology and Ethnography of the Russian Academy of Sciences) in St. Petersburg. The original drawing is no longer there. Copies created at the time were sent to Johann Friedrich Blumenbach in Göttingen and Georges Cuvier in Paris. The caption is in Blumenbach's hand: "Elephas primigenius, the so-called mammoth in Russia, excavated with skin and hair in June of 1806 at the outlet of the Lena into the Arctic Sea. Roughly drawn just as it was found, truncated and filthy". The additional notes found to the top left of the drawing are by Wilhelm Moritz Keferstein (1833–1870), Professor of Zoology at Göttingen University between 1861 and 1870. (Original in the Ethnographic Collection of the University of Göttingen)

Ice Age Elephants

Today, thanks to the media, everyone knows the woolly mammoth, *Mammuthus primigenius*, as the symbol of the last ice age (Pleistocene). What is less known is that it also helped to overcome widespread disbelief regarding extinct species and therefore made a significant contribution towards the acceptance of palaeontology as a science. Belonging to the elephant family (Elephantidae), the woolly mammoth (Fig. 2), alongside the woolly rhinoceros, the giant deer and the cave bear, is one of the most well-known and striking faunal elements from the so-called Weichselian glacial period in the Early Pleistocene (Fig. 3-4).

The ancestor of the woolly mammoth is considered to be the steppe mammoth *Mammuthus trogontherii*. In the early Middle Pleistocene (around 700,000 years ago), the dental morphology of its north-east Siberian representatives had already begun to change decisively in the direction of the later *M. primigenius*. In Europe, the woolly mammoth appeared for the first time around 200,000 years ago at the time of the Saalian glacial period. In the (warmer) Eemian interglacial period that followed, it withdrew again, roaming to the west once more during the late phase of this period. In the subsequent cold phase – the Weichselian glacial period – the woolly mammoth reached its maximum distribution and was native to almost the entire region of Eurasia. It also advanced across the frozen Bering Strait as far as North America, particularly into what is now Alaska and Canada [1].

The Woolly Mammoth

Mammuthus primigenius preferred open countryside and was morphologically adapted to the tough grass and scrub vegetation of the glacial loess steppes and steppe-tundra. In size, the woolly mammoth was roughly comparable with today's elephants: large bulls reached a shoulder height of up to 3.75 metres, while female animals were considerably smaller. This means that, compared with its ancestors and relatives, it is among the smaller representatives of the mammoth lineage. Probably the most striking characteristics of the woolly mammoth were its thick hair, adapted to the climate conditions of the Ice Age, and the tusks which were extremely imposing, especially on males, curving upwards and inwards in a spiral shape [1].

With the end of the Weichselian glacial period, the days of the woolly mammoth were also numbered. It successively disappeared, first from western and central Europe, western Siberia and the Ural region, and eventually also in north-eastern Europe and in north and north-eastern Siberia. Isolated 'dwarfed' populations survived on islands in the Arctic Ocean (Wrangel Island) and the Bering Sea (Saint Paul Island) into the middle or even late Holocene until just under 4,000 years ago [3].

The changes in landscape vegetation resulting from the warmer Holocene climate are considered to be the main cause of the ex-

Fig. 2.
Reconstruction of the woolly mammoth *Mammuthus primigenius* in the exhibition of the Royal British Columbia Museum in Victoria, Canada.

tinction of the woolly mammoth. The human aspect, especially the hunting of this large mammal, continues to be a subject of controversial debate [2].

Of Myths and Folkloric Traditions

What remained of the ice-age giants and their ancestors was a large number of relics of fossil elephants in Pleistocene sediments, and very early on these laid the foundation for myths and legends in the local populations. The finding of large bones and molar teeth led people to believe in the existence of giants and other mythical creatures, and tusks were often thought to be unicorn horns.

In northern Asia, mammoth carcasses found in the permafrost, some of them completely preserved, gave rise to the assumption that there were giant animals living underground. In medieval and early modern Europe, the remains of the woolly mammoth and its relatives were displayed in many churches, town halls and other public buildings as alleged giants' or dragons' bones. In the 16th and 17th centuries, belief in the unicorn was also very widespread along with the belief that fossils were inorganic natural anomalies. From the late 16th century, however, the voices of scholars were increasingly heard who linked the supposed 'giants' bones' and similar objects to skeletal elements of elephants, which were already known to some degree in Europe by that time (e.g. J. G. Becanus 1569, J. Riolan 1613, W. E. Tentzel 1696) [1].

With the first published anatomical descriptions of modern elephants at the end of the 17th and beginning of the 18th century, the correct identification of fossil elephant remains was accelerated. Scholars now only disputed the question as to how the bones and teeth had come to Europe. In those days, it was very popular to believe that they were the relics of animals that had been brought to Europe in the past as war elephants or state gifts for the amphitheatres of ancient Rome. Equally widespread was the assumption that they were the remains of animals that had been washed ashore by the biblical great flood.

