SAPIENCE

CENTRE FOR EARLY SAPIENS BEHAVIOUR

UNIVERSITY OF BERGEN

ANNUAL REPORT 2024

Norwegian Centre of Excellence

STATEMENT
FROM THE CHAIR OF THE BOARD

2024 proved to be yet another excellent year for SapienCE. Throughout it eight years of existence, Sapience has demonstrated an unwavering commitment towards advancing the international research frontier. In doing so, SapienCE continues to be a flagship to the University of Bergen, The Faculty of Humanities, The Faculty of Science and Technology, The Faculty of Psychology and for all its partner universities in Europe, Africa and elsewhere.

SapienCE is a testament to the profound power of the cross-fertilization of academic fields and genuine, strong international partnerships. SapienCE has not only changed our knowledge on early human life but has also shaped the lives and careers of the scholars that have been part of the Centre. To many of the Early Career Researchers SapienCE was instrumental in catapulting them on to the stage of the world-leading research. Similarly, SapienCE has also represented the crowning moment for several senior scholars. Common to them all, however, is that their lives and careers will forever be bound together through SapienCE.

The tremendous success of SapienCE is a product of this monumental and prolonged team effort. For a team to succeed, excellent leadership is required. As the Chair of the Board of SapienCE, I would like to express my gratitude to the Centre Directors and the Administrative Manager for their steadfast commitment and excellent guidance. Most of all, however, I would like to thank them for their extraordinarily generous spirit – including inviting each team member, regardless of career stage, to put their signature onto the collective project.

On behalf of the Board of SapienCE, I would also like to extend our appreciation to all past and present members of the SapienCE Team for their efforts towards ensuring that we will not only know more in the future than we do today, but that we also will think differently about our most distant past. Your work represents invaluable contribution towards ensuring that we will continue to be societies and communities based on knowledge, democracy and humanity.

Thank you!

Camilla Brautaset

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STATEMENT
FROM THE DIRECTOR

In 2024, the Centre for Early Sapiens Behaviour (SapienCE) has made significant progress across our multi-disciplinary research initiatives. A notable event was the Scientific Advisory Committee (SAC) meeting held at Rosendal in September, with a comprehensive report subsequently circulated to the board. Our excavations at Blombos Cave and Klasies River have yielded key findings, which were analysed at our Cape Town Satellite Laboratory, UiB, and Wits University. The interdisciplinary collaboration among our branches—Archaeology, Climate, and Cognition—has grown, resulting in numerous publications in top journals and enriching our understanding of the evolution of early humans in southern Africa. Additionally, our team has expanded with the recruitment of new Postdocs.

Under the leadership of Director Christopher Henshilwood and Deputy Directors Dr. Karen van Niekerk and Prof. Simon Armitage, the SapienCE team now includes 38 active researchers, 6 PhD students, 13 Postdocs, and 13 administrative staff. New members since October 2023 include Dr. Eoghan Reeves, Dr Katrina Nilsson-Kerr, Dr Kurt Wogau, Dr Ella Walsh, Dr Marzena Cendrowska, Dr Jeremy Beller, Dr Samuel Pereira, Dr Antoine Muller, and Dr. Ellie Pryor.

In 2024, SapienCE has published 30 journal articles, further enhancing our reputation in the scientific community. Our collaborations with esteemed international institutions continue to attract high-quality partners to our projects, thereby enhancing the impact and reach of our research.
Our fieldwork this year has been particularly productive. The Blombos Cave excavations, led by Dr. Karen van Niekerk, focused on layers dating back 85,000-100,000 years and yielded over 200 artefacts, including well-preserved bone specimens. Similarly, the Klasies River excavations, directed by PI Sarah Wurz, revealed exceptionally preserved bovid bones and typical MSA1 lithics, dating back over 120,000 years.

Looking ahead, our research efforts for 2024-2027 will continue to focus on key areas in Archaeology, Climate, and Cognition. We are particularly excited about ongoing projects in cognition such as the ERC Synergy Grant on the Evolution of Cognitive Tools for Quantification, and studies on Pleistocene fibre technologies and fungus culture & cognition. Our climate research will delve into downscaling circulation model data and biomarker-based reconstructions of past environments, while our archaeological research will continue with excavations and further explore material culture and the integration of site data.

In May, we had the pleasure of hosting the Research Council of Norway (RCN) at UiB. They were impressed by our research achievements and the integration of disciplines within our Centre. Their suggestion to align our annual report with the calendar year for more accurate financial reporting is something we are considering for future reports.

Our outreach and team-building efforts have also seen considerable success. The 'Early Human Behaviour' exhibition at the University Museum of Bergen has attracted approximately 90,000 visitors, while the 'Origins of Early Southern Sapiens Behaviour' exhibition at SANParks Cape Point has seen over 300,000 visitors. A new exhibition at De Hoop Nature Reserve, focusing on modern human behaviour, opened in January 2024 and has already attracted 30,000 visitors. We are also looking forward to the opening of the Blombos Museum of Archaeology exhibition in December 2024.

Our social media presence has grown significantly, particularly in Norway, South Africa, the UK, and the US. Engagement levels have risen, especially among professionals aged 25-55, with a notable increase in female followers. We continue to engage with local communities in the Hessequa region of South Africa, particularly around Blombos Cave, and we are grateful for their ongoing support.

In summary, 2024 has been a year of substantial progress for SapienCE. Our excavations at Blombos Cave and Klasies River, coupled with ongoing research at our satellite laboratories, have deepened our understanding of early human behaviour. Interdisciplinary collaborations have resulted in significant publications, and our outreach efforts have engaged thousands of people with our work. The continued success of SapienCE's research and outreach efforts confirms our role as a leader in the field of human evolution.

We thank the Research Council of Norway, the AHKR department in the Faculty of Humanities, University of Bergen and Witwatersrand University, South Africa for their continued support and interest in our work. Our SapienCE team look forward to another year of discovery and achievement.

Christopher Stuart Henshilwood

SCOPE

The SapienCE Centre of Excellence is built around a carefully selected interdisciplinary team of archaeologists, climatologists and psychologists. The team aims to increase our understanding of how and when *Homo sapiens* behaviour changed, making us who we are today.
Within the next decade, the SapienCE team will investigate Middle Stone Age (MSA) archaeological sites by looking in detail at the evidence, layer by layer, site by site.

HIGH-RESOLUTION RECORDS

SapienCE researchers will produce an exceptional range of securely dated, high-resolution records of early human cultural, social, technological and subsistence behaviours, alongside global, regional and site-based palaeoenvironmental information. The centre's aim is to integrate these records, allowing a holistic analysis which will provide groundbreaking insight into the diverse aspects of what it means to be human.

ACCESS TO UNLOCK THE PAST

The SapienCE team has exclusive access to Blombos Cave, Klasies River main site and the Klipdrift Complex; sites that contain the key for unlocking the past. Blombos Cave is known as the cradle of human culture. Engraved ochre, shell beads and world's earliest drawing are amongst the significant finds from this cave. Early modern humans occupied the cave between 100 000 - 70 000 years ago.

Klasies River main site is famous for its numerous human fossils and the extensive 20-meter archaeological archive of early human behaviour. Early modern humans occupied the site between 120 000 - 59 000 years ago. The Klipdrift Complex covers both the Middle and Later Stone Age. The site is particularly associated with the Howiesons Poort techno-complex dating to approximately 65 000 - 59 000 years ago.

KEY RESEARCH QUESTIONS

1. When, why and how did humans first become behaviourally modern and how is this defined?
2. Did cognitive changes accelerate behavioural variability?
3. How were these groups of hunter gatherers socially organised?
4. Was social cohesion enhanced by the adoption of symbolic material culture and did it lead to innovation?
5. What cognitive skills had to be in place in order for other skills to develop?
6. How adaptable were humans to environmental change and did climate impacts act as drivers for technological innovation and subsistence adaptations?
7. Can we determine, from our planned genetic research, the relationship of these early *H. sapiens* to extant human populations?

ACTIVITIES

ARCHAEOLOGY

BY KAREN VAN NIEKERK

SapienCE welcomed three new postdoctoral fellows to the archaeology team in 2024. These are Marzena Cendrowska who specialises in lithic usewear analysis, Jeremy Beller who will look at lithic raw material provenance and our most recent recruit, Antoine Muller, who is preparing to 3D scan lithic material and developing computational methods for analysing the scans.

Excavation of the lower layers continued at Blombos Cave during February and March, led by Karen van Niekerk, assisted by a team consisting of SapienCE ECRs, a UiB MA student and a PhD from the University of Witwatersrand (Wits). Progress was hampered by many large rocks which had to be carefully removed. We were finally able to excavate the layers deposited below the 100ka layer known for its ochre processing containers. These were limited to a few small quadrates on account of many more massive rocks. Below these layers was thick sterile sand and we believe that we have now reached bedrock. Thus, this was our final season at Blombos Cave. These oldest layers contain well preserved shell and bone, lithics, ochre and OES. Simon Armitage took OSL dating samples and Chris Miller collected several block samples for micromorphological investigations of the oldest layers. We are excited to analyse this material and compare it to those from contemporaneous sites.

The Blombos Cave core excavation team of 2024. Ella Walsh, Ashild Jensen, Karen van Niekerk, Jasmin Culey, Asia Alsgaard, Alex Pearson. Inset – Marzena Cendrowska

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Field activities outside of the cave

In addition to excavation, many SapienCE and affiliated scientists came to the field for various material and data collection. Francesco d'Errico assisted Marie-Curie postdoc Neemias Santos da Rosa to study the taphonomy of rock art. Andrea Bender and Åge Oterhals (NOFIMA) started their pilot investigation into mushrooms in the vicinity of Blombos and Klipdrift Complex, Ella Walsh, Simon Armitage, Christopher Miller and Kurt Wogau did landscape recording and sampling and Nele Meckler joined the team to collect speleothem material in De Hoop. Jeremy Beller did field surveys for lithic raw materials with the help of a local geologist, Pieter-Jan Gräbe. Over the weekends Marzena Cendrowska began experiments to replicate use-wear traces on lithics. Asia Alsgaard spent what free time she had from excavation processing 15 white sea catfish that she acquired through a local fisherman.

The field season was followed by intensive sampling and material analysis in the Wits satellite laboratory in Cape Town under the watchful eye of curator Samantha Mienies. Here Francesco worked with Marzena and Jasmin Culey on artefacts with ochre residues. Jeremy Beller, Marzena and Jasmin studied and selected archaeological materials from the Blombos Cave M3 phase for their respective studies.

Excavations at Klasies River main site, led by Sarah Wurz and Jerome Reynard with a team of postgraduate students from the University of Witwatersrand, continued in August. They excavated most of the Silty Black Soil (SBLS) sediments, and the LBS member was opened to a larger extent. Preservation of fauna, shellfish, hearths and ochre in this member was better than in the SBLS member. The fauna includes relatively larger bovids, as well as penguin, bird and fish. MSA I lithics, different in character to those of the overlying SBLS MSA I were found - the blades are larger and more elongated cortical elements occur. The shellfish of the LBS member

is fragmented, but it seems that patella species occur frequently, as in the SBLS member. Two members of the South African Heritage Resources Provincial Heritage Authority visited the site in preparation for nomination of KRM as a world heritage site.

Laboratory analyses continued throughout the year – Marzena visited Francesco in Bordeaux to use confocal microscopy for quantifying experimental traces and plans to apply this technique to the Blombos lithics in the future. Currently, she is documenting traces on both experimental and archaeological samples using our new metallographic microscope. Ella visited laboratories in Tübingen and Royal Holloway to prepare and analyse dune-palaeosol samples for XRD, micromorphology and luminescence dating. She also processed drone photogrammetry data to create 3D models of the landscape and has prepared samples for palaeosol leaf wax biomarker analysis. Jeremy prepared lithic thin sections at UiB and ran silcrete samples by fusion ICP-MS and SIMS to obtain their geochemical and isotopic profiles at the University of Manitoba. Asia exported the catfish otoliths to Bergen for carbon and oxygen stable isotope analysis. While the goal was originally to identify the season of catch in the archaeological otoliths, the present-day catfish did not show any evidence for a seasonal cycle. However, she will use these data to discuss where catfish may have been fished in the past at Blombos Cave. The compositional analysis of the ochres from Elizabeth Velliky's Leakey funded survey and the Klipdrift Shelter ochre assemblage are completed, and she is currently organizing the data. Alexandra Pearson is analysing the Blombos Cave and Klasies River MIS 5 fauna for her PhD at Wits.

The Klasies River main site excavation team of 2024.
Back Row – Jerome Reynard, Hannah Pasques, Carl Holmes. Front Row - Alex Pearson, Sarah Wurz, Nazreen Isaacs

Many publications have been forthcoming, and we are particularly proud to highlight some recent papers by our PhDs here – Zahra Haghighi published on palaeoproteomic identification of original binders and modern contaminants in paints from a Norwegian stave church (Scientific Reports) and is currently working on finalising the manuscript of her second paper on extracting and identifying protein residues from within several ochre-rich sediment samples from HP layers of Klipdrift Shelter. Ole Unhammer's paper on using retrospective photogrammetry to bridge the divide between analogue and digital site data was recently published in PLOS ONE. Jasmin's first paper of her PhD - a comprehensive review of the evolution of the field of ochre studies, is in its final stages of preparation for submission. A full list of publications can be found at the end of this volume.

Inter and Intra disciplinary collaborations continue to flourish both within and outside of SapienCE. Beth organized two workshops in collaboration with the Contemporary Art Department at UiB, one titled "activating symbolism" and one titled "Resisting Nature and the Ochre Workshop" both involving distinguished international scholars. In collaboration with cognitive scientists, Francesco published a paper in Brain Structure and Function in which they use brain imaging techniques to identify the neural networks involved in recognizing social status from facial ornamentation, with implications for the origin of this behaviour. Francesco and two members of the SapienCE cognition team, Larissa Straffon and Andrea Bender, have submitted two articles on the emergence of religious practices and the origin of symbolically mediated behaviours to a volume co-published by the CNRS and Pontifical Academy of Science, and to the Journal of the Royal Anthropological Institute. Jeremy and Beth are crafting a manuscript on lithic and ochre raw materials in the Blombos region for the SASQUA 24 proceedings. Marzena and Jasmin are collaborating on an exciting experimental project replicating residues on lithics. In collaboration with Christopher Miller and Jakub Senesi (master student in Tübingen), Ellie Pryor conducted a heating experiment on modern shells from Blombos beach to assess the impact of different extent of heating on clumped isotope signatures, with the goal to apply this proxy for reconstructing hearth locations and possibly cooking methods. SapienCE archaeologists Francesco, Beth, Karen and Christopher Henshilwood submitted an article in which they describe and experimentally reproduced tools made of ochre from Blombos Cave, providing the first direct evidence of a utilitarian use of ochre in the Middle Stone Age to Science Advances.

While excavations at Blombos Cave have come to an end, there is a treasure trove of materials being analysed from the site, with many exciting results anticipated from our dynamic team. From 2025 we will return to the Klipdrift Complex, excavating at both the Shelter (Middle Stone Age) and the Cave (Later Stone Age).

