It began all of 8,000 years ago. Contacts over a long period between southern Arabia and the Horn of Africa can be established archaeologically. Just how extensive southern Arabian influence on Ethiopia was is being investigated by the German Archaeological Institute in a project at Yeha funded by the German Research Foundation (DFG). Impressive evidence of these trans-regional contacts is provided by the Great Temple of Yeha. This remarkable monument is being restored with the help of local workers as part of a joint Ethiopian-German project under way since 2009. To stabilize the building, steel scaffolding began to be erected in autumn 2016, replacing a temporary scaffold structure.
The sunlike body pictured on the cover is in fact microscopic, measuring a mere 5 to 200 µm. The photo shows pollen from a species of geranium. Pollen grains are capable of surviving for thousands of years. They enable scientists to make inferences about plant cover at the time they were deposited and thus are indicative of climatic conditions in the far distant past. A highly involved preparatory process in the lab is necessary before pollen can be analysed under the microscope. Interpreting the findings after analysis is complex and requires a knowledge of ecology and biology, knowledge about climate in different periods, about wind direction and wind speed, and most particularly about the dispersal capacity of plant species.

At the German Archaeological Institute, pollen analyses as well as analyses of botanic macroremains are carried out by archaeobotanists in the Natural Science section.

Photo: Dinies

The exhibition is laid out on the plan of a temple complex with a full-scale model of a temple in the centre. Large-format photographs give an impression of Vietnam’s landscapes and cultures.

The biggest ornamental stone artefact from south-east Asia is the nephrite sceptre from Xom Ren, which measures 64 cm and is the biggest ornamental stone artefact from south-east Asia. It was discovered by chance in 2006 along with other funerary items in a late Stone Age grave at the site, and dates approximately to the 13th century BC.

“Relations between Germany and Vietnam are close and varied. Our countries are linked together by a cultural accord signed over 25 years ago and by a Strategic Partnership established in 2011. The good relations between Germany and Vietnam are also supported by the many interwoven biographies and the intensive cooperation in the cultural and educational sphere. It therefore comes as something of a surprise that “Treasures of the Archaeology of Vietnam” is the first exhibition of its scale on the cultural history of Vietnam to be held in Germany. The exhibition is the result of long-term planning and great enthusiasm. Thanks for this is due to the German Archaeological Institute, which is acting as principal curator and has shown real commitment to the project.”

From the foreword to the catalogue, jointly written by German Foreign Minister Frank-Walter Steinmeier and Vietnam’s Minister of Culture, Sport and Tourism, Nguyễn Ngọc Thiện, patron of the exhibition.
DEAR READERS,

Interest in the past has always been linked with the natural sciences. Rudolf Virchow, for instance, was instrumental in founding the Berlin Anthropological Society in 1869, which later became the Berlin Society for Anthropology, Ethnology and Prehistory. For a long time studies on human and animal evolution were only possible through studying the morphology of skeletons. It is therefore no new thing that archaeology and the natural sciences work together. What is new is the multiplicity of methods that have become available and continue to develop rapidly in parallel to advances in technology.

Since the discovery of the double helix of the human genome, DNA analysis has rapidly come to be a now indispensable method in medicine, criminalistics and archaeology too. The results of investigations into ancient DNA are now firmly part of the spectrum of archaeological sources. These and other methods offer insights into the kinship and migrations of human groups. In conjunction with natural science and classical archaeological investigations into climatic processes in times past, we are getting ever closer to a full understanding of humans in their respective environments in the ancient world. The reciprocal relationship of humans and nature is today a central question in archaeological excavations.

Answering this question depends on the cooperation of many disciplines. And if this kind of interdisciplinary research is to be successful, we need to refute, politely but firmly, British physicist and author C. P. Snow's declared belief in the irreconcilability of "the two cultures" – literature and humanities on one side and the sciences and technology on the other. Modern archaeological practice has no alternative: the two cultures must be brought together harmoniously and made to communicate so that sound, solid and above all comprehensive results can be achieved and so that archaeology can deliver on its mission to utilize knowledge of the past for the preservation of our cultural heritage. Modern archaeology can thus also serve as an example for other scientific disciplines.

In this issue, our Cover Story illustrates how the collaboration between archaeology and the natural sciences can function. And how international cooperation specifically can lead to ground-breaking results is shown in the Cultural Heritage section with a feature on Chinese-German activities at the Sacred Pond Pavilion in the Forbidden City, Beijing. The Panorama section proves the point that authors of archaeological manuscripts should never give up hope. It can happen that they get published 90 years after submission.

I hope you enjoy reading this issue of our magazine!

Prof. Friederike Fless
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ARCHAEOLOGY WORLDWIDE

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ARCHAEOLOGY WORLDWIDE
Natural sciences in archaeology

ArchäometrieNetzwerk Berlin-Brandenburg

Archaeometry has been applied in the field of archaeology for a long time already. In 2015 the “ArchäometrieNetzwerk Berlin-Brandenburg” was set up on the initiative of the Berliner Antike-Kolleg with the aim of intensifying cooperation on the institutional level. The archaeometry network is an association of over 20 natural science facilities in the Berlin/Brandenburg region. The investigative methods of archaeometry come from the disciplines of chemistry, physics, mineralogy, materials science, medicine and the life sciences. This therefore represents a substantial expansion of the research spectrum of archaeology. Age determination can now be put on a more secure footing. The materials investigated – such as stone, metals, ceramics, botanic macroremains and pollen, human and animal remains – can cast light on matters like the origin, dissemination, innovation history, trade routes and political relations of early cultures.

One of the key areas of application of archaeometry is ancient metallurgy. For example, mass spectrometry is capable of identifying the isotope signature for specific sites where metal ore was mined. Furthermore, chemical analysis and X-ray fluorescence analysis can provide data on the provenance of clay from which pottery was produced, enabling scientists to determine whether wares were locally produced or imported. Anthropology, archaeozoology and archaeobotany focus in on human life in the distant past. Human skeletal material is a source of data on way of life, nutrition and possible illnesses, while isotope analysis can recreate migration routes. The remains of various animal species allow inferences to be made about the means of subsistence of human communities as well as the domestication and breeding of animals. Analysis of plant remains and pollen is of use in reconstructing vegetation in the ancient world, whether naturally occurring vegetation or cultivated crops. Analyzing ancient DNA can reveal kinship within grave fields, for instance. Archaeometric methods are indispensable when it comes to reconstructing ancient landscapes and developing climate models for the past.

Members of the network include universities and colleges as well as museums and research facilities like the German Archaeological Institute, the Rathgen Research Laboratory belonging to the Staatliche Museen zu Berlin, the Federal Institute for Materials Research and Testing (BAM), the Helmholtz-Zentrum Berlin, the Leibniz Institute for Zoo and Wildlife Research, the Natural History Museum in Berlin, the German Research Centre Geosciences (GFZ) in Potsdam as well as companies active in the relevant fields.

“With its high density of research institutes and range of research specializations, the scientific region of Berlin-Brandenburg represents an outstanding environment for the development of new ideas,” says network coordinator Prof. Dr. Norbert Benecke, head of the Natural Science Section at the German Archaeological Institute (DAI).

More information can be found at the network’s website along with a glossary on the methods, technologies and study fields in archaeometry.

Photo: Gresky
An exhibition on half a century of research in Portugal

For 50 years the German Archaeological Institute (DAI) has been working at the Chalcolithic settlement site of Zambujal, north of Lisbon. The historical period under investigation extends from the end of the last ice age right up to modern times. Located very near to the Zambujal site is the municipal museum, Museu Municipal Leonel Trindade, where finds from these five decades of archaeological work are displayed. It is also hosting the exhibition “Histórias do Zambujal: 50 Anos do Instituto Arqueológico Alemão em Torres Vedras” (“Histories of Zambujal: 50 years of the German Archaeological Institute in Torres Vedras”).

The “histories” presented at the exhibition are those of Zambujal itself – a site that was occupied for about 1,000 years in the 3rd and 2nd millennium BC, the history of archaeological research there and in the surrounding area, and finally also the history of the Sazindro valley, where the geological evolution of a former bay has been investigated in interdisciplinary projects in collaboration with Institute of Pedology and the Prehistory Seminar of Johann Wolfgang Goethe University in Frankfurt am Main. The findings from these investigations were used to create a detailed landscape reconstruction.

The exhibition shows finds from the Mesolithic, Neolithic, Chalcolithic and Bronze Age, with Copper Age finds predominating. “That’s possibly because of the location of the settlements – the Neolithic ones were sited near the rivers, today buried under about 5 metres of sediment, while the Chalcolithic ones were on higher ground,” says exhibition curator Dr. Michael Kunst from the Madrid Department of the German Archaeological Institute (DAI). “But there could also have been demographic changes.”

Typical of Chalcolithic find assemblages are arrowheads with surface reworking, and specimens were found at many different spots in the settlement area as well as in the tombs.

The tombs are featured in a special atmospheric area of the exhibition – a darkened room where the only light comes from the display cabinets. Two models illustrate different types of tomb: a tholos (a circular chamber tomb) and a tomb under a rock shelf, possibly a hypogeum (a rock-cut chambered tomb). A tomb of the latter type was excavated by an American research team from Iowa University led by Katina Lillios. The museum’s entrance area presents the evolution of the Sazindro valley in a wider European and Mediterranean context, doing so through landscape reconstructions and the Holocene climatic curve. Culturally, politically and technologically the 4th millennium BC was a time of innovation, and the many innovations may have connected with climate change. Among other things, new weapons were invented, for instance arrowheads with surface reworking and above all the recurve bow, which later, in the mid 3rd millennium, played a major role in the Bell Beaker phenomenon and the emergence of a warrior ideology. “Recent scientific results indicate that this development may have originated from the region that today is Portugal’s Estremadura,” Kunst explains. The DAI’s investigations at Zambujal are an essential contribution to research in this field.

“Histórias do Zambujal. 50 Anos do Instituto Arqueológico Alemão em Torres Vedras”
Where: Museu Municipal Leonel Trindade in Torres Vedras (Lisbon District, Portugal)
When: until 31 December 2017
www.dainst.org/standort/madrid

From the Land of the Rising Dragon
Archaeological treasures from Vietnam on display in Germany for the first time

Vietnam, an emerging economic power in south-east Asia and a newly discovered dream destination for long-distance holiday-makers, is still terra incognita for most people, especially as regards the millennia-old and fascinating culture and the eventful history of this country bounded by the Mekong and the Red River. Now the unknown can be explored at a new exhibition, “Schätze der Archäologie Vietnams” (“Treasures of the Archaeology of Vietnam”), which displays archaeological finds that have never been seen before in this country. The exhibition opened on 6 October 2016 at the LWL Museum of Archaeology in Herne Westphalia. It will subsequently travel to the State Archaeological Museum in Chemnitz and the Reiss-Engelhorn-Museen complex in Mannheim. Under the scientific aegis of the German Archaeological Institute, the exhibition is the first to offer a comprehensive survey of archaeological discoveries in Vietnam from the past 50 years. In 2010, the citadel of Thang Long in Hanoi was inscribed on the UNESCO World Cultural Heritage List. The extraordinary excavation finds from the grand imperial buildings are the high point of the exhibition, which was organized by the museums and the German Archaeological Institute (DAI) with its partners in Vietnam and Germany. The remains of the previously unknown citadel were discovered in 2001 during building work in Hanoi. Archaeologists have been working systematically at the site since 2002 and have recovered rich finds of high-quality metal, terracotta, wood and stone artefacts and figures, along with weapons and objects of daily use.

“Vietnam is an absolutely thrilling place to work for archaeologists because the early cultural history has not been investigated in anything like the detail it has in many other regions," says Andreas Reinecke, chief curator of the exhibition and south-east Asia specialist at the DAI’s Commission for the Archaeology of Non-European Cultures. “Since the end of the 1950s, archaeological research has been carried out on the country’s historical heritage by Vietnamese and international partners. But outside Vietnam, little attention has been paid so far to the great achievements in research in recent decades, naturally because of the language barrier among other things.”

Modern Vietnam has been showing increasing interest in its own history and archaeology. Studying the past is useful for establishing one’s position in the present and determining one’s direction in the future. “German and Vietnamese archaeologists have been working together for 50 years now. On these excavations many discoveries have been made that have attracted international interest,” Reinecke says. The partners on the Vietnamese side are the Ministry of Culture, Sport and Tourism of the Socialist Republic of Vietnam, the Vietnam National Museum of History, the centre for the preservation of the ancient citadel of Hanoi, Hanoi City Museum and the Vietnam Institute of Archaeology. The patrons of the exhibition are German Foreign Minister Dr. Frank-Walter Steinmeier and Vietnam’s Minister of Culture, Sport and Tourism, Nguyễn Ngọc thiện. A book has already been published about the international preparatory conference on the great archaeology exhibition in Germany.

Curator Michael Kunst leading visitors round the exhibition. The glass cabinet beside him contains a reconstruction of the tholos de Barro, a chalcolithic tomb with a corbelled vault.
**Cultural contacts**

DFG approves long-term project on Yeha

There is evidence of long-distance links between southern Arabia and the northern Horn of Africa as early as the 6th millennium BC and it increases in the early 1st millennium BC. It is these later contacts that are the focus of a research project directed by Dr. Iris Gerlach of the Sana’a Branch (Orient Department of the German Archaeological Institute). The project is being carried out in collaboration with Prof. Norbert Nebes, Chair of Semitic Philology and Islamic Studies at Friedrich Schiller University in Jena. Since 2009, researchers at Yeha have been investigating the reasons for and mechanisms of cultural interactions between the southern Arabian and East African cultures on both sides of the Red Sea. They are also trying to gauge the extent of South Arabian influence on the northern part of the Horn of Africa. Impressive testimony to these contacts is provided by the "Great Temple" and a monumental, palace-like building at Yeha, which are both being examined and restored in a joint Ethiopian-German project.

The German Research Foundation (DFG) has now approved the long-term project “Cultural Contacts between South Arabia and Ethiopia: Reconstruction of the Ancient Cultural Region of Yeha (Tigray/Ethiopia)” for a period of 12 years. The project will further extend the DAI’s exploration of cultural contacts between the local population in Tigray and the Sabaeans, who migrated into that region from South Arabia in the early 1st millennium BC. The main focus geographically will be the site of Yeha, which, given its monumental architecture and the epigraphical evidence, can be regarded as the political and religious centre of this barely investigated and yet historically most significant region in the northern part of the Horn of Africa. The project will build on the known archaeological and epigraphic remains and the results expected from Yeha and the surrounding area. Furthermore it will analyze the emergence and transformation of the cultural region and identify possible continuance of traditions into the Axumite period. An important part in the research project is also to be played by the reconstruction of the palaeo-environment, the climatic history, and resource utilization.

