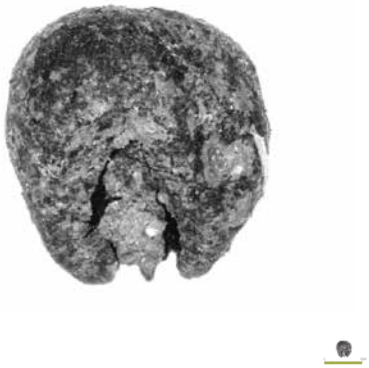
Small pieces, big impact

What carbonised plant remains and clay shards reveal about the Nok culture 3,000 years ago in West Africa

By Katja Irle

The Nok culture: their terracotta sculptures, which are among the oldest figurative art in Africa, are famous throughout the world. But how did their originators live? What did people's everyday life look like and what did they subsist on? This is what researchers from Goethe University Frankfurt have been studying for twelve years in Central Nigeria within a German Research Foundation project. Under the leadership of archaeologist Professor Peter Breunig and archaeobotanist Professor Katharina Neumann, and in collaboration with chemists from Bristol, the team has unearthed some astonishing things.



Top picture:
Carbonised grain of pearl millet from a Nok site – as an enlarged view and bottom right in original size.

Left picture:
These pearl millet grains from the archaeobotanical reference collection in Frankfurt help to categorise archaeological finds.

For archaeobotanist Alexa Höhn, jigsaws are an old family tradition. She used to puzzle over ones with up to 2,000 pieces. Today, it's a little less often, but when she has time, she still likes to do jigsaws. In a way, she even pursues her hobby at work. With a lot of patience and meticulousness, she and her colleagues try to piece together a coherent overall picture from the smallest of pieces. It can take years, sometimes decades, until that succeeds. And when one puzzle is solved, the next one pops up. In fact, it never ends.

"You have to enjoy guessing games," says Alexa Höhn, pulling open a drawer of the archaeobotanical reference collections at the Institute for Archaeological Sciences in the IG Farben Building. Real treasures are stored here, each one as small as a piece of jigsaw. Their structure can often only be seen under a microscope: tiny parts of plants, such as pollen grains, and slightly larger ones, such as fruits, seeds or wood. They were extracted from the present-day vegetation surrounding excavations during numerous field trips. The almost 20,000 objects in the collections, which have grown over 40 years, help archaeobotanists to identify plant remains discovered at archaeological sites.

Encounter with people from thousands of years ago

Unlike jigsaw puzzles as a hobby, archaeological finds are a window into the history of mankind. This is something that archaeobotanist Professor Katharina Neumann also finds fascinating. She remembers her first research stay in the Sahara in the 1980s. She was digging for cultural remains of cattle herders who had settled there around 7,000 to 8,000 years ago – in a Sahara that was still green, not a desert of stone and sand as it is today. Already back then she found and analysed carbonised plant remains, as they would also later play a major role in the excavations related to the Nok culture in Nigeria: "This allowed me to encounter people who lived thousands of years ago, I could touch what they had used."

To reconstruct environmental conditions, changes in vegetation or the dietary habits of past cultures, archaeobotanists rely, among others, on fruits and seeds from archaeological sites because these plant remains are astonishingly resilient and can be preserved in carbonised form for thousands of years. For example, carbonised seeds of pearl millet (*Cenchrus americanus*, syn. *Pennisetum glaucum*) up to 4,000 years old are stored in the Frankfurt archives. This millet species plays an important role in the study of the Nok culture, which is known for early iron production in West Africa in the first millennium BCE and for its elaborate terracotta sculptures, which first became known to the scientific public about 80 years ago, after some finds had been discovered during tin mining.

Seeing the past in the present

But what remained obscure for a long time was the social context in which the figures were created: How did the Nok people live? What did they eat, which plants did they cultivate? Did they have domestic animals? That is the reason why Frankfurt researchers led by archaeologist Professor Peter Breunig and archaeobotanist Professor Katharina Neumann were on the trail of these people for over twelve years, starting in 2009, within the long-term research project "Development of Complex Societies in Sub-Saharan Africa: The Nigerian Nok Culture of Nigeria" funded by the German Research Foundation. To preempt the outcome: the researchers came nowhere close to answering all the ques-

tions surrounding the prehistoric community. But they were able to debunk some old assumptions and gain new insights. For example, Professor Breunig's team could show, among others, that the Nok culture began earlier than previously assumed, namely about 3,500 years ago. And the German Research Foundation research also sowed doubts as to whether many of the fully preserved Nok sculptures, which are traded on the art market for vast sums, are really genuine, as the archaeologists themselves did not find a single complete figure during their excavations.