CLIMATE

BY SIMON ARMITAGE

Work within the climate group aims to understand the nature of the environments experienced by our ancestors living along the southern African coastline. We are particularly interested in the timeframe during which coastal cave sites such as Blombos Cave, Klipdrift Shelter and Klasies River Main Site were occupied, i.e. from ~120-50 thousand years ago (ka), though as the scope of SapienCE's activities has widened, so have the timeframes of interest. Our approach has been to obtain climate data from a wide range of sources, and to combine these with climate model results. Each approach has its strengths and weaknesses. On land we are focused on obtaining long, detailed climate records from cave speleothems (stalagmites), with the disadvantage that linking these data to human activities is imprecise. More fragmentary records have been obtained from faunal remains and the archaeological sediments themselves, where a lack of detail is compensated by unequivocal relationships with the archaeology. We also continue to study deep-ocean sediments from locations close to the south coast of South Africa. In principle, these should provide continuous, detailed records of climate, though linking this information to human activity is not straightforward. Climate model data helps us to understand the probable causes of the environmental changes which we discover. In each of our areas of research, 2024 has been a productive and sometimes challenging, year.

Ozan Mert Göktürk led regional climate modeling work, using the Weather Research & Forecasting (WRF) model to understand southern African climate at 93 and 63 ka. His work involves using coarse-scale global climate model data to produce more detailed regional climate simulations for "time-slices" in the past. His work brings the number of time-slice simulations completed by SapienCE to four. This makes our regional paleoclimate model record look increasingly more like a time series, enabling SapienCE scientists to understand better southern Africa's ancient climate and its impact on early humans. These new insights will soon be published in upcoming publications where model and proxy data present independent lines of evidence on past climatic changes in the region.

Work on deep ocean cores also progressed during the year, led by PhD student Karl Purcell and postdocs Kurt Wogau, Katrina Nilsson-Kerr. Karl submitted his first PhD paper to Climate of the Past, which uses variations in the chemical composition of the core to infer changes in river discharge along the south-east coast of South Africa over the past 260,000 years. Kurt Wogau investigated horizons referred to as "the dark layers" in his core, where the characteristic dark colour is caused by high organic matter content. The layers are closely associated with low levels of oxygen at the sea floor during periods of reduced ocean circulation, which enhances the preservation of organic matter delivered to the core site by several rivers in eastern South Africa. The increase in river runoff recorded in the dark layers may also suggest high precipitation conditions in the continental region. Katrina focused her efforts on data generation including the completion of high-resolution planktic foraminiferal census data from marine sediment core MD20-3591 spanning the last 150 thousand years, which provides insights into variations in the strength of the Agulhas Current. She also performed geochemical analysis on selected samples for individual foraminifera during a research stay at the University of Cambridge. Laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) was conducted to retrieve trace element concentrations from planktic foraminifera, working in collaboration with Dr Oscar Branson. These data will allow Katrina to investigate sea surface temperature changes, focusing on changes in seasonality, and allowing her to understand better the complicated interplay of various ocean currents in the region.

On land, Ella Walsh, Christopher Miller (Tübingen, Germany) and Simon Armitage (Royal Holloway, UK) conducted a week-long survey of the area surrounding Blombos, collecting samples which will allow them to the landscape evolution around the cave during the Middle Stone Age. Ella also visited the laboratories in Tübingen and Royal Holloway to work on the material which she collected. Nele Meckler led fieldwork in the De Hoop Nature Reserve, where Klipdrift Shelter is located, collecting water samples and downloading temperature and drip-rate data from loggers which had been installed in caves during 2023. These samples and data support Jenny Maccali's work on dating speleothem samples recovered from the same caves in 2020, and understanding the climate records which they contain. Jenny was frustrated in 2023 by a number of problems with the mass spectrometer which she uses for dating the speleothems, but her persistence paid off in 2024, and she was able produce much more data. Master's student Alfred Skeidsvoll continued to work on De Hoop speleothems, investigating climate change in the region between 60,000 to 90,000 years ago. This research involves analyzing ancient water trapped in stalagmites from

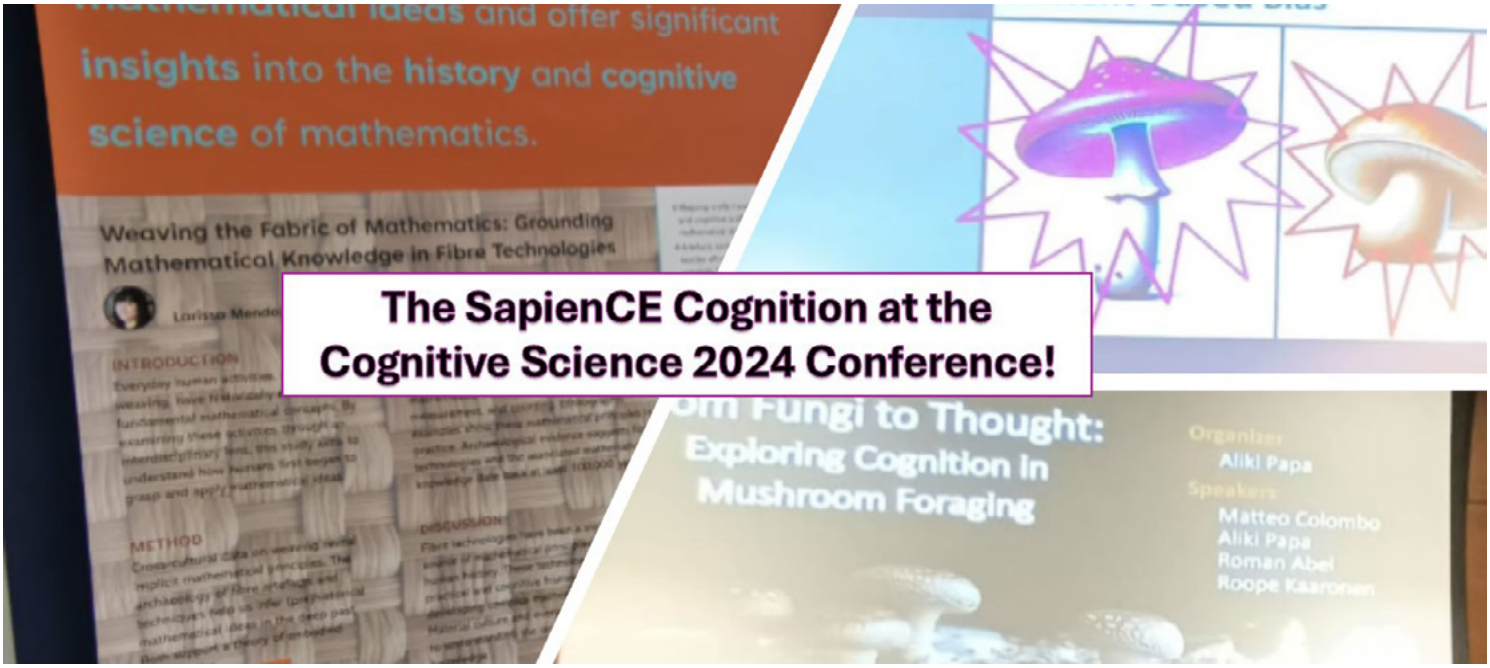
Bloukrantz Cave. Changes in the chemical composition of this water can reveal information about ancient climate conditions, such as temperature and precipitation.

The biomarkers team (Samuel Pereira and Eoghan Reeves) established methods to measure various biomarkers in sediments and speleothems from Blaukrantz Cave, including fire biomarkers (polycyclic aromatic hydrocarbons), fatty acids, alcohols, and fecal matter (stanols and sterols). Preliminary results indicate high abundances of plant- and bird-derived fecal matter in the cave soils, suggesting the presence of birds within the site. Meanwhile, the speleothems exhibit relatively higher abundances of bacterial-derived biomarkers and terrestrial-plant-derived compounds. These terrestrial biomarkers hold the potential for reconstructing paleoenvironmental conditions during the period in which speleothems were growing.

Kurt Wogau and University of the Witwatersrand MSc candidate Shanae Page visited the Little Karoo, a semi-arid desert region located between the Cape Fold Belt mountains, searching for open air sites located in paleo-wetlands. Two sites were surveyed within the Sanbona Nature Reserve: The Big Pan and the Brak Riverbank. Their initial survey suggests that the Big Pan was a flooded area in the past and was visited by hunter-gatherer groups, as indicated by the presence of flakes and chunks along the Big Pan's western shore. The Brak Riverbank revealed a past landscape shaped by pond systems next to the main river channel. This area may also have been attractive to ancient hunter-gatherer groups due to the presence of freshwater and a high number of natural resources.

2024 was also a busy year for conference presentations by members of the climate group. Six SapienCE researchers attended the Southern African Society for Quaternary Research conference at Oudtshoorn, South Africa in May, while six of the team presented at the Institute for Basic Science Conference on Climate and Human Evolution in Busan, South Korea in October.

Lastly, in 2023 we wrote that "Margit Simon collected new leaf wax samples from a range of archaeological sites in both northern and southern Africa, with a view to conducting a larger-scale study" linking past climate changes and human behavioural evolution. This year she was awarded a €2.17 m European Research Council Consolidator Grant entitled "Palaeoenvironments of Human Behavioural Evolution in Africa (PIONEER)" to perform that larger-scale study. Clearly, 2025 will be another busy year for SapienCE climate research!



COGNITION

BY ALIKI PAPA

It's an exciting time to explore how we became who we are, and our group's research sheds light on early sapiens behavior, the development of symbolic practices, and the processes shaping cultural evolution. By integrating perspectives from archaeology, cognitive science, and cultural studies, we contribute to a deeper understanding of the origins and trajectories of human thought and culture.

One of our key research programs, titled Fungus Culture & Cognition, examines the multifaceted role of mushroom foraging and consumption in cultural and cognitive evolution. This program includes several sub-projects that explore different aspects of this fascinating topic. One major project, led by Katharina Wolff (ISP/SapienCE), focuses on risk appraisal and decision-making under uncertainty in the context of mushroom foraging. Findings from three comprehensive studies suggest that decision-making is influenced by the source of knowledge, the level of uncertainty in species identification, and the severity of symptoms from consuming poisonous mushrooms.

Another initiative, led by Andrea Bender (SapienCE) and Åge Oterhals (Nofima), investigates cultural influences on the evolution of mushroom edibility appraisals. This project involves compiling a large-scale database documenting edibility appraisal across different cultures and historical contexts. The database currently includes information on several hundred mushroom species from 14 countries, with some data spanning the last 200 years. Two papers have already been published from this work, providing valuable insights into the field. Åge and Andrea also conducted fieldwork in South Africa during the spring of 2024 for a survey on the potential of mushrooms as a food source in the Western Cape. This research is described in more detail in "Tracing an 'Invisible' Food in South Africa" (in the Story section), which also introduces an ethnomycological database for sub-Saharan Africa currently being developed by our temporary group member Chiara Anceschi.

In addition, Aliki Papa has been investigating the effects of mushroom knowledge (e.g., edibility, visual aspects) on the cumulative cultural evolution of information. Data has been collected from Norwegian participants in Bergen and Greek Cypriot participants in Nicosia. This research has resulted in one submitted manuscript examining how mycophobia (fear of mushrooms) and cultural transmission biases (during acquisition and teaching) affect the evolution of mushroom knowledge. More details about this research can be found in the story section, titled "How Fear Shapes Our Mushroom Knowledge: A Story of Teaching and Learning". Two additional manuscripts are in preparation: one explores the effect of the presence versus absence of a learner during

transmission on mushroom information evolution, and the other presents a cross-cultural comparison of these effects in Norway versus Cyprus. Aliki and Andrea also organized a symposium, From Fungi to Thought: Exploring Cognition in Mushroom Foraging, which captivated a large audience at the Cognitive Science 2024 conference in Rotterdam. This was the second symposium they organized to examine mushrooms from multiple perspectives, and together with Roope Kaaronen (Helsinki University), they are currently editing a Special Issue in *Topics in Cognitive Science* based on this and last year's awarded symposium.

Larissa Mendoza Straffon, a senior researcher, has made substantial contributions to several projects within and beyond SapienCE. Her ongoing research on early sapiens cognition, in collaboration with Andrea Bender and Francesco d'Errico, has yielded two publications exploring methods for reconstructing cognitive evolution, particularly concerning the origins of religion and symbolic behavior. She also co-authored a chapter on the uses of ochre in rock art studies, led by postdoc Elizabeth Velliky, and published a study on cultural learning and drawing skills development. This work is part of the project Visual Signs as Cognitive Tools, funded by the John Templeton Foundation and hosted at Leiden University. Larissa is also involved in the ERC QUANTA project, where she is conducting a comparative study on the relationship between fiber crafts and embodied mathematical ideas. Her research included visits to the Max Planck Institute for Evolutionary Anthropology in Leipzig and the Institute of Archaeology in Brno, Czech Republic. She presented her findings at three international conferences and co-organized the workshop Activating Symbolism, which explored how symbolic activity emerges from interactions between materials, body, and mind, and how these interactions are traceable in the archaeological record. Additionally, her work on the origins of art was featured in the Templeton Ideas Blog, highlighting what ancient aesthetic objects reveal about our ancestors and ourselves.

Finally, Heidi Øhrn has been advancing her research on knot-tying and cognition, contributing significant findings to our understanding of this intricate skill. During data collection, she worked with over a hundred participants, resulting in nearly 50 hours of video material that captures the detailed process of knot-making and its cognitive demands. Heidi is currently completing the last stages of data processing and analysis, drawing on this rich dataset to examine how individuals approach complex tasks that require spatial reasoning, problem-solving, and fine motor skills. The first manuscript based on these findings is well underway and promises to provide valuable insights into the role of material interaction in cognitive development. A possible additional publication will investigate further the interplay between cultural learning, teaching, and individual problem-solving strategies, including how these evolve when they are passed on from generation to generation. Her work highlights how everyday activities, such as knot-tying, can reveal the broader mechanisms of learning and innovation, offering a unique window into the cognitive processes that shape human behavior and cultural evolution.

From decoding ancient symbols and reconstructing technologies to unraveling the cultural puzzles of foraging and decision-making, our group thrives on curiosity and exploration. By examining the interplay between cognition, culture, and the environment, we aim to trace some of the evolutionary milestones of our species. It's a thrilling adventure into what makes us uniquely us – and we can't wait to see where the next discovery takes us!

STORIES

WORKSHOP

ACTIVATING SYMBOLISM AT THE ART ACADEMY (UIB)

BY ELIZABETH VELLIKY, LARISSA MENDOZA STRAFFON

This workshop aimed at exploring the different ways in which symbolism emerges through practice and the interactions of the human mind/body with materials and creative processes, and how such experiences can inform our interpretations and theories of art and symbolism in the deep past.

Even though symbolic behaviour in archaeology has long been regarded as a defining characteristic of modern human cognition, its exact manifestations and subsequent interpretations in the archaeological record are often unclear and subjective. In addition, the role of materials and productions processes are often overlooked in such interpretations. Our workshop aimed to challenge that traditional narrative of symbolism in the past.