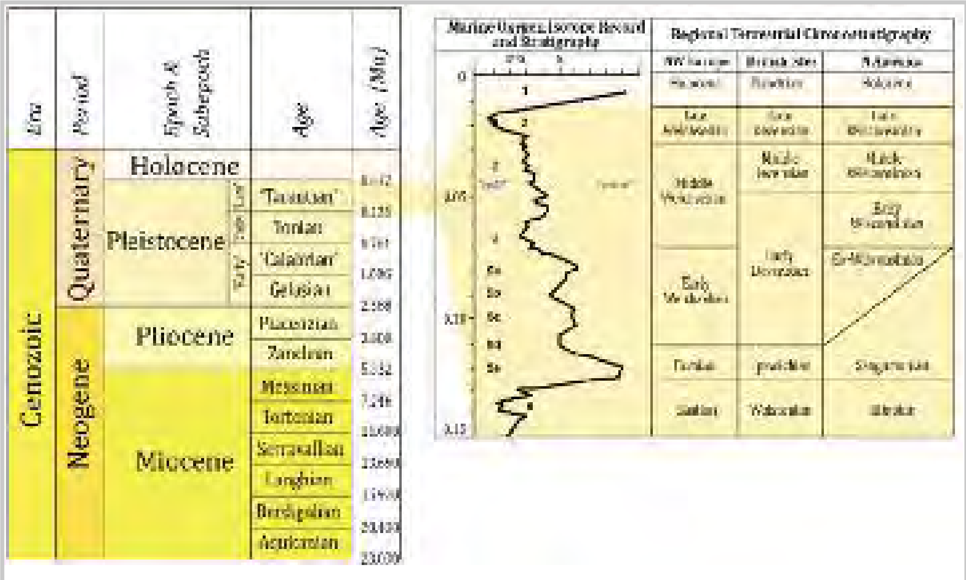


Fig. 3.
Time scale of the Pleistocene with alternating glacial and warm periods.

The Georgia Augusta and its Ice Age Mammals

This was also the period of the founding of Göttingen University in 1737. Less than 20 years later, professor Samuel Christian Hollmann (1696–1787) was already taking an intense interest in the remains of large ice-age mammals. Around 1750 he received the first remains from the southwestern edge of the Harz mountains, particularly those of the woolly rhinoceros, but also woolly mammoth bones. Later he obtained further mammoth material from the Harz, but only commented indirectly on its origin (in 1776) by endorsing a thesis according to which the 'mammoth bones' found in the Great Tartary and Siberia were the remains of former war elephants [1, 4].

A significant role in disputing the two above-mentioned assumptions about the provenance of the elephant remains discovered in Europe was played by Johann Heinrich Merck (1741–1791). In a short work *Über den Ursprung der Fossilien in Teutschland (On the Origin of Fossils in Germany)* in 1784 he explained these assumptions to be untenable with very detailed, well-founded arguments. The years that followed were marked by lively discussions about the differences between the distinct teeth of modern and fossil elephants by the leading anatomists in this field at the time, Johann Friedrich Blumenbach

Fig. 4.
Mammal faunal elements of the ice-age Mammoth Steppe, a hybrid of steppe and tundra vegetation, in the Eurasian Pleistocene. From v. Koenigswald (2002), modified.