The processing of archaeological finds is being coordinated and conducted by the DAI in Berlin, while the Friedrich Schiller University in Jena is responsible for the evaluation of the epigraphic sources and the investigations ensuing from that.

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**European Masters Programme in Classical Cultures**

DAI Rome is participating in the programme

The European Masters Programme in Classical Cultures has been in existence since the winter semester of 2009/10. The interdisciplinary study course is an international programme offered at eleven universities in eight European countries. It has already gained a high reputation for itself and places on the course are in high demand. The curriculum comprises the core subjects of Ancient History, Classical Philology and Classical Archaeology. In addition to excellent instruction, the programme includes opportunities for students to gain practical and relevant work experience, generally on placements at archaeological research facilities.

One such facility is the Rome Department of the German Archaeological Institute. Based on the research projects being conducted by the department, students can acquire in-depth knowledge of classical studies and archaeology in Italy and can contribute to ensuring that contacts and cooperation between German and Italian academics and researchers remain on a secure footing in the long term.

The universities taking part are, in Italy, Università degli Studi di Palermo, Università degli Studi di Perugia and Università degli Studi Roma Tre; in Germany, Hamburg University, Freiburg University and Westfälische Wilhelms-Universität Münster; in addition to universities in Austria, France, Poland, Greece and Turkey.
Cultural preservation

DAI and Germany’s foreign cultural and educational policy

The German Archaeological Institute is a scientific facility operating under the auspices of the Federal Foreign Office and as such it is a strong component of Germany’s foreign cultural and educational policy. In July 2016, responsibility for the DAI was transferred to the Cultural Preservation Task Force established for that purpose at the Foreign Office.

“Setting up a task force with sole responsibility for the DAI underlines once more what importance the DAI has for the Foreign Office,” declares Ronald Münch, director of the new task force. The DAI’s scientific excellence, its international network and its familiarity with its host countries, built up by the DAI in the course of its history, are a valuable foundation underpinning good cooperation internationally, he said. Also important is the role the DAI plays in cultural preservation. “Against the background of recent events in Syria, Iraq and other countries of the Near East and Africa, attention in the German federal parliament is at a very high level. All the more important therefore is close cooperation between the Foreign Office and the DAI in the field of cultural preservation,” Münch stressed.

Among the first projects ensuing from this change are joint initiatives like the establishment of the Archaeological Heritage Network in May 2016 and the launch of that network’s first project “Stunde Null: A Future for the Time after the Crisis” (see Archaeology Worldwide 1-2016, p. 4).

A large number of DAI projects have been funded through the programme, too, like the investigation, restoration and public presentation of the monumental temple known as the Great Hall at Karakorum, the ancient Mongolian capital. In Algeria, the DAI runs a collaborative project with the Archaeological Museum of Cherchell as part of which local craftsmen receive training in statue restoration and socle making.

In the task force, Renate Reichardt is the coordinator of the cultural preservation programme. “The joint projects with our partners are about promoting knowledge transfer and cooperative cultural dialogue,” Reichardt says, describing the programme’s purpose. Also part of the task force are Mrs Annette Scheulen and Mr Helmut Domas along with Mrs Sonja Lührs in the office and Mrs Barbara Heise in the registry.

Among the first projects ensuing from this change are joint initiatives like the establishment of the Archaeological Heritage Network in May 2016 and the launch of that network’s first project “Stunde Null: A Future for the Time after the Crisis” (see Archaeology Worldwide 1-2016, p. 4).

The new initiatives correspond to the Foreign Office’s cultural preservation programme, which was introduced in 1981. Since that time it has supported more than 2,750 projects in 144 countries with total funding of nearly 70 million euros. The aim of the programme, which is coordinated now by the task force, is to protect and preserve cultural diversity.

In fact it’s an excerpt from the German Archaeological Institute’s first systematic catalogue. By 1836 the collection of the Instituto di Corrispondenza Archeologica, precursor of the DAI, had grown to over 1,000 titles. The philologist and archaeologist Emil Braun, employed as junior archivist and librarian, was asked to create a library catalogue. The register was in the then usual form of a folio volume, originally with 143 sheets, hence 268 pages, where the titles were listed according to a systematic classification. The page we see here lists the literature on specific localities. The catalogue remained in use as late as the 1860s.

More on Emil Braun and his systematic catalogue in the section “The Object”, p. 36

Photos: DAI Rome

Photo: Public domain/Magnus Bäck
Natural science methods and technologies are a self-evident part of archaeology today. Introducing them into the archaeological sciences has been a continuous and long-lasting process that began back in the 19th century and has sometimes been a matter of controversy. In the GDR, natural science methods were applied in archaeological research early on and were integral to the study of Pre- and Early History.

The challenges of this eventful period were discussed by PROF. DR. SC. BRUNO KRÜGER, former head of the Pre- and Early History section at ZIAGA, and PROF. DR. HELMUT KYRIELEIS, who was President of the DAI at the time the institutes were merged. The discussion took place in August 2016 and was hosted by DR. PHILIPP VON RUMMEL, Secretary General of the DAI.

Photos: Niemeyer
Research in the German Democratic Republic (GDR) was conducted principally within the Academy of Sciences with its research staff of 26,000, 15,000 of whom were academics. Universities mainly had the task of training the young generation of researchers. ZIAGA – Zentralinstitut für Alte Geschichte und Archäologie (central institute of ancient history and archaeology) – was therefore integrated in the Academy of Sciences. ZIAGA comprised the sections of Pre- and Early History, Ancient Near Eastern Studies, and Graeco-Roman Archaeology.

The fall of the Berlin Wall led to the merging of ZIAGA with the DAI. That was the recommendation of the German Council of Science and the Humanities, which had conducted an appraisal of the monopoly of the GDR’s non-university institutes. The challenge lay in fusing two different scientific systems which had developed along divergent lines following the Second World War, as well as tackling complex bureaucratic requirements so that the basis could be created for the integration of certain sections of ZIAGA into the DAI and for at least some of the scientific staff to be taken on at the DAI.

The challenges of this eventful period were discussed by Prof. Bruno Krüger, former head of the Pre- and Early History section at ZIAGA, and Prof. Helmut Kyrieleis, who was President of the DAI at the time the institutes were merged. The discussion took place in August 2016 and was hosted by Dr. Philipp von Rummel.

"Archaeology’s methods are dictated by the tasks in hand,” said BRUNO KRÜGER when asked what importance was attached to the natural sciences at ZIAGA, where natural science research was concentrated in the Pre- and Early History Sections.

“We primarily studied the history of people in their settlements, that is, the everyday circumstances of their lives. One of our overarching aims was to find out when the transition occurred from kin groups to territorities. Since as prehistorians we have limited written sources at our disposal, we have to use make use of other sources too, for example the results of palaeoanthropology, which can furnish us with sound data about the way of life of early humans. Another major area of research for us was the migration of the Slavs. What way of life did they bring with them? How did they build their strongholds? Dendrochronology was able to establish what timber they used for building, while zoology and botany – in this case especially pollen analysis – provided information about the use of animals and plants. In the end it turned out that the Slavs were able farmers and livestock breeders in greater proportion than we had previously thought. Given the importance of the natural sciences in our research work, 13 out of 38 of our members of staff were natural scientists at the beginning of the 1970s."

"At the German Archaeological Institute, natural science research results were occasionally incorporated,” HELMUT KYRIELEIS remembers. “But on the whole those subjects played no real role in Classical Archaeology. The Zentraldirektion (supervisory board) of the DAI largely consisted of representatives of Classical Archaeology, which unlike Pre- and Early History has a range of dating possibilities. So the need for natural science research results was limited at first. At that time there was no debate about the pros and cons of the natural sciences in Classical Archaeology. That changed subsequently, during German reunification, when integrating the ZIAGA with its strong natural sciences into the DAI became a realistic option. For the DAI, it was a great opportunity to set in motion the long overdue modernization.”

The bureaucratic effort involved in merging the two institutes was immense. Creating new positions in staff appointment schemes was among thorny matters that needed to be sorted out. Financing had to be negotiated and provided for. Therefore not only the department of culture and communication at the German Foreign Office, which is responsible for the DAI, had to be involved, but also the German Parliament’s budget committee and the Federal Ministry of Finance.

"Dismantling the Academy of Sciences of the GDR was a mammoth undertaking,” remembers BRUNO KRÜGER. “We did ask ourselves, of course, what would happen to the employees, their knowledge and expertise. In the confusing situation that prevailed it was hard to know how discussions on consolidating the institutions could best be conducted.”

"In the end, the budget committee of the Federal Parliament approved 27 of the jobs at ZIAGA, unfortunately not all 42,” says KYRIELEIS with regret. “But all in all the process went better than we had any reason to expect. Incorporating the natural sciences systematically in the DAI’s research work was certainly a strong argument, even though not all the colleagues who were eventually re-employed were natural scientists. In the Zentraldirektion there were initially different ideas about how the colleagues and facilities being transferred should be distributed among the DAI’s existing departments. But overall, the acquisition of research staff, scientific facilities and methods came to be an outright success story for our institute – though we were wrong on one point!”

"Our colleagues thought we all spoke perfect Russian,” continues BRUNO KRÜGER. “There was always excellent cooperation with the academies in Warsaw and Prague, where the colleagues generally spoke German. But it was only sporadically that we had anything to do with the academy in Moscow, and scientific cooperation of any intensity happened only occasionally.”

Collaboration between the natural sciences and the humanities or cultural sciences has long been a hotly debated – and often controversial – topic. How is collaboration between the two different research cultures to be managed in a way that is productive and beneficial?

“For us, it was important to get the specialists and the technologies into the institute,” says BRUNO KRÜGER. “That way we could ensure the research data could be discussed critically, in situ, by members of all disciplines. You see, when you have isolated data that may have been obtained outside a particular research context, it’s extremely difficult to integrate it into that context in a meaningful way.”

“It’s always a matter of resources, too, when an institute acquires natural science research staff with the relevant equipment,” says HELMUT KYRIELEIS. “But today, generally speaking, the natural sciences are self-evidently part of the archaeological sciences. And in Classical Archaeology it has to be said they are an important corrective. For the DAI as an institution, it was very fortunate that the natural science disciplines were concentrated so competently at ZIAGA and that it was possible to transplant them eventually to the institute.”
The Natural Science Section was established in its present guise in 2003. It embraces the disciplines of archaeobotany, archaeozoology, dendrochronology and prehistoric anthropology. The research staff carry out analyses on human, animal and plant remains recovered from settlements, graves and cult sites, and studies on climate history using timber finds. The section can be seen as a service facility for DAI departments and commissions carrying out excavations, but it also conducts its own research into ancient natural science questions. It also houses substantial reference collections that have been built up over decades.

PREHISTORIC ANTHROPOLOGY
A magnifying glass and a tape measure are the first pieces of diagnostic equipment to be used. Before that, though, the surviving skeletal material must be laid out on a table, bone by bone, all in the right order. Then the basic questions can be answered: man or woman? What shape is the pelvis? What are the dimensions of the long bones? How closed are the cranial sutures? Is there evidence of physical labour and workload? Prehistoric anthropology can determine age, gender, workload and disease very effectively from human skeletal remains. Not only primary bone disease, fractures and deformation for instance by hard labour are clearly recognizable. Scientists studying bones can also detect deficiencies like anaemia, scurvy and rickets or inflammations like tuberculosis, leprosy and syphilis.

Evidence of trepanation, an early surgical technique. Photo: Gresky
Laboratory of Archaeozoology

The domestication of animals marks a revolutionary step in human history. Animal remains from residential areas and settlement sites can yield information about what animal species were consumed as food and how they were procured, whether caught in the wild by hunters and gatherers or kept as domestic animals. When did humans begin to rear horses, sheep, and pigs in a targeted way? The universal use of animals as raw materials can be discerned from artefacts made of bone, teeth, and horn or from production-related refuse. In addition, information can be gleaned from animal remains in graves or at sacrificial sites about the role or status of animals in ritual practice and in the conceptual world of bygone epochs.

Archaeozoological studies can shed light on settlement typology, migration routes, and major societal transformation processes. Species can be identified using the archaeozoological laboratory’s reference collections of mammal, bird, amphibian, reptile, and fish specimens.

Archaeobotanists analyse plants in various forms – whether tiny pollen and spores or botanic macroremains like seeds, fruit, or wood – to chart the vegetation history and the development of cultivated plants in a given region, which also generates data about humans in their historical environment. The distribution of wild and cultivated plants tells us about diet and agriculture. Plant remains that are found in a region where those plants could not have originated allow us to reconstruct trade routes. Pollen analysis furthermore can provide information on vegetation and climate history.

After an initial examination in situ, samples are sent to the laboratory in Berlin where they are analysed under the microscope and compared with specimens in the substantial reference collection. If it is prohibited to remove finds from ancient sites, help is at hand in the form of the digital Plant Atlas – a joint research project of the Archaeobotanical Laboratory and Groninger University – which represents a globally valid standard for identifying archaeobotanical material.

See also our cover story “Surveying the Ancient World”, p. 38.
It is considered to be one of the masterpieces of Chinese architecture – the Forbidden City. Rectangular in ground plan and arranged around a central north–south axis, the city reflected the world view of the erstwhile imperial rulers. The imperial colour was emblazoned on the roofs in gilded ornaments and glazed yellow tiles. No building in Beijing was taller than the Forbidden City, the residence of 24 emperors of the Ming and Qing dynasties.

Palace of Lasting Happiness
Sino-German cooperation on carefully restoring an architectural monument

The Forbidden City in Beijing

Covers an area of 720,000 square metres, 150,000 of which are occupied by buildings. The vast complex accommodates 890 palaces with countless pavilions.