In the morning session, the invited speakers examined the practices and performances surrounding symbolic media, providing new insights into ancient cognitive processes and human dynamics. The keynote speaker, Prof. Francesco d'Errico (SapienCE, U. of Bordeaux) talked about the relationship between the evolution of human symbolic cognition and our species' ecological niche expansion. Marianne Heier (UiO), assisted by Lisa Marie Hovden, addressed the issues surrounding our contemporary readings of human body interpretations, particularly female bodies and what this means for how we understand prehistoric and classical art depictions through a presentation and live-art performance. Geir-Harald Samuelsen (UiB, KMD) drew links between the cave, the body, and the artist's studio as spaces that provide a background for creative exploration, and ultimately symbolic expansion. Finally, Ivan Colagé (Pontifical U. Holy Cross) discussed symbolism within the framework of cultural evolution and the extended mind. Drawing from perspectives in archaeology, cognition and contemporary art, the talks fostered a transdisciplinary dialogue and innovative approaches to understanding symbols and their significance in the human experience, both in the past and today.

In the afternoon session, participants explored symbolism through the lens of technique, craft theory, and the intersection of materiality and human experience in the creation and understanding of symbols, with a particular focus on art. Each participant had the opportunity to interact with various materials in an open manner, discovering the properties and affordances of each one for different purposes. We provided reindeer antler (for engraving, carving, or cutting), red ochre minerals (for pounding, engraving, or colouring), and lithics (for flaking, cutting, or engraving). With no end-product in mind, individuals were encouraged to touch, feel, and experience how the materials reacted to and changed with their interventions, and to think how the knowledge of material and technique could have influenced their use for particular symbolic means in the past.

In sum, through presentations, material engagement and discussions, participants were stimulated to reconsider traditional paradigms and embrace diverse methodological approaches in the study of symbolism in archaeology.
The social program included dinner at Bien Centro, and the following day, participants had the opportunity to visit a rock art site near Bergen.

OCHRE'S ROLE IN EARLY HUMAN SOCIETIES

BY ELIZABETH VELLIKY, JANNE-BEATE BUANES DUKE

SapienCE scientist Elizabeth Velliky and her team have uncovered that the world's oldest ochre mine, Ngwenya in Eswatini, wasn't the only source of ochre pigment as we once thought. Instead, people used a variety of local ochres, showcasing unique cultural traditions and social interactions in Stone Age communities in Eswatini.

This discovery, published in *Nature Communications* challenges old assumptions and shines light on the complex networks that shaped early human societies. Despite the high-quality pigment from the Ngwenya ochre mine, local communities preferred using diverse ochres, reflecting their unique cultural traditions. The groundbreaking study also underscores the intricate networks of exchange and symbolic expression that shaped early human societies.

NEUTRON ACTIVATION ANALYSIS (NAA)

Using Neutron Activation Analysis (NAA), a highly sensitive technique housed at the University of Missouri Research Reactor (MURR), specialists such as Dr. Brandi MacDonald, the lead author of the paper, can unlock detailed information about the composition of ochres, offering a deeper understanding of ancient practices.

"This particular method makes it possible to unlock information on the major, minor, and trace elements of materials, which many other non-bulk sampling techniques do not offer. I have also been using this technique when analyzing ochres that I have collected around Blombos and in the Klein Karoo, so essentially our data will be comparable to the Eswatini data," Elizabeth Velliky explains.

CHALLENGING PREVIOUS ASSUMPTIONS

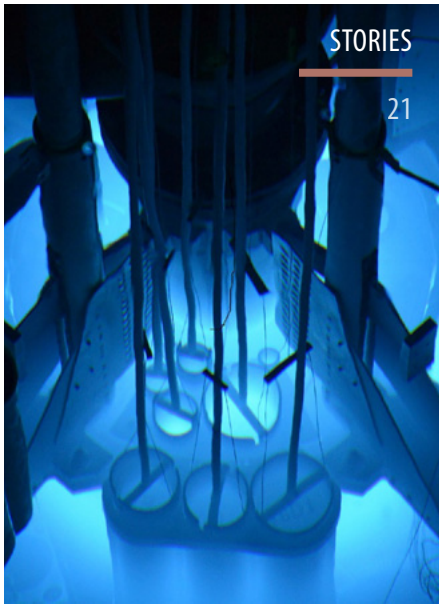
However, the groundbreaking aspect of the study from Eswatini is not the only new observation coming from these data. The results also tell the story of how should always challenge "givens" in science, and work to reshape and go forward from previous assumptions, Velliky says.
"For a long time, many archaeologists believed that the Ngwenya ochre mine was likely a major source of ochre pigment for prehistoric groups, with some suggesting that ochre from this mine could have been transported up to 300 km away. We now know that there is a lot more to the story than we once assumed."

The reason why many archaeologists believed that this particular ochre would be sought after is due to its physical qualities – the colour is very saturated, and the ochre is fine-grained making it soft and easy to turn into powder, and it is sometimes specular, meaning that it has a glittery appearance.

"We found that even in a fairly close and constrained area, people had unique cultural traditions that they maintained, despite the 'quality' of the Ngwenya ochre. Instead, diverse local ochres were being used, highlighting unique cultural traditions and complex social interactions in the Stone Age," Velliky says.

SURPRISING FINDINGS

They were surprised to find that two contemporaneous archaeological sites located relatively close together had very different pigment artefacts.



"It was very interesting to see that even when there is this gigantic ochre mine close by, it doesn't mean that it was the only ochre mine being accessed in the past. It was also interesting to see how many types of ochre could form in one location, and how people were also using a variety of pigments within such a small area," Velliky says.

Regardless, the Ngwenya ochre was collected and transported up to 100 km. Even though not regularly, it still shows that there was a shared recognition of the importance of this material throughout the Middle Stone Age and Later Stone Age in Eswatini. The findings also show that cultural practices did not develop in isolation but were part of a wider system of relations influenced and facilitated by social interactions, such as technological learning, seasonal traveling, material culture exchange, and symbolic expression.

SOCIAL PRACTICES AND CULTURAL IDENTITY

"Different social practices and norms are what drove people to seek out ochre, and use it in different group activities. These could include people moving through the landscape to locate and collect different materials, including ochre, and then teaching others how to locate these types of formations and which physical characteristics are present in each place. The knowledge and know-how needed to be transferred and shared over and over again for people to sustain these types of behaviours and social practices" Velliky says.

The diversity and complexity of these behaviors illustrate precisely how an overarching, shared cultural identity surrounding ochres can unify various localized and contextually contingent communities of practice. In addition, Velliky says, this study brings back international relevance to Eswatini in the larger conversation of MSA and LSA behavioral practices in southern Africa – as much of the focus has previously been on South Africa, but that is only part of the picture.

HUMANS ARE COMPLEX CREATURES

"The emerging picture is one of a unifying culture of significance around ochre and its longstanding importance within social activities across Stone Age Eswatini, nuanced with unique and contextually contingent variations in the ochre communities of practice. Our study was done in close partnership with the Swazi Archaeological Research Association (SARA) and the Eswatini National Museum; indeed, the study could not have been done without their involvement and support," Velliky says.

She emphasizes that this is a good reminder that we always need to be open to challenging our assumptions, as the obvious, simplest explanation is not always the right one. "Humans are complex creatures with nuanced behaviors, cultures, and social structures. We do things that don't always make sense; we go out of our way for certain things for personal or communal reasons. It was fascinating to see a part of that picture in Eswatini, and right now we are working to understand the same things in Blombos and Klipdrift," Velliky says.

BRIDGING THE PAST AND THE FUTURE

Velliky aims to compare these findings with her ongoing research in other regions and SapienCE sites. She has collected samples from over 50 ochre sources in the region, which she hopes will give new answers about the behaviors and practices surrounding ochre use during the Middle Stone Age.

"Perhaps it paints a similar story, perhaps it is completely different. Perhaps the coolest thing was seeing how the people of Eswatini were still using ochre today; you could easily buy it at the market, and everyone knows what it is. So, it's not really this 'distant ancient past' material that we are talking about; it is still very alive even today. This will tell us more about how and perhaps why people do the things they do in regard to ochre and pigment use."

TRACING TRACES THROUGH EXPERIMENTS

BY MARZENA CENDROWSKA

Everything you do will leave a trace if you do it long enough. Statues polished by tourists' touch or stone steps worn by ages of footsteps could serve as prime examples. The same applies to stone tools. Distinctive traces of activities such as bone tool making or butchering can be observed on their surfaces even after thousands of years have passed. Moreover, knowledge about things otherwise elusive in the archaeological record, such as use of plant materials, can be gained by studying lithics.

But how do we even begin to understand this vast array of possible traces? The way a use-wear trace develops depends on many factors, such as the raw material used to produce the tool, the hardness and water content of the worked material, the directionality of movement, and the duration of the task. To unpack this complex formation process, we need to plan and carry out experiments carefully.

This year's field season at Blombos offered the perfect opportunity for such an experimental setup. The first step involved collecting the same raw material types as the ones used in the cave. Thanks to the courtesy of the local geologist Peter Jan Gräbe and SapienCE post-doc Jeremy Beller, I was able to gather silcrete at several locations within an approximate 20 km radius of the cave. The two other raw materials – quartz and quartzite – posed less of a challenge, as both can be found directly at Blombos beach. One sharp cutting edge was enough for my purposes, so simple flakes were knapped using direct percussion from all three materials.

Proper documentation is one of the fundamental elements of any experiment. Before moving forward, all the tools used were photographed, their outline was drawn, and a cast of the working edge was made using silicon. This cast was then repeated halfway through each experiment. By doing this, I assured that I would be able to understand the trace formation processes, especially those involving edge rounding or loss. I recorded the time taken, counted every movement, and took photos of the experimental process. All of this allows me to control the experiments and trace back every step I make.

Choosing which activities should be replicated provides yet another challenge. One way to approach this subject is to look at the ethnographic record of present-day and historical hunter-gatherers and the way they use stone tools. Additionally, data from use-wear studies conducted for other similarly dated sites comes in handy. I conducted experiments dedicated to working bone, hide and woodworking, as well as butchering, scraping ochre, cutting reeds, and peeling tubers. Some of the activities included additional variations of the worked material. For example, I used bones of 4 animals – cow, ostrich, seal and sheep. Additionally, the first three were dried and then soaked in water for a few days, whereas the last one was cut fresh, directly after the butchering experiment.

In total, I conducted over 50 experiments over more than 40 hours and 100 000 cuts or scrapes. It gave me a unique opportunity to not only observe the traces but also experience the tasks. And they are a hard and dirty jobs! Some quite surprising conclusions could be made during the process already. I realised that the quartzite and silcrete tools were useless for catfish butchering, whereas quartz flakes cut through the fish skin with ease. Working with wood and bone caused significant edge chipping, and those removals served as a natural retouch, creating a serrated age and making the tool usable for much longer. Surely, similar observations have been made and considered while selecting the perfect tool for a given task in the past.

What happens next? After conducting the experiments, it is time to observe and document the obtained use-wear traces. I follow the same procedure as in the case of archaeological artefacts. First, the traces are documented in low magnifications (up to 50×) through a stereo microscope to observe the distribution of edge damage, traces and residues. Then, a metallographic microscope with magnifications up to 500× is used to document the details of the polish. Finally, through confocal microscopy, it is possible to obtain surface roughness measurements and quantify the differences between different traces. As a result, I created a reference collection of traces that I will use to compare with the use-wear observed on the archaeological materials.

DRONE MAPPING TO CREATE HIGH-RESOLUTION LANDSCAPE MODELS

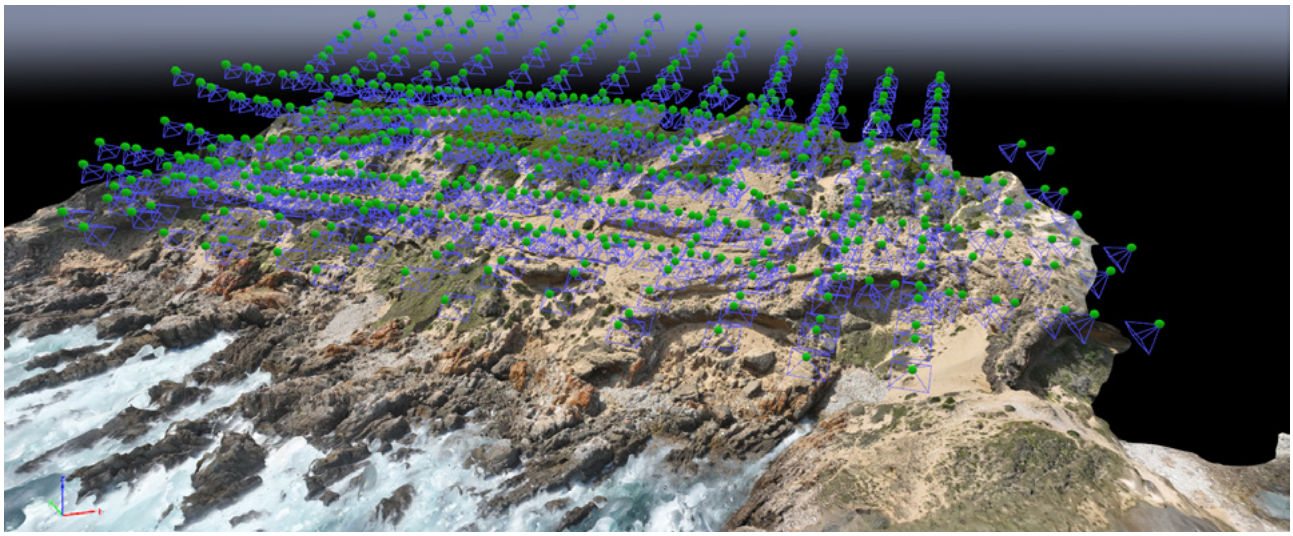
BY ELLA WALSH

During the Middle Stone Age occupation of Blombos Cave, fluctuating sea levels due to glacial and interglacial cycles significantly impacted the surrounding environment. Emerging datasets from marine cores, speleothems, and climate models suggest that the climate changed at a range of scales. To gain an insight into the local environments in which humans lived, sediments preserved across the surrounding coastal landscape can be investigated. Palaeosols, or ancient soil layers, indicate stable periods where vegetation could establish, while dune layers reflect more dynamic conditions with significant sediment movement. By studying these deposits, which date from around 100 000 to 70 000 years ago, we hope help establish a timeline of environmental shifts in the vicinity of the cave.

Stacked dune-palaeosol sequences have been described between 50m and 3 km from the cave, but mapping and correlating these deposits across the coastline has been challenging due to the scale of the landscape, discontinuous preservation of the sedimentary layers, and difficulties in accessing steep parts of the coastline. One way to address these challenges is to look at digital elevation models (DEM) of the terrain. Publicly accessible DEMs, however, are only available at low resolution. During the 2024 field season, we had the opportunity to use a drone create our own DEM.