A terracotta figure from the Pangwari site.

Archaeobotany, an important subdomain of the research project, has recently also been able to unveil a lot about Nok history. Alexa Höhn was herself involved in the excavations in Janjala, Central Nigeria, in 2016. "The time on site was a great experience," recalls Höhn, who worked closely with locals at the research station. At some times, the German Research Foundation project was the largest employer in the region. But six months after Alexa Höhn had returned to Frankfurt from Janjala, there was a serious incident: Professor Breunig and his doctoral candidate were kidnapped for several days, and two Nigerian employees were shot dead at the same time. "That was a shock for all of us," says Alexa Höhn. The incident also meant that fieldwork in the area could not continue. To this day, the political situation is too unstable, and the German Foreign Office warns strongly against travelling to the region.

Nok pots from the Ifana site.

Hard to corroborate: yam

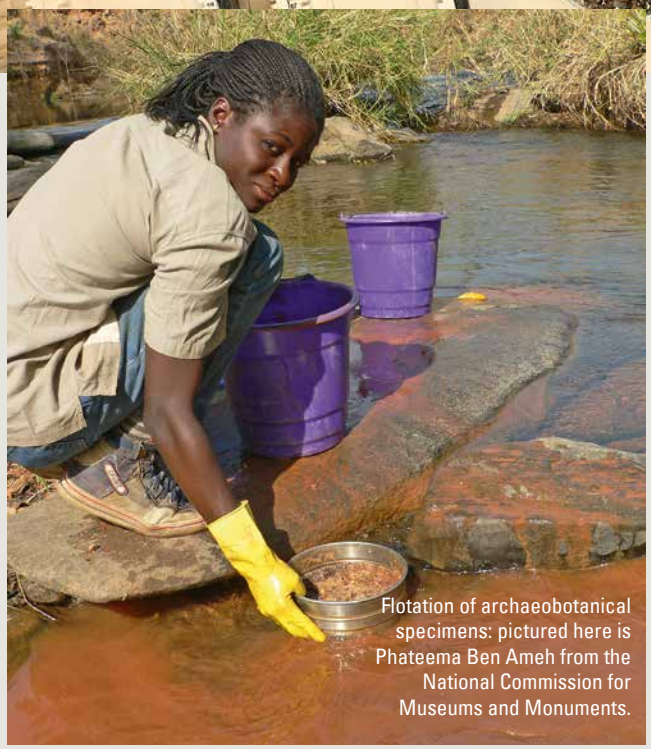
In Frankfurt, research into the Nok culture continued nevertheless – with the help of the insights already gained and new soil samples taken on site. The archaeobotanists' objective was to reconstruct vegetation and dietary habits. Alexa Höhn and her colleagues had found carbonised remains of pearl millet, among others, in archaeological sediments – a total of 10,000 grains over the entire duration of the project. However, whether the Nok people's diet also included other starchy plants, such as yam, which today is a fixed part of the traditional diet in the region, was previously unclear because – unlike pearl millet or cowpea (*Vigna unguiculata*) – it is difficult to find evidence of yam: the finer tissue of the yam tuber, also when carbonised, is more fragile than seeds or charcoal.

"When we find remains of plants or animals during our excavation work, we usually only see a small detail of the people's diet at that time," says Katharina Neumann. In the case of the Nok culture, she adds, an additional complication was the fact that animal bones had not been preserved at all in the acidic soil, meaning that further pieces of the puzzle were necessary in order to get closer, step by step, to people's living habits. These were found in the pores of clay shards from old pots in the form of lipids, that is, water-insoluble natural substances. The chemists brought in from the University of Bristol ultimately succeeded in separating out these lipids and evaluating them by means of gas chromatography (a separation process for mixtures of substances). "The result was a large and complex spectrum of plant lipids, among others from leaves," says Katharina Neumann. She says that this is very unusual: "If you throw a leaf on the compost heap at home, it's gone in two to three weeks. That's why the analysis from Bristol was a real sensation for us."

Enlightening molecules

Still today, the leaves of herbs and trees form the basis for sauces eaten in West Africa together with cereals and tuberous plants. The chemical analyses from Bristol also provided evidence of the very early origins of this African cuisine. It seems that similar dishes were already part of the everyday diet 3,500 years ago. In addition, the researchers were able to detect chemical compounds derived from suberin, which in turn

A peek inside the archaeobotanist's workshop: reference material, reference books, archaeobotanical samples and other equipment.