Photo: Wulf-Rheidt
The Forbidden City, with the world famous Palace Museum inside it, is more than a collection of fine works of art and grand old buildings. Similarly the world famous sanctuary of Zeus at Olympia in Greece, is, in European cultural history, more than “just” one of countless ancient sanctuaries. Olympia was a milestone in archaeology and architectural history, and as a result of that, it also became a concept. Greece was seen as the cradle of European culture, and the Olympic Games of the modern era were inaugurated in emulation of the revered contests held there in antiquity. Both the Forbidden City and Olympia are UNESCO world cultural heritage sites.

But what do the sanctuary at Olympia and a palace in the Forbidden City have to do with one another? They are both testimony to a global conception of cultural heritage and an ever stronger awareness of the need to protect and preserve it. One building in the Forbidden City – the Sacred Pond Pavilion (Lingzhao Xuan) – and the sanctuary of Olympia were the scene of cooperation between Chinese and German specialists in 2016, and remain the focus of Sino-German dialogue. The idea is to provide further training to both German and Chinese researchers, including the younger generation of researchers, in construction history methodology and also to develop plans for the restoration of a pavilion in the Forbidden City.

Since 2009 when the DAI’s Beijing Branch was established under the direction of Mayke Wagner, cooperation has intensified across the board with Chinese monument authorities, museums and research institutes and the foundations have been laid for cooperation with the Palace Museum in Beijing. As a result the DAI is the only foreign institute working in the Forbidden City.

"In modern China, a lot of importance is attached to preserving cultural heritage and informing the public about it," explains branch director Mayke Wagner. This one of the reasons why Chinese archaeological institutions have been showing increasing interest in international cooperation and dialogue in recent years. And for this reason also one of her colleagues, Patrick Wertmann, is studying the role cultural heritage plays in fostering a sense of national identity in China. A strong economy has lately made it possible to open a number of new museums, which are supposed to provide a historical underpinning for the national identity of the Chinese people.

As for people who cannot get to the museum, the museum will come to them. Mobile exhibitions and collections are enormously popular in rural areas. The virtual images on show in museum trucks packed with the very latest computer technology go down very well with teenagers in particular. China’s first Mobile Digital Museum made an impressive appearance at the German embassy in Beijing on its open day on 7 May 2016, one event in the German-Chinese Year of Exchange for School Pupils and Young People. The travelling museum had come to Beijing from the Autonomous Region of Inner Mongolia on its mission of making archaeological discoveries accessible and even tangible.

In China there are some 400,000 protected monuments, above ground and underground. 770 monuments have been given protected status since the mid nineties, more than in the 40 years before that. Around 1,000 projects to rescue and protect monuments have been implemented, with the result that many endangered monuments have been saved for posterity. The tremendous challenges in this vast country are a good basis for international cooperation.
SUMMER SCHOOL

The Sacred Pond Pavilion (Lingzhao Xuan) was the focus of a summer school organized jointly by the DAIs Architecture Section, the Technical University in Regensburg (construction history and monument conservation) and their Chinese colleagues. The pavilion can be found on the grounds of the Palace of Lasting Happiness — originally a retreat for empresses, concubines and ladies of the court — which is one of the six eastern palaces in the Forbidden City. The pavilion was almost totally destroyed in a fire in 1845. In 1909 it began to be rebuilt. Also known as the Crystal Palace, the building stood in a water basin, a kind of giant aquarium. Construction halted during the turmoil of the 1911 revolution and was never completed. In 1917 the unfinished building was partly damaged in bombing.

“in terms of ground plan and material the building is very unusual for the Forbidden City,” Ulrike Wulf-Rheidt points out. “It’s a stone and iron construction with cast iron struts, steel girders for the floor and ceiling constructions, and pavilion superstructures made from steel profiles.” The construction techniques are evidently European influenced, while the decoration and architectural ornament displays both Chinese and European elements. The floor paving laid in the interior comes from Germany, and German architects may have furnished the designs.

Planning for the conservation and presentation of the ruin started in 2002. The Palace Museum commissioned expert reports and the School of Archaeology and Museology at Beijing University produced a structural survey on the basis of a laser scan, which was later a subject of study in the summer school in September 2016. The construction history specialists now want to find out how far building had proceeded before work stopped in 1911. Structural analysis will clarify how great the damage to the building is and what needs strengthening. One important question concerns the conservation concept for this unusual building. Should it be preserved as an interesting ruin as testimony to the period of upheaval? Should it be restored to the unfinished state of 1911 or should the building be completed in modern form?

Workshops at the summer school covered documentation methods in use in determining a historic building’s construction and use. Furthermore, experts explained how materials can be recognized and damage documented as preparation for a historic building’s careful rehabilitation. Other important items on the programme were a theoretical introduction to early iron production and iron working, and damage diagnosis especially in iron construction, which were explained by Werner Lorenz (middle row, 4th from left in the photo above) from the Chair of Construction History at Brandenburg University of Technology (BTU) Cottbus-Senftenberg. This was followed by useful discussion of conservation strategies.

“For all of us it was extremely fruitful to talk to our Chinese colleagues about basic concepts of cultural heritage preservation and restoration,” Ulrike Wulf-Rheidt says. What is the relationship between original and reconstruction? Are copies permissible when the original does not survive? What does authenticity mean? “It’s a great opportunity for us to think about our own concepts and ideas in the area of cultural heritage preservation.” This process of sharing ideas and imparting knowledge began back in early summer 2016, when two members of the Palace Museum’s scientific staff visited sites in Greece for three weeks. They acquainted themselves there with ancient stone-built architecture, unfamiliar to them, and also with methods of surveying historic buildings — from measurements by hand to photogrammetry. The building chosen to work on was the Leonidaion at Olympia, which is being studied and documented under the direction of Claudia Mächler from the DAI’s Architecture Section. The history of that building’s construction and use is closely bound up with the evolution of the sanctuary as a whole, which makes it especially interesting for a follow-up investigation of its construction history.

OPENING OF THE JOINT SUMMER SCHOOL in Beijing. Mayke Wagner, director of the DAI’s Beijing Branch (front row, 4th from right) and Ulrike Wulf-Rheidt, director of the DAI Architecture Section (front row, 5th from right), organized and led workshops and seminars. The summer school took place under the aegis of the director of the Palace Museum, Shan Jixiang (middle row, 1st from left). For him, the big new restoration workshop is a kind of “hospital,” where cultural heritage is restored. Photo: Zhou

PRECISION WORK. One of the topics at workshops and seminars was structural surveying — here at the Sacred Pond Pavilion (l.) and the Leonidaion at Olympia (r.). Photo: Wulf-Rheidt

A VISIT TO THE PARTHENON IN ATHENS was a highlight of the young Chinese researchers’ tour of archaeological sites in Greece. Photo: Xu
The joint training programmes for researchers of the younger generation are accompanied by an arrangement on cooperation relating to natural science methods such as are increasingly important in archaeology today. A first step is for the DAI’s Natural Science Section to support the Palace Museum in setting up a dendrochronological laboratory to determine the chronology of the various construction phases of the sprawling palace complex. The agenda for the future includes jointly conducted palace research. Then the question to be explored will be what the imperial palaces the Forbidden City in Beijing and the imperial palaces on the Palatine in Rome have in common.

GERMAN AMBASSADOR CLAUS would like to see a mobile archaeological museum in Berlin too.

Photos: Zhou

PROSPECTS

COOPERATION

Palace Museum Beijing
Beijing University
BTU Cottbus-Senftenberg
OTH Regensburg
Archaeology in the Anthropocene

The systematic observation and study of nature is not a phenomenon of our time. In the cultures of the ancient world, too, studying space and the heavenly bodies was highly important; the ring ditch enclosures that were created in central Europe from ca. 4800 BC are evidence of this, as is the Nebra Sky Disk from ca. 1600 BC. Substantial records of the motions of the heavenly bodies are known from the Ancient Near East and Ancient Egypt too. In antiquity the spectrum of disciplines involved already went far beyond astronomy, although some combinations of specializations may at first strike us as unusual. One would say: if anything at all, then natural sciences that is still so pronounced in scientific research in general does not exist in the everyday activities of archaeology. Of course, what would be necessary is for all the natural sciences to work together in an attempt to make sense of the world we live in today. Archaeological projects do precisely that, but with reference to a past time period. As a consequence, archaeological projects also get more and more complex and comprehensive.

Looking at archaeological projects today one would say: if anything at all, then natural sciences belong to them. An archaeological project nowadays brings together a wealth of disciplines so as to exploit all potential sources, where possible, in the analysis of ancient contexts. Archaeology does not master all these methods itself; instead it harnesses them in its projects through cooperation with a wide range of specialists. The DAI achieves this by means of its natural science section and through a host of partnerships on the national and international level.

But what does archaeology seek to learn about, and from, the ancient world in these partnerships?

Hearing the title of the documenta 14, “Von Athen lernen!” (“Learn from Athens!”), which will open next year in Kassel and Athens, the classical archaeologist may think first of Pericles’ funeral oration, in which Athens was exalted as the school of Hellas. In the documenta 14, however, Athens is a “symbol of a rapidly changing global situation and epitomizes the economic, political, social and cultural dilemmas which Europe finds itself confronted with today”. Hence it isn’t the ancient world or its transformations, but the transformations under way in our own time that make Athens, for the duration of the documenta 14, an exemplum that it is possible to learn from.

One of the biggest transformative processes that we are all experiencing at present has been proposed as the eponym of a new epoch in Earth’s history: the Anthropocene, the man-made age. Humans shape the natural world, but now they are interfering in it more radically and irreversibly and changing it more profoundly than has ever demonstrably occurred before in Earth’s history. The human race has become a determining influence on geological, biological and atmospheric processes on Earth.

But this also presents a major challenge. Of course, what would be necessary is for all the natural sciences to work together in an attempt to make sense of the world we live in today. Archaeological projects do precisely that, but with reference to a past time period. As a consequence, archaeological projects also get more and more complex and comprehensive.

The repercussions of these processes have been discussed in recent years at the Haus der Kulturen der Welt, for instance, as part of the Anthropocene Project, which searched for solutions to these transformations. In a report on the project it was noted that the traditional methods of knowledge acquisition – both in the natural sciences and the humanities – have reached a limit. Not only that, the report also states: “The indivisible concatenation of industrial metabolism, climate change, urbanization, soil erosion and the extinction of species, as well as a new social (self-) consciousness have shown: The rapid re-formation of cause and effect, means and end, quality and quantity requires a new approach to the world which is not governed by postmodern discourse but material interconnections and processes.”

Under these laboratory conditions, archaeological projects have an important role to play since they investigate material interconnections and processes in a thoroughly concerted, collaborative way with the natural sciences and have done so for a long time already. The dichotomy between the humanities and the natural sciences that is still so pronounced in scientific research in general does not exist to that degree any more in archaeological projects.

But this also presents a major challenge. Of course, what would be necessary is for all the natural sciences to work together in an attempt to make sense of the world we live in today. Archaeological projects do precisely that, but with reference to a past time period. As a consequence, archaeological projects also get more and more complex and comprehensive.

At the same time these projects pose entirely new challenges for interdisciplinary, collaborative research. A necessary precondition of this is a solid understanding of how knowledge is generated in the various disciplines. For example, if genetic analysis is used as an ‘objective’ procedure in the writing of human history, it is important to take into account also the circumstances in which, say, testable skeletal material reached the lab. Even though genetic analysis employs standardized technology and follows a fixed technical procedure that would appear to leave little room for subjective interference, the bones themselves do not enter the lab objectively, abstractly classified. Their arrival is preceded by excavations, classifications, estimated datings and cultural contexts which reflect the conceptual models that exist in the excavators’ minds. If natural scientists want to analyse skeletons as a historical source, they have to understand the processes and circumstances of knowledge production in archaeology, which in turn are founded on ancient knowledge and ancient paradigms.

From the Exhibition Jenseits des Horizonts (“Beyond the Horizon”) of the TOPOI excellence cluster, Freie Universität Berlin/ Humboldt-Universität zu Berlin

WWW.jenseits-des-horizonts.de/item/061

Design: res d design und architektur, Cologne
Photo: Landwehr

Prof. Dr. h. c. Friederike Fless
President of the German Archaeological Institute
Photo: Ruckertz
They could be seen 40 kilometres away: the mightiest monuments of their time, dominating the landscape and transforming it into a landscaped environment. As demonstrations of power they were unmistakable.

The area surrounding the first mega pyramids in human history was also modified as part of a man-made cosmos – 3.6 million cubic metres of material was transported and used in construction.
Fractal landscapes

King Sneferu’s modifications of the landscape were gigantic. But he had to compete with one of the most powerful forces of nature, water. Different types of modification are not apparent at first sight. Comparison of these digital elevation models, however, reveals the fractal nature of the natural landscape (below right) in contrast to the landscape modified by human activity (below left). Natural erosion channels transmit their fractal structure—resembling a tree in this model—to the surface.

Fractal landscapes

THE GARDEN

The enclosed area was a garden. Its well preserved remains date back to the first years of the reign of King Sneferu (4th Dynasty of the Old Kingdom, c. 2600 BC). “It’s the oldest garden on this scale found in Egypt to date,” Arnold points out. “It can’t have been a gardening plot. That wouldn’t have been created in the middle of the desert where there isn’t enough water for irrigation.”

Archaeologists have found over 300 plant pits at the site. Some of them even contain roots. The archaeobotanist Reinder Neef from the Natural Science Section of the DAI has analysed the remains and identified tree species—mainly palms and sycomore (a fig tree), but there were also roots of a species of cypress. This was not native to Egypt and probably came from the Lebanon or Syria. “The trees were apparently grown from seed in a nursery and then transported to the pyramid garden as mature trees,” Reinder Neef explains. Naturally the trees depended on a constant supply of water since, at their unusual location, they couldn’t draw any water from the ground. The plant pits are surrounded by a ring that made it easier to water them. The water itself was probably transported by donkey from the valley. The garden seems to have lasted only a few years, as the plants took root but died soon after, probably because the water supply was interrupted.

