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DID FOSSILS OF TUSKED DICYNODONTS INSPIRE A SAN ROCK PAINTING?

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The relationship between San myth and rock art has fascinated researchers for many decades. In his 1874 commentary on Joseph Orpen's copies of rock paintings, the linguist Wilhelm Bleek wrote enthusiastically:

Fig. 1: The rain-animal panel at RSA LBF1. Today, its surface is much affected by fluid weathering processes. There is a mud swallow nest in the upper left corner.

'The fact of Bushman paintings, illustrating Bushman mythology, has first been publicly demonstrated by this paper of Mr. Orpen's; and to me, at all events, it was previously quite unknown, although I had hoped that such paintings might be found. This fact can hardly be valued sufficiently. It gives at once a higher character to Bushman art and teaches us to look upon its products not as the mere daubing of figures for idle pastime, but as an attempt, however imperfect, at a truly artistic conception of the ideas which most deeply moved the Bushman mind and filled it with religious feelings.' (Bleek in Orpen 1874: 13)

Today we know that San rock paintings do not illustrate San myths. Try as we might to prove otherwise, the images are not scene-by-scene panels of well-known stories (Witelson 2018, 2023a: fig. 3.1). That notion is a culturally foreign idea: it comes, not from indigenous San commentators but from within our own familiar Western culture, one that values written stories and picture books. And yet, San rock art does include mythological themes, such as the well-known

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Fig. 2: George William Stow's nineteenth-century copy of some of the images at LBF1, including four rain-animals (Iziko South African Museum)

'non-real' rain-animals that have a variety of fantastic forms modelled on animals such as hippopotamuses, eland and snakes (eg Woodhouse 1992, see also Witelson 2023a, b).

Recently, palaeontologist Julien Benoit (2024) proposed in a widely disseminated article that a rock painting of a 'tusked' rain-animal at the RSA LBF1 rock art site in the Free State Province (Fig. 1) may have been 'inspired' by Indigenous San observations of fossils of tusked dicynodonts (*Diictodon feliceps*). These were piglet-sized burrowing animals with downward-pointing tusks that went extinct millions of years ago. Benoit accepts that the 'tusked' image in question is indeed a San rain-animal but feels that the 'question of the identity of this animal has been dismissed because it is seemingly a rain-animal from the San "spirit-realm", which is spiritual by essence and does not have to be realistic; however, this does not address the question of what inspired this figure in the first place' (Benoit 2024: 2). Although 'artistic inspiration' is a trope in western art rather than an indigenous concept, Benoit (2024: 3) suggests that the painting 'could be the oldest depiction of a dicynodont ever made' and that the possibility is 'intriguing and warrants scrutiny'. This article takes up Benoit's open invitation to scrutinise his dicynodont hypothesis, one which draws on the remarkable history of the LBF1 rock paintings.

After the 19th-century geologist George William Stow copied some of the LBF1 images (Fig. 2), he showed that copy and some of his other copies of rain-animals to a Free State San woman known only as 'Kou'ke. In response, she told him about 'great monstrous brutes' that had lived in the times of her 'fathers' fathers' and were no longer around (Stow 1905: 131–132). Without commenting at all on the 'tusked' rain-animal image from LBF1, 'Kou'ke identified three 'brutes' specifically (Stow 1905: 131–132; Stow and Bleek 1930: pls 34, 39). They were 1) a dangerous, large black serpent, 2) a water-dwelling, antelope-horned serpent (the red, white and black snake in the upper right corner of Fig. 2, and 3) what she called a 'Master of the Water'. Benoit (2024) takes 'Kou'ke's testimony to be a 'geomyth', an awkward notion that treats myths as resulting from Indigenous attempts to explain geological or palaeontological phenomena - in this case *D. feliceps* fossils.

This article independently assesses the rock art evidence at LBF1 and the nature of 'Kou'ke's testimony as it survives in Stow's writing.

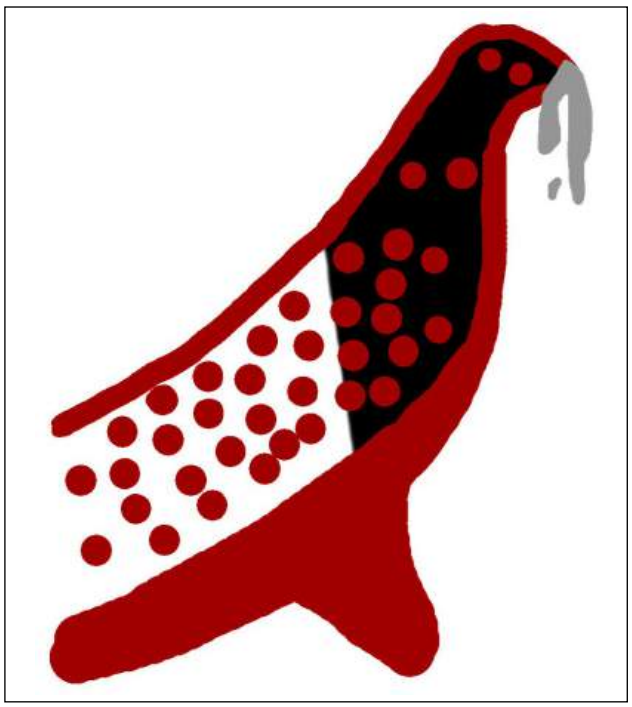

Fig. 3: Julien Benoit's interpretative drawing of the 'tusked' rain-animal's head. Redrawn from Benoit 2024: Fig. 3b.

The rock painting

Benoit visited the original LBF1 rock paintings and photographed them with a digital camera. The digital photograph was then enhanced (by manipulating contrast, temperature and saturation) and used to produce an interpretative drawing (Fig. 3).

If we compare the current state of the original rock paintings (Fig. 1) to digitised photographic slides from the 1970s in the Neil Lee Collection (RARI LEE RSA LBF1 45) of the African Rock Art Digital Archive (www.sarada.co.za), we can see that the panel has deteriorated substantially. At one time, it appears to have been covered in an unidentified oily film, apparently originating from the ceiling immediately above the panel. In some places, the oily residue and the paintings have been leached away or covered in whitish mineral deposits. Importantly, these processes created a mottled visual effect across the surface of the panel (Fig. 1): the same paint colour appears darker when covered by the oily residue and lighter when leached or covered by mineral deposits.

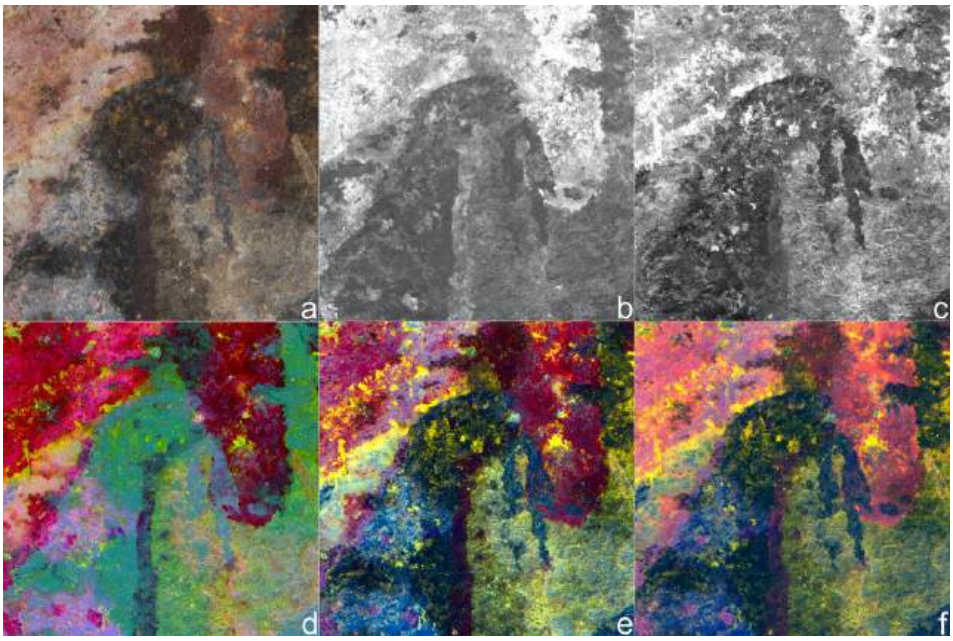

Fig. 4: Comparisons of digitally enhanced photographs with the original photograph (A). B: Greyscale LAB (A-channel). C: Greyscale LAB (B-channel). D: DStretch (CRGB). E: DStretch (LDS). F: DStretch (YBK).

Unfortunately, Benoit's digital manipulation enhanced the visual appearance of the weathering processes on the panel's surface more than it enhanced the colour of the rock art paints (Benoit 2024: Fig 3). This resulted in several inaccuracies in his interpretative drawing. To assess the accuracy of the interpretation in Fig. 3, a different digital photographic enhancement technique was applied. High-resolution photographs of the original rock paintings were enhanced using the LAB colour space (Margulis 2005) and the DStretch plug-in for ImageJ (https://dstretch.com/), the latter of which has been the industry standard for digital enhancements of rock art for more than a decade (Fig 4). DStretch uses a principle called decorrelation stretch (also used in medical and military imaging software) to 'stretch' the differences between specific colours. Rock art images that might look dull or invisible to the naked eye typically become clear and bright after DStretch enhancement.

The high-resolution photography and digital enhancements (Fig. 4) were used together with observations of the original paintings under a magnifying glass and different lighting conditions to understand the order in which the images were painted and how the superficial weathering processes affect their visual appearance today (Fig. 5).