The DJI Mavic 3 Enterprise drone, equipped with a high-resolution camera, was flown over targeted areas of the coastline. Within defined boundaries, automated flight paths were created to capture the full area. In locations with complex sequences of palaeosols and dunes, we flew the drone closer to the land surface to capture finer details. During each flight, the drone took hundreds of georeferenced overlapping photos, both downward-facing and oblique. The accompanying precise geographical data means that the images could be processed in photogrammetry software, Pix4D, to create a continuous, high-resolution maps. The resulting 3D models of the landscape surrounding Blombos Cave provide a way of mapping geomorphic features and establishing a stratigraphic timeline of environmental changes. Using these, we can calculate the elevation of deposits and measure the thickness of units. Within strongly dipping dune sequences, we can measure the angle of depositional layers and estimate the prevailing wind direction at different points in time.

At each of our study locations, we collected samples for geochronological, sedimentological and micromorphological analyses. This data will help refine the timing, nature and extent of landscape changes. For example, a number of dune outcrops correspond chronologically to the 70,000-year-old dune layer within the cave. By using the location and elevation of these coastline deposits, we will be able to map the area covered by dunes during this period. Together, these photogrammetry and lab-based approaches will enable us to better understand what the landscape surrounding Blombos Cave looked like in the past.



HOW FEAR SHAPES OUR MUSHROOM KNOWLEDGE: A STORY OF TEACHING AND LEARNING

BY ALIKI PAPA

Imagine you're in a small Norwegian village surrounded by dense forests and looking at a basket full of wild mushrooms. Some are bright and inviting, while others look a little dangerous. You know that mushrooms can be tricky – some are edible, while others can be poisonous. But how do we learn what's safe to eat and what's not?

Our study explored how people pass down knowledge about mushrooms, particularly focusing on the role of fear – what we call mycophobia. In Norway, there's a deep-rooted cultural fear of mushrooms, with many people believing that most wild mushrooms are poisonous. This fear shapes how mushroom knowledge is transmitted across generations.

To study this, we created an experiment where people worked in pairs. One person acted as a "teacher," passing on mushroom knowledge to a "student." The student would then teach someone else, and so on, through multiple generations. This happened until all participants in all the chains passed on the mushroom knowledge to someone (Fig. 1 provides a visual demonstration of how the chains l ooked and how participants made up the dyads of teachers and students).

Each person in the chain was asked to classify mushrooms as "poisonous," "edible," or "inedible," based on a set of 24 mushrooms (Fig.2).

The confederate initiated all generations, acting as another participant who was given the "teacher" role (Generation 0 dyad). This person also acted as a "naive" learner for every final participant in each chain (Generation 8), so that those participants also produced output.

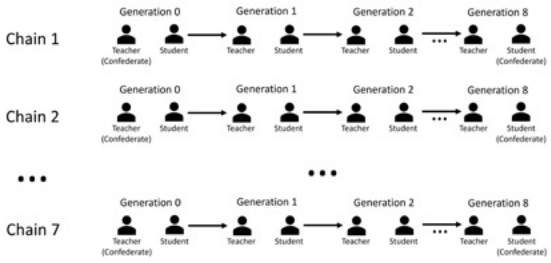


Figure 1

Figure 2

Figure 3: One of the last dyads (Generation 7) in a chain interacting. The teacher (right) transmits information to the student (left). The teacher divides the mushrooms into 21 poisonous (taking overwhelmingly two and a half rows) and edible (last three mushrooms close to the student).

What we discovered was fascinating. Participants overwhelmingly tended to classify mushrooms as poisonous. This wasn't a mistake – it reflected the deep-seated fear that many Norwegians feel toward mushrooms. Our hypothesis was that mycophobia would cause people to be overly cautious, classifying more mushrooms as dangerous, and the results proved us right.

However, we were surprised by one thing: the source of the information – whether the teacher was familiar or unfamiliar – didn't matter much. Previous studies suggested that people tend to trust and remember information better when it comes from familiar sources, like friends or family. But in our experiment, it wasn't familiarity that influenced the transmission of knowledge; it was the content itself. The most important information for people was whether a mushroom was safe to eat, and facts related to survival and danger were the ones that stuck.

At first, participants passed along a variety of information. But as generations progressed, the information became more streamlined. By the fifth generation, only the basic information remained: Is the mushroom poisonous, edible, or inedible? This simplification was likely driven by cognitive constraints: our brains can only hold onto so much information, so we tend to prioritize what's most important for survival.

Interestingly, as the experiment went on, the mushrooms in the dataset became more poisonous (for example, see Fig. 3). Participants, already primed by their mycophobic tendencies, became more likely to remember and pass on information about poisonous mushrooms. This phenomenon, likely driven by a confirmation bias, shows how our preconceived beliefs (in this case, that mushrooms are dangerous) can influence what we choose to remember and share.

By the end of each transmission chain, participants were highly accurate in identifying poisonous mushrooms but had trouble identifying inedible or edible ones. This shift in focus clearly demonstrated how mycophobia shaped the knowledge being passed down, as people were more concerned with avoiding danger than with identifying safe mushrooms.

This study highlights the powerful role that cultural attitudes, such as fear, play in shaping how knowledge evolves. Mycophobia, which is widespread in Norwegian culture, not only influenced what people learned but also how they taught others. Over time, the information became more focused on avoiding danger, with less emphasis on the positive aspects of mushroom knowledge, like finding sustenance and nutrition in these morsels.

Looking to the future, this research opens up exciting possibilities. What would happen if we studied mushroom knowledge in cultures with a more positive view of mushrooms? Would people there transmit more balanced, less fearful information? By studying how cultural biases affect knowledge transmission, we can gain deeper insights into how human knowledge evolves across generations, whether it's about mushrooms, other foods, or even broader cultural practices.

THE DUAL ROLE OF CULTURE FOR RECONSTRUCTING EARLY SAPIENS COGNITION

BY ANDREA BENDER, LARISSA MENDOZA STRAFFON, JOHN B. GATEWOOD & SIEGHARD BELLER

Psychological Review, Dec 14, 2024 DOI: 10.1037/rev0000462

In a paper published in Psychological Review, SapienCE Cognition group PI Andrea Bender and Researcher Larissa Mendoza Straffon, in collaboration with cognitive anthropologist John B. Gatewood from Lehigh University (USA), and drawing from ideas of past SapienCE member Sieghard Beller, argue that data from comparative studies across cultures and languages should be better and more often incorporated in cognitive evolution research.

THE ROLE OF CULTURAL DIVERSITY IN COGNITIVE EVOLUTION

The paper argues that culture has played a dual role throughout human evolution: it has not only scaffolded cognitive development but also driven continuous diversification. By examining cognitive universals and cultural diversity, the study offers novel insights into the evolution of human cognition and its interplay with culture.

CULTURE AS A SCAFFOLD AND DIVERSIFIER OF COGNITION

Human cognition has been deeply shaped by cultural environments. Key enablers of human culture—such as teaching, imitative learning, and language—have amplified cognitive abilities, facilitating the "ratcheting up" of culture. Language, for instance, enhances communication while boosting cognitive processes like Theory of Mind (ToM)—the ability to attribute mental states to oneself and others. This scaffolding role spans individual lifetimes and evolutionary timescales, fostering cognitive growth and variation.

Cultural practices also generate cognitive diversity by shaping knowledge, beliefs, and problem-solving approaches. Variability is evident in how and what children learn, with some cultures emphasizing observational learning over direct instruction. Such differences influence cognitive inclinations and how information is organized and interpreted, often along culture-specific lines.

MECHANISMS OF COGNITIVE EVOLUTION

Two major strategies help reconstruct the evolution of human cognition. The first seeks universal cognitive traits shared across cultures and with other species. For example, aspects of ToM, such as Level 1 perspective-taking, are foundational and distributed variably among humans and non-human animals, like primates and corvids. Level 1 perspective taking refers to the understanding that another person may not see something they themselves are able to see and know. These shared traits provide a baseline for understanding early human cognition.

The second strategy leverages cultural diversity, for example through phylogenetic comparisons. This approach examines relatedness among cultural groups and tracks the evolution of cultural systems. By analysing diversity, it is possible to infer ancestral states and transformations, gaining insights into how cultural practices, such as religious beliefs, emerged and evolved.

THE ROLE OF LANGUAGE IN THE EMERGENCE OF RELIGION

Religious beliefs, ubiquitous in human societies, provide a case study for the proposed approach. Through a detailed literature analysis, the paper suggests that Level 1 perspective taking would have been enough to support animistic beliefs. Animism is posited as the ancestral core of religion. However, the effects of language would have been required to foster communal belief systems, which are the mark of religious systems.

Without language, early humans' ability to transmit and refine complex ideas would have been limited. This suggests that religion likely arose with language, predating the necessity for advanced ToM, such as Level 2 perspective taking or the recognition others might believe something that conflicts with one's own beliefs and act based on such diverging belief.

INTEGRATING UNIVERSALS AND DIVERSITY

The study concludes that human cognition is best understood by combining research on universal traits with insights from cultural diversity. This dual approach reveals that cognitive evolution is not a linear trajectory but a complex interaction of shared foundations and culturally driven innovations. By acknowledging the dynamic role of culture—as both a scaffold and a diversifier—we can better reconstruct the cognitive landscapes of early humans and their extinct relatives.

This perspective emphasizes the importance of treating cognitive diversity, past and present, as a central component of human evolution. It challenges simplified models and highlights the intricate relationship between culture and cognition in shaping our species.

SCHIZOPHYLLUM COMMUNE

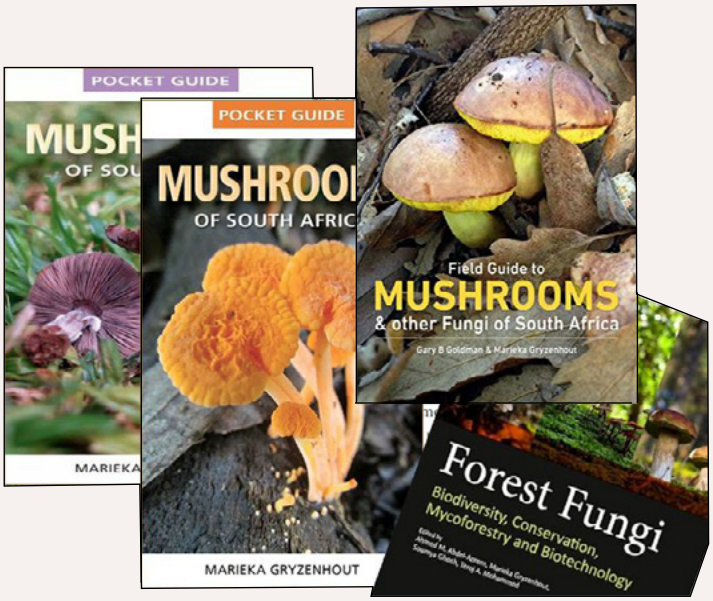
FUNGUS CULTURE & COGNITION GROUP

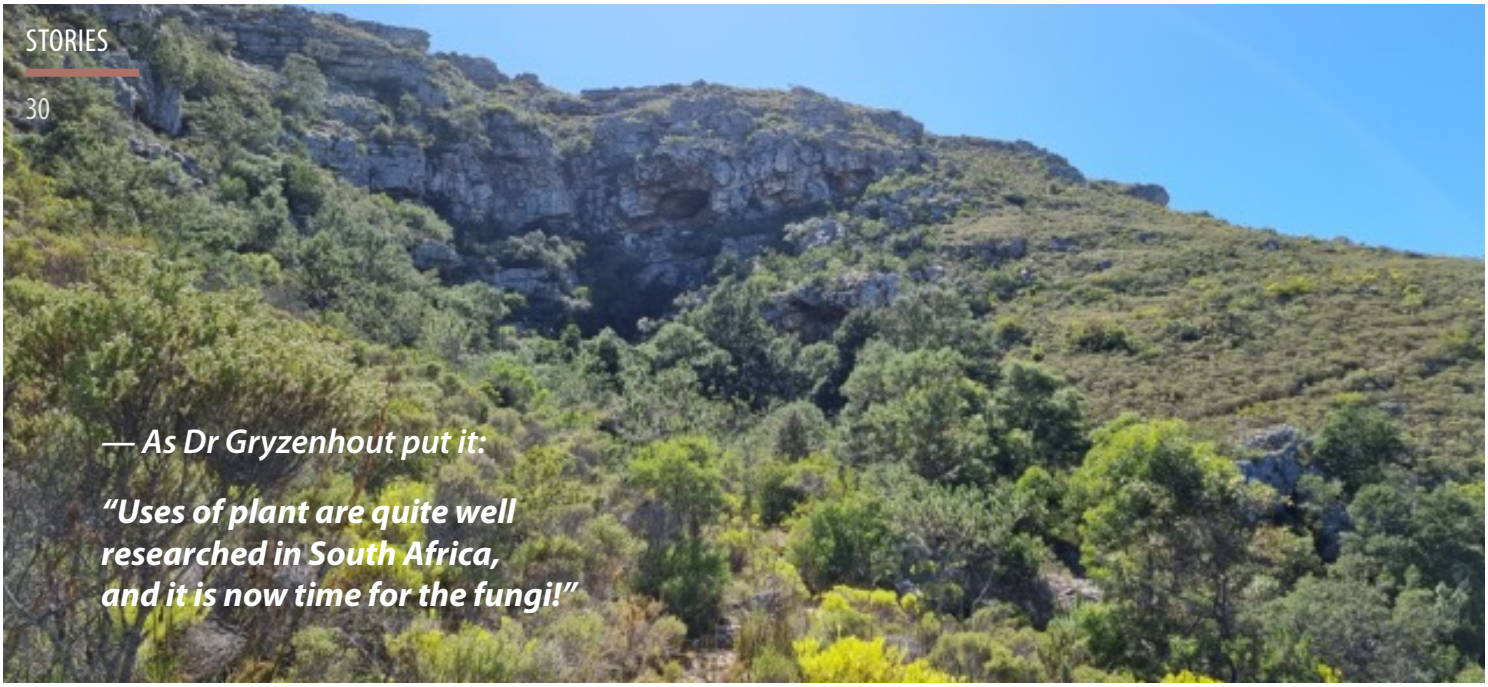
TRACING AN 'INVISIBLE' FOOD IN SOUTH AFRICA

BY ANDREA BENDER

People tend to leave behind a lot of things, including food. But not every type of food leaves behind traces in archaeological field sites. If food happens to contain bones or shells, there is a chance that some of it will survive, but seaweed, blue-green algae, or mushrooms will not – and will hence remain invisible. As a contribution to this "Invisible Food" theme in SapienCE, the Fungus Culture & Cognition group aims to unearth one candidate in particular, which decomposes rapidly and has therefore hardly ever been perceived as a notable contribution to the human diet in the African Middle Stone Age (MSA). In fact, we maintain that edible mushrooms were not only of interest to MSA populations but were very likely an important component of their subsistence. To back up this conjecture with substantive empirical data, and to investigate how the knowledge essential for making safe choices may have accumulated, we collaborate with food scientist Dr Åge Oterhals from the Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima) in Bergen, Norway, and with geneticist Dr Marieka Gryzenhout from the University of the Free State at Bloemfontein, South Africa, both of whom are also experts in mushroom surveying and species identification.