The garden court was found to contain three oblong basins that were apparently cut one after the other. The oldest basin is 10.5 metres long, 3.5 metres wide and about 40 cm deep. The two younger basins are approximately 7 metres long and 2.5 metres wide. All three basins had a bedding course of loam and papyrus matting laid inside them in order to keep the dark, very fertile soil constantly moist. The basins were probably made for plants that required a lot of water, for instance marsh plants like papyrus or reed. The basins also had a slightly sloping floor so that it would have been more moist at one end than at the other. “This may have been a way of accommodating the needs of different plant species,” Arnold suggests.
LANDSCAPE WITHIN A LANDSCAPE

The precise function of the garden court is still not clear. “The garden relates to a central aspect of King Sneferu’s construction projects,” Arnold says. He evidently had the whole landscape in mind when he planned it. Visitors to Dahshur today see an expanse of untouched desert landscape, but in fact a wide area around the pyramids was the result of human intervention, as established by the research of Nicole Alexanian, the late excavation director at Dahshur who died in May 2016. She worked with geoscientists from the Freie Universität Berlin in an effort to reconstruct the landscape as a whole. And it turned out that, King Sneferu’s gigantic ambitions notwithstanding, the human hand was not the only landscape architect at work at Dahshur. Another was natural fluvial erosion.

Identifying reciprocal effects and discerning various individual impacts on the landscape was not easy after such a long time and underneath so much sand. The geoscience investigations undertaken showed that in antiquity the pyramids stood on an elevated terrace above the Nile valley. The building material for the pyramids was extracted from this terrace, with quarries being cut right beneath the pyramids on the side facing the Nile. Extracting stone from the terrace modified the landscape.

A digital elevation model was created to clarify the fractal nature of the natural erosion channels so that they could be distinguished from man-made alterations of the landscape.

Once more it became clear just how vast were the pharaonic modifications of the natural landscape. A garden as a landscape within a landscape or perhaps as an idealized image of that landscape sits well with our view of Sneferu as a planner. There may also have been an allusion to an awareness among the people of Ancient Egypt of how precarious their situation was in a river valley surrounded by desert.

“The garden could be interpreted as a reference to a regeneration or fertility rite,” Arnold says. Did the King need to enter the garden and its buildings in order to ensure his own survival and the survival of the environment in which his people lived? “We know about ensembles of this kind from other cultures, for instance Babylon and Assur. And what place could have been better suited to such a rite than a verdant garden in the middle of the desert?”

COOPERATION PARTNERS
Freie Universität Berlin (FU)
Supreme Council of Antiquities (SCA), Cairo (Egypt)

SUPPORT
Deutsche Forschungsgemeinschaft (DFG)
Freie Universität Berlin (FU)
Emil Braun and the first library catalogue of the Institute of Archaeological Correspondence in Rome

The prehistory of the German Archaeological Institute, today a globally active organization, begins on 21 April 1829, the ancient Roman day of the Parilia. It was on that day that a group of scholars of the ancient world got together at the Prussian embassy in Palazzo Caffarelli on the Capitol in Rome to found the Instituto di Corrispondenza Archeologica, whose aim was to improve the exchange of information among archaeologists and to disseminate scientific news quickly. The initiative originated with a small core of German scholars who named themselves the Roman Hyperboreans, after a legendary people of the far north mentioned in Herodotus. They persuaded the Prussian crown prince, Friedrich Wilhelm, in 1828 to take the new, privately organized institute under his aegis. On the Crown Prince’s request the Prussian ambassador in Rome, Christian Karl Josias von Bunsen, functioned as secretary general, while two Hyperboreans did the practical work – Eduard Gerhard as secretary and August Kestner as archivist. In spite of this conspicuous Prussian and German dominance, the secretary general, while two Hyperboreans did the practical work – Eduard Gerhard as secretary and August Kestner as archivist. In spite of this conspicuous Prussian and German dominance, the Instituto initially financed itself largely through the sale of its publications and was always in financial difficulty. The library catalogue, which likewise came to be known as the “real catalogue” and continued the tradition established by Gerhard’s own devising. It is notable for being probably the earliest bibliographic classification system in the field of archaeology. It is the prehistory of the German Archaeological Institute, today a globally active organization, begins on 21 April 1829, the ancient Roman day of the Parilia. It was on that day that a group of scholars of the ancient world got together at the Prussian embassy in Palazzo Caffarelli on the Capitol in Rome to found the Instituto di Corrispondenza Archeologica, whose aim was to improve the exchange of information among archaeologists and to disseminate scientific news quickly. The initiative originated with a small core of German scholars who named themselves the Roman Hyperboreans, after a legendary people of the far north mentioned in Herodotus. They persuaded the Prussian crown prince, Friedrich Wilhelm, in 1828 to take the new, privately organized institute under his aegis. On the Crown Prince’s request the Prussian ambassador in Rome, Christian Karl Josias von Bunsen, functioned as secretary general, while two Hyperboreans did the practical work – Eduard Gerhard as secretary and August Kestner as archivist. In spite of this conspicuous Prussian and German dominance, the Instituto initially financed itself largely through the sale of its publications and was always in financial difficulty. The library catalogue, which likewise came to be known as the “real catalogue” and continued the tradition established by Gerhard’s own devising. It is notable for being probably the earliest bibliographic classification system in the field of archaeology. It is

1836

Emil Braun and the first library catalogue of the Institute of Archaeological Correspondence in Rome

Emil Braun officially presented his systematic subject catalogue in 1836 on the anniversary of Winckelmann’s birth, 9 December, in Casa Tarpea. Not long afterwards he handed over library matters to Wilhelm Albeken, who then established the first alphabetic catalogue in addition to Braun’s catalogue. Braun himself was promoted to the position of secretary editor and was responsible for editorial matters along with the Egyptologist Richard Lepsius, effectively directing the Instituto of Archaeological Correspondence. He was in sole charge of the institute from 1840 to 1856 as editorial secretary. His main profession certainly remained archaeologist and he wrote many scientific articles. Yet his activity evidently did not fully satisfy his curiosity and dynamism. Braun was a successful art dealer, purveying a large part of the new acquisitions for the library. The old catalogue, in which books were sorted not only alphabetically according to author but also chronologically, was unable to cope with the expanding collection. In the 1850s with the recently developed method of photography. Finally he contributed to the Allgemeine Zeitung newspaper with articles on political and social developments in Rome, but being a conservative sympathetic to the papacy, his reporting almost led to his deportation in the revolutionary year of 1849.

Emil Braun's catalogue is accessible online: http://arachne.uni-koeln.de/item/buch/5376

Thomas Frohlich

Librarian and archaeologist. DR. THOMAS FROHLICH is head of the library at the Rome Department of the DAI. As an archaeologist he focuses on the documentation and interpretation of Roman collective graves and is involved in the German-Iranian excavation project at Fabatiera Nova, a Roman colony of the late Republican period in southern Latium. He occasionally works on research history and the history of the Institute.

Dr. Thomas Frohlich
The origin of weights and measures, numbers and standards is a story in itself. It began 6,000 years ago and has created concepts without which modern scientific procedures would be unthinkable. Long disregarded or even criticized in the humanities, yoking together disparate disciplines is a challenge that no researcher today can avoid. Sound and reliable results can ultimately be achieved if there is collaboration between chemistry, physics, geosciences, materials science, anthropology, botany, zoology, climatology, X-ray diffractometry, X-ray fluorescence analysis, satellite remote sensing, and laser scanning.

MES AYNAK, AFGHANISTAN: Taking readings in one of the oldest industrial landscapes of the world. Photo: Steiner
What reads like the index of a modern compendium of natural science procedures to methodologies that are part of the spectrum of archaeology, helping to answer open questions, and substantiate or refute existing findings or suppositions.

1 METALLURGY is one of the most important innovations in human history. Slag from a smelting site near Arjved, Kalbak. Photo: DAI Bueaia Department

2 GEOMAGNETIC INVESTIGATIONS at Hattusha, conducted by Kiel University. Photo: Schächter

3 DENDROCHRONOLOGY can determine the age of timber and provide a climate archive reaching back far into the past. Photo: Heüßner

4 POLLEN ANALYSIS can chart a region’s vegetation history. Pollen from Chenopodiaceae Chloridoideae. Fig.: Divies

5 ARCHAEOZOOLOGY investigates the history of the domestication of animals and its significance for humans. Photo: Bérard

6 PREHISTORIC ANTHROPOLOGY illuminates the circumstances of human life in the ancient world through bone analysis. Photo: Steiniger

7 CERAMICS is one of the principal classes of finds in archaeology. Photo: Steininger

Pottery is another example of human ingenuity, with a long history and far-reaching consequences. Aside from that, it is one of the principal classes of finds in archaeology. Pots and vases are, of course, very much more than simple containers. While in the past they were generally classified by form, decoration and find-spot, today additional data can be prised from them by chemical and petrographic analysis, answering questions about place of manufacture and hence contributing to our knowledge of the economic history of a given community. One such method is X-ray fluorescence analysis, a method of qualitative and quantitative detection of the element composition of sample material. The method is used frequently in modern archaeology because it is non-destructive. Other non-destructive methods come from geophysics, geoelectrics and geomagnetics, and are known from mining and mineralogy. Where, in the age of heroic archaeology, vast quantities of earth were moved in order to wrest knowledge from under the ground, now geophysical prospecting is carried out to establish where an excavation trench should be laid. Some changes observable in buildings and settlement structures have climate-related causes. Studying the palaeoclimate is the field of dendroclimatology, which analyses tree-rings from various species to reconstruct the ancient climate in particular regions. Archaeobotanists are likewise able to procure data on climate in the distant past. Pollen profiles, for instance, allow inferences to be made about vegetation and how it fluctuated in certain regions at certain times. Archaeobotanists are able to focus in on the people of the ancient world, on their everyday lives in considerable detail. That’s because much of their time was spent procuring, growing, processing and preparing food. They had, moreover, overwhelmingly a plant-based diet. But was it wild or cultivated plants they ate? The domestication of plants – and animals – is one of the most revolutionary innovations in human history. Archaeozoology studies the animals used by early humans in agriculture, in warfare, or as a source of protein in their diet. Anthropology, meanwhile, studies humankind itself. Bones are a font of information about the nutritional status, living conditions and illnesses of early humans – even about spectacular medical operations. Analysing ancient DNA allows us to recognize kinship among internees in burial grounds. At the DAI, the use of hard science methods is self-evident. They furnish archaeologists with important findings, extending the range of data sources. Archaeology, archaeobotany, anthropo-logy and dendrochronology are brought together under one roof in the Natural Science Section. Other scientific methods used by DAI staff include portable X-ray fluorescence analysis. The wealth of data generated by DAI projects is evaluated collaboratively, nationwide as well as internationally, and new possibilities of interpretation are explored.
Metal ore plus energy produced an epoch-making material. In certain parts of the world, mining and processing metal is the basis of the economy, and it’s also the stuff of heroic tales true and legendary. The production of metals probably developed in several different places independently. The first traces of metallurgy can be found in western Asia, only slightly earlier than in the Balkans. Individual regions display very marked differences in the development of metallurgical technology and in the way that technology is embedded in society. Research on early copper-making has shown for example that the schema of step-by-step development of metallurgy in the ancient world – regarded as uniformly applicable, and paradigmatic in research – does not do justice to the complexity of the phenomena.

DAI research cluster no. 2, “Technological and Social Innovations”, has put the focus more strongly on early metallurgy throughout the Near East and Europe as an integral phenomenon, and this has proved to be extremely fruitful. Regional and local perspectives have revealed how communities developed or adapted technologies, and sometimes even rejected them. Therefore researchers need to move away from deterministic concepts of technological “progress” and instead link technological developments more closely to social processes.

The extraction and smelting of ores and the working of metals are central questions in the DAI’s research projects, as is the determination of the composition and provenance of ancient metal using modern technology.

ON THE TRAIL OF EARLY METALLURGY

RULERS IN THE WORKSHOP

In Tehran’s National Museum, Gunvor Lindstrom of the DAI’s Eurasia Department is carrying out investigations into a bronze statue that constitutes rare material evidence of the Hellenistic period in Iran. Only a few fragments of the head and the limbs survive, but the figure, slightly larger than life size, can nevertheless be reconstructed in its fundamentals. It shows a man supporting himself on an erect spear shaft which he grasps with his left hand. This is a pose typical of representations of Hellenistic rulers. But do the fragments really all come from the same statue? X-ray fluorescence analysis provided the answer. Daniel Steiniger, a member of the Eurasia Department staff, analysed the bronze fragments using a portable device. “The data show a consistent alloy in the head, arm and leg fragments,” Steiniger said, confirming the attribution. The material used for another bronze statue at the Tehran Museum – one of its most striking exhibits, in fact – comes from an entirely different source, however. That statue is also of a nobleman, 1.94 m high and dressed in richly folded riding garb. But he dates from Parthian times. “The alloy is totally different to the statue of the Hellenistic ruler,” Steiniger declares.
The two bronze statues played a prominent role in several international workshops that were held in Tehran in June 2016 and provided an introduction to the methodology of portable X-ray fluorescence analysis. X-ray fluorescence can be used to obtain information about the material composition of objects, about the origin and distribution of materials and about ore deposits. The workshops were organized and carried out by the head of the DAIs Tehran Branch, Judith Thomalsky, and by X-ray fluorescence expert Daniel Steinger in partnership with the Iranian Centre for Archaeological Research (ICAR), the Iranian National Museum and the Islamic Art University in Tabriz (Tabriz IAU). They were attended by students, doctoral candidates, scientists and research staff. Under the guidance of the two DAIs scientists, the workshop participants performed practical tests on standard geochemical samples and archaeological finds from Iran, with particular emphasis being placed on heterogeneity of material. “Firstly we wanted to demonstrate the effectiveness of the technology,” says Judith Thomalsky. “Secondly it was about learning the method long-term through continued practice.” Samples on which data was taken were obsidian, including obsidian artefacts from Neolithic and Chalcolithic settlement sites in north-western Iran, as well as lapis lazuli, the mineral turquoise, modern and medieval glazed earthenware, mud bricks and cermics, but also metal finds and slag, as well as pigments from medieval manuscripts. The results of archaeological analysis are a source that must be investigated by students, doctoral candidates, scientists and research staff. Analyzing the obsidian finds and the metal production artefacts from ongoing excavations by the Tabriz IAU will be one of the first areas where investigations are conducted jointly,” Thomalsky says. The analysis of raw material deposits exploited in prehistory and early history is becoming increasingly significant, says Steinger, who has succeeded Judith Thomalsky as co-director, with Nikolaus Borofka, of a project on resource exploitation in Afghanistan. Afghanistan’s rich natural resources have been exploited and traded over long distances since prehistoric times. Lapis lazuli, which only occurs in the border region of Afghanistan and Pakistan, has been found in distant Egypt and the northern Caucasus as early as the 4th millennium BC. But the most coveted natural resources were copper and tin, the main constituents of bronze. Afghanistan is a source of both ores and therefore has an exceptionally important role in the development of one of the crucial technological innovations of the early metal ages. Still virtually nothing is known about the exploitation of mineral deposits in Afghanistan in prehistory and early history. For this reason the Eurasia Department is putting together a compendium on the country’s mining culture and archaeology. It will form the basis of future archaeological research into one of the ancient world’s biggest industrial regions.