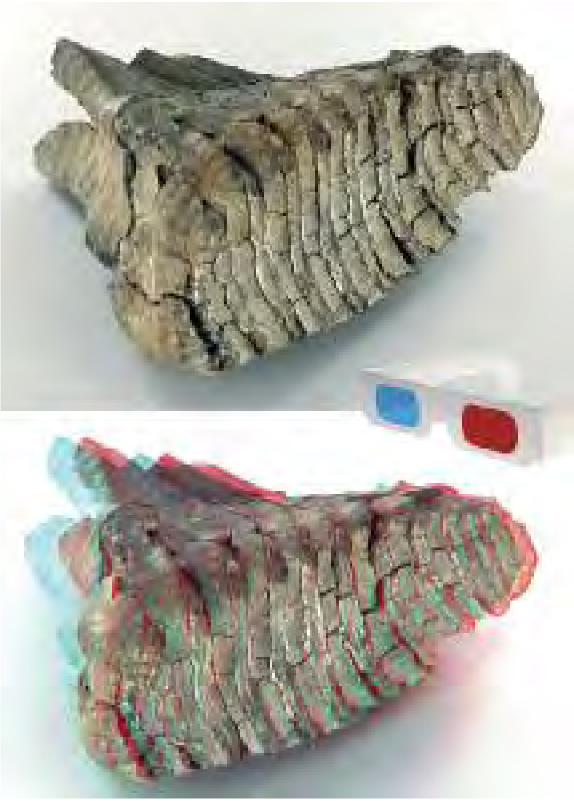


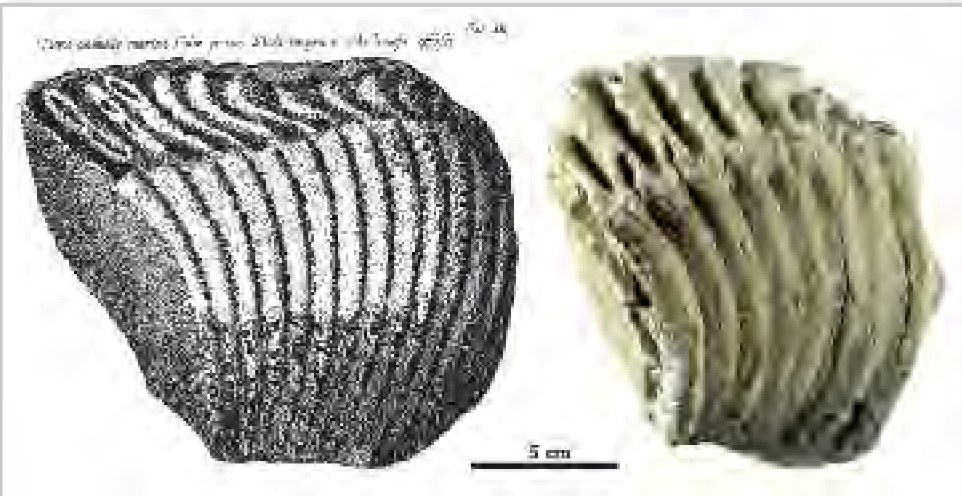
Fig. 5.
Lower left molar of a woolly mammoth from western Siberia. A gift from Baron Georg Thomas von Asch to Johann Friedrich Blumenbach at the end of the 18th century. Photographic images – 2D and stereoscopic pictures (anaglyph image) – as part of the project 'Johann Friedrich Blumenbach – Online'. (Geoscience Museum Göttingen)

Research: Establishing the Age of Bone Material

Radiocarbon dating, also called the ^{14}C dating method, is a technique for radiometrically determining the age of materials – above all organic ones – that contain carbon. Developed in 1946, the method is based on the decline, according to the law of decay, of radioactive ^{14}C atoms bound into dead organisms. This technique can be used for ages between approx. 55,000 and 300 years. Dating carried out on the collection material described in the text yielded the following ages (years B):

- Mummified skin and hair from the 'Adams mammoth' from the Lena Delta from the Blumenbach collection: 34,450 ± 2,500
- Molar tooth from Salzgitter-Thiede from the Leibniz collection: 34,240 ± 200
- Molar tooth from Osterode from the Blumenbach collection: 34,340 ± 230 [5]

Fig. 6.
Probably lower left first molar (m1) of *Mammuthus primigenius* from the collection of Gottfried Wilhelm Leibniz – discovered in the mid-17th century in Salzgitter-Thiede. Some of the front lamellae have unfortunately broken off in the course of time. In his *Protogaea*, published posthumously in 1749, Leibniz still described it as the "tooth of a marine animal". (Geoscience Museum Göttingen)



(1786, 1788, 1791), Petrus Camper (1788), J. H. Merck (1786) and Georges Cuvier (1796) [1].

It was finally Blumenbach (1752–1840), adjunct professor from 1776 and full professor from 1778 as well as junior custodian (later senior custodian) of the Royal Academic Museum in Göttingen, who was the first to name the African elephant (*Loxodonta africana*) scientifically as a separate species. Two years later, he distinguished the woolly mammoth from the modern elephant species by designating an independent species (Blumenbach 1797, 1799) [1].

Blumenbach's research benefitted from the collection material that he already possessed when he came into office, along with numerous additional mammoth remains which he had been able to gather together primarily through his large, scientific network and by picking things up himself. This included bone material of a famous Swiss 'giant finding' (the Giant of Reiden) from 1577 (Blumenbach 1788), which is, unfortunately, missing today, along with what is probably a mammoth milk molar which formed part of the

Research: DNA Analyses of Mummified Mammoth Material

Various molecular-biological techniques can be used to clarify genetic changes and questions of kinship, gender, diseases, etc. With advancing technology, and since the sequencing of ancient DNA became more efficient in the 1990s, *Mammuthus primigenius* in particular has developed into a standard model for molecular systematics.