Flotation of archaeobotanical specimens: pictured here is Phateema Ben Ameh from the National Commission for Museums and Monuments.

Archaeobotany in West Afrika

Archaeobotany is concerned with the role that vegetation and various plants played for people in the past. It is a discipline at the intersections of archaeology, botany, ethnology and geosciences. What are known as macroremains (fruits, seeds, wood (charcoal) and other vegetative plant remains) and microremains (pollen, starch, phytoliths – small silica crystals) found during archaeological excavations are analysed. Many things are invisible to the naked eye, which is why archaeobotanists look at the plant remains under a microscope and try to work out what species they might be on the basis of features such as surface structure or internal composition. The archaeological context of the find can also be revealing. Depending on whether the plant remains came from a hearth, a waste pit, an iron smelting site or a grave, they tell a different story. In this way, archaeobotany, in collaboration with other disciplines, can make statements not only about crop history but more generally about people's diet in the past, about the cultivation and processing of foodstuffs, technology and culture and society. Archaeobotany can also contribute to a better understanding of climate and vegetation changes.

There has only been archaeobotanical research in West Africa for a few decades, and now African universities are also showing growing interest in conducting their own archaeobotanical studies. For example, Alexa Höhn, in collaboration with colleagues in archaeology and botany from the University of Ghana in Accra, is supervising the first students interested in archaeobotany. "We look forward to working together with African researchers on archaeobotanical topics in the future and are curious to hear the African perspective on questions of prehistoric land use and landscape development," says Alexa Höhn. Katharina Neumann and Peter Breunig's long-term research project funded by the German Research Foundation was obliged to manage without such cooperation for its archaeobotanical research. However, it would have been impossible without local support: the archaeobotanical sampling on site was supervised for several years by Phateema Ben Ameh, a member of staff at the National Commission for Museums and Monuments.

Insight into the archaeobotanical "treasure chamber" in Frankfurt: the reference collection for fruits and seeds.

is a main constituent of tree bark – and the cortex of tuberous plants. It is quite probable that the suberin originates from yam tubers – even if one hundred percent evidence is still pending.

But the lipid analysis in Bristol brought another surprise for the German Research Foundation team. Chemist Dr Julie Dunne discovered beeswax residues in the ancient pottery shards. "Of course, we had suspected that honey had been used because it is the most important natural sweetener and there are honeybees in the savannah," says Katharina Neumann: "But we were now able to prove it at first hand and for the first time for Sub-Saharan Africa."

And in this way the researchers in Frankfurt have added further essential pieces to the Nok puzzle. The long-term research project of the German Research Foundation might be over for now, but the guesswork surrounding the long-vanished culture in Central Nigeria? Far from it! ●

The author

Katja Irle,
born in 1971, is an education and science journalist, author and moderator.

k.irle@schreibenundsprechen.eu

ABOUT KATHARINA NEUMANN

Katharina Neumann (right), born in 1953, established African Archaeobotany as a focus area at Goethe University Frankfurt and headed the department from 1995 to 2019. She has also been an adjunct professor at the Institute for Archaeological Sciences since 2007. From 1974 to 1982, she studied botany, pharmacognosy, ethnology and soil science at Goethe University Frankfurt, where she also earned her doctoral degree. From 1983 to 1988, she was a research associate at the University of Cologne, and from 1989 to 1994 within Collaborative Research Centre 268 at Goethe University Frankfurt. Her special interests are prehistoric plant use and the history of African vegetation. In 2019, she was appointed as an honorary member of the Senckenberg – Leibniz Institution for Biodiversity and Earth System Research (SGN).

k.neumann@em.uni-frankfurt.de

ABOUT ALEXA HÖHN

Alexa Höhn, born in 1968, has been working since 2005 as a research associate within various projects of the African Archaeology and Archaeobotany Working Group at Goethe University Frankfurt. Since 2019, she has been part of the Priority Programme "Entangled Africa" of the German Research Foundation with her own project "Cultivated Landscapes". She studied botany, zoology and physical geography in Frankfurt and also earned her doctoral degree there. Höhn's research interests lie in complex human-environment relationships in West Africa, especially the influence of land use on the woody vegetation of the savannahs and the rainforest. At the centre are questions about the development history of today's cultural landscape in conjunction with the emergence and propagation of different land use systems as well as the sustainability of these systems.

a.hoehn@em.uni-frankfurt.de