**COOPERATION PARTNERS**

**IRAN**
National Museum of Tehran
Tabriz Islamic Art University

**AFGHANISTAN**
Afghan Ministry of Information and Culture (MIC)
Kabul National Museum
Delegation archéologique française en Afghanistan (DAMAF), Kabul
Swiss Afghanistan Institute/Stiftung Bibliotheca Afghanica in Bubendorf, Baselandle Canton
USAID Mining Investment and Development for Afghanistan Sustainability (MDAS), Kabul
Curt-Engelhorn-Zentrum Archäometrie gGmbH, Mannheim
Deutsches Bergbau-Museum, Bochum

What looks rather like an off-the-shelf hairdryer is in fact a highly sophisticated measurement device. It is used in a method of qualitative and quantitative detection of the element composition of material: X-ray fluorescence analysis (XRF). Until recently, if objects were to be analysed, a sample needed to be taken from them. Then followed cost and time intensive preparation and analysis in a laboratory. These days, a portable X-ray fluorescence analysis device is commonly used instead to determine the chemical composition of materials away from the lab. For an archaeologist this opens up a wide scope of application in the field – conservation and restoration work as well as the evaluation of finds. Furthermore, a hand-held XRF device is a boon in countries where legislation strictly forbids the export of any samples. So what exactly can X-ray fluorescence analysis do that classical archaeological methods can’t?

It goes without saying that nowadays we know where the things we buy come from. The designation of origin “made in...” is standard in modern global trade. People in the ancient world also knew where the objects they used came from. But for archaeologists, the provenance of ancient artefacts isn’t always easy to establish – unless one is able to look inside the material itself. Chemical analysis using X-ray fluorescence can identify the geochemical fingerprint of artefacts, so to speak, and thus reveal the origin of mineral and geologic materials, pottery and ceramics, and metal items too. The technique is based on the detection of characteristic trace elements. It’s also possible to answer questions about the manufacturing technique. What metallic elements were added to a given alloy? How was the raw clay tempered? XRF is used in the main to analyse inorganic materials; metals and alloys including their corrosion layers, glass, faience, ceramic, rock, loose sediment and soil including the heavy metals and phosphates and inorganic nutrients they contain, in addition to the pigments in wall paintings, frescoes and mosaics. The results are most precise when the readings are taken where rock or metal – for instance on statues or columns – has recently flaked or been chipped. Results are less precise the more the original unaltered material is obscured by the patina of the centuries or millennia.

“The detection limit for portable XRF analysis differs for every element and depends on a great number of factors,” explains Daniel Steinger. “[The limit] lies approximately between 10 and 100 ppm, i.e. parts per million, corresponding to 0.001-0.01 per cent by weight.” Portable devices cannot as yet detect any traces beneath this limit, and so for the time being they are no substitute for laboratory analysis. “But they can be used to make a better selection of finds that are later going to be analysed in the lab.”
THE CHEMISTRY OF SHERDS

Internal inspection of a key category of finds

Pietrele is a village in Romania, located on the Lower Danube. There a team of archaeologists under Svend Hansen, First Director of the Eurasia Department, is excavating a Chalcolithic settlement. Since work began, 1,270 completely preserved vessels and more than 10 tonnes of sherds (some 400,000 pieces) have been recovered. Ceramic artefacts, one of the most important categories of finds in archaeology, hold a wealth of information – not only about techniques of manufacture and the culture they belong to, but also about economic zones, trade routes, and technology transfer. Yet this information cannot always be extracted from them using classical methods alone.

“Portable X-ray fluorescence analysis gives archaeologists a whole range of opportunities that couldn’t be conceived of before,” an enthusiastic Hansen declares. Though the instrument is not yet as powerful and effective as the laboratory-based procedure, “it’s now so good at detecting the trace elements important in ceramics analysis that precise questions produce precise results.” It’s important to have as clean and freshly exposed a surface as possible. If sherds are covered with sinter crusts or if metal objects are badly corroded or thickly patinated, that can mask the values of the original material composition. “We can get round that if we do readings on clean material from the core of the artefacts,” explains Daniel Steiniger, who has carried out X-ray fluorescence analysis with a portable measuring device in Pietrele. The best surface to analyse is a fresh clean break, on a ceramic sherd for instance.

To analyse the ceramics, the archaeologists additionally have a polarization microscope for thin section analysis and a powerful reflected-light microscope at their disposal. The different methods complement each other, Steiniger says, combining them makes it possible to extract the greatest possible amount of information that is materialised in the ceramic objects under analysis. Scientists can thereby discover details about the manufacturing process, firing temperatures, and the sources of the raw materials used – the latter information is crucial to the reconstruction of ancient trade links and patterns.

In Pietrele, archaeologists are keen to know whether the clay used in certain vessels is of local provenance or came from more distant deposits. Just because ceramic pots resemble one another in form, colour, pattern or surface treatment, they don’t have to come from the same workshop. Excavation director Svend Hansen puts it like this: “Did a potter from Pietrele perhaps travel to the Moldau (Vltava) region and bring back a design from there which he then copied using local clay? Or does the pot really come from the Moldau?”

“Portable X-ray fluorescence analysis enables archaeologists to determine where the clay used to make vessels and figures came from.” Photos: Steiniger

400,000 SHERDS have been found at Pietrele since excavations began. Photo: Reingruber

FIGURINE UNDER ANALYSIS. Photo: Steiniger
Similar questions are being asked by archaeologists from the DAI’s Cairo Department in respect of the settlement mound at Buto (today: Tell el-Fara'in), Egypt, which is being investigated under the direction of Ulrich Hartung. The mound is located in the north-west Nile river delta, about 40 kilometres from the current Mediterranean coastline and approx. 10 kilometres from the Rosetta arm of the Nile.

“The special thing about Buto is not just that it’s one of the biggest archaeological sites in the western Nile delta, but also that the site goes back to predynastic times,” says Ulrich Hartung, explaining the locality’s interest to researchers. Specifically it’s about beer jugs, proofing baskets for dough, cooking pots and wine jugs from the late 4th/early 3rd millennium that have been found there. Their geochemical composition will be analysed to find out whether the clay they were made with came from one and the same site or from different deposits.

As the Nile delta has always been a very dynamic region, reconstructions of landscape dynamics are an important tool in research. A focus of interest is possible correlation between settlement layers and changes in the landscape. “Examining loam layers and the ceramics with a portable X-ray fluorescence device can provide significant data on chronological relationships between raw materials deposits and settlement strata,” says Daniel Steiniger, who has carried out more than 1,500 readings at Buto. That number of tests would hardly have been possible in the laboratory given the enormous cost and the length of time required. Another advantage of portable X-ray fluorescence analysis is that archaeological excavations can be planned in a targeted way and carried out carefully and sustainably.

Unlikely, opined scholars at the time. Yet the textual finds in the Akkadian language that were recovered in 1906 at excavations conducted by Theodor Makridi and Hugo Winckler furnished proof that the ruins near Boğazköy were those of Hattusha, the capital of the Hittite Empire. The period of its greatest prosperity was ca. 1650 to 1200 BC. After this it was struck by a series of catastrophes and declined into insignificance.

Today Hattusha is a UNESCO world heritage site and the cuneiform archives found there are included in the UNESCO “Memory of the World”, a global register of documents of exceptional value.

Andreas Schachner of the Istanbul Department of the DAI directs research at Hattusha – the excavation licence has been granted to the German Archaeological Institute and its partners in Turkey and around the world since 1931. The ancient capital of the Hittites, a UNESCO world heritage site, lies about 180 kilometres to the east of Ankara on a craggy plateau scored by ravines. The Hit-

Hattusha may have lain forever forgotten if the ruins near the village Boğazköy had not been discovered by Charles Texier, the first European traveller, in 1834. This remote, mountainous landscape of central Anatolia was supposedly the cradle of a great civilization?
COMPLEX GEOLOGY

Conducting archaeological work in a landscape like the rocky and rugged terrain around Hattusha is a challenge. The region has moreover been exposed to complex interacting influences throughout the millennia of human use. It is impossible and also, from a heritage conservation viewpoint, undesirable to excavate the Bronze Age metropolis completely. So archaeologists are exploring the site by conducting systematic geophysical prospection over the entire urban area in parallel to the excavations, an approach first trialled in the late 1970s. Despite a few disturbances here and there as a result of the complex geology of the location, these methods afford an insight into large parts of the as yet unexplored city. Geophysical surveys have revealed furthermore that the area surrounding the city was apparently only sparsely populated. Researchers have found the remains of solitary buildings, presumably farmsteads, as well as big buildings that were probably used for public functions. Large areas were used as fields and gardens. Some of these, being topographically well situated, may have been irrigated. The water needed for the purpose was collected in artificial reservoirs that display technical sophistication. Clay for the production of pottery was obtained along the river, while quarries and metal deposits were in use to the south and east of the city. High-lying areas were evidently used as pastureland for livestock.

By comparing an anomaly with known structures, archaeologists can interpret it as a building, fortification, water reservoir or road, for example. 

Investigating a site like this one only with classical archaeological methods would take a great deal of time and resources, Schachner explains. “Natural science techniques help us to achieve the greatest possible advance in knowledge while reducing the cost and interventions to a minimum.”
**THE AGE OF TREES**

Dendrochronology in economic and cultural history

Nuku Hiva is the principal island of the Marquesas Islands, which are part of French Polynesia. Myths and traditions tell of sacred trees in which the dead were entombed and which played a key part in rituals and temple architecture. Some of the mighty Indian banyans stand on paved areas that are former ceremonial enclosures.

“But are the trees really as old as the ceremonial squares?” asks Annette Kühlem from the Commission for Archaeology of Non-European Cultures (KAARK). “Are they really sacred trees?” Because of their height and thickness banyans can look older than they are, so there could be no certainty about whether the trees were in fact linked with the ceremonial enclosures. “There’s also the theory that the trees merely found these stony patches a favourable growth location and weren’t planted,” Kühlem says. Still, early ethnographic sources bear witness to sacred trees of great significance. On the other hand there is no information about the layout of the trees in relation to the architecture at the site. The sources in question are the work of missionaries, who reached the archipelago in the first half of the 19th century. “The Polynesian religion was practised here the longest,” Kühlem notes. That makes the Marquesas so interesting for this research initiative.

**WATER MANAGEMENT**

The cooperation between the excavators of Hattusha and hydraulic engineers is another example of how innovative natural science technologies are applied to answer questions about cultural history. It has been long known that the Hittites collected water using artificial reservoirs. While initially the sources of their water were streams or similar seasonally flowing watercourses, hydrologists have demonstrated that Hittite engineers tapped the groundwater table, which varies throughout the year, and thus were able to channel large quantities of water. Thanks to these artificial reservoirs, together with underground granaries, the Hittite kings had control over the essential resources – water and grain – that were the economic basis on which was established the only empire in the ancient history of central Anatolia.
“The trees display a precipitation signal, from which we can deduce climatic phenomena, like El Niño for example, over long periods,” Heußner explains. If sufficient data is collected, scientists can reconstruct the climate history of whole regions – dendroclimatology. Precise measuring of the tree-rings can reveal the growth conditions that prevailed for a particular tree – good years result in thick rings, i.e. more robust growth, than bad years. With trees of the same species from one and the same region, the growth patterns of successive rings are so similar that they can be matched and synchronized exactly to the year.

“Measurements taken on Nuku Hiva have revealed that the trees stood on some of the ceremonial squares before the missionary period began,” reports Annette Kühlem. “So they were growing there at a time when the enclosures were still being used for the practice of the Polynesian religion.”

Annette Kühlem’s project is being conducted in the framework of KAAK director Burkhard Vogt’s investigations on Easter Island. “There are indications that Easter Island was settled from the Marquesas,” Kühlem says. Near a ceremonial platform on Easter Island archaeologists have found plant pits for trees containing the remains of palm roots (as reported in a previous issue of Archaeology Worldwide). It seems the tree plantings were an integral part of the sacred landscape architecture; laid out as a grove, they were a manifestation of the water and fertility rituals practised there.

“The question is whether we have here hit upon a rule for the layout of ceremonial squares,” Annette Kühlem says. “The pantheon on the Marquesas is largely the same as on Easter Island. There are many similarities in cult and ritual too.”

The age of the trees therefore had to be reliably determined. Karl-Uwe Heußner, in charge of the dendrochronological laboratory in the DAI’s Natural Science Section, and the technician Alexander Janus took core samples from various tropical tree species in order to furnish the archaeologists with answers.

“Because of the many aerial roots on the banyan it was extremely difficult to get samples at the right places,” Heußner recalls. The giant tree had a characteristic that tropical trees generally don’t have, one that means that much more than the trees’ age could be divined from the dendro-data obtained. Banyans produce annual growth rings and even shed leaves. The rings are a source of data about seasonal changes in weather conditions in the region.

“Banyans can look older than they are because of their great girth and height,” the trees were evidently planted or did they settle there themselves? The question is whether we have here hit upon a rule for the layout of ceremonial squares,” Annette Kühlem says. “The pantheon on the Marquesas is largely the same as on Easter Island. There are many similarities in cult and ritual too.”

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JUNIPER CHRONOLOGIES

In Tibet, the annual growth rings of juniper trees being analysed by DAI dendrochronologists could hardly be made out. In a collaborative project with Chinese archaeologists, directed for the DAI by Mayke Wagner, Karl-Uwe Heußner and his colleagues were attempting to produce a chronology on the basis of wood samples found at a burial ground at the northern edge of the Tibetan plateau.

“The region under investigation was the scene of brisk trade, bone of contention in territorial disputes between regional powers, and population figures there fluctuated dramatically,” says Mayke Wagner, explaining the thrust of research.

The cemetery at Dulan, excavated by Chinese archaeologists, yielded well-preserved timber that was capable of being used for dendrochronological analysis. Thanks to the persistent aridity of the region the juniper trunks had survived so well that Heußner was able to extract as many as 45 core samples from them.