- The sequences gained from skin and hair material from the 'Adams mammoth' has been stored in the 'GenBank database' under the number EU153445 [6]

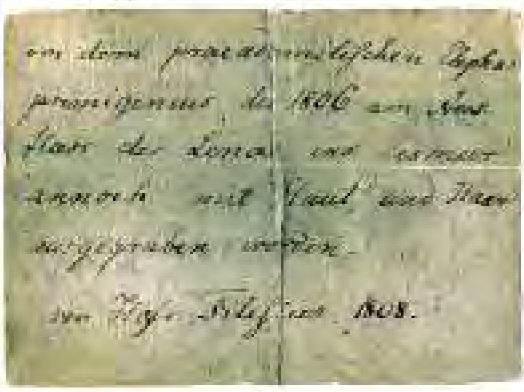


Fig. 7.
Piece of skin of the mummified carcass of *Mammuthus primigenius*. Discovered in the Lena Delta in 1799, but not excavated and transported to St. Petersburg until 1806.

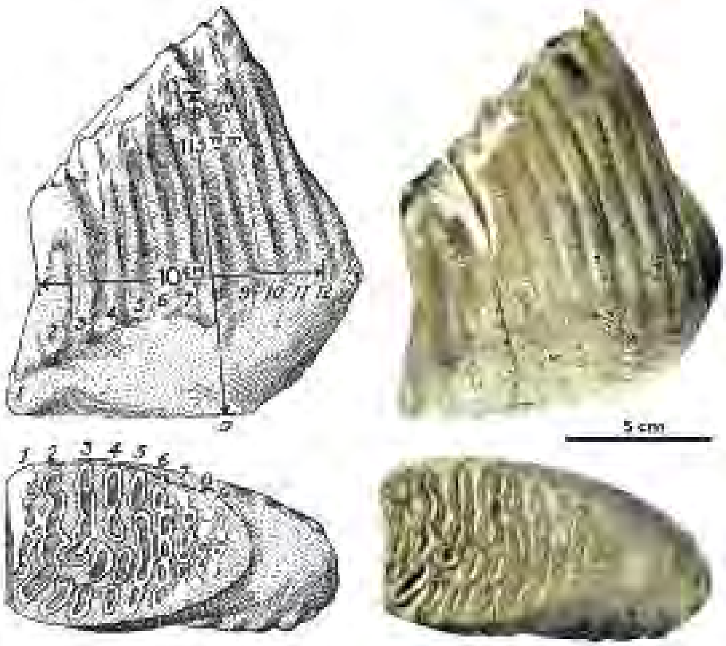


Fig. 8.
'Original', the so-called lectotype, of *Mammuthus primigenius* from Johann Friedrich Blumenbach's collection. This is an upper left molar (M1) from Osterode am Harz which the American vertebrate palaeontologist Osborn defined as type material for the woolly mammoth in 1942. (Geoscience Museum Göttingen)

ice-age mammal remains excavated in 1663 near Quedlinburg, and which were used by Otto von Guericke (1602–1686) for his famous unicorn reconstruction. In the collections of the Centre for Geosciences of the University of Göttingen, western Siberian material is still to be found. This was a gift from alumnus Baron Georg Thomas von Asch (1729–1807) and includes a molar tooth which Blumenbach presents in his 1797 *Abbildungen naturhistorischer Gegenstände (Illustrations of Natural History Objects)*, in which he still wrongly describes it, however, as that of an Asian elephant (Fig. 5). An additional molar, found in Thiede near Salzgitter, which was integrated into the Göttingen collections in 1777 as part of the acquisition of a collection from the Royal Library in Hanover, is from the natural history cabinet of the polymath Gottfried Wilhelm Leibniz (1646–1716). It was the original from which an illustration was made in his famous, posthumously published in 1749 *Protogaea, or A Dissertation on the Original Aspect of the Earth and the Vestiges of its Very Ancient History in the Monuments of Nature* (Fig. 6).

The 'Original' Woolly Mammoth

When in 1799 a mummified mammoth was found in the Siberian permafrost and retrieved in 1806 (the 'Adams' or 'Lena' mammoth), Blumenbach, as one of the leading experts, was so esteemed that one of the first reconstruction drawings of this animal (Fig. 1) and samples of skin and hair (Fig. 7) were made available to him for his collection. From numerous, primarily German find sites, Blumenbach obtained fossil elephant material to further supplement his collection at the beginning of the 19th century.

A bone bed of ice-age mammals discovered between Osterode and Dorste (am Harz) in the spring of 1808 provided Blumenbach with additional, extensive woolly mammoth material (Blumenbach 1808) as well as with food for lively discussion in his correspondence with Johann Wolfgang von Goethe (1749–1832). A molar tooth from this find complex (along with a second one from Siberia) was drawn in the middle of the 20th century by the then very famous American vertebrate palaeontologist Henry F. Osborn (1857-1935) and defined as type material for the species *Mammuthus primigenius* (Fig. 8) [1, 5]. This was done according to the practice of the International Commission on Zoological Nomenclature (ICZN), which had not existed in Blumenbach's day.

