PALAEO-RESEARCH INSTITUTE

UJ Palaeo-Research Institute 5th Palaeo-TrACKS Symposium

Theme: "Changes in human-ecological interactions in the fossil and archaeological record"

Venue: The Kerzner @STH, Bunting Road Campus, UJ
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THREE DECADES AT DRIMOLEN: A REVIEW OF THE DISCOVERIES FROM 1992 TO 2022, AND SOME FUTURE WORK

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Abstract:
The Drimolen Main Quarry Fossil Hominin site was discovered in 1992. Soon thereafter the most complete cranium of the enigmatic species *Paranthropus robustus* was discovered (c. 1994). The site has since amassed the largest concentration of near-complete *P. robustus* crania for any of the Cradle deposits. As a result, the Drimolen hominin specimens have been at the centre of debates for this taxon's morphological variability, dietary reconstructions, and life histories. The discovery of *Homo erectus* from Drimolen has similarly resulted in a reappraisal of our understanding of the timing and dispersal routes of this ancient human ancestor. The site boasts the largest single accumulation of Type I osseous tools found alongside a varied faunal assemblage. In this presentation, I will review the notable discoveries from the site and introduce those upcoming projects and their potential impact on southern African palaeoanthropology.

VANISHED TECHNOLOGIES BROUGHT TO LIGHT THROUGH THE STUDY OF BONE TOOLS

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Abstract:
I review five "vanished technologies" from southern Africa that have been brought to light through use-wear studies of bone tools. Most of the examples discussed here represent the first recognition of these technologies in the region and provide unique insights into the technological and behavioural repertoires of past humans and hominins. Hominin foraging and subsistence practices are inferred from the use-wear patterns on modified bones from four sites in the Cradle of Humankind. Early evidence for bow-and-arrow technology comes from Sibudu Cave and Klasies River Main site, with the evidence from the latter site extending the known distribution of this technology farther south. Use-wear has shown that modified bones, thought to have been pendants, were used in a manner more consistent with the production of sound and likely represent early musical instruments. In a similar vein, use-wear has shown that several bone points, conventionally interpreted as arrowheads, were used for domestic activities, such as making reed mats or baskets. Among some of the earliest state-level societies in southern Africa, the presence of bone hoes attests to the practice of small-scale garden agriculture, placing greater emphasis on individual agency within these complex societies. Use-wear studies continue to highlight the absurdity of attributing function based on shape.

NEW CHRONOLOGICAL SEQUENCES AND TECHNOLOGICAL TRENDS FROM THE AMANZI SPRINGS ACHUELIAN SITE, EASTERN CAPE, SOUTH AFRICA

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Abstract:
New research at Amanzi Springs in the Eastern Cape of South Africa has recently provided ages for some of the major sedimentary units preserving Acheulean technology. Two spring eyes, known as Areas 1 and 2, have yielded the largest Acheulean assemblages and are now chronologically constrained between Marine Isotope Stages 14 and 9 (~563 – 300 ka). Amanzi Springs is thus situated within the 'later Acheulian' period, yet handaxes and cleavers from the site do not reflect the refined morphologies that are typical of this phase of the Acheulian. In fact, new research on handaxes from Amanzi Springs has revealed a record of knapping mishaps that significantly affected their size and shape. Investigating these mishaps has further provided valuable insight into the acquisition

of technological skill throughout the chronological sequences of Areas 1 and 2. Such perspectives suggest that the technical knowledge and know-how underlying handaxe production did not solely arise from the advanced motor-cognitive capacities of Middle Pleistocene hominins. Rather, later Acheulian knapping skill developed from complex social learning strategies that may have involved some form of active teaching, which in turn may have been critical to the evolution of human cumulative culture.