“The growth rings were exceptionally thin, not thicker than 0.3 millimetres,” Heußner says. “Some trees hadn’t formed any more growth rings – they were evidently just getting by on the subsistence level.”

By comparing the new data with a reference sequence, scientists were able to compile an absolute chronology for the years from 515 BC to 800 AD – the first absolute chronology covering that period for the region. That made it possible to date the graves. Beyond that it allowed scientists to make inferences about the development of the climate and especially about precipitation in the region.

It turned out that, at an early point in history, there had been several consecutive sequences of drier-than-average years. The longest such drought period apparently lasted from 51 to 375 AD, i.e. for more than three hundred years. This coincides with the depopulation of north-western parts of the region. The following epoch, characterized by territorial disputes between nomadic peoples, likewise experienced a succession of lengthy drought periods. The data leads Mayke Wagner to the conclusion that “[…] large tracts of the land were unfit for crop cultivation and only just enabled grazing by pastoral peoples.”

STORY OF A DESERT

Archaeobotanical studies on plants in the Sahara

The Ennedi plateau is situated deep in the Sahara, in north-east Chad. Few regions of the world are so sparsely populated. A few hundred kilometres to the west lies the Ounianga basin with lakes, palm trees, sand dunes and small hamlets. A landscape that seems out of place – lake land in the heart of the driest desert on Earth.

The Ounianga basin is the site of one of the German Archaeological Institute’s archaeobotanical projects. In cooperation with the University of Cologne and the German Research Centre Geosciences (GFZ) in Potsdam, Reinder Neef, head of archaeobotany in the DAI’s Natural Science Section, and palynologist Michèle Dinies are investigating the botanic history of the oasis. Little research has been conducted to date into the beginnings of the oasis economy in North Africa.
Plant remains in various forms, be it pollen and spores or botanical macro-remains like seeds, fruits or wood, enable archaeobotanists not only to discover the vegetation history of a given region, but also to reconstruct the dynamics of past climate and environment systems. They can determine whether changes in climate and environment had a natural cause or were induced by human activity. The distribution of plant species and the composition of plant cover reveal what natural resources were available, including potential pastureland for wild and domesticated animals, fuel and building material, and foodstuffs for earlier populations. If moreover plants are found that are not native to a particular habitat, they can provide evidence on ancient trade routes.

MOISAC OF PLANTS

Before the Sahara became the driest desert on earth, it was covered by a fairly thick and fairly diverse vegetation in the early and middle Holocene (9th to 5th millennium BC). Until recently, however, we had little evidence to go on – sporadic seeds, fruits and charcoal from ancient find-sites as well as a mere handful of pollen diagrams showing the occurrence of species for only a few time-slices within this wet phase. “There are very few archives from the doum palm (Hyphaene) could be one of the early plants cultivated for their utility in the oasis. It grows in places where there is ground water near the surface and was present verifiably from the beginning of the lake phase in the early Holocene. “In the pollen diagram from the drilling core there is increased incidence of it from 500 AD,” says Anne-Marie Lézine of the Université Pierre et Marie Curie (Paris), who has completed the pollen analysis of the younger portion of the drilling core. Was the Doum palm cultivated intentionally or was it at least encouraged to grow, from that point onward? How people in the Sahara used plants to survive and to carry out oasis farming is one of the larger questions that archaeobotanists are seeking to answer in association with scientists from the University of Cologne, Freie Universität Berlin and the German Research Centre Geosciences (GFZ) in Potsdam. The Doum palm is now north-eastern Chad, with its cluster of hamlets, formerly an oasis.

CROP CULTIVATION AT AN OASIS

Since prehistorian Stefan Kroepelin and his colleagues from the University of Cologne extracted a 16 metre long drilling core from Lake Yoa, one of the lakes of Ounianga in Chad, scientists now have at their disposal an archaeobotanical record that, given the core’s length, will span at least 11,000 years. They hope they will now be able to render existing data on the vegetation of the Sahara more precise. “We want to find out if species with higher humidity requirements such as hackberries – Celastrus – or plants like Commelincaceae were present right at the start of the ‘lake phase’ or if they settled there gradually,” says Michèle Dinies.

In endless expanses of desert, oases have always been staging and trading posts that are vital to survival. Was this oasis in what is now north-eastern Chad, with its cluster of hamlets, formerly a major international trading centre and regional power like the oasis of Tayma on the Arabian Peninsula, where archaeobotanists from the DAI are likewise exploring the history of crop cultivation? At the Lake Yoa oasis, the first solid evidence of the cultivation of useful plants is relatively late, dating from a few centuries into the common era; moderately intensive cultivation is verifiable there for no more than the past 800 years or so. The reasons for this, apart from cultural influences, may be the site’s geographical isolation and the reduction in biotic resources that accompanied increasing aridification. The data from the drilling core has still not been collated and fully evaluated. But throughout the Holocene or at least during the wet phase of the early and middle Holocene there is a great number of plant species that may have been exploited as useful crops.

“Without vegetation there is no mitigating effect on the microclimate to which humans are directly exposed.” Reinder Neef: “If there has ever been a desert it has not always been the driest desert on Earth. What could have caused a region of the world to become so forbidding and extreme an environment? Many climate models that have been proposed for the great desert have failed to take adequate account of the vegetation, leading to distorted results. Archaeobotanists are agreed that the Sahara is extremely complex. Scientists hope the only drilling core to provide a continuous record of the Sahara’s botanic history for the past 11,000 years will clear up many of the unknowns. “The Sahara has always been an ecosystem at the extremes,” Reinder Neef says. Among other things, a desert always shows what happens when plant life disappears. Reinder Neef: “Without vegetation there is no mitigating effect on the microclimate to which humans are directly exposed.”

ECOSYSTEM AT THE EXTREMES

The Sahara has for ever been an object of fascination. What could have caused a region of the world to become so forbidding and extreme an environment? Many climate models that have been proposed for the great desert have failed to take adequate account of the vegetation, leading to distorted results. Archaeobotanists agree that the Sahara is extremely complex. Scientists hope the only drilling core to provide a continuous record of the Sahara’s botanic history for the past 11,000 years will clear up many of the unknowns. “The Sahara has always been an ecosystem at the extremes,” Reinder Neef says. Among other things, a desert always shows what happens when plant life disappears. Reinder Neef: “Without vegetation there is no mitigating effect on the microclimate to which humans are directly exposed.”

COOPERATION PARTNERS

University of Cologne
German Research Centre Geosciences (GFZ)
in Potsdam
Freie Universität Berlin
Rijksuniversiteit Groningen
Université Pierre et Marie Curie, Paris
Agriculture is one of the human race’s key cultural techniques. With the industrialization of food production and the ever-increasing consumption of convenience food, some knowledge of how people lived in their environment, how they exploited natural resources but also preserved them in their own interests has been lost.

The Digital Plant Atlas – a joint project of the DAI’s Archaeobotanical Laboratory and Rijksuniversiteit Groningen – is a unique archive of plants of the ancient world. Now a further instalment has appeared: the Digital Atlas of Traditional Agricultural Practices and Food Processing. In three volumes it documents the many and varied stages of the process, including preparing the fields and processing harvested produce for human food and animal feed and for other purposes. The Digital Plant Atlas preserves a substantial part of mankind’s immaterial cultural heritage which is at risk of disappearing.

of microscopic size, measuring 5 to 200 µm, pollen grains are also highly resistant, surviving for millennia. They enable scientists to make inferences about plant cover at the time they were deposited. A highly involved preparatory process in the lab is necessary before pollen can be analysed under the microscope. Then the tiny grains, magnified 400 times, have to be counted – the most laborious part of pollen analysis and also one that demands experience and expertise, not least because pollen don’t always occur in perfect condition. Such high fault-tolerance is required that computers could hardly manage the task, programming them to be smart enough to do so would be prohibitively resource-intensive.

Interpreting the data derived from the analysis is a complex matter too. “You need a knowledge of ecology and biology, knowledge about climates in different periods of the past, about wind direction and wind speed, and most particularly about the dispersal capacity of specific plant species,” Michèle Dinies explains.

130 pollen types, mainly plant species, have been identified in the drilling core from Lake Yoa. Here they are classified by provenance and distribution.

Yellow: Saharan elements (incl. Saharan-Mediterranean elements)
Orange: Sahelian elements (incl. Saharan-Sahelian elements) and some representatives of this group (Salvadora persica type, Balanites, Hyphaene type)
Green: Sudanese elements (incl. Sudanese-Sahelian elements) and some representatives of this group (Commiphora, Grewia type) as well as grasses and Chenopodiaceae

The diagram reflects the successive aridification of the central Sahara over the past 6,000 years. While at the beginning the remnants of open savannah shrublands are detectable, in the millennia that follow they are replaced by semi–desert and then desert communities.

Diagram: Lézine

THE ORIGIN OF EUROPEAN FARM ANIMALS

What classical archaeozoology and genetic analysis can tell us about cultivated forms

In the history of human innovation, the domestication of animals is one of the big issues. How humans have dealt with domestic and farmyard animals as well as animals in the natural environment has long been a subject of debate among researchers. The coexistence of humans and animals in the ancient world is the field of archaeozoology: a science that can shed light on settlement typology, migration routes and major societal transformation processes.

Animal remains from graves and sacrificial sites can provide us with information about the role animals played in ritual practice and in the conceptual world of bygone epochs. Animal remains from settlement sites can indicate how various animal species were used, whether for food or for work, for instance as draught animals. But where exactly did European farm animals like cattle, pigs and horses originate? Were they reared from wild varieties on the continent of Europe or were they imported from other parts of the world?

Scientists were never quite sure whether the cultivated forms of modern domestic and farm animals – excluding sheep – were imported from the Near East. Wild varieties of cow and pig certainly did exist in Europe. Genetic analysis provided the answer: the cultivated varieties came from the Fertile Crescent. But what happened there genetically? asks Benecke. Were there perhaps hybrid forms crossed with indigenous European species? When it came to goats and sheep, archaeozoologists had always been certain. All ancestors of the small ungulates came from the Near East; no wild forms of those animals existed on the European continent. “But with pigs and cows we were never totally sure,” Benecke says. “There were wild forms of both species in Europe. But if it’s not possible to distinguish them from cultivated forms satisfactorily by bone structure, then we have to use genetics,” Benecke explains. The technology first began to be applied in the archaeological sciences not much more than ten years ago. “Genetics and isotopy hardly used to figure in archaeozoology at all,” says Benecke. Now, though, molecular biology laboratories specializing in this kind of analysis have sprung up. They offer the service of analysing archaeological samples and ascertaining their gene sequences. “These sequences can only be decoded by specialists, however,” Benecke adds. “And to do that, they need to know the research objective and the scientific context.”

The cultivated forms of pig and cattle have now been traced back to their origins using applied genetics. “It turns out the oldest cultivated forms on the European continent were imported,” Benecke says. “But archaeozoologists found themselves confronted with an unexpected development regarding the pig. Around 3000 BC the haplotypes that migrated from the Near East completely disappear. They are replaced by haplotypes that indicate breeding with indigenous wild forms,” Benecke says. The phenomenon is still not fully understood and at the present time scientists can only speculate. Perhaps the imported pig was not strong enough or was susceptible to disease. What is certain, on the other hand, is that the pig with the European haplotypes later appears in the Caucasus. That is not the case with cows. “Haplotypically speaking, cattle stay true to their Near Eastern roots.”

In the investigation of the development of farm animals, the Archaeozoological Laboratory is working with Humboldt University’s Institute of Animal Breeding and the Leibniz Institute for Zoo and Wildlife Research, both based in Berlin. For it to be possible to integrate methods like ancient DNA analysis into the research results of the archaeological life sciences, close cooperation with all scientific disciplines is required, says Nobert Benecke with conviction. One of the reasons why the Archäometrienetzwerk Berlin-Brandenburg was founded in 2015 was precisely to intensify scientific cooperation.

COOPERATION PARTNERS
Institut für Tierzucht der Humboldt-Universität zu Berlin
Leibniz-Institut für Zoo- und Wildtierforschung, Berlin
Palaeogenetic study group, University of Mainz
THE CHILD IN A BOWL

Prehistoric anthropology reconstructs an infant life

Some of the objects were barely recognizable in the jumble of dust and bone fragments, the contents of an assortment of grave goods recovered from the early Egyptian necropolis of Gebel el-Silsila. All that was certain was they had all been excavated at the end of the 19th century.

But in spite of great age, war damage and several relocations of the ensemble, Robert Kuhn of Berlin’s Egyptian Museum was able to identify vessels, a bowl and a dish, that appeared to contain skeletal remains. At first they were taken to be animal bones. But closer scrutiny, by Dr. Cornelia Becker from the Institute of Prehistoric Archaeology at the Freie Universität in Berlin, revealed that the bones were in fact human. The remains were then transferred to Julia Gresky, who is in charge of prehistoric anthropology in the DAI’s Natural Science Section.

In the laboratory, Gresky and her colleagues analyse human skeletal material from archaeological excavations using physical anthropological, osteological and above all palaeopathological methods, in order to answer questions about demographic developments, burial customs, the incidence or spread of disease, and such like. After the initial diagnosis the skeletal material is in some cases further examined radiologically, endoscopically and with a microscope.

“The steep-sided bowl was filled with very many, extremely small pieces of bone,” Julia Gresky reports. She first examined them with a magnifying glass and digital microscope; in meticulous and fiddly work she scrutinized piece by piece, identified the smallest particles and placed them together with fragments of the same category until she had assembled a small part of a human skeleton. Radiological and histological methods added further detail to the initial diagnosis.

“We weren’t able to determine the sex of the child,” Gresky says. The bone was in too poor a state of preservation. “But we were able to establish that the child must have died at the age of seven to nine years following severe chronic illness.” The child’s illness was evident to the anthropologist from the bone structure.