When these pieces could not be located in the 1980s, they were considered to have been lost in the Second World War and a so-called neotype was established by Russian Scientists. In the course of work done on the Göttingen collections over the last eight years, however, one piece of the unlabelled type material was rediscovered (Fig. 8) [1, 5].

Dr. Mike Reich, born in 1973, studied geology, palaeontology, zoology and chemistry at the University of Greifswald, where in 2000 his diploma work on microfossils won the Pomeranian Science Prize. He received his doctorate with distinction from the University of Innsbruck in 2002, and after various museum and curator positions came to the University of Göttingen in 2003. Since 2004 he has been curator of the Geoscience Collection. Between 2006 and 2009 he held the position of interim professor in Göttingen as well as guest lecturer at the universities of Hanover and Xi'an (China). In total he has more than 100 scientific publications to his name.

Dipl.-Geowiss. Alexander Gehler, born in 1978, studied geosciences with specialisations in palaeontology, zoology and geophysics in Göttingen. His early work experience included internships in various museums as well as student assistantships. After completing his diploma work on ice age mammals in the geoscience collections he was employed at the Geoscience Museum, where he was among other things responsible for the conception and implementation of several special exhibitions. Since 2009 he has been working on a Ph.D. in the isotope geology division of the Geoscience Centre.

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The Geoscience Museum and its Collections

The Museum of Geological Sciences of the University of Göttingen, also called the Geoscience Museum, is one of the few museums in Lower Saxony with publicly accessible exhibition areas on topics related to geology, mineralogy and palaeontology.

The roots of the Geoscience Collections in Göttingen go back to an initial natural history cabinet from the time of the university's founding in 1737. In later years these collections were exhibited at the 'Royal Academic Museum' (1773–1840) as well as the city's 'Natural History Museum' (1877–1929), all the while continuing to expand in breadth and depth. The separate sections and museums into which the different geoscience collections had long been divided (e.g. the 'Mineralogical Museum' and 'Museum of Geology and Palaeontology') were brought together into one unit – the 'Geoscience Museum' – in 1999/2001.

The main focuses of the Göttingen Geoscience Collections are: (1) the collection of types and original specimens – covering more than 100,000 palaeontological, biological and mineralogical items and series – on more than 3,000 publications since 1724; (2) geoscience collections significant from a historical perspective, including the collections of Gottfried Wilhelm Leibniz (1646–1716) and Johann Friedrich Blumenbach (1752-1840); (3) the meteorite collection, founded in 1777 and expanded over the course of time, with more than 400 findings from around the world in 1,500 individual pieces; (4) the amber collection, including the former 'Königsberg Amber Collection'; (5) collections on the regional geology of Lower Saxony, Germany and Europe; (6-7) the extensive systematic palaeontological and mineralogical collections from all over the world, along with (8) the collections related to the study of fossil lagerstaetten, currently very much in demand for research.

Thanks to their steady expansion over three centuries, these collections currently make up more than four million objects and series in the Centre for Geosciences alone, making the University of Göttingen home to the fourth largest geoscience collection and the largest university geoscience collection in Germany.

Alongside the permanent exhibits, the Geoscience Museum presents varying special exhibitions on a whole range of topics. Researchers from the Faculty of Geoscience and Geography are involved in numerous international research projects across the globe. This enables us to keep presenting you with the latest findings from current research, alongside the public collections and special exhibitions.