As shown in Fig. 5a, the first painting in the relevant section of the LBF1 panel was a yellow image that was then partly covered by a red, spiky hippo-like rain-animal (this can be seen more fully in Fig. 2). Those two paintings were then partly covered by the blueish-black body of a slug-like rain-animal (Fig. 5a). Maroon dots and outlines were then added to the black rain-animal (Fig. 5b). Contrary to Fig. 3, the maroon line on the black rain-animal's back ends before the top of its head (Fig. 5b). Significantly, the black rain-animal does not have the tusked snout shown in Fig. 3. Instead, it has an open mouth that partly overlaps the red rain-animal's leg (Fig. 5b; Stow wrongly inversed this relationship).

We now come to the 'tusks'. The dicynodont hypothesis holds that the tusk-like shape must indeed have been an attempt to illustrate tusks because they are too 'thick' to be something else, their 'irregular shape compared to real tusks' being due perhaps to 'damage combined with the coarse grain and irregular surface of the sandstone, which made the drawing of this small element difficult' (Benoit 2024: 5). The evidence at LBF1 counts against this conclusion.

Fig. 5c shows that an irregular black inverted U-shape was painted so that its crest sat under the black rain-animal's chin, barely touching the maroon line. The left 'limb' of the inverted U-shape partly overlaps the red rain-animal's leg (Fig. 5c). Today, the oily residue partly covers and darkens the black rain-animal's head, but the black inverted U-shape now looks grey

Fig. 5: A schematic illustration of the layering of the paintings around the head of the 'tusked' rain-animal. A: The black body of the rain-animal was painted so that it partly overlapped a leg of the red rain-animal, which in turn was painted over a yellow image. B: Maroon lines and dots were painted on top of the rain-animal's black body. C: A black inverted U-shape was added under the rain-animal's lower jaw. D: The visual effect created by the weathering processes. E: The outline of Fig. 3 superimposed on 4d. F: The outline of Fig. 3 superimposed on Fig. 4a.

because of the leaching or mineral deposit. In the 1970s when the oily residue covered the whole panel uniformly, the inverted U-shape appeared just as dark as the creature's head. Benoit's (2024: 4) conclusion that the 'tusks' were painted in a 'different, more greyish colour than the black head of the animal' is erroneous.

Importantly, weathering processes influenced the interpretation in Fig. 3: the edge of a dark oily patch was, as a result of Benoit's enhancement technique, incorrectly taken to be the outline of the rain-animal's head (Fig. 5d, e and f). Fig. 3 cuts off the top half of the rain-animal's head. The position of the inverted U-shape under the rain-animal's jaw (Figure 5c) leaves no room for the possibility that an Indigenous painter attempted to depict a pair of dicynodont tusks in their anatomically correct position (top-down on either side of a 'beak' as suggested in Figure 3). Indeed, Figure 5c leaves no room for the possibility that any expert observer of animal bodies and behaviours could have intended the inverted U-shape to depict anatomically correct tusks of any kind.

Despite noting that the black paintings in Fig. 1 are those most severely affected by the weathering processes, Benoit (2024: 4) concluded that the inverted U-shape does 'not appear to belong to another element of the painting'. Given that the correct colour of the inverted U-shape is black (not grey, as in Fig. 3), the 'element of the painting' most closely associated with the inverted U-shape is immediately to its right: an oddly shaped charcoal-black image that might be a human figure with a headdress (Fig. 6). It overlies the yellow image and the back leg of the one-horned antelope (which can be seen in Fig. 2). Because the inverted U-shape and the figure are the same charcoal-black and both were painted partially on top of the other layers of images, they were probably made at the same time.

Two additional painted details can be combined with the vast (>12 000 pages) Wilhelm Bleek and Lucy Lloyd Collection (http://lloydbleekcollection.cs.uct.ac.za/) of verbatim, ǀXam-language manuscripts to allow us to contextualise the inverted U-shape in indigenous rather than western terms. The manuscripts in the Bleek and Lloyd Collection contain unedited Indigenous ǀXam dictations later translated into English.

The first additional painted detail is a red (not black, as in Stow's copy) human figure immediately below the one-horned antelope visible in Fig. 2 (Fig. 7). It adopts what is known as a 'hand-to-nose posture' and situates the whole panel since it refers to the San trance dance (Lewis-Williams 1983: 542–543), the ritual context in which San healers heal their communities (eg Lewis-Williams and Pearce 2004; Lewis-Williams and Challis 2011).

The second additional painted detail, the four rain-animals in Figs 1 and 2, is related to the first: trance dances are *also* a ritual avenue by which ǀXam-speaking rainmakers travelled to the spirit world to capture rain-animals and cause rain to fall (eg Hollmann 2022: 187–269). Painted allusions in many rain-related rock paintings reference travel by rainmakers to the spirit world via the trance dance: some rain-animals bleed, like healers themselves, from the nose (Witelson 2023a: Fig. 13.9). Benoit (2024: 5) dismissed the possibility of the inverted U-shape in Fig. 5c depicting blood pouring from the creature's nose because 'nosebleed [sic] are painted in red and usually displayed as exaggeratedly long and slender sprays in San rock art'. The expectation that streams of blood be painted in red is not unreasonable for polychromatic images. However, in monochromatic image clusters, like the charcoal-black images at LBF1, everything is the same colour.

In the absence of additional ethnographic and painted details, the parsimonious explanation of the relationship between the slug-like rain-animal and the inverted U-shape is that a later painter added the irregular smear of black (possibly indicative of the black figure's own nasal blood) to the rain-animal as part of his or her interaction with it (see Lewis-Williams 1981: 81). Via this act, the painter engaged with the rain-animal and contributed to the panel (eg Lewis-Williams 2019; Witelson 2023a).

'Kou'ke's testimony

We can now turn to the San commentary that Stow wrote down that Benoit took to be evidence of an indigenous 'geomyth'. In contrast to a literal reading of Stow's western, English-language translation of 'Kou-'ke's words, we should instead situate her testimony in its appropriate Indigenous cultural context. A detailed consideration of two key issues allows us to see that geological or linear time was Stow's western translation of indigenous concepts.

Fig. 6: The image most closely associated with the inverted U-shape: a black shape resembling a human figure with a headdress. Left: Original photograph with figure outlined. Right: DStretch (YBK) enhancement.

First, in her consistent and coherent account of large, long-gone animals, 'Kou'ke specifically referred not to extinct biological taxa represented in the Karoo Basin fossil record, but to the regional disappearance within living memory of San *rain-animals*. Stow's passage imperfectly translates her indigenous knowledge of powerful, dangerous and gigantic four-legged and serpentine beasts with strong affinities to water/rain. Indeed, her testimony agrees strongly with known San beliefs about dangerous, powerful and destructive rain-animals that are also gendered: male thunderstorms and soft, gentle female rains (Hollmann 2022: 187–269). The destructive male rain is also personified as *!Khwa,* a mythical being characterised by dangerous, punitive and predatory powers in addition to many associations with the fluids of female humans and his own 'things' (eg Witelson 2018, 2023a, b; Hollmann 2022).

Second, although Stow's (1905: 131–132) peculiar choices of words that the 'brutes' were animals from 'ancient times', now 'extinct' in 'these degenerate days', or having 'long since disappeared', suggests that he understood 'Kou'ke to have referred to a bygone time and that he is likely to have misunderstood her intended meaning. We know that 'Kou'ke differentiated between previous events in her own life and events that occurred further back but within living memory (Stow 1905: 102–105, 131–132), so she is unlikely to have confused temporal notions. From a western perspective, biological extinction seems to be an adequate explanation. Indigenous San notions of time are not, however, the same as the unidirectional notion of time in the Western worldview: there are two important alternatives.

First, 'Kou'ke may have been referring to a known distinction in San belief between the current Present Order of creation, in which humans and animals are formally distinct, and the Primal Order characterised by people-animals (Guenther 1999: 66–68). The distinction between the Present and Primal Orders allows for the possibility of 'before' creatures that no longer exist because of the 'degeneration' from the Primal into the Present Order. Importantly, however, the Primal Order is not simply a previous time. In the Primal Order, the boundaries between humans and animals *are* fluid; in the Present Order, humans and animals are distinct *except* for temporary hybrid transformations, such as healers might experience during ritual trance dances when they temporarily re-enter the Primal Order (Keeney and Keeney 2013). Given that the distinction between the Primal and Present Orders of creation is a widespread feature of San thought, it was almost certainly part of 'Kou'ke's indigenous worldview.

Because 'Kou'ke referred specifically to rain-animals, a second possibility is even more likely. In the San cosmos, mythical beasts dwell primarily in the spirit world, even though they, and some humans, can move between realms (eg Lewis-Williams and Pearce 2004; Lewis-Williams and Challis 2011; Hollmann 2022). As we have seen, 'Kou'ke identified at least three kinds of rain-animals in Stow's rock art copies. It is worth noting again that when identifying those rain-animals, 'Kou'ke did not mention tusks or refer to a 'tusked' rain-animal. As far as we can tell from Stow's account, it was immediately after identifying the three kinds of rain-animals in his copies that 'Kou'ke provided a detailed description of the 'hunt' of the one that she called a 'Master of the Water' (Stow

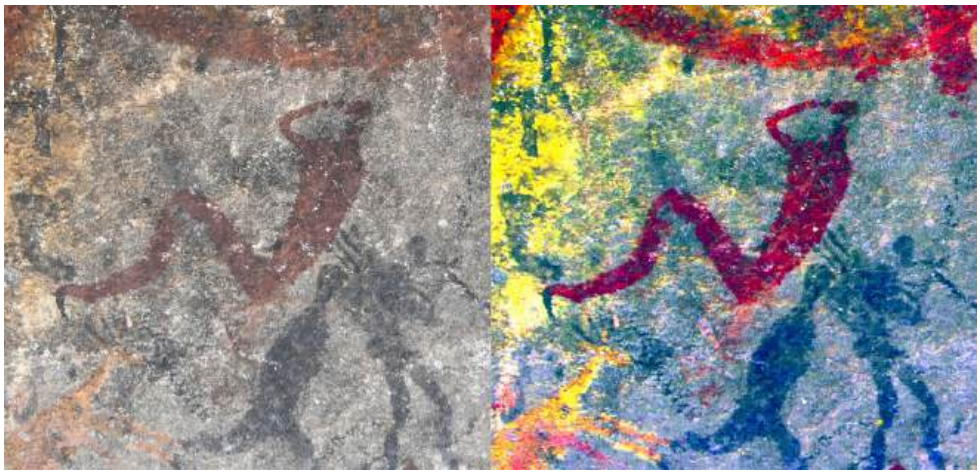

Fig. 7: The 'hand-to-nose' posture is a contextualising San reference to the trance dance. Left: Detail of the red figure. Right: DStretch (LDS) enhancement.