“There were substantial pathological changes,” Julia Gresky says. “The bones don’t consist of a compact layer but of exceptionally thin bone lamellae stacked on top of each other.”
Radiocarbon dating and ancient DNA analysis have unfortunately yielded no results as yet. That’s because of the bone’s poor state of preservation,” says Julia Gresky. Even while it is alive, a living organism is assailed by a variety of damaging processes, but they are counteracted by protection and repair mechanisms within the living cells. After death these mechanisms become inactive and the DNA is subject to inevitable post-mortem degradation. At some point this leads to the structure being totally destroyed. This is not the case with the skeletal material being examined in the northern Caucasus as part of a project directed by Sabine Reinhold of the Eurasia Department. There Julia Gresky has investigated the way of life and the diseases of the ancient population in the region of Kislovodsk. To make the results more precise, ancient DNA (aDNA) from skeletal material found in graves will now be analysed, as happens in many DAI projects looking at population genetics. One question in this expanding field concerns the Neolithization of Europe. For instance, the population history of the Carpathian Basin is being explored in a project coordinated by Eszter Bánffy, First Director of the DAI’s Roman-Germanic Commission. The team of archaeologists are trying to establish where, genetically speaking, the first agriculturalists in the Carpathian Basin came from. Members of the Starčevo Culture – named after a settlement site in Serbia – are regarded as the last migrants having a genetic origin in Anatolia.

Other fields apart from population genetics where aDNA analysis can be applied are epidemiology and pathology. “The analyses can be used to determine where certain diseases came from and which animals transmitted them,” Gresky explains. One of the most widespread diseases among the prehistoric human population was tuberculous. “But the presence of TB-causing agents in the bone doesn’t necessarily mean those people developed the disease,” cautions Gresky. Conversely it can be that an individual displaying TB-typical bone deformations did not necessarily acquire them from tuberculous. Doing medical checks on people from the long-distant past is no easy business. “Together, prehistorical anthropology and ancient DNA analysis can achieve good results,” says Julia Gresky with conviction.

When it comes to the child in the bowl, the results of some in-depth investigations are not yet known. But it shouldn’t be long before Julia Gresky discovers what he or she died of 5,000 years ago.

**COOPERATION PARTNERS**

Egyptian Museum and Papyrus Collection of the SMB, Freie Universität Berlin, Prehistoric Archaeology
An interest in the past manifested itself early on in life. While still at school, Kerstin P. Hofmann worked as a volunteer ground monument conservation assistant in Verden, took part in excavations and assisted on regional archaeology exhibitions. Acquiring third party funding, she created multimedia exhibition items and a museum’s educational programme. Twice, in 1991 and 1993, she was awarded a prize in the Federal President’s History Competition. The German National Merit Foundation later helped fund her doctoral work.

For Kerstin P. Hofmann, archaeology is one of the few subjects that require a positively holistic approach. “Our subject is much more than just the exploration of the past. I regard it instead as history and social sciences must be closely involved in order to study the entirety of human life. “It’s important, though, to know and reflect the perspectives and traditions of the respective disciplines,” she states. “The cooperation will work better then.”

Of course Hofmann’s decision to study and work in archaeology was animated by a passionate interest in uncovering the traces of the past, in fathoming out man’s relationship to man and to things in different periods of history. “I definitely don’t consider a study of the past to be a nice-to-have or a kind of orchid [i.e. fringe] subject,” says Hofmann. “Archaeology is a practice that relates to society; it should always have the ambition to involve the local community and to localize itself and others in space and time.”

With science being thus grounded in society, there can be no strict distinction drawn between theory and practice. “In archaeology you quickly get grounded on account of the finds and features,” Hofmann says. “Theories are – and should always be – empirically grounded, just as the empirical is always theory-driven.”

Looking for traces from the past in science itself, whether by the medium of the history of science or the sociology of science, is an important part of the job for Kerstin P. Hofmann, as it encourages one to review, and better understand, one’s own research practice. The archives of the Roman-Germanic Commission – the collected work of generations of archaeologists – will serve as an excellent resource for Kerstin P. Hofmann, as it allows her to make use of her considerable experience in science management.

Kerstin P. Hofmann studied pre- and early history at the universities of Kiel and Cologne, taking computer science as well as medieval and modern history as subsidiary subjects. While a student she worked for the district archaeological department in Rotenburg (Wümme) and on a priority research programme on Romanization. She obtained her doctorate (summa cum laude) at Kiel in 2006 with a thesis entitled “Ritual practices with death. Investigations into Bronze and early Iron Age cremation burials in the Elbe-Weser triangle.” For the thesis she developed a new interdisciplinary approach in the study of death ritual, which she termed “thanato-archaeology.” Awarded a scholarship for studying abroad by the German Archaeological Institute, she then worked at the DAI’s Rome Department from 2006 to 2009, looking into funerary practices in south-east Sicily during the period known as the Great Greek Colonization. For the “TOPD” Excellence Cluster 264 she was then employed at the DAI head office in Berlin from 2009 to 2012, first as coordinator of Cross Sectional Group V “Space and Collective Identities.” Then from 2012 to 2016 she was a junior researcher and group leader responsible for the Key Topic “Identities: Space and Knowledge Related Identification” and for the research group B-4 “Space – Identity – Locality” of the Excellence Cluster at Berlin’s Freie Universität.

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Soon after beginning her studies of archaeology, she realized it was not a stand-alone subject. A wide spectrum of diverse methods and approaches characterizes the study of all epochs of the past—and there are great potential gains to be had from the combination of neighbouring disciplines. If, from the beginning of one’s academic life, one’s compass of admissible disciplines is wide-ranging, then afterwards interdisciplinary thinking will not be so hard to do, avers Susanne Sievers, who was Second Director of the DAI’s Roman-Germanic Commission in Frankfurt am Main till the end of July 2016.

Susanne Sievers studied pre- and early history, classical archaeology, art history, geology, medieval history and ethnology at Wurzburg, Göttingen, Hamburg and Marburg, where she was awarded her doctorate in 1978 for her thesis entitled “The central European Hallstatt dagger. A contribution to funerary weapons of the later Hallstatt period.” From 1978 to 1981 she took part in archaeological investigations of the Heuneburg citadel in a project run by the German Research Foundation (DFG). In 1982 she was engaged at the DAI’s Roman-Germanic Commission as a specialist for the Iron Age; from the outset she also worked in the editorial office. In 1994 she became Second Director of the RKG. In that capacity she directed an excavation project at the Oppidum of Manching while continuing her editorial work.

Susanne Sievers finds it can be inspiring to compare and contrast—not only in the study of different subjects at different universities, but also when it comes to practical experience of other cultures. Obtaining a DAI travel grant for the years 1981 and 1982 she travelled to Italy, Greece, Turkey, Egypt, Romania, Bulgaria, Hungary, Spain and Portugal, and finally Britain as far north as the Orkney Islands in Scotland. “Like diversity in subjects studied, experiencing cultural differences widens the horizon and encourages unprejudiced thinking and learning,” says Susanne Sievers.

After taking stock of what she had seen and learned, Sievers finally decided to make the Iron Age the central field of her research. “What particularly roused my scientific curiosity was the fact that there are no written sources from that period,” Sievers remembers. So was the challenge of working with rapidly evolving natural science technologies. “There’s something almost thrilling about the way you can get from a worm’s eye view to a bird’s eye view, thanks to modern methods based on aerial photography,” the archaeologist says. “But one should never lose the ability to acquire a bird’s eye view without these technologies;” she adds.

“Above all, you shouldn’t be satisfied too quickly with results that seem easily obtained,” she warns. As long as researchers are open to dialogue and are willing to learn the basics of another, allied discipline, that dual perspective can produce the best results, especially if they take the opportunity of using those other methods as a corrective to the results achieved by their own discipline: “I’ve always enjoyed talking with other people.” This is indeed a necessity in view of the very different research traditions that can exist in Europe. Taking part in the French-German Alesia project was highly instructive for her; she says.

As an Iron Age specialist Susanne Sievers has repeatedly been confronted with a myth, the “myth of the Celts”, which is surrounded by rumour, mystery, exoterricism and sensationalism that distorts what is verifiably known. “We really don’t know so much that we can say with certainty: ‘This is exactly what the Celts were,’” says Sievers, warning against projections and fanciful imputations that are without any reference to the archaeological record. “It is absolutely right to inform the public, and in an entertaining way, but it’s important to keep both feet on the ground and keep to what is conceivable on the basis of the facts.” The archaeologist is critical of the many clichés about the Celts that are propagated by the media. “We have to make it clear what we know and what we don’t.”

But for all the sensationalism surrounding the “myth of the Celts”, at the end it turns out that most people are interested mainly in everyday life in the past. As a tour guide Sievers noticed a common desire to focus in on daily lives, combined with astonishment that people in ancient times were not inarticulate hordes clad in animal skins—a notion that still persists—but possessed sophisticated knowledge with which they shaped their living environment. As an honorary professor at Goethe University in Frankfurt she passes on this knowledge to the following generation in the hope of preserving a part of cultural heritage.

In her research work Susanne Sievers has always focused in on people. Her primary interest was daily life inside communities, for example the Celtic oppidum of Manching, subject of an RKG project of long tradition.

“In year-round excavations, you really think your way into the situation,” the archaeologist explains. “You ask yourself how cold it might have been inside the houses, or what it might have smelled like?” Susanne Sievers is convinced that nature—be it topography or the seasons—is what shaped man’s imaginative world, and she dreams the dream of most archaeologists: to go back in time and be with these people who, though we have got so close to them, will yet never give up their final secret.
“Extremely small-scale” doesn’t exactly spring to mind when we hear the word “archaeology” in conjunction with “Egypt”. The familiar images of gigantic pyramids are simply too quick, leaving other associations in the starting blocks. And indeed for a long time those images obscured the fact that not only kings and priests dwelt in ancient Egypt, but also ordinary citizens. They lived lives that had nothing to do with court ceremony and ritual but were made up of work, eating and drinking, and the mundane realities of what we call life.
“What was life like on the island? What uses were spaces put to? What conditions did the inhabitants live in and what contacts did they have? Where did they procure the raw materials and goods necessary for their everyday life and work?” These questions are at the heart of the project as Johanna Sigl describes it. It aims to present a close-up of the everyday lives of the inhabitants of the north-west section of the town. The “Lebenswirklichkeiten” project is “a synthesis of archaeology and natural sciences”, combining experience in archaeological fieldwork with modern research methods.

In investigations centre on a previously unprocessed section of the residential area of Elephantine dating from the Middle Kingdom (c. 2137 to 1781 BC). “The superbly preserved stratification demands and enables extremely small-scale work in the field,” explains Johanna Sigl. Using archaeometric analyses, researchers hope to extract as much information as possible from the “dirt” of the settlement area. “This way we can identify the composition, distribution and use of a big number of organic and inorganic remains from everyday life, for example bone fragments, botanic micro-remains or invisible traces of substances formerly inside vessels,” Sigl says.

Traditionally the prime sources for reconstructing daily life in ancient Egypt have been art found in tombs, texts on papyri and ostraka as well as accounts by historians of the ancient world like Herodotus. But it’s the elite of pharaonic Egypt whose voices are heard in those sources. There is no word of the little people eking out their modest lives.

Elephantine is one of the oldest Egyptian habitation sites, first settled 6,000 years ago and situated on an island in the Nile opposite the heart of modern Aswan, Egypt’s southernmost city and also one of its biggest. Archaeological investigations on the island have been in progress since 1969, conducted jointly by the DAI and the Swiss Institute of Egyptian Construction History and Archaeology (Cairo). Half a century of research has thrown up abundant results. The history of the town is well known – its temples, its fortifications and the settlements from successive epochs that have piled up there to form a high mound. And yet there are still things the archaeologists don’t know.

PLAN OF TWO BUILDINGS FROM THE 12TH DYNASTY: Here archaeologists found evidence of the production of ornamental objects of amethyst and carnelian. The roadway is shaded yellow.

Fig. Kopp

REALITIES OF LIFE. View of the excavation site. Photo: Kopp
At the end of 2014, an interdisciplinary workshop was carried out to put the project on a sound footing in terms of methodology. One of the results was an adjustment of the excavation and find processing methods. “During excavation, recovery and storage, we make sure there is the greatest possible freedom from contamination. That means we treat our excavation site like a crime scene, where a forensic analysis of the circumstances of the act is to be conducted,” Sigl explains. Finds of a fairly big size are still recovered by hand, as is usual. For the archaeometric analysis, the excavators collect large quantities of sediment samples which are then sieved using a variety of techniques, flotation and water-screening; processing is followed by a preliminary sorting. “This way we capture a totally new spectrum of finds,” says an enthusiastic Johanna Sigl. The gain in knowledge comes at a certain price, however – members of the excavation team are not allowed to smoke, eat or drink at the site so that the finds really do remain free of contaminants. And with objects that appear particularly promising as evidence of everyday life on Elephantine, the archaeologists and excavators wear gloves to avoid getting sunscreen lotion or sweat on them.

**Methodological Adjustment**

**Micromorphology**

“The quantity of finds is immense,” Sigl says. Good for the archaeologists, but also a logistical challenge. What is obviously of interest to museums is, for safety’s sake, transferred directly to the central depots of the Ministry of Antiquities in Aswan in cooperation with representatives of the Egyptian authorities. Most of the material is housed on the site storage facility. The excavation team is to be conducted, “Sigl explains. finds of a fairly big size are still recovered by hand, as is usual. For the archaeometric analysis, the excavators collect large quantities of sediment samples which are then sieved using a variety of techniques, flotation and water-screening; processing is followed by a preliminary sorting. “This way we capture a totally new spectrum of finds,” says an enthusiastic Johanna Sigl. The gain in knowledge comes at a certain price, however – members of the excavation team are not allowed to smoke, eat or drink at the site so that the finds really do remain free of contaminants. And with objects that appear particularly promising as evidence of everyday life on Elephantine, the archaeologists and excavators wear gloves to avoid getting sunscreen lotion or sweat on them.

“Micromorphology is a branch of morphology that deals with the natural science methodology is being used ever more widely in archaeology. What it reveals is, as it were, the biography of a piece of soil. It provides information about the soil’s origin and porosity, and detects hidden signs of combustion. It is even possible to determine whether men or animals walked over it, because birdfoot with feet leave different compaction traces in the soil than quadrupeds with hooves.”

**Everyday archaeology**

Bone and plant remains and seeds can shed light on dietary habits. Archaeologists also found coprolites and insect remains, from which they can infer how food was stored (e.g. composition or infestation of the stored food).
Central spheres of human existence – nutrition, work, living space – come under the researchers’ microscope in the “Lebenswirklichkeiten” project.

The extraordinary diversity of finds and the complexity of the site require not only the adjustment of excavation methodology but also an open scientific discussion running in parallel as well as a widening of the methodological spectrum in line with possibilities available in Egypt. “Without intensive international cooperation and without the involvement of natural scientists the work would be unmanageable,” Sigl says.