THE FEASIBILITY OF PALAEOPROTEOMICS FOR STUDYING ANCIENT HOMININS FROM SOUTH AFRICA

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Palaeoproteomics allows for the recovery of genetic information beyond the limits of ancient DNA preservation. Dental enamel proteins older than one million years areas can be phylogenetically informative, as demonstrated by the analysis of fossil teeth from *Gigantopithecus blacki*, *Homo antecessor*, and *Homo erectus*. Here we report on a preliminary study of faunal teeth from Swartkrans and Cooper's Cave, South Africa. The analysis of faunal enamel from *Connochaetes*, *Damaliscus*, and *Tragelaphus* identified endogenous peptides supporting the confident reconstruction of the proteome sequence with a coverage spanning hundreds of amino acids. Following this, extraction of enamel proteins from *Paranthropus robustus* samples was attempted. The analyses yielded promising results to what was observed for the fauna, identifying one of the individuals as a male. These preliminary results demonstrate that it is possible to recover ancient proteins from African hominin remains, opening the possibility to attempt their phylogenetic placement based on molecular evidence.

FOODPLANT FACTS AND A SUPERFOOD FOR THE HOMININS OF THE CRADLE OF HUMANKIND

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Abstract:
The Cradle of Humankind comprises less than 0.002575% of sub-Saharan Africa, yet its relative richness in foodplants may have contributed to the area's ability to sustain one of the world's most abundant and varied hominin populations through time. Despite a century's work in Cradle, there has been no systematic consideration of its foodplant regime to reconstruct past hominin dietary ecologies. I present the first inventory of 223 human-foraged foodplants growing in the Cradle, and discuss the time depth of the relative biomes, showing that the plant regimes may have been available for hominin foraging throughout the Quaternary. I demonstrate that whilst emphasis was placed on *Cyperus papyrus*, even inspiring an 'aquatic diet' hypothesis for all hominins, the Cradle's Cyperaceae population questions such assumptions. Most of them have C_4 photosynthetic pathways and do not need aquatic ecologies or permanent wetlands. I introduce the six Cyperus foodplants of the Cradle, highlighting *Cyperus esculentus* as a possible superfood for southern African hominins based on its energy, protein and fat/lipid profile.

ACHEULEAN LANDSCAPES TO STONE TOOLS: RECENT INVESTIGATIONS AT WONDERBOOM, SOUTH AFRICA

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Abstract:

Wonderboom preserves one of the largest collections of Earlier Stone Age lithics – specifically Acheulean – in South Africa and for the region north of the UNESCO 'Cradle of Humankind' World Heritage Site. First reported in the 1950s, it has since been excluded in discussions concerning the southern African archaeological record due to a lack of chronology. Currently, the site is being revisited by a collaborative team aiming to expand our understanding of Pleistocene Acheulean hominin lifeways beyond cave systems in the Cradle area. The site is situated in a shallow valley of the Magaliesberg and its position provided strategic value to local populations, as reflected by the production of ±15000 lithics closely associated with outcropping raw materials. With this contribution, we unpack the topographical, geological, hydrological, and ecological aspects of the local landscape to provide insight into the strategies employed by Acheulean populations, while also investigating tool-production techniques and lithic sourcing preferences. Our results indicate that Wonderboom played an important role in the Pleistocene landscape. Hominins utilised their knowledge of the local landscape to organise their subsistence activities and landscape use patterns. In addition, an inter-site comparison of handaxes from Wonderboom with early and later Acheulean assemblages elsewhere across South Africa, tentatively places the site within the regional Acheulean chronology. We also discuss the significance of a nearby 'poort' (narrow mountain pass) and how it may have served as a natural game funnel for meat harvesting during the Acheulean.

BOVID FOSSIL ANALYSIS OF FEMUR DUMP (BOLT'S FARM CAVE SYSTEM) AND THEIR USE IN UNDERSTANDING PAST ENVIRONMENTS

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Abstract
Femur Dump (FD), a site within Bolt's Farm Cave System, has yielded a diverse array of fauna including *Dinofelis barlowi*, *Papio broomi* and *Cercopithecoides williamsi*. The fauna found at Femur Dump requires assessment as it may reveal information regarding the palaeo-environmental conditions, evolution and historical setting of the cave system. A faunal analysis conducted on 12 bovid phalanges using both osteometry and osteomorphology revealed the assemblage to comprise of *Gazella*, *Oreotragus* and *Tragelaphus*. The above-mentioned bovids have proved useful in palaeo-environmental reconstructions as they are commonly found at hominid-bearing sites. Further, the use of bovids as environmental indicators depends on the assumption that habitat and feeding preferences are analogous in extant species. The presence of the above-mentioned genera suggests Femur Dump was a mosaic environment with abundant tree cover, a nearby water source and an open savanna/grassland.