1905: 132).

Given all that is known about lXam rain beliefs and practices (Hollmann 2022: 187–269), we can confidently identify this 'hunt' as a southern San rainmaking ritual. During that ritual, specialist rainmakers (*!khwa:-ka !giten*) travelled via trance dances to spirit-world pools where rain-animals (such as the *!khwa:-ka xoro*) lived. There, they attempted to capture a desirable, gentle female rain or a less-desirable male thunderstorm, which they then dragged across the landscape and 'cut', or dismembered and cooked or scattered, so that rain fell in a specific place (Hollmann 2022).

From 'Kou'ke's perspective, the disappearance of the rain-animals would not have been due to them having been real animals that had lived in previous geological periods: the ritual nature of rainmaking required the maintenance of human relationships with the rain (eg Lewis-Williams 1981: 103–116). The parsimonious indigenous explanation is therefore that in the time of 'Kou'ke's fathers' fathers, the rain-animals disappeared, or the rainmakers had ceased being able to 'hunt' them, when the appropriate relationships were not maintained, if the rainmakers themselves were not the ones who disappeared.

Conclusion

This article finds no evidential support for the dicynodont hypothesis. Benoit's manipulation of the digital photograph's contrast, temperature and saturation, and the insufficient attention that was paid to the complex weathering processes on the painted panel's surface, resulted in an inaccurate interpretative drawing in which the top half of the animal's head was omitted and the 'tusks' were shown in the wrong position and in the wrong colour (Fig. 3). Moreover, the justification for the dicynodont hypothesis, the 'geo-myth' recovered from Stow, is found to be more comprehensively explained in terms of indigenous San ideas about orders of creation and rain-animals than in terms of an imagined attempt by past peoples to 'explain' tusked fossils in the absence of western science. No other rock art evidence was presented in support of the dicynodont hypothesis, and, given the misinterpretation of the single sample, we are forced to reject the possibility that dicynodont fossils 'inspired' a rock painting.

Acknowledgement

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MAPOTE'S PAINTING OF A ROAN-LIKE ANTELOPE AT QACHA'S NEK IN LESOTHO: SYMBOLIC WOUNDS?

Francis Thackeray

Marion How published a book in 1962 entitled *The Mountain Bushmen of Basutoland*. In this she recorded her post-1930 experiences with a person called Mapote at Qacha's Nek in southeastern Lesotho (Jolly 2024; King et al. 2021). He was the son of a Mpondomise woman and a Phuthi chief who had links with southeastern San (Jolly 1996a, b; 1998; King 2019). How asked him to paint images of his choice on two stones. Figs 1 and 2 show one of Mapote's scenes in which antelope and hunters are depicted. As noted by Jolly (2024), 'the paintings done by Mapote for How were realistic, with no imaginary features of the kind one often finds in the art of the southeastern San that have been linked to trance/dream experiences of San shamans or to San myths by rock art researchers'. The following points are of interest in relation to two antelope in Fig. 2:

Fig. 1: A stone painted by Mapote at Qacha's Nek in Lesotho at the request of Marion How (1962). Photo A Salomon (Jolly 2024). Stone currently on display at the Origins Centre, Rock Art Research Institute, University of the Witwatersrand.

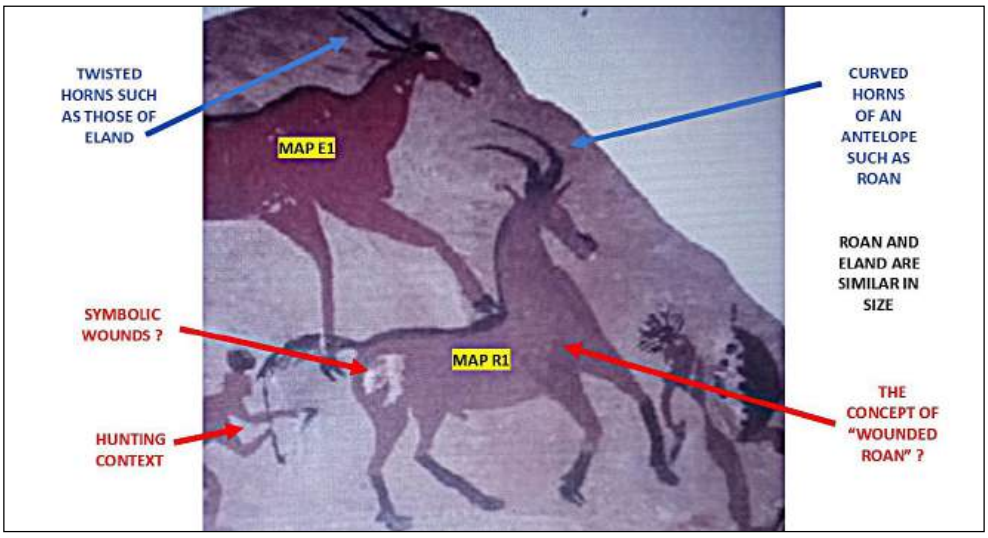

Fig. 2: Antelope and hunters on a stone painted by Mapote. MAP E1 is identified as an eland. MAP R1 is identified as a probable roan antelope, symbolically wounded on the rump. Photo A Salomon (Jolly 2024).

1. The lower antelope (MAP R1) appears to have long curved horns, reminiscent of roan (*Hippotragus equinus*). It is as big (relatively speaking) as the eland (*Taurotragus oryx*, MAP E1) above it with long, apparently twisted, straight horns.
2. Roan and eland are the largest extant African antelopes, similar in size.
3. Roan are grazers and their distribution in southern Africa was much wider in the past than at present. In prehistory they evidently occurred in grassland habitats in the Drakensberg, as demonstrated by a painting of a 'symbolically wounded' roan at Giant's Castle (Thackeray and Russell, 2004).

A white patch has been painted on the rump of

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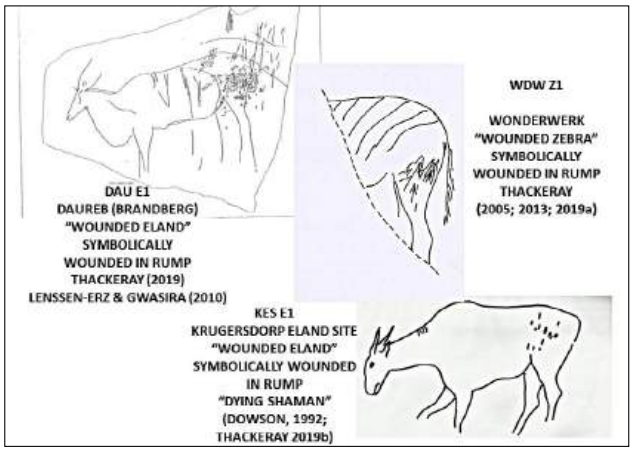

Fig. 3: Three examples of ungulates with 'symbolic wounds' on the rump (Thackeray 2023)

the lower antelope (MAP R1), probably a roan in Mapote's painting. I have previously shown that in some (rare) cases (Fig. 3), 'wounds' appear on the rump of ungulates as in the instance of an engraving of a zebra at Wonderwerk Cave (Northern Cape), radiocarbon-dated from in situ deposits to be 4 000 years old (Thackeray et al. 1981). The same applies to images of certain 'wounded' eland (Thackeray 2023). Bradfield et al. (2014) have indicated that marks engraved on the rump of the Wonderwerk zebra were probably deliberate. As a hypothesis, I suggest that the white patch painted on the rump of the likely roan in Mapote's scene is a deliberate representation of a wound. In at least some instances, such images of wounds may be conceptually associated with 'empathetic' hunting rituals (ERT 1, Empathetic Ritual Type 1) related to the principle of hunting success (Thackeray 2023).

Paintings of three therianthropes at Melikane in Lesotho, designated by Thackeray (2023) as ORP1, ORP2 and ORP3, were first recorded by Joseph Orpen (1874) and again by Patricia Vinnicombe (1976). I have interpreted ORP 1 as a person under the actual skin of an antelope with symbolic wounds painted upon it, although perceptions associated with trance (Lewis-Williams 1981) certainly cannot be excluded. This interpretation is strongly supported by a photograph of a person described as a 'buckjumper' under the head and skin of a roan antelope (Thackeray 1993). Stripes appear to have been painted on the skin, representing symbolic wounds (Thackeray 2005). The 'buckjumper' (corresponding to ORP 1) was recorded in 1934 in the southern Kalahari and has been interpreted as a person taking on the appearance of a wounded roan (Thackeray 2023).

Beliefs associated with the concept of a wounded roan were evidently widespread in African prehistory (Thackeray 1993, 2005, 2013, 2019, 2023, 2024; Thackeray and Russell 2004). Mapote's painting of a probable roan (MAP R1) appears to be an additional example of this concept.

Acknowledgement

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DECODING THE DUST

How AI and digital technologies are transforming the archaeologist's toolkit

Rina Faria

What if we could uncover ancient cities buried beneath centuries of earth without immediately lifting a trowel?