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EPILOGUE

Central spheres of human existence – nutrition, work, living space – come under the researchers’ microscope in the “Lebenswirklichkeiten” project.

The production, procurement and preparation of food occupied a large portion of daily life in the ancient world. The distribution of food and drink was one element of a highly complex system of production and trade. Containers made of pottery, stone, leather or wicker were required in the preparing, storing and transporting of foodstuffs. What tools and procedures were used to make them? “We want to know what people’s immediate living environment was like,” says Sigl. “Were the houses damp perhaps, or generally dry? How was the space divided up and how was it used?” And let’s not forget: where did the refuse go?

Finally, the residents of the town had to build their living environment and produce articles of clothing, weapons, tools, jewellery, vessels. Where did the raw materials come from? If there was a trade in these products, how far did that trade reach?

The complexity of real life must be reflected in the research, Johanna Sigl says with conviction. “Solitary analyses without context are pointless,” the archaeologist says. As excavation director she consequently attaches great importance to intensive communication among team members, keeping everybody properly informed. Workshops are held regularly to deepen the exchange. Included in this process, Sigl believes, is self-critical analysis of one’s mistakes as well as constantly reviewing the suitability and applicability of the methods adopted.
The Commission for Archaeology of Non-European Cultures (KAAK)

In its evaluation of the German Archaeological Institute from 2015, the German Council of Science and Humanities (Wissenschaftsrat) stated: “The DAI should continue with full commitment along the path it has taken towards a global archaeology.” This is precisely the approach adopted by the Commission for Archaeology of Non-European Cultures, which thus may be seen as epitomizing the DAI as a whole in respect of what the Council of Science and Humanities recommended. The body was founded in 1979 as the Commission for General and Comparative Archaeology (KAVA), and acquired its present name in 2005. The head office is located in Bonn and a KAAK branch operates far away from there in Ulaanbaatar in Mongolia. Asia is just one of the regions in which the KAAK conducts research, it is also active in Africa, Latin America and Oceania. Consequently the KAAK works in areas that lie beyond the Mediterranean and hence outside traditionally established DAI territory. The periods it investigates in its projects likewise extend beyond the purview of classical archaeology, encompassing also prehistoric epochs. Because of the KAAK’s global reach, it can study prehistoric and historic developments in all their diverse manifestations. Since levels of knowledge vary greatly in the regions of the world where it operates, the KAAK carries out both basic archaeological research in host countries as well as investigations into general overarching themes. Its research centres on communities in past epochs, their interaction with the environment and their exploitation of existing natural resources. A transdisciplinary approach to work is consequently essential; the humanities, cultural sciences and natural sciences join forces in the exploration of find-sites and the wider context in which they are situated. The activities of the Commission are especially significant for archaeology in Germany inasmuch as many of its research fields are not taught at university level in this country. The KAAK thus has an important role to play in the field of further education and training. Furthermore its projects also take account of the fact that, in many regions of the world, archaeological research plays an increasingly significant role in historiography.

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The Manuscript

The strange journey of a travel report

ERICH GOSE AND FRIEDRICH SCHOBER

These intriguing lines are an excerpt from an account written by two young archaeologists, Erich Gose and Friedrich Schober, who travelled through Phocis, a mountainous region in central Greece, in 1926 on a German Archaeological Institute travel grant. One of their first ports of call was Kalapodi. At that time the ancient sanctuary, which the German Archaeological Institute has been excavating for some years now and which in all probability can be identified as the ancient oracular sanctuary of Abae (Abai), had not been found. The account of their journey was probably submitted for publication in Athenische Mitteilungen in 1928 at the latest. What followed was an incredible story of delays, misunderstandings, personal vanity, betrayal and disappointment.

In a depression flanked by Palaiovuna in the north and Sandolakka in the south, and 2 ½ hours from Metochi, lies the modest monastery of St. Nikolaos, completely hidden in a grove of wild olive and fig trees. Inside the Byzantine church, in the rightmost of three apses, there is a large ancient base for a tripod. From here to Exarcho it is two more hours without any real road over Palaiovuna and down into the valley, where the road from Orchomenos to Exarcho leads near the foot of the hill Mavrorachis (the people [residents] do not know the name). The valley of Exarcho is approx. 2 km wide and 3 km long. In the north it is bounded by the Kalogria (663 m); in the south, where it widens, is the acropolis of Abae.

TITHOREA, 1926. View of the village and of Mount Parnassos from the north. The Kachales gorge is visible on the left.
Photo: Gose/Schober

“The manuscript has had a strange fortune,” says Katja Sporn, First Director of the Athens Department of the DAI. “Much later, in 1932, the manuscript is mentioned in a letter from Schober to Walther Wrede, then Second Secretary at the DAI Athens, and he only answered in 1933.” At that point the two grant holders still expected their manuscript to be published. But things were to fall out differently. Five more years passed before there was a new development in 1938. It is evident from Schober’s and Gose’s correspondence that the aim was to continue the work begun the previous decade and to travel to Phocis once more.
But the next disappointment followed soon after. The project came to nothing owing to "Herr Wrede's opposition", as Schober wrote. There was apparently an insinuation on Wrede's part that the former grant holder was not sufficiently competent. "Even though some sections certainly needed a fairly thorough revision and corrections, the charge is not justified," says Katja Sporn. Wrede had requested the return of the section of the manuscript dealing with the new inscriptions that they had found in Phocis. In summer 1939, Schober sent this section for publication or storage to the Berlin-Brandenburg Academy of Sciences and Humanities. Should publication not be possible, "the work can perhaps be deposited as material in the boxes of the Academy," Schober wrote in his covering letter.

There was a brief flutter of hope again in late 1938. Would the project be resumed after all and another trip to Phocis undertaken the following year? "Schober at least responded cautiously, and he was right to do so." The prospect of publication receded again over the horizon. Finally Erich Gose and Friedrich Schober abandoned any hope of their report being published. Apparently they requested the return of the section of the manuscript dealing with the new inscriptions that they had found in Phocis. In summer 1939, Schober sent this section for publication or storage to the director of inscriptions Goez of the Berlin-Brandenburg Academy of Sciences and Humanities. Should publication not be possible, "the work can perhaps be deposited as material in the boxes of the Academy," Schober wrote in his covering letter.

PHOCIS BOUND

In autumn 2015, the DAI Athens organized a study trip to Phocis for a group of young postdocs from various branches of classical studies. Overseeing the trip were Katja Sporn, archaeologist Panos Valavanis from Athens University and the ancient historian Peter Funke of the University of Munster. "Peter Funke remembered having had an unpublished manuscript by Schober in his hands about 30 years before in the archives of the DAI Athens," Katja Sporn recounts.

Joachim Heiden, head of the archives of the Athens Department, dug the manuscript out for them in November 2015. It was dated 1926 and bore the title "Results of a topographical journey through Phocis." The typewritten manuscript was in a folder on which was written "Berichte" and "Schober." The typescript was 49 pages long with handwritten additions, notes and appendices as well as 20 black-and-white photographs which had been pasted in.

"The bibliographic and epigraphic appendices to the report are no doubt from Schober, the supplements about architectural monuments and art works most likely from Gose, who was the trained classical archaeologist," Katja Sporn points out. "The passages on historical and ancient texts are obviously the work of Schober, an ancient historian who brought with him comprehensive knowledge of the literature on Phocis thanks to his dissertation on the region. He was also the one who had initiated the whole project." The manuscript contains nine chapters, eight of which deal with one specific locality each, while the ninth is devoted to all the inscriptions the two scholars recorded during their travels. The localities are described in the order in which the scholars visited them in June 1926: Orchomenos – Abae – Hyampolis – Kalapodi – Elateia – Modi – Tithorea – Ag. Marina – Daulis – Panopeus. At one point the manuscript mentions a cave at Tithorea; this section is illustrated by a photograph of the entrance to the cave.

THE CAVE

The postdoc students of 2015, on their tour round Phocis, also discovered a cave near Tithorea which was notable for its relief and incised decorations, including an ancient relief of Pan in the interior. "On the surface we only saw some pottery," Katja Sporn says. First of all the archaeologists contacted the Greek authorities to obtain permission for further investigations. In the course of preparations for archaeological field work it was discovered that a large number of the photos in the manuscript were kept as glass plate negatives or prints in the DAI Athens image archive. These were the pictures taken by Schober and Gose on their tour of Phocis in 1926!

But had they found the same cave? On closer inspection it turned out to be a different one. "The north flank of Parnassus is rugged and craggy and there are very many caves," Sporn says, explaining the ease of confusion. But the cave they found did lead to a survey of caves being carried out in 2016 in the region around Tithorea. "It was not unlikely we’d find the cave of Gose and Schober," says Katja Sporn. And sure enough the archaeologists struck lucky: the cave was located, in the 2016 survey, and was cleaned out and measured.
In spring 2017, the DAI Athens will hold a big conference on Phocis, funded by the German Federal Ministry of Education and Research (BMBF). There the vicissitudes of the manuscript and the two authors will be presented to the public for the first time. Additionally, Greek and German archaeologists will report on their field work at Tithorea, which includes a remapping of the impressive city walls produced after the clean-up in autumn 2016. The new maps are the work of the Ephorate of Phthiotis and Eric Laufer of the Athens Department. Gose and Schober, of course, didn’t have the opportunity for such in-depth research. Next year also the account of their tour of Phocis will finally be published, with a scientific commentary, in the *Athenische Mitteilungen* – 89 years after the manuscript was first submitted!

One riddle remains unsolved. “The manuscript mentions plan drawings,” says Katja Sporn. No plans were found in the folder but they were recorded in the old register of the Athens Department archives. “So they should actually be somewhere,” Katja Sporn concludes. Some research projects never end.

**Tithorea**

Ancient Tithorea is one of the most beautiful fortresses in Greece. Not only because of its good state of preservation but also because of its marvellous location. When you approach from the Cephissus, you first have to cross a wide, bare plain that is so stony as to sustain only meagre plant growth. Near the village of Veliţa this veritable stony desert is punctuated by sporadic small fields on which mainly tobacco is grown. The village makes an all the more surprising impression, with its green gardens and tall plane trees which are watered by the diverted Kachales stream. The village lies approximately in the middle of the formerly fortified area. The old bed of the Kachales forms an exceptionally wide and deep gorge which protected the fortress from any attacks from the east. Even better natural protection was afforded by Mount Parnassus, whose steep slopes stand like a gigantic wall behind the village on the south side. (...)

The purpose of this wall can only have been to prevent attackers from bombarding the city from the terrace. It was not possible to gain access to the city from this terrace because the latter lies, not directly above the urban area, but further west, and because the steep cliffs make a descent from this point impossible. No remains indicating that a permanently manned fort was sited here came to light. The only evidence of human activity was found in a natural cave that is situated approximately in the middle of the wide rock face of terrace. It is 9 m deep, 4 m high and 11 m wide. Some steps cut into the rock lead inside. In the interior, various round holes as well as right-angled sockets for stelae attest that there was an ancient ritual site here.
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**ARCHAEOLOGY WORLDWIDE**

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- **Elefantina**, Egypt. Everyday Archaeology, page 72

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**Cover Photo**

The sunlike body pictured on the cover is in fact microscopic, measuring a mere 5 to 200 µm. The photo shows pollen from a species of geranium. Pollen grains are capable of surviving for thousands of years. They enable scientists to make inferences about plant cover at the time they were deposited and thus are indicative of climatic conditions in the far distant past. A highly involved preparatory process in the lab is necessary before pollen can be analysed under the microscope. Interpreting the findings after analysis is complex and requires a knowledge of ecology and biology, knowledge about climate in different periods, about wind direction and wind speed, and most particularly about the dispersal capacity of plant species.

At the German Archaeological Institute, pollen analyses as well as analyses of botanic macroremains are carried out by archaeobotanists in the Natural Science section.

Photo: Dinies

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**The Exhibition**

400 exhibits from 45 find assemblages illustrate the ten millennia-long history of Vietnam. The exhibition is laid out on the plan of a temple complex with a full-scale model of a temple in the centre. Large-format photographs give an impression of Vietnam’s landscapes and cultures.

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**The Biggest Bronze Drum of Southeast Asia**

was found in Sao Vàng in Thanh Hóa Province in northern Vietnam in 2006. It has a diameter of 1.26 m and is richly decorated with houses and boats, feather-adorned warriors and animals, symbolizing the transmigration of the soul from this life to the world of the ancestors – some 2,000 ago.

**The Gold Seal of Emperor Minh Mang**

which weighs 4.7 kg, is the heaviest gold object in the Vietnamese archaeological exhibition in Germany. On the square seal base the grip is in the form of an imperial dragon. This “imperial seal for the control of the calendar of our glorious time”, made in 1827, was kept at the imperial court in Huế until 1945 when it was transferred after the revolution to the National Museum of Vietnamese History in Hanoi.

Photos: Nguyễn Quốc Bình

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“Relations between Germany and Vietnam are close and varied. Our countries are linked together by a cultural accord signed over 25 years ago and by a Strategic Partnership established in 2011. The good relations between Germany and Vietnam are also supported by the many interwoven biographies and the intensive cooperation in the cultural and educational sphere. It therefore comes as something of a surprise that “Treasures of the Archaeology of Vietnam” is the first exhibition of its scale on the cultural history of Vietnam to be held in Germany. The exhibition is the result of long-term planning and great enthusiasm. Thanks for this is due to the German Archaeological Institute, which is acting as principal curator and has shown real commitment to the project.”

From the foreword to the catalogue, jointly written by German Foreign Minister Frank-Walter Steinmeier and Vietnam’s Minister of Culture, Sport and Tourism, Nguyễn Ngọc Thiện, patron of the exhibition.
It began all of 8,000 years ago. Contacts over a long period between Southern Arabia and the Horn of Africa can be established archaeologically. Just how extensive Southern Arabian influence on Ethiopia was is being investigated by the German Archaeological Institute in a project at Yeha funded by the German Research Foundation (DFG). Impressive evidence of these trans-regional contacts is provided by the Great Temple of Yeha. This remarkable monument is being restored with the help of local workers as part of a joint Ethiopian-German project under way since 2009. To stabilize the building, steel scaffolding began to be erected in autumn 2016, replacing a temporary scaffold structure.

Photo: Gerlach