Mike Reich

Photo:
Frank Stefan Kimmel

Talking Heads

Unearthing the Stories Behind the Skulls in Blumenbach's Collection

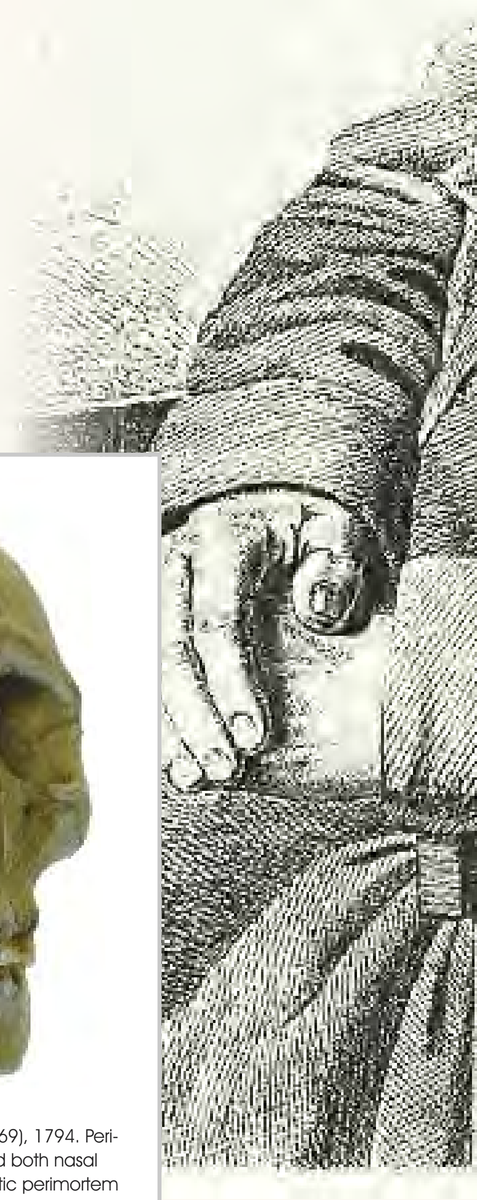
Michael Schultz

The Göttingen Skull Collection established by Johann Friedrich Blumenbach, professor of medicine at the University of Göttingen from 1776–1840, is probably the oldest preserved university skull collection worldwide. Blumenbach is widely considered one of the most important natural scientists of his time, and as one of the last universal scholars he did research in the various fields of medicine, zoology, paleontology, mineralogy and ethnology. He is called the 'Father of Anthropology' and was the 'First Comparative Anatomist'. His skull collection is based upon approximately 300 skulls which he partly used to write his thesis in 1775 entitled *De generis humanis varietate nativa (On the natural varieties of the human species)*. There, he described the natural, i.e. biological diversity of the morphology of humankind, and differentiated between five principal morphological varieties of anatomical man. It is important to know that he did not establish a racial ideology; however, this was frequently alleged. The five skulls representing prototypes of the anatomical varieties are still today part of the Blumenbach Skull Collection of the Department of Anatomy (Figs. 1 and 2).

During his academic career, Blumenbach continually received human skulls from scholars, friends

Fig. 1.
Female skull from Georgia (Caucasus).
Blumenbach No. 119 (new number 546), 1790 (?).

Fig. 2.
Male skull from Tahiti. Blumenbach No. 36 (n.n 769), 1794. Perimortem cut of right nasal process of maxilla and both nasal bones by a blade weapon (arrows) and traumatic perimortem breakage of the zygomatic process of the right maxilla and the maxillary process of the zygomatic bone.



J. F. Blumenbach

Fig. 3.
Head of an Egyptian mummy.
Blumenbach No. 25 (n.n. 641), 1796.

Fig. 4.
Trophy skull of a male from Nukahiva (Polynesia).
Blumenbach No. 38 (n.n. 748), 1808.

and colleagues, including Sir Joseph Banks, Baron Georg Thomas von Asch, Alexander von Humboldt, Johann Wolfgang von Goethe and Franz Joseph Gall. As Blumenbach was a member of the Medical Faculty and the content of the collection clearly belonged to the scientific field of anatomy, the skulls along with other constituent parts of Blumenbach's collections were bought after his death in 1840 by the University of Göttingen. The anatomist and surgeon Konrad Johann Martin Langenbeck (1776–1851) integrated the skull collection into the collections of the Institute of Anatomy, and it was subsequently supplemented by Langenbeck's successors, including Jacob Henle and Friedrich Merkel.

There had been a comprehensive catalogue containing detailed descriptions of the exhibits which also included the results of several anthropological investigations (e.g., Wolfgang Hauschild). Unfortunately, this catalogue burnt at the end of World War II when the 'Anatomical Theatre', as the Institute of Anatomy was called, was destroyed by bombs. Fortunately the skull collection survived thanks to Erich Blechschmidt, the director of the department at that time, who relocated the skulls to the small village of Bremke outside Göttingen. For most of the collection, therefore, very little information exists; on a few skulls, however, there are some short descriptions written by Blumenbach which give us some insight into their origin. In addition, some years ago a project was established that deals with the estate of Blumenbach's letters and hand-written texts, which might shed some light upon the origin of the other skulls. Additionally, several skulls were re-examined with main emphasis on pathological changes (cf. Figs. 2, 6-8) by the paleopathology research group at the Department of Anatomy. Today, the Blumenbach Skull Collection is part of the collections of the Department of Anatomy of the University of Göttingen and contains approximately 850 skulls and casts.