Thanks to advances in artificial intelligence (AI), this is no longer the realm of science fiction. AI, often described as a 'datavore' for its insatiable appetite for information (Tuomi 2018), thrives on vast datasets to produce potential insights. Yet, human expertise remains essential. In archaeology, where information is both precious and often fragmentary, this hunger for data is proving to be a powerful ally.

The tech-savvy explorer: Dr Albert Lin

Many of us are familiar with the work of Dr Albert Yu-Min Lin, featured in *National Geographic's* Lost Cities and Buried Secrets of the Bible. His explorations through remote and treacherous landscapes are not just visually stunning; they exemplify a new frontier in archaeological research.

Dr Lin combines historical, geographical, and technical data with advanced tools such as drones, satellite imagery, ground-penetrating radar, LiDAR and 3D scanning. These technologies allow his team to detect and reconstruct lost sites with remarkable precision. The resulting digital models reveal ancient civilisations in vivid, comprehensive detail, offering perspectives that traditional excavation alone cannot provide. It is notable, however, that archaeologists always verify digital findings through on-site work, ensuring that technology complements rather than replaces hands-on investigation. Dr Lin himself works closely on-site with archaeologists, underscoring the vital collaboration between digital innovation and traditional fieldwork.

Field constraints and digital possibilities

Archaeologists often operate under tight constraints: limited funding, narrow excavation windows and environmental conditions. Every dig must balance uncovering the past with preserving it. Given these realities, AI and digital tools offer the potential to enhance both efficiency and accuracy if they can be made accessible and ethically integrated into practice.

A pioneering effort: VANDAL and early AI

AI in archaeology is not entirely new. In 1989, materials scientist Dr Vanda Vitali created an early expert system named VANDAL to improve the interpretation of ceramic origins (Vitali 1989). Using a combination of chemical composition data and archaeological context, the system helped identify ceramic groups more accurately than unaided human analysis. Programmed in a specialised programming language, VANDAL's success in classifying ceramics demonstrated the potential of AI in archaeology, even if at the time it was constrained by a limited computing power and data availability in the late 1980s.

Since then, advances in both computing and data collection have enabled more sophisticated applications. A more recent study by Ruschioni et al. (2023) demonstrates how supervised machine-learning algorithms can effectively classify ceramic fragments based on their chemical-element concentrations obtained through portable X-ray fluorescence (pXRF). Using a dataset of 36 pottery fragments from Etruscan and other sites, the researchers applied various algorithms, including Random Forests and Support Vector Machines to distinguish between local and non-local productions. The models achieved high accuracy (often above 95 per cent), proving that AI can support archaeologists in provenance studies by interpreting complex compositional data and identifying meaningful patterns that align with archaeological classification.

Reimagining the past in 3D

Over the past few decades, digital models of ancient sites have become widespread, from museums and documentaries to scholarly publications (Lock 2003; Terras 2010). These visualisations provide not only public engagement tools but also valuable academic insights. They help manage large datasets, expose inconsistencies and reveal new interpretive possibilities.

Digital technology can 'give voice' to inanimate objects. For instance, a 3D-scanned artefact can tell its story through virtual reconstruction. In an AI-driven world, such tools are transforming how information is shared and understood, effectively mediating our interaction with the past. Algorithms perform a kind of interpretation on data, subtly but significantly

shaping our understanding. This virtual cognitive process is embedded in computational media, where algorithms not only analyse information but also guide users toward specific content. In this sense, AI tools do not merely report data, they actively shape our comprehension of it. They 'decide' which patterns to emphasise, acting as mediators between raw evidence and human interpretation.

Projects like the Pompeii Archaeological Research Project Porta Stabia, led by Steven Ellis (2016), have demonstrated how tools like tablets, standardised forms and photogrammetry software such as Agisoft Metashape that streamline excavation documentation and enable rich 3D reconstructions. Recent advancements in technology have also enabled archaeologists to recreate a vowel-like sound from the vocal tract of a 3 000-year-old Egyptian mummy (Howard 2020).

This interdisciplinary study employed computed tomography (CT) scanning and three-dimensional (3D) printing techniques to reconstruct the vocal tract of Nesyamun, a Theban priest who lived during the politically turbulent reign of Pharaoh Ramses XI (c. 1099–1069 BC). Given his ritual role, which likely involved singing, Nesyamun would have relied heavily on his voice in religious ceremonies. Notably, ethical considerations were fundamental to the research process, particularly in the light of inscriptions on Nesyamun's coffin expressing his desire to 'speak again' in the afterlife. By giving voice to individuals from the past, such innovations open compelling new pathways for engaging with history, both in scholarly research and public discourse.

GIS, drones and a new landscape of discovery

GIS (Geographic Information System) and drone-based remote sensing are now integral to archaeological research. LiDAR, for example, can detect subtle architectural remains hidden under thick forest canopies or other surface cover, revealing previously unknown sites. These tools allow archaeologists to ask broader questions about landscape use, settlement patterns and spatial relationships in the ancient world.

Barriers and considerations

Despite their potential, digital tools bring challenges. Specialised software and hardware require training and financial investment. Data storage and long-term access become critical concerns. Furthermore, proprietary systems may limit collaboration and an over-reliance on visual models can risk distorting interpretation if not grounded in critical reflection.

Equally pressing are ethical issues surrounding AI, such as biased data sets, opaque algorithms and the exclusion of marginalised narratives (Bender 2021). For example, if AI predictions are based mostly on well-studied sites, they might overlook evidence from regions or cultures that have not been researched as extensively, thus sidelining those narratives. If not carefully managed, these systems may unintentionally reproduce social inequalities or misrepresent historical realities.

A balanced future

The future of archaeology lies at the crossroads of traditional methods and digital innovation. As Huggett (2021) reminds us, while AI systems might seem ready to replace human expertise, they should always be tools that enhance, not replace, the skills of archaeologists. It is crucial that human knowledge and careful oversight continue to guide these technologies. To fully harness their potential, archaeologists need training in data science and ethical reasoning, collaborative platforms for resource-sharing and a strong commitment to preserving context and nuance. When used wisely, digital technologies can enrich, not replace, our understanding of the past.

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A GEOARCHAEOLOGICAL FIELD SCHOOL

Exploring the ancient Greek Agora

Maryke Horn

Fig. 1: All the students gathered to present the results of their sites

The geoarchaeological field school hosted by the American School of Antiquities in Athens, Greece, every year provides an excellent opportunity for students to gain introductory geoarchaeological skills. I had the privilege of attending the 2024 field season to help expand my knowledge as this specialisation forms the basis of a PhD research project I am pursuing at the University of the Witwatersrand. My research relates to the Sterkfontein Caves in the Cradle of Humankind, a UNESCO World Heritage Site. This site has a rich archaeological and fossil record, making it one of the most significant localities in the world for understanding human evolution.

My research approach includes 3D spatial modelling, stratigraphic analyses and an investigation of the context of fossils from various exposed excavations on the landscape surface and within the cave system. Furthermore, it explores multiple aspects of how a site is formed, particularly the investigation of the processes that have affected the distribution of archaeological materials and fossil remains. A comprehensive recording of spatial and chronological markers provides valuable insight into tracking and accessing the movement of pre-historic remains over millions of years. These markers also help to understand how different conditions and environments at the site, either on the exposed surface or in the underground cave system, has impacted the condition of preservation and the contextual integrity of fossil discoveries and stone tool assemblages, which is a core principle of geoarchaeology during this time period.

The field school was presented by two world-renowned specialists in geoarchaeology to post-graduate students from various countries and archaeological backgrounds and specialisations. Prof. Panagiotis Karkanas from Athens is a leading researcher with expertise in site formation processes, palaeoenvironmental reconstruction and paleoclimate studies. He earned his bachelor's and doctorate degrees in geology from the University of Athens. The other specialist, Prof Paul Goldberg, is a distinguished American geologist and geoarchaeologist specialising in micromorphology, site formation processes and the geological study of various heritage sites that have contributed to his doctorate research at the University of Michigan. The student group comprised 11 participants from America, Bulgaria, China, South Africa and Switzerland, 10 of whom were pursuing their PhDs at the time. Two students, including myself, work within prehistoric archaeology in contrast to the others who were involved in classical archaeology.

In Athens I stayed in the suburb of Exarcheia, one of the student centres of the city and home to the National Archaeological Museum. This area is also well known for its political resistance and its home of socialist, anarchist and anti-fascist groups, which brings with it a prominent police presence. Not being a tourist hub, the suburb provided me with the opportunity to meet and connect with the locals, gain an insight into its history and cultural significance.

The field school was an enriching experience that allowed me to explore the history of the Greek Agora and Acropolis, study the formation of the Agora's

Fig 2: Our assigned site in the Agora: the Byzantine silo

cultural sites and learn new interpretive methods in the laboratory. The school commenced with a tour of the facilities of the American School of Antiquities and a special visit to an ancient riverbed in Attica to introduce us to the geoarchaeological practices applied at these sites. The day was spent learning how to read the surrounding topography, identify the formation processes responsible for its creation and make profile drawings of the exposed sequences. From then on it was field work in the mornings and lab work in the afternoons.

John Papadopoulos, who was responsible for some of the main excavation phases of the Agora, led our tour of the site. Located in Monastiraki Square, the site is significant for its continuous occupation by the Greeks, Romans and Byzantines. This makes it an ideal location to study the relationship between human cultural activity and natural geomorphological processes. We were divided into teams and allocated an area to conduct a geoarchaeological investigation. Results were presented at the end of the week (Fig. 1). My team was assigned a quarter of the study area (Fig. 2) containing the ruins of a Roman water feature, which was created from re-used marble of an earlier Greek monument celebrating the sacrifice of three women (Fig. 3). In addition, there was also a silo feature built during the Byzantine occupation (Fig. 4). The site's stratigraphy, which is strongly affected by intermittent waterflows owing to a canal running through the site, created various stratigraphic beds composed of different materials. A portion of the site had served as a dump as evidenced by significantly different layers of ash being mixed with pure red kaolinite clay, indicating that each layer placed was exposed to intentional and continual burning episodes.