ANALYSING THE USE OF 3D PHOTOGRAMMETRY IN PALAEONTOLOGICAL ANALYSIS OF FOSSIL PRIMATE POSTCRANIA SPECIMENS FROM SWARTKRANS MEMBER 1

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Abstract:
In recent years the use of 3D scanning techniques, such as photogrammetry have proven to be effective in taxonomic and taphonomic examination of palaeontological remains. The challenge of isolated postcranial specimens that are not accompanied by crania or dental material has been demonstrated to have an impact on the ability of researchers to establish the sites' taxa, which impacts on their taphonomic assessments. We applied a 3D scanning technique - photogrammetry - to seven postcranial specimens from Swartkrans Member 1 with the aim to identify them to species level and to identify taphonomic agents which modified them. The paper establishes that photogrammetry is a useful digital tool in the taxonomic and taphonomic examination of isolated fossil primate postcrania. It is a non-destructive method and ensures the safety and preservation of the specimens. It is effective in the qualitative taxonomic analysis due to its ability to highlight delicate and minor features, which can be used to classify taxa and identify some of the taphonomic factors which impacted on specimens.

USING LITHIC MODIFICATION TO ESTABLISH EVIDENCE OF HUMAN MIGRATION DURING THE HOLOCENE IN TURKANA, NORTHERN KENYA

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In this research I attempt to establish evidence of human migration during the Holocene in 2 sites located in Turkana, northern Kenya, namely, Dangodien (GaJi 4) and Illeret (FwJi 5). Previous studies suggest that these sites preserve the earliest record of herding through pottery and lithic remains. I plan to undertake a lithic analysis study of retouched stone tool assemblages stored at the National Museums of Kenya to establish use patterns of the lithic assemblages and determine the nature of the sites. The stone assemblage character of the site will indicate whether the site is a primary or secondary site. Through this study I will hypothesize that diversification, domestication, and intensification allowed humans to disregard the raw materials supply by assimilating cultural practices that allowed them to settle in any area within the Turkana region.

SACRED FORESTS AS ARTEFACTS OF LONG-TERM LAND-USE PRACTICES: THE CASE OF MPHUNGURA, SOUTH-EASTERN ZIMBABWE

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Abstract:
The Ndau people's homelands of Chimanimani and Chipinge Districts, southeastern Zimbabwe, have several sacred forests, such as Chirinda and Mphungura, which they revere as ancestral landscapes. The conventional view of these places is often functionalist and expresses that they are relics of climax forests and peak cultural florescence thereby creating assumptions of steady states and cultures. Royal cave burials (*mapa/ninga*), drystone-walled residences (*masvingo*), venerated trees (*marombo*) and rivers/natural springs embodying tutelary spirits (*njuzu*) enrich these forests, revealing long-term socio-ecological interrelationships. Using the case study of the Mphungura forest, this presentation demonstrates that this historical reality is not often factored in when considering changes in the management of the environment in the archaeological record. I draw upon written sources, archaeological evidence and ethnographic inquiries to discuss changes in socio-ecological interrelationship shaping and shaped by sacred forests. Further, I present an argument that the designation of forests and their associated cultural materials, such as graves and drystone walled settlements, as sacred was a socially mediated practice by past societies for preserving vulnerable bio-cultural heritage. As such, sacred forests provide alternative and more socially embedded insights into human responses to socio-environmental threats.

EARLY PLEISTOCENE HOMININ HABITAT AND CHANGE IN THE NORTHEASTERN TURKANA BASIN, KENYA: SEDIMENTARY FACIES ANALYSIS AND SEQUENCE STRATIGRAPHIC MODELLING OF THE UPPER BURGI MEMBER, KOOBI FORA FORMATIONS

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Abstract:
The Koobi Fora Formation, Kenya, northeastern Turkana Basin, is a well-dated sedimentary sequence that allows for the study of human ancestral evolution and its development over time. Although a good chronostratigraphic framework exists, investigations are limited by lithologically diverse sequences and spatially limited outcrops. However, an early Pleistocene site (area 13) preserves good outcrop. By adopting sedimentary facies analysis (mapping, lithological descriptions, petrography, faunal analysis) a detailed palaeoenvironmental reconstruction was achieved at the site associated with early *Homo* species, including some of the earliest *Homo erectus* (KNM-ER 2598). The area represents a near-lake shore with deltas fed by East-South East flowing rivers in western tidal flats. Finally, a basin-wide analysis shows that the hominins were living there over an extensive period during an unstable lake transgression. This detailed geological study reconstructs hominin habitats, in both space and time, contributing to a richer perspective in understanding hominin evolution.