The Scientific Impact of the Blumenbach Skull Collection

The scientific value of the Blumenbach Skull Collection is beyond dispute. The collection includes not only anatomically, but also anthropologically, archaeologically, ethnologically and historically interesting exhibits. For instance, the Bavarian King Ludwig I gave Blumenbach an ancient skull excavated in a tomb of the Etruscan necropolis at Tarquinia in 1834. Furthermore, the collection includes an ancient Egyptian mummy head which probably was dissected by Blumenbach himself (Fig. 3). Originally, this head was in possession of the Royal Society of London and was given to Blumenbach by Thomas Turner in 1796. Even Goethe contributed exhibits to this collection. For instance, when Goethe returned from his second trip to Italy, he provided Blumenbach with a cast of the skull of the famous Italian painter of the High Renaissance, Raffaello Santi. However, the allocation of the skull from which the cast has been made is problematic.

Interesting exhibits of ethnological interest are a Polynesian skull from Nukahiva (Fig. 4) and a Melanesian skull from New Caledonia (Fig. 5). At first sight, both skulls show the same morphological feature: an artificial wooden 'nose'. However, the skull from Nukahiva is a trophy skull and has a rough wooden plug in the anterior bony aperture of the nose which is completely blocking this opening (in this skull, also the mouth is closed by a kind of bandage), while the skull from New Caledonia is an ancestor skull and shows a stylised wooden nose which is carefully carved, has an opening for some decorative elements (e.g. feathers) and is fixed in the median plane of the nose aperture. Additionally, the base of the Polynesian trophy skull had been broken to enlarge the occipital foramen, probably to remove the brain. This traumatic lesion suggests cannibalism, something that has been found in skulls dating all the way back to Neanderthal times. As for the artificial 'noses', there are two different theories. In the case of the trophy skull, the owner of this skull was probably trying to protect himself from the victim's spirit by closing the nose and the mouth. In the case of the ancestor skull, the artificial nose was probably thought to make the skull complete and thus more aesthetically pleasing.

The Blumenbach Skull Collection is also of current medico-historical interest (Schultz 2007; Schultz and Kuhn 2001), in particular the pathological aspects currently being studied by the paleopathology research group. Many of these skulls, for instance, exhibit vestiges of diseases caused by deficiency (e.g. scurvy) or infection (e.g. syphilis). A few skulls which came from South-East Asia (e.g. Burma) exhibit the rare features of anemia (Fig. 6), which might be due to malaria. Interestingly, all of these skulls date to before the development of antibiotics. Therefore, the morphological features which are observable in this collection and which are characteristic of various diseases are, as a rule, completely developed without limitation due to antibiotic treatment and teach us today about the pure morphology of lesions characteristic of such diseases.

There are also skulls which reveal vestiges of violence (e.g. blunt trauma, surgical procedures). Here, two examples stand out. The first case is a skull from Melanesia (Fig. 7) which, according to a small label, was brought to Europe possibly by the explorer Captain James Cook. This is a skull of a juvenile male which exhibits vestiges of blade weapons (e.g. a European sabre). The young islander did not survive these blows (Fig. 8: black arrows), one of which caused a gaping crack in the skull (Fig. 7: white arrows). The second case represents a trepanned skull from Russia that Blumenbach received from Baron von Asch who was at that time a military surgeon of the Russian Tsar at St. Petersburg (Fig. 8). The skull vault of this adult male shows two scars which are closely situated left to the sagittal suture (the seam running between the skull's two halves) and represent the remnants of a blunt trauma (Fig. 8: arrows). This trauma probably damaged a blood vessel of the meninges, and since as a rule such bleeding is fatal without surgical intervention, an operation was necessary. The difficulty of such an operation in this case would have been its location close to the sagittal sinus, an important venous blood conduit situated just below the sagittal suture. If the operator had damaged the sinus, this 18th-century patient would most certainly have died. Fortunately, as the morphology of the operation wound illustrates, this patient survived for many years, leading to the conclusion that the operator must have been an exceptionally gifted surgeon. The operation itself was performed using a cranial trepan, a surgical instrument shaped like a crown which creates a round hole by rotation. Described as far back as Hippocrates' texts written in the 5th century B.C., similar instruments are still in use today. However, as the results of paleopathological investigations on ancient skulls show, the mortality rate due to this technique was a relatively high 25 to 50% (Schultz 1993). As Figure 8 also demonstrates, several years after the op-

Fig. 5.
Ancestor skull of a male from New Caledonia (Melanesia).
Old No. 523 (n.n. 740), 1880.

Fig. 6.
Male skull of a Burmese exhibiting severe changes due to anemia (*porotic hyperostosis*).
Blumenbach No. 120 (n.n. 589), 1832.

Fig. 7.
Male skull of a juvenile from New Hebrides (Melanesia) with three perimortem injuries caused by blade weapons. One blow delivered from the back met the vertex of the skull vault (Fig. 8: black arrows), penetrated the bone and caused a gaping crack (Fig. 8: white arrows).
Blumenbach (?) or old No. 719 (n.n. 533), year unknown.

eration this individual suffered from a severe inflammation of the scalp, which eventually healed up after ravaging the external surface of the skull vault (Fig. 8a).