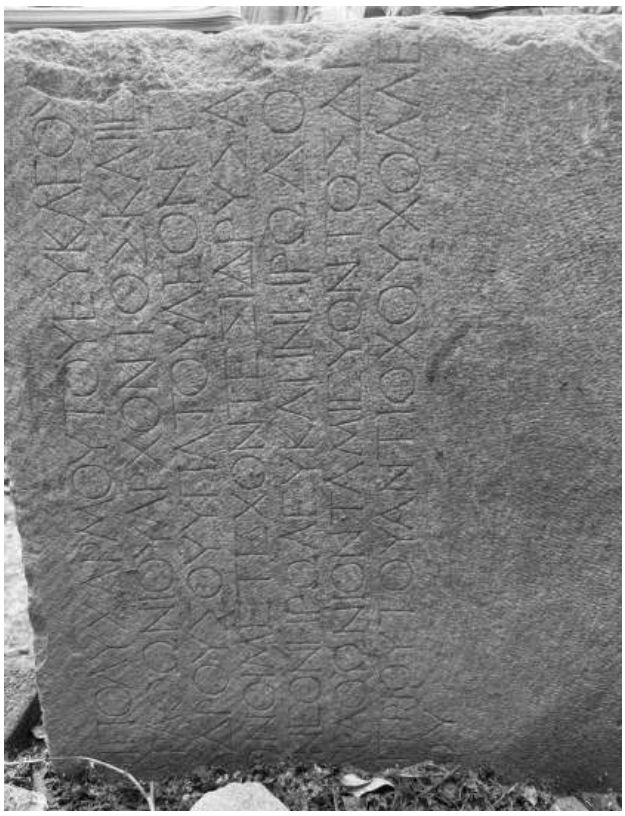

Fig. 3: The Greek marble celebrating three woman that was repurposed by the Romans as a water feature

Fig. 4: Our whole study quarter

Our exposure to innovative laboratory-based approaches began with learning about micromorphology. Here the particular focus was on the sampling and preparing of slides or thin sections (Fig. 5). This was followed by practicing how to microscopically analyse and identify different materials in the slides. Fourier Transform Infrared Spectroscopy (FTIR) was the second method we explored. This included the preparation of samples and familiarising ourselves with the computer programme to successfully run our samples and analyse the results. It was the use of this technique that confirmed that the red kaolinite (described above)

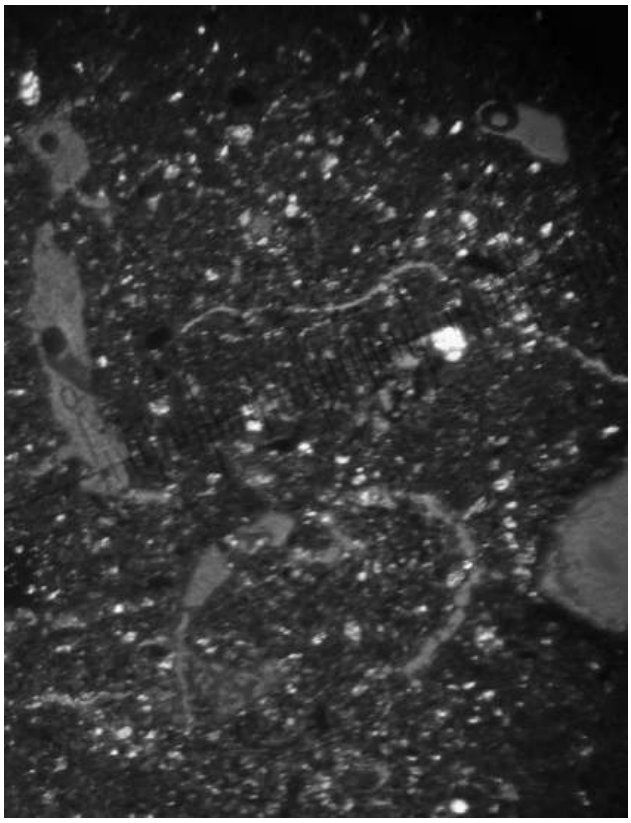

Fig. 5: Micromorphology slide as seen under microscope

was significantly 'pure'. Lastly, we were introduced to X-ray diffraction (XRD) and X-ray fluorescence (XRF) techniques. After preparing samples and learning how to use the equipment, obtaining results took significantly longer than in the case of the previous methods as this needed to be done over a number of different days.

The field school was an excellent opportunity to expand my field skills within a European context and site, while also providing much- needed experience within a laboratory setting. This applied particularly to the nuanced methods of analysing material within geoarchaeology. The school has provided invaluable insight into incorporating some of the data collecting methods and analysis to my current and future research approaches. My research training was advanced, but most importantly the field school provided incredible space for knowledge-production and -sharing between the participants and researchers. I am dedicated to sharing this knowledge and my new insights and skills in archaeology with future students in South Africa.

Acknowledgements

My thanks go to the Northern Branch of the South African Archaeological Society, the NRF, DST, IFAS and PAST Africa, without whose funding this field trip and research would not have been possible.

ART-HISTORY VERSUS HISTORY?

A response to Anne Solomon

John Wright

In her article, 'Arts, meanings and (over-) interpretations' (*The Digging Stick*, April 2025), Anne Solomon disagrees with my view in 'Making rock paintings as a performance' (*The Digging Stick*, December 2024) that David Witelson's book, *Theatres of Imagery: A Performance Theory Approach to Rock Art Research* (2023), has important things to say about the making of rock paintings in the historically known hunter-gatherer societies of southern Africa.

I argued that the book points us to thinking more specifically than has often been the case in rock art research about the historical contexts in which rock paintings were produced and – of central importance – about how these contexts and, with them, the meanings carried by the paintings changed over time. In response, Solomon argues that because of the difficulties of dating the paintings, it is almost impossible to discuss changes in their meanings over time. Instead, she seems to be saying, the meanings should be examined primarily through study of the making of their visuality or forms, using perspectives from art history and anthropology.

I agree that research into the visuality of the paintings could have a lot to say to us about why they were produced. It might well be, as Solomon suggests, that the skilful and imaginative making of images helped in 'enhancing the power of the art to influence the spirits' in the world in which the hunter-gatherers lived. The more skill and imagination shown in the making, the more potency the paintings had, as in other forms of 'artistic' creation in other African societies.

But I fail to understand Solomon's position that the art-historical approach to researching the paintings is incompatible with researching changes over time in their meanings and social and political functions. Yes, this is a difficult business because of the problems of establishing a firm chronology for the image-making. But it is not impossible to find firm evidence on the changing historical contexts in which the paintings were produced. Over the last 20 years or more, archaeologists of the Later Stone Age in southern Africa have provided us with evidence about variations in time and space in the lifeways and social relationships of hunter-gatherer people that give us a very different picture from older views, rooted in Western ethnographic perspectives, of static 'Bushman' life. There is no reason to think that this kind of archaeological research will not continue into the future and continue to broaden our ideas about changes over time in hunter-gatherer lifeways, and of the contexts in which paintings were produced.

For researchers of rock art, the problem becomes how to make connections between shifting lifeways and shifting image-making. Agreed, as Solomon states, that 'establishing specific contexts for specific paintings is, in most cases, simply impossible'. But it is certainly possible in some cases to make broad-brushstroke suggestions about connections between changes in the paintings of a specific region and archaeologically and historically evidenced changes in the lives of local hunter-gatherer groups. Scholars have been doing just this, even if contestably, for several decades in connection with hunter-gatherer groups of the documented period of southern Africa's history. Witelson sets out to do it for a particular region across a long earlier period. In my view as a historian, he does it very suggestively. Whether he does it successfully in the eyes of rock art researchers and other archaeologists is a matter I look forward to learning more about. But I cannot agree with Solomon that his argument 'amounts to little more than saying that painting was a shamanic ritual'; his ideas about change over time go far beyond this.

The alternative of exclusively privileging the study of the visuality of rock paintings runs the danger of confining research into the processes of image-making into a western-made ethnographic silo, and of once again rendering southern Africa's historical hunter-gatherers as people without history.

John Wright lectured in history at the University of KwaZulu-Natal. He is a former research associate in the Rock Art Research Institute at Wits University and in the Archive and Public Culture Research initiative at the University of Cape Town.

STONE AGE MEGASTRUCTURE UNDER THE BALTIC SEA

Just off the Baltic shores in Germany, the submerged ruins of a 1 km-long wall, crafted out of 1 673 individual stones, has been discovered. Named the Blinkerwall, it is estimated to have been built around 11 000 years ago, before the brackish waters of the Baltic submerged the area. Archaeologists believe that it was constructed by hunter-gatherers to trap reindeer during migration. An interdisciplinary joint research project called SEASCAPE, led by the Leibniz Institute for Baltic Sea Research Warnemünde (IOW), will investigate the structure further.

Maddy Chapman, 12/06/2025

OBITUARY

Ione Elizabeth Rudner (nee Muller) 1926 – 2025

Janette Deacon

In 2015, Ione Rudner gave me a copy of her life story, *Ten Paces Behind: A Family Saga,* published by Africana Publishers, saying I could use it when I came to write her obituary. We joked sometimes about who would go first and when it would happen. At 361 pages, Ione's book is way too long for me to cover all the details of her life here, but the time has come to summarise the adventures of a remarkable 20th century woman who, despite obstacles, was able to spread her wings and contribute meaningfully to her own career in southern African palaeontology, archaeology, rock art, a Master's degree on the ethnographic use of ochre, and the editing and translation of numerous books by early Swedish travellers to southern Africa. She was a faithful member of ArchSoc and worked on translating well into her 80s. She missed her centenary by only nine months on 10 July 2025.