Marieka Gryzenhout's publications, which provide the best and most comprehensive overviews to date, suggest an enormous diversity in edible species in South Africa, but also a lack of region-specific inventories, notably for the Fynbos biome. Likewise, very little has been published on the presumably rich indigenous knowledge on mushrooms that exists in the region.





A RAVINE BELOW THE BLACK EAGLE CAVE (in the De Hoop NR) turned out to be a hotspot of fungus diversity.

A PILOT SURVEY OF (EDIBLE) MUSHROOMS IN THE WESTERN CAPE

In early 2024, two members of our group conducted a pilot survey in the Western Cape. The goal was to obtain an initial overview of mushroom species present in the area of the SapienCE sites, their distribution, and their suitability for human consumption. During the first two weeks of March, we visited three field sites: two sections of the De Hoop Nature Reserve where Klipdrift is located – one around the homesteads in the West and the other around Potberg in the North – and the joint Blomboschfontein and Blombos Nature Reserve where Blombos Cave is located. A diverse range of habitats were included in the survey, from humid ravines to open Fynbos. We had chosen the beginning of March so that we would be able to coordinate with the excavation and landscape surveying teams in the field, but unfortunately, the weather conditions turned out to be suboptimal. After a long summer, it was still too warm and dry for many species to fructify.

SPECIES SAMPLING

Typically, only some of the mushrooms found can be identified to species level in the field; these are reported as "observation". Most species require microscopic examination for final identification; and in some cases, DNA sequencing is essential. When in-field identification was not possible, we therefore collected samples and dried them in preparation for transport and subsequent examination (as per our Cape Nature collecting permit CN35-28-28078 issued on 15-02-2024). All such samples are given a number to be used as a reference in our field notes. Both observations and collections are documented by pictures and described according to a standard scheme (including information on habitat, substrate, morphology, consistency, smell, and potential changes during handling).

The primary goal of this survey was the identification of edible species. However, given the scarcity of systematic data on fungal diversity in the region, we aimed to sample and register all encountered species in order to contribute to the documentation of their diversity and distribution.

FINDINGS

In De Hoop (March 3-8), we registered 6 observations and 67 collections, and in Blombos (March 11-16), we registered 6 observations and 23 collections – amounting to a total of 102 registrations. All species have been allocated to one of three major groups: Ascomycota, Basidiomycota, and Myxomycota (see text box). About 70% of the collected samples have been identified to species level so far, in some cases tentatively so, awaiting DNA sequencing for confirmation.

Ascomycota, *Basidiomycota*, and *Myxomycota*

Ascomycota (sac fungi) and Basidiomycota (club fungi) are the two divisions that constitute the higher fungi. They differ in how they produce spores (which can be decisive for species identification), but they are alike in that they generate fruiting bodies called 'mushrooms' and comprise a range of culturally salient species.

Myxomycota (slime moulds) are a more heterogenous group that is situated between animals and fungi and combines aspects of both animal and fungi lifestyles. They are included in our survey because they, too, contain edible species and are covered by ethnomycologies.

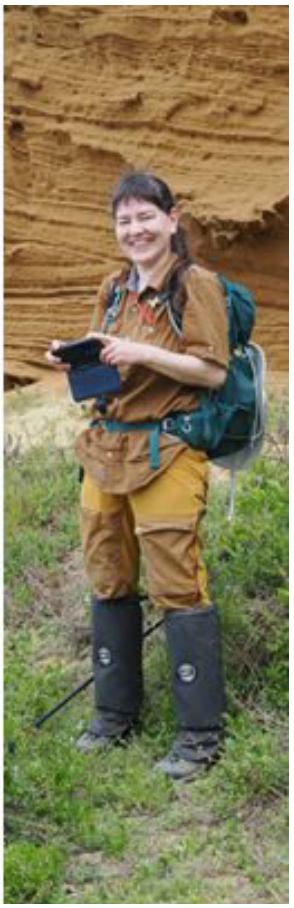
Registrations	Asco-mycota	Basidio-mycota	Myxo-mycota	Σ
observations		9	3	12
collections	44	38	8	90
Total	**44**	**47**	**11**	**102**

Despite the unfavourable weather conditions, a surprisingly large number of species were registered. While most of the species that endure aridity and warmth produce fruiting bodies too small to be of cultural interest, several were also documented, for the first time, as existing in the region or the country at large – and in some instances even in the entire continent, such as the small ascomycete *Propolis farinose*, which the GBIF (Global Biodiversity Information Facility) database – the leading open-access database on species distribution worldwide – does not yet list for Africa (see map).

Still, we did also find a number of culturally important species, among them the Split Gill, *Schizophyllum commune* (Afrikaans: waaiertjie; see picture on the top of page 29), which is widely used across Africa for a variety of purposes, such as for medicine and as food.

This pilot has established a solid basis for the more targeted and systematic main survey (planned for July 2025). The data collected during these surveys will serve as a reference point for reconstructing the diversity and availability of species in the MSA. As fungi are sensitive to climatic conditions in distinct ways, information about their relative distribution would also speak to the local climate models. The collected samples will be delivered to mycological collections in South Africa.

NATURE RESERVE OFFICER DALFRENZO LAING – here with Åge Oterhals (Nofima) – was our highly knowledgeable, helpful, and enthusiastic guide in search of promising survey sites in the western section of De Hoop.



TRADITIONAL USAGE OF MUSHROOMS IN SOUTHERN AFRICA

Finding edible mushrooms near our excavation sites is one thing; finding out whether they were actually eaten is a different thing altogether. Unfortunately, we can't answer this yet. Our group is therefore collaborating with a team of South African mycologists, led by Marieka Gryzenhout, to compile data on actual mushroom foraging in this part of the world.

The Bergen team was strengthened by mushroom enthusiast Chiara Anceschi, who was funded by SapienCE for three months in late 2024 to build a database on traditional usage of mushrooms in Southern Africa (MuCuSA). Drawing on a systematic literature search of ethnomycological studies from Sub-Saharan Africa, Chiara compiled data on mushroom species used, the groups that have used them, the purposes they have been used for, and the distribution of knowledge and expertise within the groups. So far, this database contains information on the type of usage (if any) of more than 500 mushrooms species in more than 150 cultural groups.

At the same time, Marieka Gryzenhout and two of her colleagues are collecting information on undocumented ethnomycological traditions in Southern Africa. Their review is planned as a contribution to both our special issue on Mushrooms as 'food for thought' (in Topics in Cognitive Science) and, eventually, to any database on that domain.

Being central for integrating different strands of information, the emerging MuCuSA database not only aims to systematize information on ethnomycological traditions in Southern Africa but will also help us to assess the findings from our surveys in the Western Cape. In that sense, it will serve as a point of departure for tracing a source of food that is too delicious to be invisibly left behind in the MSA.

Chiara Anceschi

SELECTION OF EDIBLE SPECIES FOUND:

1.a Deceiver species, *Laccaria fraterna*
(Afrikaans: verkulswam)

2. Meadow Puffball, *Lycoperdon pratense*
(Afrikaans: oueltjie or wit stuifbal)

3. Field Mushroom, *Agaricus* cf. *campestris*
(Afrikaans: veldsampioen or kampernoeli)

4. White Parasol, Macrolepiota zeyheri
(Afrikaans: witsambreel)

5. Orange-Yellow Rough Top, *Laetiporus baudonii*
(Afrikaans: bloekomvoetswam)

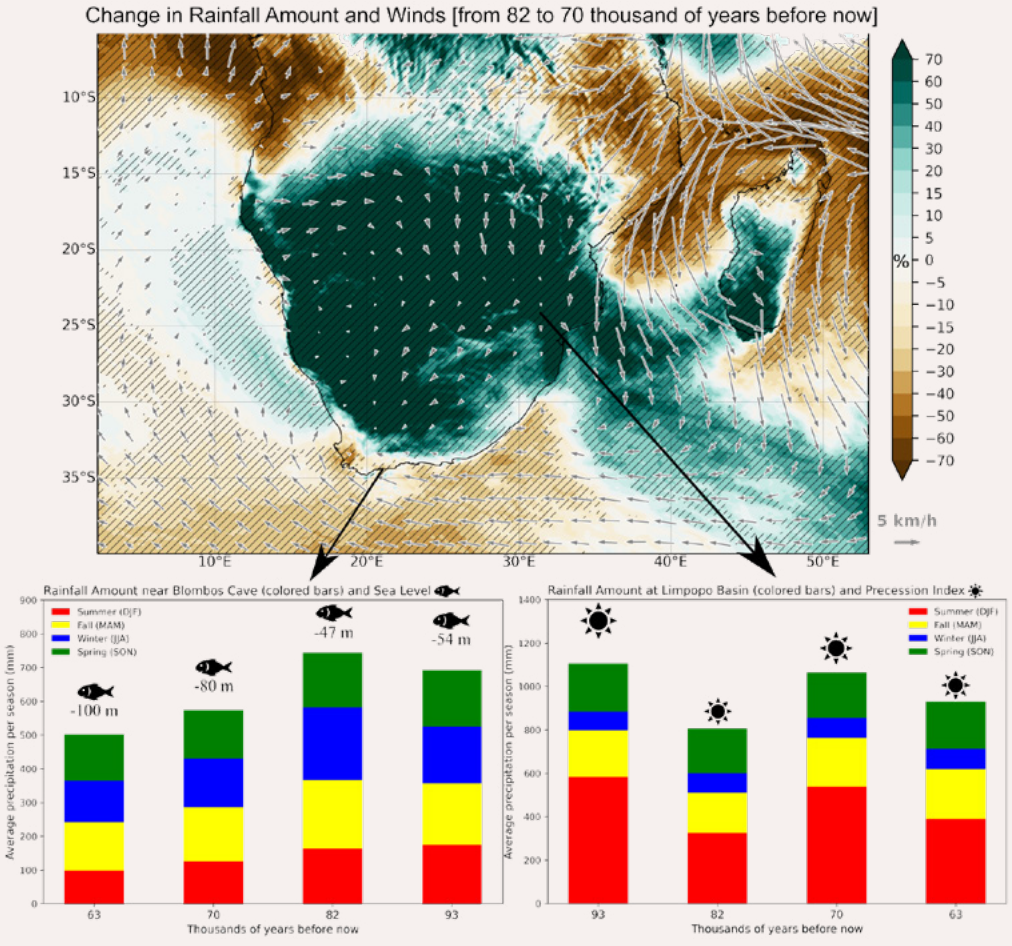
The latter is a close relative of the 'Chicken of the Woods', which is popular around the world. It was hard to overlook how sought after this one is also in the Western Cape: When we discovered it, we were in a rush to leave the Nature Reserve before the gates closed, and therefore decided to return early next morning for its proper documentation – only to find most of the mushroom had been taken.

DECIPHERING ANCIENT WEATHER:
NEW INSIGHTS FROM CLIMATE MODELLING

BY OZAN MERT GÖKTÜRK

In addition to using natural archives, SapienCE scientists employ computer models to uncover the details of past climates. Recent high-resolution modeling that focused on southern Africa has provided new insights into the region's climatic variations over time.

Using the Weather Research and Forecasting (WRF) model, simulations for four key periods—93, 82, 70, and 63 thousand years ago—have been conducted, creating a detailed 'model-based time series of past climate' for the region. This ongoing work reveals an intriguing story: the climates of inland and coastal areas in southern Africa evolved in markedly different ways over these millennia. These differences stem from distinct regional responses to large-scale climatic forces - such as solar radiation, shifts in sea levels (which altered land extent), and changes in sea surface temperatures.
By zooming in with high-resolution models, our team captures the regional pattern of climatic changes with unprecedented geographic detail. These findings not only expand our understanding of ancient climates, but also highlight the diverse environments that shaped early human behavior and adaptation. With each new time slice analyzed, the picture of southern Africa's climatic past grows sharper, offering deeper insights into the challenges and opportunities encountered by early humans.

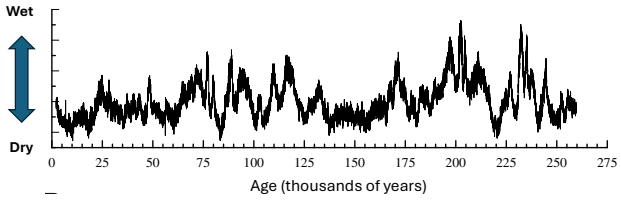


Upper: Regional climate model (WRF) output showing the change in rainfall amounts (in percentage) and surface winds, from 82 to 70k years before now. Lower: WRF output showing average seasonal rainfall amounts near Blombos Cave (left) and Limpopo River Basin (right) for each epoch. While rainfall at Blombos Cave area is linked mainly to changes in sea level and associated land extent, Limpopo River Basin's rainfall is rather influenced by Earth's orbital parameters, namely the 'precession' here (which controls the incoming solar radiation).

ANCIENT RAINS: A KEY TO HUMAN EVOLUTION?

BY KARL PURCELL

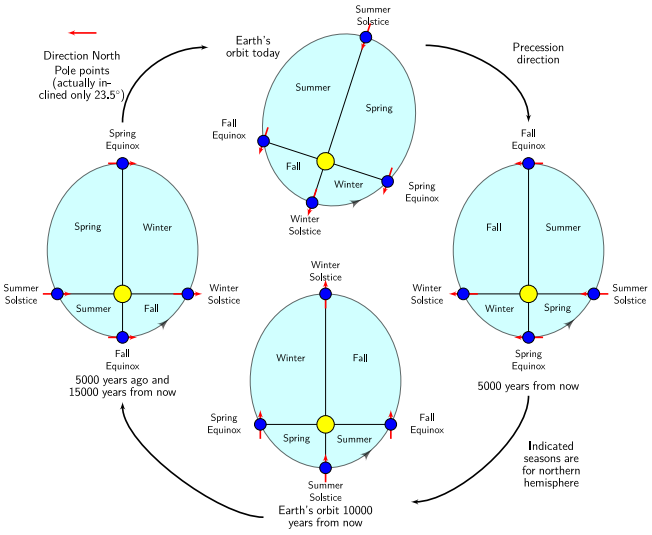
Researchers from the University of Bergen have gained insight into rains of the past, rains which are thought to have affected the availability of resources for our ancestors in Africa. The study shows that the south of South Africa experienced humid conditions around 117 thousand years ago, 93 thousand years ago, and 72 thousand years ago, with intermittent dry conditions around 105 thousand years ago, 83 thousand years ago, and between 60 and 50 thousand years ago.



Record of past rains over southern South Africa. Age is indicated in the horizontal axis, while an indicator of wet/dry conditions is in the vertical axis. Modified from https://doi.org/10.5194/egusphere-2024-2499

The results produced in this study can be of use to archaeologists. Indeed, these results give a clearer picture of the conditions experienced by early humans in this region. The data produced covers around 250 000 years continuously. This is helpful since many indicators of past climate in the region have gaps in time, which make working with them more difficult. Further studies could use the results of this study to help pinpoint if and how the changes in climate affected the behaviours, the technologies, and the areas occupied by early humans in South Africa. These results could also help climate modellers make more accurate computer models of the climate in this region. In turn, this could result in more accurate climate change predictions in South Africa, which could help with the efforts in adaptation to future climate change.