The Blumenbach Skull Collection thus contains important reference cases that are valuable for research across a wide variety of fields, including paleopathology (deficiency and infectious diseases in the past), forensic anthropology and legal medicine (trauma, scalping) and the history of medicine (surgical interventions). These cases inform us about the nature and the etiology of diseases as well as the abilities – and inabilities – of medical doctors in earlier days. ◀

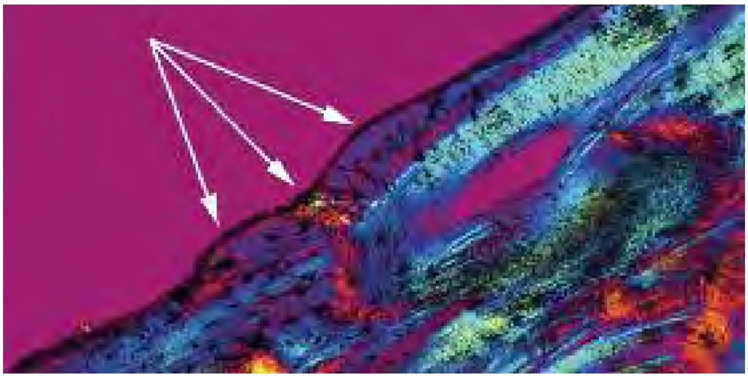


Fig. 8a.
Cross section through the external surface of the skull of a Russian (same as in Fig. 8). Vestiges of scarring (arrows) after severe scalp infection. Undecalcified thin ground sections (thickness 70µm) viewed through the microscope in polarised light using a hilfsobject red 1st order (quartz) as compensator. Magnification 100x.

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Fig. 8.
Male skull of a Russian from St. Petersburg showing healed blunt trauma (arrows), healed trephination and vestiges of severe scalp infection. Blumenbach No. 181 (n.n. 460), 1797.

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Secrets of the Bog Bodies

Bog bodies are naturally preserved human corpses found in the sphagnum bogs of Northern Europe. As archaeological skeletons and mummies they are also bio-historical documents, giving us insight into the lives of people who lived long ago. But how can we find out what they have to say? For this we need the methods and techniques of paleopathology, a relatively new scientific field situated at the convergence between medicine, physical anthropology and archaeology. Paleopathology explores the nature, the scope and the frequencies of diseases within an ancient population. The results of an extensive paleopathological investigation allow, of course within certain limits, to reconstruct the biography of an ancient individual. This was performed in the context of a scientific project initiated by the State Archaeologist of Lower Saxony and carried out by the Universities of Hamburg and Göttingen. Most of the bog bodies date back to the Iron Age. At this time, however, cremations were common. As cremated bones give relatively little information on the dead person and their living conditions, bog bodies represent a rare and valuable find for archaeologists. The most interesting case of a bog body from northern Germany is presented here.

In 2000 the bog body of 17-19-year-old female, named 'Moora' by the archaeologists, was excavated in the Uchter Moor south of Hamburg. Beginning in childhood this young female had undergone several phases of arrested growth, possibly caused by malnutrition or infectious diseases. Her skeleton is exceptionally well preserved, also in its microstructure (see figure). Two healed impression fractures on the external surface of the frontal bone due to blunt skull trauma document rough living conditions. On the skull base sits a small spongy tumor, which might have been the cause of her death. On the endocranial surface of the skull, vestiges of meningeal reactions are visible (probably tuberculous meningitis). Porotic orbital roofs represent an inflammatory process which was induced by penetrating chronic sinusitis frontalis (inflammation of the sinuses). Vestiges of inflammatory processes in the nasal cavities, on the adjoining surface of the external nasal apeture and the intraorbital surface of the upper jaws complete the impression of unpleasant living conditions. Also the postcranial skeleton tells us about the labored and painstaking life of this young female. Her spine was slightly scoliotic (crooked) and in the upper back moderately kyphotic (hunched), probably due to inadequate physical strength. Furthermore, pathological alterations in the form of longitudinal striation on the surfaces of the long bones of the legs suggest chronic nutritional deficiency (e.g. scurvy) or infectious diseases. Several months before her death, 'Moora' also suffered from a traumatic lesion of the pelvic sacroiliac joint.

Although we have evidence of many diseases 'Moora' suffered from, we do not know the cause of her death 2650 years ago. Quite possibly, she just became a sudden victim of the moor.

Michael Schultz

Cross section through left femur of the bog body 'Moora'. Compact bone substance. Undecalcified thin ground sections (thickness 50μm) viewed through the microscope in polarized light using a hilfsobject red 1st order (quartz) as compensator. Magnification 200x.