Ione Muller was born between the two World Wars on 7 April1926. She was the eldest of three children to Murray, an engineer in Upington, and Elizabeth (Betty), who taught high school English and History. After matriculating, Ione wanted to study Zoology but was obliged by her parents to do a BCom. degree at the University of Stellenbosch instead. Her first job was as secretary to the Head of English Programmes at the South African Broadcasting Corporation (SABC), quite a coup for a first appointment. She held this job for three years during which she married immigrant Swedish architect and town planner, Jalmar Rudner, in November 1950.

Jalmar had a long-term interest in archaeology that had started in Sweden and Ione became fascinated by the fact that potsherds and stone tools made and used by indigenous San and Khoekhoen, were still to be found on shell middens along the Western Cape coast and at rock shelters inland. With encouragement from archaeologist John Goodwin, geologist Jack Mabbutt and anatomist Ronald Singer, all from the University of Cape Town, the Rudners' interest became a serious hobby. In the absence of a professional archaeologist at any of the local and national museums in the 1950s, Goodwin persuaded the director of the South African Museum (now Iziko) in 1955 to appoint Ione as honorary curator of the archaeological collection, and she began organising the collection for the first time in its 100th year. This voluntary (ie unpaid) work continued into the early 1960s, even though Jalmar was then listed as the honorary curator. As he was able to work at the museum only on weekends, Ione continued the cataloguing when her sons Sigurd and Björn were at school and added the archaeological material that the family had collected themselves.

The museum had a post for a professional archaeologist from the mid-1960s. By this time the director, palaeontologist Dr 'Fuzz' Crompton, had recognised Ione's excellent skills and potential as a Karoo fossil preparator and was able to pay her a part-time salary from his CSIR research grant and contributed towards her training in the UK and then at Yale, where he had moved in 1965. Her outstanding ability was formally recognised in 1966-67 after a paleontological expedition to Lesotho when she identified an exceptionally small mammal that was named after her - *Megaszostrodon rudnerae* - the oldest complete fossil mammal ever found. In this moment of international fame, one of the many

journalists referred to her as ‘a housewife’.

Ione and Jalmar travelled widely in southern Africa, both for the pleasure of exploration and for collecting ethnographic and archaeological items for the museum. They made lifelong friends along the way. Jalmar and his sons often kept diaries of their trips to Angola, Zimbabwe, Botswana and Namibia that contributed many details to Ione’s family book, as did their intimate knowledge of the Iziko collection. Their copies of rock paintings from southern Africa and accompanying text were published as *The Hunter and His Art: A Survey of Rock Art in Southern Africa* in 1970, and they wrote scores of articles together and separately for publication on a diverse range of archaeological topics. In 1959, shortly before he died, Prof. John Goodwin asked Jalmar to take over from him as Honorary General Secretary of the ArchSoc, but it was Ione who dealt with the correspondence and general running of the society and assisted with the editing of the *South African Archaeological Bulletin* until Ray Inskeep was appointed. Her editing skills and experience were also used in preparing papers for the *Annals of the South African Museum*.

As archaeology worldwide became a profession, the details expected of amateur collectors like the Rudners began to fall short of those required by professional archaeologists who insisted that a permit was essential for the collection of artefacts from Stone Age and other protected sites. The National Monuments Act of 1969 made it illegal to remove any items protected by the act without a permit and this included all items from the Stone Age. Although Ione, Jalmar and others complained, it was to their credit that they stopped collecting artefacts. From as early as 1964, inspired by the palaeontological work of Crompton and the welcome challenge of preparing fossils, Ione herself shifted interest to palaeontology.

As if her contribution was not enough, Ione confessed that the work she most enjoyed with Jalmar in their later years was the retranslation into English of the accounts by the well-known Swedish travellers Thunberg (1772-1775), Sparrman (1785 and 1786) and Victorin (1853-1855). In addition, they translated the handwritten journal (1873-75) of Gustaf De Vylder, an entomologist whose collections from Namibia are in museums in Sweden, which was published by the Van Riebeeck Society in 1998.

After Jalmar died in 2003, Ione translated the diaries of TG Een (1866-71) and E Rosenblad (1894-98) on their journeys in southwestern Africa from Swedish to English. These were published in 2004 and 2007, while a biography on the renowned 19th century Swedish trader and ornithologist in southwestern Africa, Axel Wilhelm Eriksson, was published in 2008. EJ Kärrström’s story of a young adventurer’s 18 years in South Africa during which he fought with the British colonial troops in indigenous wars and later worked as a miner, was published in 2013. Ione considered that the most difficult editorial challenge for her was the revision and annotation of the rough translation from Norwegian of I Schröder-Nielsen’s book *With a Norwegian in the Veld Among the Boers in Peace and War*, published with Bill Nasson in 2012.

Perhaps the most difficult time in her career, however, was in the early 1980s when she lost confidence in her fellow workers and superiors at the South African Museum. She had a strong sense of right and wrong and although some staff members were aware of irregular expenditure and the use of museum facilities for private purposes, she was the only one brave enough to blow the whistle. Unfortunately, like the case is with whistle blowers today, it did not end well for her and she was dismissed on the grounds that she did not work full-time. Legal expenses to challenge the decision were beyond her salary level. Although it might have been possible for her to follow up some 20 years later with the establishment of the Commission for the Conciliation, Meditation and Arbitration (CCMA), a dispute resolution body that provides a free service, there was no knowing then that it would be entered into law.

Apart from her academic work and wonderful library that benefitted from her bookbinding skills, I greatly admired Ione as a gardener who produced not only fresh herbs and vegetables at home but some rare and endangered plants that were lucky enough to fall victim to her collecting habit. I will miss her a lot.

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140 000-YEAR-OLD HOMINID BONES FOUND ON SEAFLOOR IN JAVA

Homo erectus **bones** revealing a previously unknown population in southeast Asia have been found among a cache of more than 6 000 animal fossils hoovered up as part of a construction project off the island of Java, which was once part of a drowned Sundaland that connected to the Asian mainland during the last ice age around 140 000 years ago. Cut marks on some of the fossils have confirmed the Madura Strait hominins were hunting turtles and large game.

The remains also suggested that these hominins were selectively targeting cow-like bovids in their prime, which Indonesian *H. erectus* is not known for. The researchers led by Harold Berghuis from Leiden University, the Netherlands, published their findings in four separate studies in *Quaternary Environments and Human.* Fossil evidence suggests that *H. erectus* continued to survive on Java until around 117 000 to 108 000 years ago, when the species eventually went extinct.

Patrick Pester, Live Science

FROM SETTLEMENTS TO STONE CIRCLES

Rewriting Northwest Africa's later prehistory

Hamza Benattia

Archaeological research in Morocco in recent years has been transforming our understanding of the later prehistory of northwest Africa. Although this region has historically been absent from major archaeological debates and research, it constitutes a significant portion of the Mediterranean basin and may yet prove crucial for understanding its wider developments and dynamics. For decades, the Maghreb was considered a peripheral (Shaw 2004), sparsely inhabited area prior to the arrival of the Phoenicians around 800 BC. However, new findings challenge this view, revealing a far more complex and interconnected past (Benattia 2025; Broodbank et al. 2024).

Map of the Tangier Peninsula and main sites mentioned by the author

As an archaeologist specialising in the later prehistory of north Africa, between ca. 3800 BC and 500 BC, my research focuses on how local communities adapted to environmental changes and participated in mobility and trans-regional interactions. As part of my recently completed doctoral research, I directed two projects in northwestern Morocco's Tangier Peninsula: the excavation of the Bronze Age settlement at Kach Kouch (Benattia et al. 2025a) and a survey of prehistoric burials, rock art and monuments (Benattia et al. 2025b). In this article, I summarise my findings that highlight the presence of local communities engaged in long-distance cultural and economic networks prior to the Phoenician arrival, as well as evidence for a dynamic late prehistoric social landscape. These results suggest that northwest Africa was a vibrant cultural crossroads connected to the Mediterranean and Atlantic worlds thousands of years earlier than previously thought.

The 4 000-year-old settlement at Kach Kouch

The archaeological project at Kach Kouch, in Morocco's Tangier Peninsula, challenges the long-held belief that the Maghreb was an empty land before the arrival of the Phoenicians. It reveals a much richer and more complex history than previously thought. Everything found at Kach Kouch indicates that during the Bronze Age more than 3 000 years ago, at the same time as societies such as the Mycenaean flourished, stable agricultural settlements also existed on the Mediterranean coast of Africa. Excavations carried out by a field team composed mainly of early career researchers from Morocco's National Institute of Archaeology and Heritage (INSAP) have expanded our knowledge of the later prehistory of north Africa and redefined our understanding of the connections between the Maghreb and the wider Mediterranean in ancient times.

Kach Kouch was first identified in 1988 and excavated in 1992. At the time, based on the Phoenician pottery that was found, researchers believed the site had been inhabited between the 8th and 6th centuries BC (Bokbot and Onrubia 1995). Nearly 30 years later, in 2021 and 2022, we carried out two new excavation seasons using cutting-edge technology such as drones, global positioning systems and 3D models. A rigorous sampling protocol allowed us to detect fossilised remains of seeds and charcoal, which were later analysed to reconstruct the settlement's economy and its prehistoric environment.

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Excavations at Kach Kouch (H Benattia)

Radiocarbon dating has indicated that the settlement underwent three phases of occupation between 2200 and 600 BC. The earliest documented remains (2200 to 2000 BC) are scarce, consisting of only three

Ceramics of the KK2 phase (P Menéndez Molist and H Benattia)

undecorated pottery sherds, a flint flake and a cow bone. The scarcity of materials and contexts could be the result of erosion or a temporary occupation of the hill during this phase.