The observed alternance of wet and dry phases occurred during a critical period for human behavioural evolution. During most of this timespan, all of humanity was confined to Africa, and in South Africa there is archeological evidence of the emergence of modern cognitive capabilities in ancient humans. Examples of this evidence are the use of pigments, the appearance of bone tool technology, engravings, complex stone tools, or engraved ostrich eggshells, which points to symbolic behaviour, art, trade, and evolving technologies. The causes of this shift in behaviours are debated, but one glaring cause could be adapting to the changing environmental and climatic conditions. Precipitation patterns are a major contributor to this as it controls the vegetation and wildlife available locally to ancient humans.



Precession. By Krishnavedala, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=37739248

The alternance of wet and dry periods observed in this study can be explained by changes in the orbit of the Earth which happen on a 23 000-year cycle, named orbital precession. In this cycle, the elliptical shape of Earth's orbit as well as Earth's rotational axis both slowly rotate. This causes seasons to become more or less extreme in one hemisphere; for instance, summers are more extreme when one hemisphere is in summer during the closest point of Earth's orbit to the sun.

When this orbital configuration is present, there is more solar radiation in summer in southern South Africa. This has been shown to increase rains by heating land faster than the sea. As hot hair rises over land, cool air from the ocean moves to replace it, and the moisture that this air carries falls as rain. The same mechanism is thought to have caused more humid conditions 11000-5000 years ago in the Sahara region, popularly known as the "Green Sahara" period.

These findings are based on analyzing a sediment core (i.e. mud) taken from the bottom of the ocean close to the South African coastline. Sediment accumulates in layers on the ocean floor over time, and they contain information about the past. To uncover this information, the composition of the sediment was measured by X-ray analysis. Increased concentration of elements originating from land in the core indicate increase rains on land which eroded and carried off these elements to sea and the coring site.

The study is currently in pre-print in the journal "Climate of the Past" *https://doi.org/10.5194/egusphere-2024-2499*

MA STUDENT'S WORK IN SOUTH KOREA

BY ALFRED SKEIDSVOLL

I am a master's student in Earth sciences at the University of Bergen, specialising in paleoclimatic reconstructions. My research involves analysing fluid inclusions in speleothems using a Picarro-an instrument which measures the isotopic composition of microscopic water droplets trapped within the crystal structure of the rock. This analysis provides valuable insights into past temperature and hydrological conditions. The stalagmite I am working on from Bloukrans Cave in South Africa spans the period from 90 to 60 thousand years ago, it records past environmental conditions to further our understanding on human evolution in the region.

In the fall of 2024, I completed a 10-week internship at the IBS Center for Climate Physics (ICCP) at Pusan National University in South Korea under the guidance of Prof. Axel Timmermann and Dr. Jasper Wassenburg. The ICCP laboratory is equipped with similar instruments as those at UiB but employs different setups, methods and research focuses. This provided me with an exceptional opportunity to gain experience with the instruments and to understand the work I am doing for my master's thesis through working with multiple methods. Early in the internship, I attended the IBS Conference on Climate and Human Evolution 2024, which provided a chance to meet and learn from brilliant people. The internship also laid the groundwork for interlaboratory comparisons as I plan to compare speleothem data from the two labs in 2025 to help interpret the data better.

ERC CONSOLIDATOR GRANT AWARDED TO SAPIENCE SCIENTIST DR MARGIT SIMON

BY JANNE-BEATE BUANES DUKE AND ŽARKO TANKOSIĆ

SapienCE scientist Dr. Margit Simon from NORCE was awarded a prestigious grant from the European Research Council for her project that stems directly from and continues SapienCE work on exploring the connection between behaviour and climate.

Her project titled "Palaeoenvironments of Human Behavioural Evolution in Africa" (lovingly abbreviated as PIONEER) aims to connect environmental and archaeological data on a regional scale, to uncover how climate change influenced human cultural evolution, primarily focusing on data from SapienCE-affiliated projects in South Africa. According to Simon, "PIONEER will change our understanding of whether climate variation triggered localized cultural changes or broader, large-scale shifts in our species".

In Africa, between 125,000 and 50,000 years ago, early *Homo sapiens* first began demonstrating behaviours that we think of as typical of our species, such as the use of symbols, personal ornamentation, and advanced toolmaking. However, the reasons behind these transformations remain a topic of debate. PIONEER seeks to determine whether climate variability in northern and southern Africa drove these cultural innovations.

The theories linking early *Homo sapiens'* innovations to climate change are diverse and frequently conflicting, reflecting the complexity of this relationship. For example, much of what we know about past climates comes from analysis of sediments from the deep oceans, but our archaeological evidence is found in caves on land. This leaves us with an open question of how to match these records that PIONEER addresses.

PIONEER builds on the strong foundation established through Simon's work as a researcher in two Centres of Excellence at UiB, namely Bjerknes Centre for Climate Research (BBCR) and Center for Early Sapiens Behaviour (SapienCE). Both centres have provided both intellectual inspiration and financial support for her pilot studies. For example, working at both Centres she developed and tested innovative methodologies, such as using leaf wax biomarkers at archaeological sites, which has laid the groundwork for PIONEER's ambitious research goals.

The SapienCE leadership is certain that the PIONEER project will provide a fantastic opportunity to further develop the capacity of SapienCE to deliver groundbreaking results in connection to the exploration of how and whether environmental change influenced the development of modern behaviour of humans in the distant past.

NEW RESEARCHERS
SAMUEL PEREIRA

RECONSTRUCTING MIDDLE STONE AGE FIRE, CLIMATE AND VEGETATION DYNAMICS THROUGH ORGANIC BIOMARKERS IN PALEOSOLS FROM BLOMBOS CAVES, SOUTH AFRICA.

Blombos Cave, South Africa, renowned for its Middle Stone Age archaeological deposits dating from 100,000 to 70,000 years ago, provides crucial insights into early human behaviour and adaptation. These rich archaeological layers—composed of bedrock-derived sediments, windblown materials, and organic residues—offer a unique opportunity to reconstruct past environments and understand the relationship between early humans and their changing surroundings.

In this study, I will analyse organic biomarkers, such as n-alkanes and polycyclic aromatic hydrocarbons (PAHs), to trace vegetation patterns, climatic shifts, and fire events. These molecular fossils, preserved in cave sediments, help differentiate between grassland and forest environments and identify combustion sources and resource use. The findings will provide a critical context for SapienCE researchers, shedding light on how early human populations at Blombos responded to environmental challenges and resource availability.

NEW RESEARCHERS
MARZENA CENDROWSKA

Studying stone tools provides a unique opportunity to discover site history through artefact biographies. It allows us to reconstruct the "life" of the lithics, from their manufacture through use to deposition or discard and post-depositional processes. The steps represent decisions made by past humans, these include: 1) which raw material to use, 2) what technological sequence should be applied, 3) how to fix mistakes if they occur, 4) whether the tool fits the given task, 5) whether it should be repaired and finally, 6) when to discard it. Individual biographies can then be combined and linked with data about other artefact types to re-tell the story about changing site use and thus make inferences about local adaptation and innovation.

In my project, I use qualitative and quantitative approaches to use-wear analysis to gain insights into tool use in the MSA. A systematic study combining techno-typological tool types and their function allows us to track the frequency of different wear traces and verify the importance of various tasks. Large-scale use-wear analysis of tools within the long chronological sequence of Blombos cave provides a suitable background for tracing changes and development of subsistence strategies. Combining these observations with what is known about hunting, mollusc gathering, ochre use, or raw material collection makes it possible to create compelling and evidence-based stories of site use, settlement dynamics and human-environment interaction. Working closely with other SapienCE researchers, I am hoping to compare my results with environmental data to estimate the impact of climate change on subsistence strategies and possibly link some of the shifts to certain technological innovations.

Moreover, the project aims to build a comprehensive experimental wear reference collection. A large and well-documented detailed blind-tested reference trace is crucial for understanding the wear formation process. Due to the increased selectivity of raw materials and longer transport distances in the African MSA, it is essential to study the role of the three crucial ones: quartz, quartzite, and silcrete. This would help detect preferences towards certain raw materials in specific tasks and provide a basis for future studies. All three of these raw materials have different properties that were most likely taken into consideration while selecting the source for specific tools. Additionally, the use of various materials could be caused by their non-functional stylistic and symbolic qualities or position within exchange systems and social dynamics.

NEW RESEARCHERS
JEREMY A. BELLER

I am an evolutionary anthropologist with an overarching aim to explain the behavioural variability of prehistoric populations (Stone Age—Bronze Age) through a techno-economic approach. Much of the behavioural variability among hunter-gatherers is produced from responses to changes in the physical environment, as they attempt to mitigate risks and overcome challenges. Relevant solutions often involve modifications in mobility strategies and resource utilisation patterns.

Anatomically modern humans first appeared and spread across Africa during the Middle Stone Age (MSA, 250 ka BP), a period marked by the emergence of cultural modernity—a suite of novel behaviours that enabled greater environmental adaptation. Despite frequent allusions to new mobility strategies as part of this behavioural package, they remain underexplored and characterised within this framework, especially within the Western Cape of South Africa.

Working closely with Dr. van Niekerk and the SapienCE team, I am investigating the mobility strategies and resource utilisation patterns associated with Middle Stone Age occupation at Blombos Cave and Klipdrift Rockshelter, South Africa. Specifically, I am inquiring from where on the landscape occupants acquired their raw materials, what factors affected these selections, and how do these decisions relate to the ecological niches (coastal vs. terrestrial) of occupation as sea level fluctuated? To answer these questions, I am undertaking a provenance analysis of the lithic artefacts recovered from the MSA layers at each site and raw material sources across the landscape. This is performed through the generation of robust petrographic, geochemical, and isotopic datasets from thin section petrography, fusion inductively coupled plasma (mass spectrometry and optical emission spectroscopy), and secondary ion mass spectrometry. Further insight into the decisions made by MSA hunter-gatherers will be elucidated through optimisation modelling, which uses a combination of digital elevation and gravity models to explore a large suite of landscape and outcrop variables to ascertain why certain sources were exploited and others were not.

This research will increase our knowledge of mobility, tool technology, and ecological adaptation, casting light on decision-making among hunter-gatherers of the Western Cape. Moreover, I anticipate that it will provide meaningful parallels for understanding similar issues for populations today.

NEW RESEARCHERS
ANTOINE MULLER

The southern African MSA archaeological record preserves an abundance of complex human behaviours, among which are a notable diversity of stone tool technologies. These technologies include a variety of flake and bade making techniques, as well as a range of tool types, including many dramatically different ways of making points. The extent to which this technological variability is driven by environmental changes and/or cognitively, socially, or demographically mediated remains under debate. My research aims to use computational analyses of 2D images and 3D models to help quantify otherwise difficult to measure features of these stone tools. Features like 3D surface curvature and volumetric distribution can help estimate the level of technological investment involved in shaping a core and pre-planning the resultant flakes. Meanwhile, for flakes and tools, features like their sharpness, sinuosity, edge concavity, and symmetry etc. can be computed. These features help us reconstruct how much requisite skill was demanded by different MSA technologies, what design parameters were imposed by MSA hominins, and what technological choices governed their stone toolmaking. The choice to make different tools is at least in part influenced by technological trade-offs like the size, shape, difficulty, efficiency, and ease of standardisation. In collaboration with the cognition, climate, and archaeology team, these technological trade-offs can be linked with changes to the climate, coastline, resource availability, and human behaviour occurring in the MSA. Variability in the technological repertoire of MSA Homo sapiens in light of these climatic changes attests to their remarkable behavioural flexibility.

NEW RESEARCHERS
ELLIE PRYOR

During the period of 100 to 50 ka, a time interval sitting within the Middle Stone Age (MSA), the climate varied considerably, oscillating between Marine Isotope Stage (MIS) 5 interglacial conditions into colder MIS 4 glacial conditions. During MIS 4, global sea level was lower due to increased ice volume in both hemispheres. This exposed the continental shelf south of South Africa, otherwise known as the Palaeo-Agulhas Plain (PAP). It has been suggested that *Homo sapiens* populations progressively increased their reliance on the PAP and the coastal zone during the 100 to 50 ka interval during sea level low stands, which is coeval with a documented increase in exploitation of coastal resources, such as shellfish. In addition, regional climate model experiments suggest sea level-related changes along coastlines also affected climate along the coast, with consequences for the living conditions of *H. sapiens* populations.

This South African coastline is a hotspot for archaeological records during the MSA. Part of these archaeological records include significant amounts of marine shellfish and ostrich egg shells. Questions about these faunal remains are still unresolved. Hence this project helps unravel which season(s) the shellfish found at Blombos Cave site were harvested and whether additional insights can be drawn about the site occupation. This will be achieved through exploring the seasonal variability of temperature and salinity in the nearshore environment. Furthermore, we hope to understand if the shellfish were subject to heat and/or roasted in fire, and whether this affects our ability to reconstruct near-shore ocean temperatures. Finally, we will address if the interaction between different *H. sapiens* groups increased or decreased during the time interval of 100 to 50 ka.

In my project we will assess the seasonality in climate from the southern Cape through oxygen and carbon isotope sampling of marine shellfish, with additional clumped isotope thermometry to deconvolve temperature and salinity variations. Heating experiments performed on modern shells help determine whether the shellfish were heated and how that affects the geochemical signals. Finally, Sr isotopes from ostrich eggshell fragments from South African cave sites will help to determine the mobility and connectivity of *H. sapiens* as Sr ratios can be used to study movement across landscapes in geologically heterogeneous areas.

OUTREACH

SAPIENCE EXHIBITION DE HOOP COLLECTION, SOUTH AFRICA

BY JANNE-BEATE BUANES DUKE

A new SapienCE exhibition opened in South Africa in January 2024. The "Origins of Early Southern Sapiens Behaviour" exhibition showcases unique archaeological discoveries offering visitors a distinct cultural experience in the heart of the De Hoop Nature Reserve.

The De Hoop exhibition 'Origins of Early Southern Sapiens Behaviour' is a culmination of decades of research by the SapienCE/Wits scientists, including Professor Christopher Henshilwood, Dr Karen van Niekerk, Professor Sarah Wurz, and their teams. The exhibition is curated by Craig Foster (co-founder of the Sea Change Project and the producer of the Oscar and BAFTA winning documentary, My Octopus Teacher) and archaeologist Petro Keene and is hosted at the De Hoop Collection. The exhibition was officially opened by Mr. Alan Winde, Premier of the West Cape, and Mr Gjermund Sæther, the Norwegian Ambassador in South Africa.

Visitors are invited to explore the rich prehistory and discoveries made by SapienCE scientists through curated exhibits and additional interactive elements incorporated to enhance the learning experience. The exhibition also emphasises the message that we are all one – we all come from Africa.

The De Hoop exhibition focuses specifically on the archaeological heritage and rich marine environment of the Southern Cape coastline. It showcases unique discoveries from archaeological sites such as Blombos Cave, Klipdrift Shelter, and Klasies River, where early *Homo sapiens* lived between 120,000 and 50,000 years ago.