In its second phase, after a period of abandonment, the Kach Kouch hill was permanently occupied from 1300 to 900 BC. Its inhabitants, who probably numbered no more than a hundred people, dedicated themselves to agriculture and animal husbandry. They lived in circular dwellings built from wattle and daub and dug silos into the rock to store agricultural products. They cultivated wheat, barley and legumes, and raised cattle, sheep, goats and pigs. They also used grinding stones for cereal processing, flint tools and decorated pottery. In addition, the oldest known bronze object in north Africa (excluding Egypt) has been found here. It is probably a scrap metal fragment removed after casting in a mould.

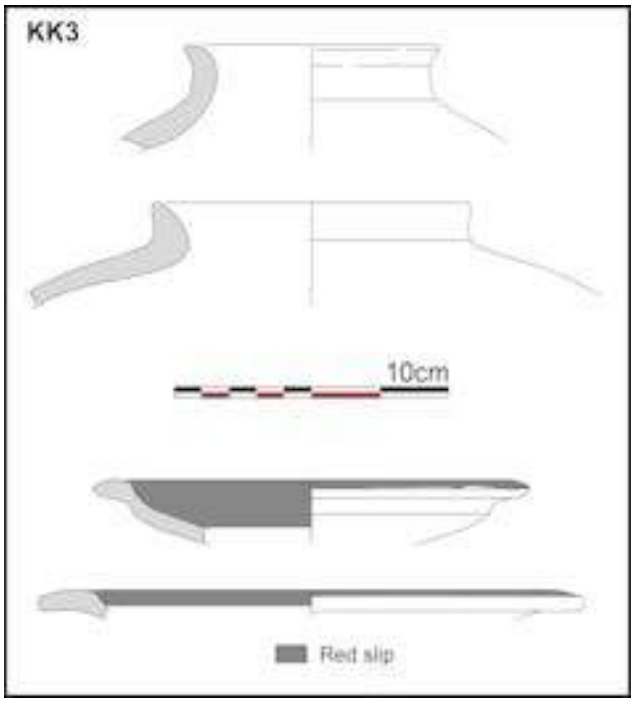
Interactions with the Phoenicians

Between the 8th and 7th centuries BC, during the so-called Mauretanian period, the inhabitants of Kach Kouch maintained the same material culture, architecture and economy as in the previous phase.

However, interactions with Phoenician communities that were starting to settle nearby, in sites such as Lixus and Ceuta (Habibi et al. 2005; Villada-Paredes et al. 2010), brought new cultural practices. For example, circular dwellings coexisted with square ones made of stone and wattle and daub, combining Phoenician and local construction techniques. Furthermore, new crops, like grapes and olives, began to be cultivated. Among the new materials, wheel-made Phoenician ceramics, such as amphorae and plates, and the use of iron objects stand out. Around 600 BC, Kach Kouch was peacefully abandoned, perhaps as a result of social and economic changes. Its inhabitants likely moved to other nearby settlements.

Oldest known bronze object in northwest Africa (M Radi)

Remains of a square house built from stone, wattle and daub (H Benattia)



Phoenician amphorae and plates (P Menéndez Molist and H Benattia)

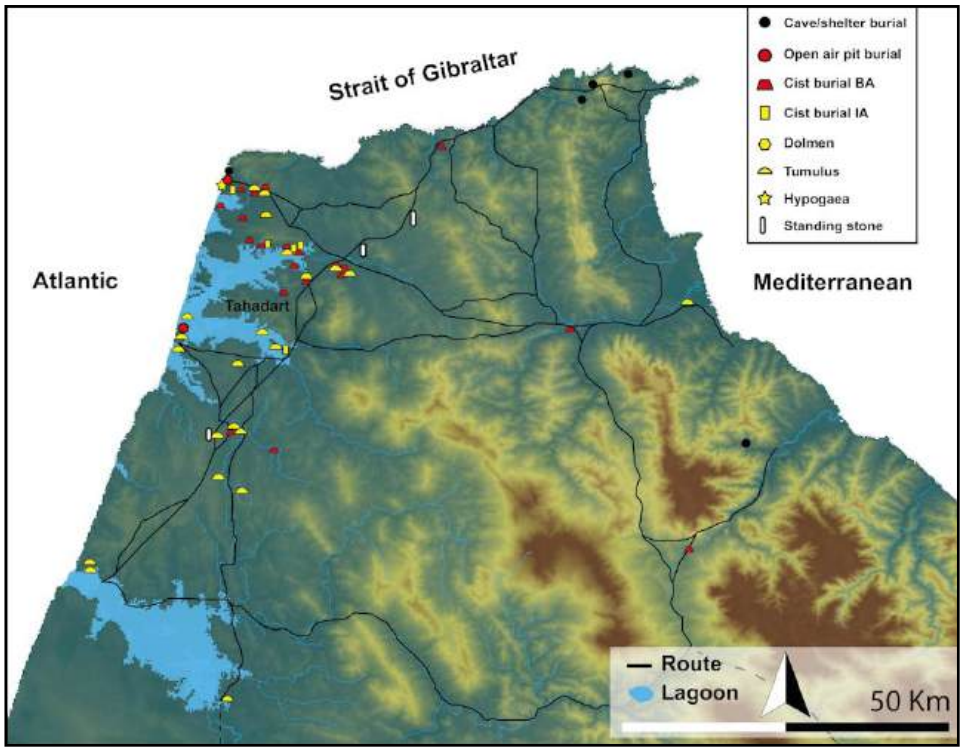
Who were the Bronze Age inhabitants?

It is unclear whether the Maghreb populations in the Bronze Age lived in tribes, as they would later do during the Mauretanian period. They were probably organised as families. Burials suggest that there were no clear signs of hierarchy (Ponsich 1970). They may have spoken a language similar to the Amazigh, the indigenous north African language that did not become written until the introduction of the Phoenician alphabet. The cultural continuity documented at Kach Kouch suggests that these populations are the direct ancestors of the Mauretanian peoples of northwest Africa. Kach Kouch is not only the first and oldest known Bronze Age settlement in the Maghreb but also reshapes our understanding of prehistory in this region, demonstrating that northwest Africa has been connected to the Mediterranean, the Atlantic and the Sahara since prehistoric times.

Rock art and tomb discoveries near Tangier

Complementing this picture of a settled Bronze Age community, new discoveries on the western side of Morocco's Tangier Peninsula reveal a rich ritual and symbolic landscape that further underscores the region's role as a cultural crossroads. Located at the meeting point of the Mediterranean and Atlantic, just 14 km from Europe, the Tangier Peninsula has always been a natural crossroads between continents and cultures. Yet it was long assumed to have been largely uninhabited during late prehistory.

As part of the Kach Kouch and Tahadart Archaeological Projects, we re-examined this area using modern methods, including GIS (Global Information System), drone surveys



The Tangier Peninsula showing the distribution of burials, standing stones and communication routes (H Benattia)

Excavation process of the Daroua Zaydan cist burial

and radiocarbon dating. Fieldwork carried out by a team composed mostly of early career researchers from INSAP revealed dozens of new sites, including prehistoric cemeteries, rock art sites and standing stones that paint a vivid picture of a thriving cultural and social landscape. Until now, research into rock art and burials in north Africa has focused on areas like the Nile Valley, the Sahara and the Atlas Mountains. Our discoveries on Morocco's north-western coast indicates that this region was a major cultural hub over 4 000 years ago. The diversity of burial practices, ritual sites, symbolic rock art and unique megalithic monuments reflect a rich prehistoric heritage that transcends modern geographic, political and cultural boundaries. It also highlights the longstanding exchanges and contacts of this region with the Mediterranean, the Atlantic and the Sahara.

A prehistoric ritual and funerary landscape

One of the most remarkable sites excavated by us is Daroua Zaydan near modern-day Tangier. Here, we uncovered a cist burial, a small stone chamber constructed from four upright slabs and covered by a larger stone slab. A crescent-shaped arrangement of stones likely marked the entrance to the burial chamber. Although the grave had been looted in the past, several human bones were recovered outside the cist, one of which was radiocarbon dated to 2118 – 1890 BC. This date corresponds to similar burial traditions in Iberia (Benattia et al. 2025b) and Early Bronze Age settlement activity at Kach Kouch, located about 65 km to the south-east.

Ballintober-type sword recovered from the bed of the Loukkos river and currently held at the Staatliche Museen zu Berlin (Claudia Plamp)

The stone circle at Mzoura (H Benattia)

Most cist cemeteries previously documented in the region were excavated during the early to mid-20th century (Ponsich 1970), often without the use of modern archaeological techniques. Daroua Zaydan therefore represents the first radiocarbon-dated cist burial in this part of Africa and offers clear evidence that these communities were integrated into broader networks of funerary and ritual practices.

Further clues to these extensive connections include a Bronze Age sword discovered in the 1920s in the Loukkos River (Brandherm 2007).

Dotted composition at Ghar el Manzla. Enhanced with DStretch

Likely made in Britain or Ireland, the sword may have reached Morocco through Atlantic exchange networks and was probably deposited deliberately in the river – a ritual practice well-documented along rivers in Atlantic Europe. Another striking example is the stone circle at Mzoura, composed of 176 standing stones (Daugas et al. 2006). Excavated in the 1930s, this unique monument in north Africa bears a strong resemblance to stone circles in Atlantic Europe, such as Stonehenge.

Painted rock art uncovered

During our fieldwork we also discovered new standing stones and rock art along prehistoric communication routes. This suggests they may have been used as territorial markers or ritual sites. In fact, before our research, only a single painted rock shelter, Magara Sanar, was known in northwestern Morocco. We have now documented 17 painted and five engraved shelters (Benattia et al. 2025b). The variety of symbols and scenes includes dotted patterns, geometric lines and human-shaped figures. They suggest strong links to Iberian, Atlantic and Saharan prehistoric imagery.

Conclusion

The combined evidence from Kach Kouch and the Tangier Peninsula reveals that late-prehistoric north Africa was far from isolated. Rather, this region was defined by stable agricultural communities, long-distance interactions and shared cultural and symbolic practices that linked it to the wider Mediterranean, Atlantic and Saharan worlds. These discoveries challenge long-standing colonial narratives that portrayed the Maghreb as marginal and isolated until the arrival of the Phoenicians or other external peoples. They highlight the region's role as an active cultural crossroads and a participant in trans-regional dynamics thousands of years earlier than previously recognised. Ongoing research will continue to shed light on this complex past, but what is already clear is that northwest Africa possesses a rich and underappreciated pre-historic heritage, one that deserves not only scholarly attention but also greater protection and public visibility.

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12th-century bronze coins found in Mozambique

A recent study by Dr Ignacio Montero-Ruiz examined the provenance of ancient copper artifacts from the island of Ibo off Mozambique's north coast. The study, published in *Azania: Archaeological Research in Africa*, 2025, provides new insights into the role small coastal villages may have played in the early development of Indian Ocean trade. For much of the Swahili trade history, the role of northern Mozambique has been considered marginal. However, in 2016, a test pit dug on Ibo brought to light various artifacts linking the area to the wider Swahili trade with the Persian Gulf, such as Iranian glazed ceramics, a fragment of soft stoneware possibly from Iran or Oman and glass beads from India and Central Asia.

Coin found at Ibo, site C–400. Credit: Montero-Ruiz et al. 2025.

Among the finds were also three bronze coins, a chain and metal fragments. Elemental analysis indicated that the coins had a unique composition unlike any other known Swahili coins. They were made up of an unusually high tin-lead ratio and, unlike Swahili coins, contained no arsenic. The researchers proposed that this may indicate a shift in the source of copper during the 11th and 12th centuries. Using a specialised mass spectrometer, they compared the isotope signatures with sources across Africa and Eurasia. The results showed that none of the metals had originated in the Islamic world, as their alloy compositions did not match. Neither were they recycled metal. Therefor the researchers hypothesised that the most likely source of the copper was the Copperbelt region in Congo-Kinshasa. This would make the copper used to create the Ibo artifacts the most distant source of copper to date. While the poor condition of the coins and the fact that the researchers could not claim they belonged to a Swahili mintage made linking them to any specific place difficult, they were able to establish a link between the Ibo coins and coins struck in Kilwa.

The Quirimbas Archipelago, which is part of Ibo, was part of the gold trade network that connected Kilwa to areas in Limpopo and the Zambezi, located in the Middle Limpopo Valley. The latter was a significant political entity that controlled long-distance trade in gold and ivory. Within it were several polities, including Mapela (c. 1055–1450 AD), Mapungubwe (c. 1220–1300 AD) and Great Zimbabwe (c.1300–1450 AD). This long history of trade between the southern areas of Africa and the Swahili coast helped introduce gold, tin, bronze and brass metallurgy into these southern areas around the second millennium.

This trade connection has been demonstrated through the analysis of a gold bead also excavated at Ibo, the gold of which according to the provenance analysis came either from Great Zimbabwe or South Africa.

While much of the ore, including copper and bronze used in these polities, was mined locally in South Africa, Zimbabwe, and Botswana, some came from the Copperbelt in the Congo-Kinshasa. The research team proposes that the copper used in the Ibo coins likely originated from the Congo region before being redirected eastward to the coast through the Middle Limpopo Valley, suggesting that they followed a similar route to the gold trade network. 'Taking into account that Sofala was considered the outlet for the Zimbabwean gold, we considered the Limpopo River, connected to Sofala, as the most probable route [of copper],' said Prof. Maria Ruiz-Galvez Piergo, a researcher on the study.

THE PROBLEM WITH THE TERM 'PREHISTORY'

In many parts of the world indigenous peoples object to the use of the term 'prehistory' to describe earlier time periods. At the same time, however, archaeologists in the US are trained to date sites in relation to this binary system – prehistory vs history. American archaeologists struggle to find respectful terminology to replace the word prehistory as a referential chronological marker.

Looking at the issue from another geographic perspective may help. The authors of this article examine the ways that 'prehistory' is used and misused in Southeast Asian archaeology. They point out that, for centuries, archaeologists have defined 'prehistory' as a time before writing and go on to discuss the inherent problems, implicit and explicit, in the use of the term. The authors suggest that the term implies a linear technological path from 'primitive' (prehistoric) to 'advanced' (historic) that does not acknowledge technological sophistication other than writing. It also privileges older archaeological sites (because they are rare and more 'valuable') and cultures at the expense of more recent sources of information.

Stephen Acabado and colleagues assert that the application of the framework of 'prehistory' and 'history' distorts an understanding of the past and often ignores the ongoing development of indigenous cultures and societies in a particular region (i.e. 'history' does not begin until people from another culture arrive. Colonisation soon follows).

What to replace it with? The authors of this article propose a 'deep history' framework that does not replace prehistory as a term but eliminates the binary system of temporality altogether. They suggest that the approach places value on continuous cultural development and expands the contributions of indigenous knowledge systems and oral histories and a wider range of technological developments to expand our understanding of the past. They provide two examples. One is the Ifugao rice terraces on the island of Luzon in the Philippines, originally thought by American archaeologists to be 2 000 years old (and thus prehistoric) but are currently believed to have been built at the beginning in the 17th century as a dynamic response to Spanish colonisation. The second is Angkor Wat in Cambodia. French insistence on calling the temple 'prehistoric' allowed archaeologists to minimise or ignore evidence indicating that the temple was a vibrant religious centre for centuries after it transitioned from a Hindu to a Buddhist site.

Incorporating local chronologies and perspectives allows for a more accurate and respectful representation of cultural history. It also requires a shift in thinking from a linear progression of technological stages to a more holistic understanding of culture change.

The prehistory–history binary and various three-age systems that are in use came into being when archaeology as a profession had few tools besides comparing artefacts to date sites. Now that we have more sophisticated and accurate methods at hand we can refer to sites within a correct chronological context. Eliminating 'prehistory' and 'prehistoric' as descriptors can also facilitate thinking about cultures in less linear ways, precipitating a conceptual change that indigenous people would like to see happen.

The article 'The Problem with the Term "Prehistory"' by Stephen Acabado, Marlon Martin, Piphal Heng, Earl John C Hernandez and Mylene Q Lising is found in *Sapiens Anthropology Magazine,* 3 December 2024**.**

This review appeared in The Federal Archeologist's Bookshelf, Archeology E-Gram, Nov. 2023, US National Parks Service.

ARCHAEOLOGY IN SOUTH AFRICA

Wits reopens Sterkfontein Caves

After more than two years of closure due to flooding and infrastructure damage, the Sterkfontein Caves, renowned for their pivotal contributions to the understanding of human evolution, have reopened to the public. The site in the Cradle of Humankind is famous for yielding some of the most important hominin fossils, including the iconic Mrs Ples (1947) and Little Foot (1994-1998), as well as hundreds of other fossils of human relatives.

Heavy rainfall over just a few days in December 2022 led to pockets of soil flushing into the cave system, destabilising its structure and raising safety concerns.

The flooding prompted a thorough safety assessment by Wits University in collaboration with an engineering firm. As part of the rehabilitation process, structural reinforcements were installed and seismic monitoring equipment was embedded to track rock movement and ensure long-term stability. The flooding served as a turning point for the caves as they have now been formally integrated into Wits' academic structure as a dedicated unit within the Faculty of Science, with direct oversight by the Dean. This integration strengthens their role as both a research facility

and an educational resource for undergraduate and postgraduate students.

To mitigate future flooding risks, the university is enhancing water flow management around the cave system and collaborating with local authorities to address challenges related to the Bloubankspruit. The reopening of the Sterkfontein Caves also marks a new chapter in how the site engages with the public. The new visitor experience will allow people to directly interact with scientists and students conducting ongoing research at the site. Behind-the-scenes tours will offer access to fossil preparation laboratories and enhanced educational programmes will cover human evolution, palaeoanthropology and related disciplines such as climate science and geosciences.

Julia Evans, Daily Maverick, 15/04/2025

NEANDERTHAL REMAINS OF 116 000 YEARS

In 2008, a team of archaeologists digging in the Stajnia Cave near Mirów in Poland unearthed very ancient tools among the remains of Neanderthal hunters. This discovery represented the first Neanderthal remains ever discovered in Poland. However, a recent shift in the scientific molecular clock indicates that these discoveries are not 55 000 years old, as was believed, but are in fact the oldest remains of Neanderthals in Central Europe, possibly dating back as far as 116 000 years.

A new study published in *Nature* demonstrates how an ancient tooth found at the site is twice as old as thought. The new research was conducted by an international team of scientists from the University of Wrocław, the Polish Academy of Sciences and the Polish Geological Institute. The Stajnia Cave DNA was found to be more closely related to the North Caucasus population than to that of Western Europe.

Exemplifying how rare this Neanderthal molar is within a European context, a July 2016 paper published in *Science Daily* by a team of scientists from the University of Cologne explained that in Germany there were only four known settlement sites for the time period between 110 000 to 70 000 years ago. Meanwhile, there were 94 sites dated between 70 000 to 43 000 years ago. *Ashley Cowie, 14/09/2020*

The South African Archaeological Society

This is the society for members of the public and professionals who have an interest in archaeology and related fields such as palaeontology, geology and history. Four branches serve the interests of members. They arrange regular lectures and field excursions guided by experts, annual and occasional symposia, and longer southern African and international archaeological tours.

The Society was founded in 1945 to promote archaeology through research, education and publication. It is a non-profit organization – Registration No. 024-893-NPO.

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- ***South African Archaeological Bulletin***, biannual scientific publication of current research in southern Africa.
- ***The Digging Stick***, the Society's general interest magazine – three issues a year.
- ***Goodwin Series***, an occasional publication on a specific field of archaeological interest.

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