The exhibition includes artefacts, displays, and multimedia elements that provide insights into the lifestyles and behaviours of early humans in the region. Particularly significant is a completely redesigned interactive section, which will help younger audiences to learn about their past through play and hands-on activities.

SapienCE is grateful for the support of our partners: De Hoop Collection and their owners William and Nini Stephens, Wits University, University of Bergen, and the Sea Change Project. This exhibition would not be possible without Mr Dalfrenzo Laing and the staff of De Hoop Collection.

OUTREACH ACTIVITIES CONNECTED WITH THE SAPIENCE EXHIBITION AT THE UNIVERSITY MUSEUM OF BERGEN

BY ŽARKO TANKOSIĆ

The highly successful "Early Human Behaviour" exhibition on display at the University Museum of Bergen closed in December 2024. It has been a source of numerous outreach activities and educational programmes organised by both the Museum staff and SapienCE.

Before the closing of the exhibition, in addition to several guided tours organised by SapienCE scientists for visiting colleagues, during 2024 we also participated in two major events that allowed us to present the work of SapienCE and educate the general public in Bergen about the evolution of human behaviour and the archaeological correlates thereof.

UMB FAMILY DAY

SapienCE was honoured to be the first project/exhibition featured in the reestablished practice of Family Days at the UMB. On January 15 several SapienCE ECRs and the Centre's co-deputy director Professor Simon Armitage organised a number of activities for UMB visitors of various age groups. We had multiple stations spread out throughout the museum where visitors could have hands-on guided experience of several aspects of SapienCE work, for example ochre processing, ostrich eggs decoration, bead-making and others, mostly aimed at the younger audiences. Professor Armitage gave several rounds of lectures for the adults interested to learn more about the scientific aspects of SapienCE, while guided tours of the exhibition were organised for both adults and children in English and Norwegian, with participation of SapienCE ECRs who are experts in the fields covered by the exhibition. Special thanks to Asia Alsgaard, Marzena Cendrowska, Jasmin Culey, Ella Walsh, Ozan Göktürk, and Lillian Time.

UMB ARCHAEOLOGY DAY

On October 20 SapienCE scientists again joined other archaeologists from the University of Bergen and presented their research to the Museum visitors. In addition to the guided tour of our exhibition, the visitors had an opportunity to chat with SapienCE experts on various aspects of our research.

MOTHER AFRICA – WELCOME HOME

NEW EXHIBITION AT THE BLOMBOS MUSEUM OF ARCHAEOLOGY IN STILL BAY, SOUTH AFRICA

BY JANNE-BEATE BUANES-DUKE

The latest SapienCE exhibition opened close to our fieldwork "home" at the Blombos Museum of Archaeology in the town of Still Bay, Hessequa Municipality. This exhibition showcases the archaeological heritage and rich marine environment of the western Cape coastline, offering insights into the cultural significance of the prehistoric sites whose data are exhibited in the new permanent exhibition.

The newly opened exhibition shows groundbreaking discoveries that illuminate the lives of *Homo sapiens* in the southern Cape from 120,000 to 50,000 years ago. Visitors are invited to explore the results of over 30 years of meticulous research by leading archaeologists, including Professor Christopher Henshilwood, Professor Sarah Wurz, Dr. Karen van Niekerk, and their teams. Their investigations at renowned sites such as Blombos Cave, Klasies River, and Klipdrift Shelter have unearthed extraordinary artifacts and evidence of early modern human behaviors and lifestyles.

The exhibition is curated by Craig Foster and archaeologist Petro Keene and features a unique blend of artifacts, visual displays, and interactive elements, offering visitors an engaging and educational experience. It also includes immersive multimedia presentations with films by the Academy Award-winner Craig Foster, filmmaker Damon Foster, and Åshild Sunde Feyling Thorsen of the University Museum of Bergen.

The opening ceremony, led by Jacqui Kromberg, Chair of the Blombos Museum control board, welcomed a distinguished audience, including the Deputy Mayor of the Hessequa Municipality, Tinus van den Berg, along with key contributors and supporters. At the opening, Kromberg described the exhibition as a culmination of years of collaboration, research, and dedication by scientists, curators, and the local community.

The event included a ribbon-cutting ceremony led by Professor Henshilwood, Deputy Mayor van den Berg, and Jacqui Kromberg, symbolizing the official opening of the exhibition to the public. Remarks were also made by Linda Fletcher, Sustainability Manager at the Gouritz Cluster Biosphere Reserve, and Petro Keene, who received recognition for her tireless efforts in designing and constructing the exhibition.

Special thanks were extended to the backers, including the South African National Research Foundation, University of the Witwatersrand, Norwegian Research Council, Centre for Early Sapiens Behaviour at the University of Bergen, Gouritz Cluster Biosphere Reserve, and Hessequa Municipality. Local families and anonymous donors also contributed significantly to the project.

The exhibition is the third permanent SapienCE exhibition in the Cape.


MOTHER AFRICA
welcome home


OCHRE - ONE OF THE EARLIEST ART MEDIUMS
THE OLDEST DRAWING
THE NEXT GREAT PUZZLE
FIRST BOWS AND ARROWS

SAPIENCE OUTREACH IN SOUTH AFRICA

BY ŽARKO TANKOSIĆ

While conducting archaeological fieldwork in South Africa, SapienCE researchers always look for opportunities to present their work to the public and especially to the members of the local communities where we work and the 2024 season was no different.

We were happy to welcome a group from our long-term collaborators and supporters, the Gouritz Cluster Biosphere Reserve, who visited our excavation at the Blombos cave. The excavation director and SapienCE co-deputy director Dr Karen van Niekerk explained the historical background of the research at Blombos and presented our methods and results. Other members of our Blombos excavation team demonstrated various aspects of archaeological fieldwork and some of the tools we use in the field.

In collaboration with the Hessequa Archaeological Society, several SapienCE scientists gave talks about their research to a full house of interested members of the local community from Still Bay and Riversdale. Christopher Henshilwood (SapienCE director), Francesco d'Errico (one of SapienCe principal investigators) as well as SapienCE ECRs Ella Walsh, Jeremy Beller, and Neemias Santos da Rosa presented their work and answered a large number of questions from the audience eager to learn more about their past.

SAPIENCE AT THE NORWEGIAN INSTITUTE AT ATHENS

BY ŽARKO TANKOSIĆ

SapienCE director, Professor Christopher Henshilwood, and co-director and PI, Dr Karen van Niekerk, presented SapienCE and delivered an invited lecture at the Norwegian Institute at Athens in Greece (NIA). NIA is a research infrastructure that belongs to the University of Bergen and represents the interests of Norway-based researchers in Greece and the eastern Mediterranean. Athens is a unique research environment for archaeologists that combines strong international presence with impressive local resources dedicated to learning about the past, from the Palaeolithic to late modern times. The talk attracted great interest, both in person and online, and was attended by Athens-based and other researchers.

SapienCE thanks NIA and its staff (Drs Delia Tzortzaki and Paschalis Zafeiriadis) for their invitation and for being amazing hosts!


TOYOTA
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SapienCE LUNCHTIME TALKS

24.01.	Dr Ella Walsh	Reconstructing past landscapes from sedimento-logical and geochemical records in southern Africa and Canada	SapienCE, AHKR, University of Bergen
06.05.	Professor David K. Wright	Timing the evolution of human ecologies in central Asia: A microarchaeological approach	IAKH, University of Oslo
27.05.	Drs Jennifer Leichliter and Tina Lüdecke	Nitrogen isotopes in tooth enamel: a new proxy for reconstructing ancient food web structure and hominin trophic behavior	Max Planck Institute for Chemistry in Mainz
22.08.	Dr Brandi MacDonald	Exploring ochre and rock art communities of practice in Stone Age Eswatini	University of Missouri
10.10.	Professor Sarah Wurz	Klasies River excavations: update on the MIS 5d-6 layers	University of the Witwatersrand
25.10.	Dr Kurt Wogau and Shanae Page	The Little Karoo: The semiarid paleolandscape inhabited by the first modern humans	SapienCE/SEAS, GEO, University of Bergen & the University of the Witwatersrand
25.11.	Dr Samuel Pereira	Deep sea to Middle Stone Age: Reconstructing environments using molecular signatures	SapienCE, GEO, University of Bergen

SAPIENCE STAFF AND MANAGEMENT

SAPIENCE LEADER GROUP

Christopher Henshilwood
Professor
Director, PI

Carin Andersson Dahl
Research Professor
PI

Andrea Bender
Professor
PI

Eystein Jansen
Professor
Deputy Director, PI

Žarko Tankosić
LG Secretary

Karen van Niekerk
Senior Researcher
PI

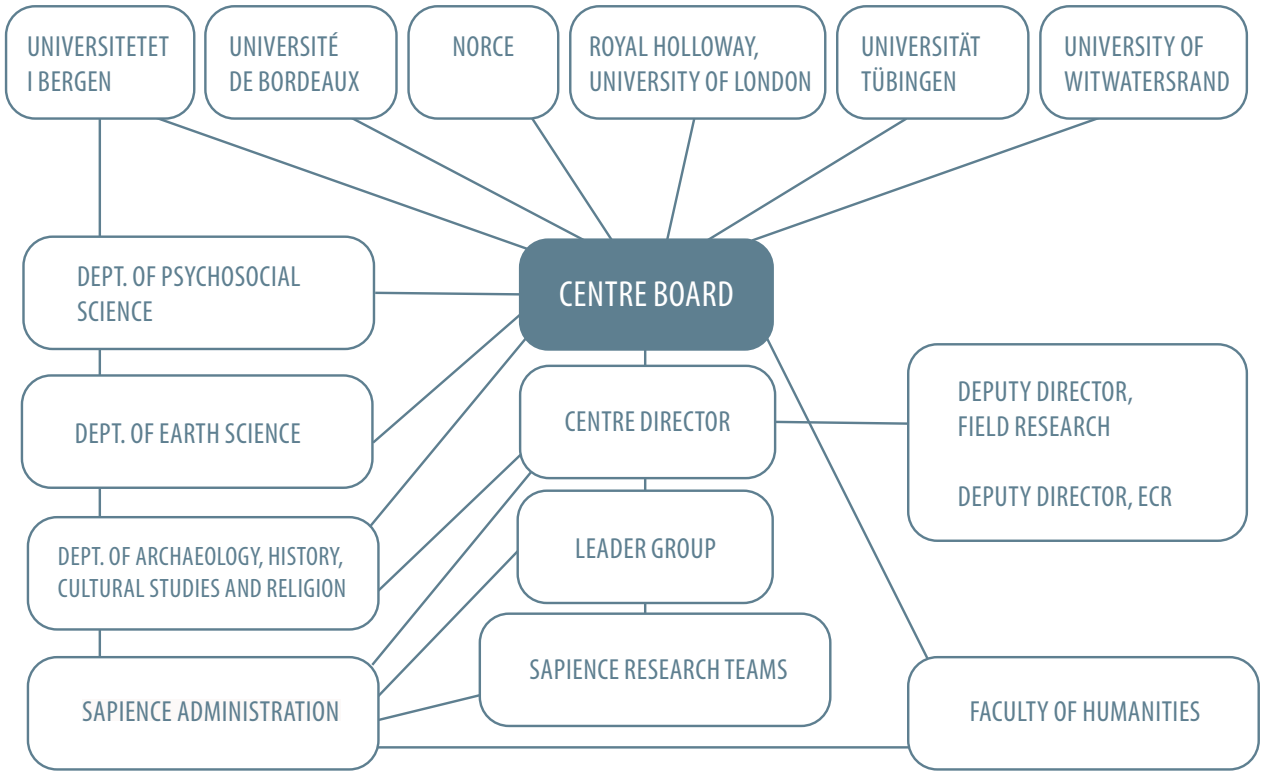
Sarah Wurz
Professor
Senior Scientist

Francesco d'Errico
Professor
Senior Scientist

Christopher Miller
Professor
Senior Scientist

Simon Armitage
Professor
PI

CENTRE STRUCTURE



PIs AND RESEARCHERS AT SAPIENCE

Christopher Stuart Henshilwood	PI, Professor, SapienCE Director Distinguished Professor	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen Evolutionary Studies Institute University of the Witwatersrand Johannesburg, South Africa
Eystein Jansen	PI, Professor Vice-president	Department of Earth Science, University of Bergen European Research Council
Karen van Niekerk	PI, Senior Researcher, SapienCE Deputy Co-Director	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Andrea Bender	PI, Professor	Department of Psychosocial Science, University of Bergen
Simon Armitage	PI, Professor, SapienCE Deputy Co-Director	Centre for Quaternary Research, Department of Geography, Royal Holloway University of London
Carin Andersson Dahl	PI, Research Professor	NORCE Norwegian Research Centre Division of Climate & Environment
Francesco d'Errico	Directeur de recherche de classe exceptionnelle Professor II	CNRS Université de Bordeaux Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Christopher Miller	Professor Professor II	Institute for Archaeological Sciences, University of Tübingen Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Sarah Wurz	Professor Professor II	School of Geography, Archaeology and Environmental Studies, University of Witwatersrand Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Anna Nele Meckler	Professor	Department of Earth Science, University of Bergen
Margit Hildegard Simon	Senior Researcher	NORCE Norwegian Research Centre, Division of Climate and Environment
Zhongshi Zhang	Professor	NORCE Norwegian Research Centre Division of Climate & Environment
Odd Helge Otterå	Senior Researcher	NORCE Norwegian Research Centre Division of Climate & Environment
Stefan Pieter Sobolowski	Research professor	NORCE Norwegian Research Centre Division of Climate & Environment
Dag Inge Blindheim	Chief Engineer	NORCE Norwegian Research Centre Division of Climate & Environment

Katerina Harvati	Professor, Director Palaeanthropology Professor II	Eberhard-Karls-Universität Tübingen Senckenberg Centre for Human Evolution and Palaeoenvironment Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Eoghan Reeves	Associate Professor	Department of Earth Science, University of Bergen
Katharina Wolff	Professor	Department of Psychosocial Science, University of Bergen
Jenny Maccali	Researcher	Department of Earth Science, University of Bergen
Larissa Mendoza Straffon	Researcher	Department of Psychosocial Science, University of Bergen
Ozan Mert Göktürk	Senior Researcher	NORCE Norwegian Research Centre, Division of Climate and Environment

SapienCE Postdoctoral Research Fellows 2024

*SEAS Fellow

Turid Hillestad Nel	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Magnus Mathisen Haaland	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Katrina Nilsson-Kerr	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Elizabeth Velliky	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Kurt Heinrich Wogau Chong*	Department of Earth Sciences, University of Bergen, SEAS
Asia Alsgaard*	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Aliki Papa	Department of Psychosocial Science, University of Bergen
Ella Walsh	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Marzena Cendrowska	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Ellie Pryor*	Department of Earth Sciences, University of Bergen, SEAS
Jeremy Beller*	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Samuel Pereira	Department of Earth Sciences, University of Bergen, SEAS
Antoine Muller	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen

Doctoral Fellows (Ph.D. candidates) 2024

Ole Fredrik Unhammer	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Karl Purcell	Department of Earth Science, University of Bergen
Jovana Milić	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen
Zahra Haghighi	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen, PUSHH fellow
Heidi Øhrn	Department of Psychosocial Science, University of Bergen
Jasmin Culey	Department of Archaeology, History, Cultural Studies and Religion, University of Bergen

SAPIENCE ADMINISTRATION

The organisation, management and administration of SapienCE is regulated through the "Guidelines for Centre of Excellence (SFF-IV) at the University of Bergen". The guidelines are based on the requirements and guidelines of the Research Council of Norway, and were adopted by the University Board on 24 August 2017.

The guidelines state that SapienCE is led by a centre Director responsible for all activity at the centre and who reports to the board. The centre has a Leader Group consisting of the centre director, deputy director(s) and research directors (PIs). The Leader Group shall participate in the preparations of the items to be discussed by the Board. In addition, SapienCE has a Scientific Advisory Committee to support the centre by providing input on the centre's scientific strategy and challenges throughout the project period. The centre has an Administrative Leader who shall assist the centre Director in the day-to-day operations of the centre, serve as secretary to the Leader Group and be the liaison to other administrative personnel and partners. Additional administrative resources shall possess expertise to meet the needs of the centre; infrastructure, finance, HR, research administration and advisory services, administration of doctoral education, information dissemination and communication. The administrative resources are partly funded by the Research Council of Norway and partly by the University of Bergen.

The resources are organised so that the centre's administration, beyond the position of Administrative Leader, shall be an integral part of the ordinary departmental/faculty administration. This ensures administrative expertise at the department and faculty levels, and ordinary guidelines and procedures are followed as in the regular university units. Thus, administrative support is provided for their respective employees by all the SapienCE partners, which either contribute with in-kind funding or receive dedicated grants from the centre. The employer's liability follows the employment, and the local administrations are responsible for HR related and ordinary financial matters.

Personnel involved in SapienCE administration in 2024	
Žarko Tankosić	Administrative leader Project Manager
Janne-Beate Buanes Duke	Adviser, Media and communication
Filmon Tesfai Monica Pedersen	Adviser, Finance and accounting
Marit Matthiessen	Senior executive officer, Web and laboratory support
Magnus Halsnes	Adviser, Doctoral education and research administration
Anna Lisa Arefjord	Adviser, HR
Grethe Bruvoll	Higher Executive Officer, Front Desk and expedition
Bjørg Anja Teigland	Senior Executive Officer
Faculty of Humanities	
Vivian Tveite	Adviser, HR
Kirsten Moen	Senior Adviser, Research
SapienCE administrators, curation and field support in Cape Town, South Africa	
Samantha Mienies	Curator/Collections Manager Evolutionary Studies Institute, University of the Witwatersrand
Lisa Hulett	Assistant Evolutionary Studies Institute, University of the Witwatersrand

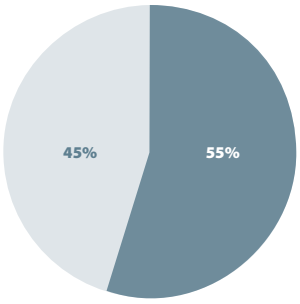
SAPIENCE FUNDING IN 2017-2024

SapienCE Funds 2017-2024 (*1000 NOK)				
Source	**2017**	**2018**	**2019**	**2020**
Own financing (Host Institution)	1 630	7 640	9 450	12 567
Agreed in-kind plus additional estimated in kind (Partner Institutions)	248	1 275	1 109	662
RCN contribution	0	11 725	9 607	11 641
Additional project funds (University of the Witwatersrand, South Africa; HUMEVAL, Norway)	0	2 880	3 316	2 852
TOTAL FUNDING OF CENTRE ACTIVITY	**1 878**	**23 656**	**23 483**	**27 946**

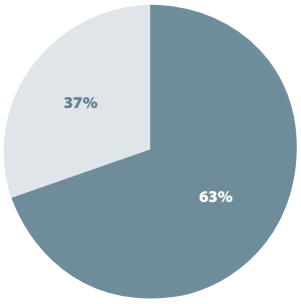
Source	**2021**	**2022**	**2023**	**2024**
Own financing (Host Institution)	10 142	10 002	6 772	9 364
Agreed in-kind plus additional estimated in kind (Partner Institutions)	683	599	286	296
RCN contribution	18 962	12 771	18 974	11 401
Additional project funds (University of the Witwatersrand, South Africa; HUMEVAL, Norway)	14 550	27 627	24 489	21 945
TOTAL FUNDING OF CENTRE ACTIVITY	**44 337**	**50 999**	**50 521**	**43 006**

DISTRIBUTION OF GENDER IN SCIENTIFIC POSITIONS AT SAPIENCE

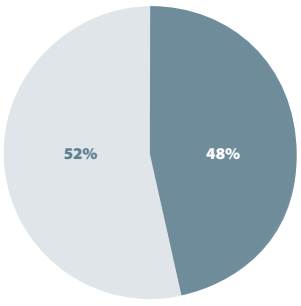
All scientific positions		
	Number of	%
Women	22	55
Men	18	45
Total	40	100



Early career researchers		
	Number of	%
Women	12	63
Men	7	37
Total	19	100

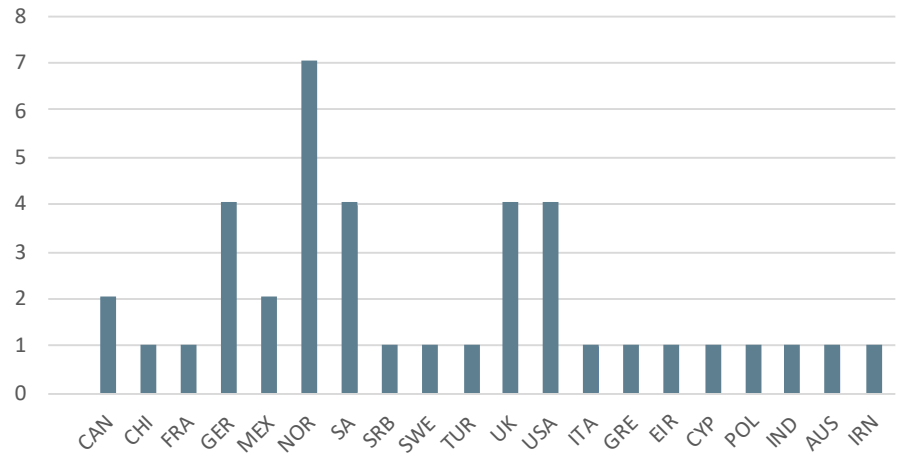


Senior scientific positions		
	Number of	%
Women	10	48
Men	11	52
Total	21	100

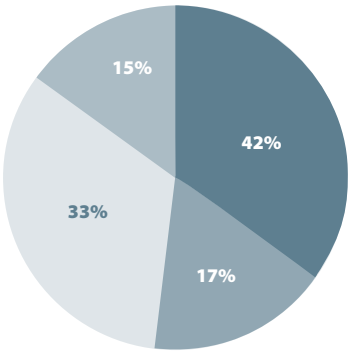


Female Male

SapienCE researchers by nationality

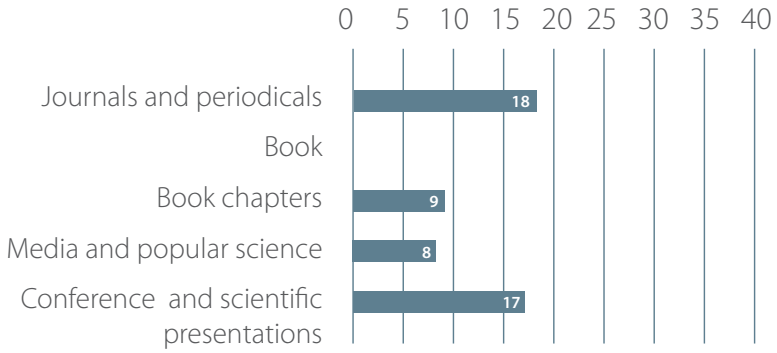


SCIENTIFIC AND ACADEMIC OUTPUTS



- Journals and periodicals: **18**
- Book:
- Book chapters: **9**
- Media and popular science: **8**
- Conference and scientific presentations: **17**

SapienCE scientific OUTPUTS 2024



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Boone, J.L. **and Alsgaard**, A. (2023) Surf & Turf: The role of intensification and surplus production in the development of social complexity in coastal vs terrestrial habitats. Journal of Anthropological Archaeology 73.

J. Zilhão, **F. d'Errico**, W. E. Banks, N. Teyssandier (2024) "A Data-Driven Paradigm Shift for the Middle-to-Upper Palaeolithic Transition and the Neandertal Debate", Quaternary Environment and Humans 2(2024), 100037.

B. L. MacDonald, **E. C. Velliky**, B. Forrester, S. Riedesel, J. Linstädter, A. L. Kuo, S. Woodborne, A. Mabuza, G. D. Bader (2024) "Ochre communities of practice in Stone Age Eswatini", Nature: Communications 15.

J. Baker, S. Rigaud, D. Pereira, L. A. Courtenay, **F. d'Errico** (2024) "Evidence from personal ornaments suggest nine distinct cultural groups between 34,000 and 24,000 years ago in Europe", Nature: Human Behaviour 8.

K. P. Ryano, **K. L. van Niekerk, C. S. Henshilwood, S. Wurz** (2024) "Shellfish gathering during MIS 5c-d at Klasies River main site and Blombos Cave, southern Cape, South Africa: An inter-assemblage comparison", Journal of Archaeological Science 57.

Maccali, J., A.N. Meckler, S-E. Lauritzen, T. Brekken, H.A. Rokkan, A. Fernandez, Y. Krüger, J. Adigun, S. Affolter, M. Leuenberger (2024) "Multi-proxy speleothem-based reconstruction of mid-MIS 3 climate in South Africa", Climate of the Past 19(9).

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Haghighi, Z., Mackie, M., Ørnhøi, A. A., Ramsøe, A. D., Olstad, T. M., **Armitage, S. J., Henshilwood, C. S.**, Cappellini, E. (2024) "Palaeoproteomic identification of the original binder and modern contaminants in distemper paints from Uvdal stave church, Norway", Scientific Reports 14.

Unhammer, O. F., Haaland, M. M., Armitage, S. J., Henshilwood, C.S Stuart; van Niekerk, K.L. (2024) "Reconcilable differences: Using retrospective photogrammetry to bridge the divide between analogue and digital site data collected during long-term excavation projects", PLOS One 19(11).

Reynard, J.P., Pearson, A., Akuku, P., **Wurz, S.** (2024) "Taphonomic and zooarchaeological analysis of fauna from the HP and post HP at KRM: palaeoenvironmental insights", Quaternary Science Advances 15.

Streib, L.C., **Armitage, S.J.**, Scholz, C.A. (2024) "Using Luminescence Dating to Constrain Lake Sediment Records: A New Age Model for the 1.38 Ma Lake Malawi Drill Core, Eastern Africa", Quaternary Science Reviews 334.

Bender, A., **Straffon, L**. M., Gatewood, J. B., & **Beller, S.** (2024). The dual role of culture for reconstructing early sapiens cognition. Psychological Review, 131(6), 1411–1434.

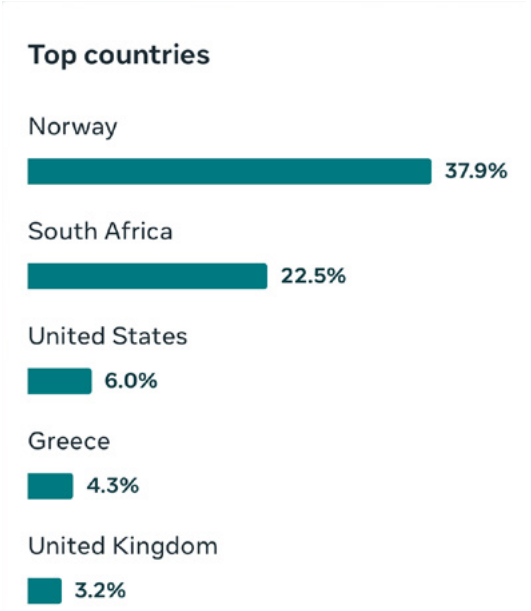
SOCIAL MEDIA

In 2024 SFF SapienCE was present on Facebook, which remained the primary outreach platform used by the Centre, X (former Twitter), and a new account was opened on Instagram late in 2024 to engage with younger audiences. The decision from 2022 to organise a separate SapienCE social media (SoMe) and outreach team started paying off massive dividends in 2023, with positive impact on the centre's SoMe exposure and outreach activities. Similar trends continued in 2024.

It should be noted that X-related statistics are not included here as they are only available for premium users, which SapienCE is not. Moreover, following the general trends in the academic community, including UiB, SapienCE plans to gradually reduce its presence at X and replace it with comparable alternatives that are currently under consideration.

On Facebook, SapienCE's reach and the number of visits increased in 2024 in comparison to 2023, including a 53% increase in reach, 37% increase in page visits.

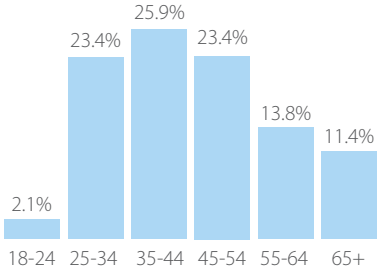
Predictably, most of our audience comes from Norway and South Africa, with UK, US, and Greece trailing behind. Most of our followers are of the professionally active age (25-55) and we are very happy to report that most of them are women.



Facebook Followers:

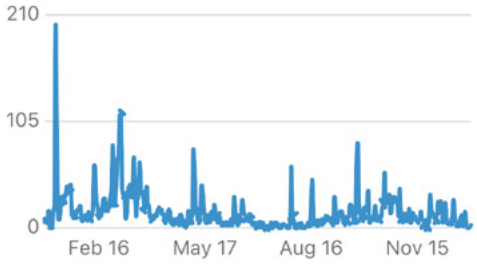
924

Women 53%
Men 46%



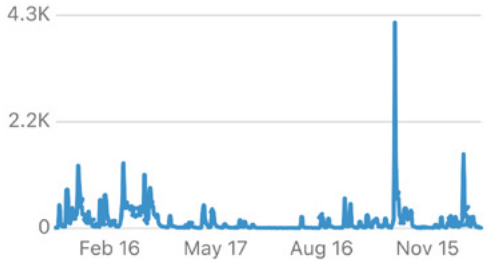
Facebook Page Visits:

5.8K +36,9%



Facebook Reach:

21.7K +53,4%



Of course, we have a Facebook page! We post news, events and papers here, but there are big differences between the interests of our Twitter and Facebook followers. Follow our Facebook page for future announcements of grants and vacancies. Scan the QR code and reflect on the fact that, like our SapienCE archaeologists, you're interested in yesterday's cutting-edge technology.

Join us on X! Be the first to receive interesting news and information about SapienCE events in Norway and South Africa. Links to new publications and events are regularly posted to Twitter. Scan the QR code to stay up to date.

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