AN EXPERIMENTAL APPROACH TO ASSESS WATER-AND-SEDIMENT ABLATION WEAR ON BONE FRAGMENTS

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Abstract:
Bone tools excavated from sites in the Cradle of Humankind, South Africa, and associated with early *Homo* and *Paranthropus robustus* remains, have led to various studies on the interactions that early hominins had with their environment. Speculations about the tools include whether they were used for harvesting termite mounds, digging for underground plant storage organs, to process fruit or as multi-purpose tools. Previous studies have suggested that some purported bone tools from the Cradle of Humankind sites of Sterkfontein, Swartkrans, Drimolen, Cooper's D and Kromdraai are pseudo tools created by taphonomic activities. Research focused cradle bone specimens has included microwear analysis, experimental archaeology, and taphonomy. I conducted a water-and-sediment ablation experiment on eight immobile bone specimens to test the effects that the movement of saturated sediment has on fresh bone specimens. The experiment included a large fish tank, a water pump (with a capacity of 10000L/hr), an air compressor (with a capacity of 280L/hr), several stones and a PVC tube with 8 check holes. I mounted the 8 bone specimens on the insides of the PVC lids at varying orientations. To simulate 2 million years of water running over the bones, I air-carried out the experiment at high velocity and introduced a re-circulation system. Water and sediment were pumped into the PVC tube with the bone specimens mounted on each lid and back into the tank. The re-circulation system was further aided by the air-stones. I used microwear analysis to assess the wear that accrued on the bones. This was to find out whether and to what extent this kind of ablation affects the surfaces of bone and whether any resultant wear that might develop could conceivably be mistaken for sediment use-wear that has been described on bone tools. The results of my experiment showed that water-and-sediment ablation causes wear that is different from that observed on bone tools excavated in the Cradle sites. While there are some minor similarities, these are very minimal. I noted some rounding and minimal pitting on some of the bone specimens. I also observed some cracking and a single striation pattern on two separate bone specimens. However, the water-and-sediment treatment did not create a single-rounded tip on any of the specimens.

MACRO USE-WEAR IDENTIFIERS ON LITHIC SCRAPERS: SCRAPER USE AT LITTLE MUCK SHELTER, SHASHE-LIMPOPO CONFLUENCE AREA, AND IMPLICATIONS FOR BEHAVIOURAL SHIFTS WITH FARMER CONTACT

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Abstract:
Forager participation in the rise of farmer state-level society is known through trade wealth and craft activities. At Little Muck Shelter, a forager site occupied from before contact until the end of the Mapungubwe phase, c. 1300 CE, increases in lithic scrapers has been associated with trade with farmer groups but it is not known what they used to obtain exchanged goods. To assess this, experimentation was used to identify macro-use wear on cryptocrystalline scrapers and in turn to determine scraper use at Little Muck. The experimental results and their comparison with the archaeological remains show that scrapers were used on a variety of

materials throughout the site's occupation. Two general phases of activity were observed, and the shift appears driven by the arrival of farmer groups in the area. It demonstrates a shift in ecological exploitation patterns by foragers likely to facilitate trade.

A TAPHONOMIC ANALYSIS OF BONES FROM DRIMOLEN: A MICROSCOPIC INVESTIGATION OF BONE MODIFIERS AT THE SITE

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Abstract:
The Drimolen Fossil Hominin Site (2.04-1.95 Ma) preserves the largest collections of anthropologically modified bone tools in the Cradle of Humankind. Apart from the focused studies on the modifications of the purported bone tools, which represent only a fraction of the overall assemblage of modified bones, the Drimolen Main Quarry lacks a robust taphonomic assessment. This project aims to assess whether there are observable taphonomic markings that may add to our understanding of the accumulation mechanisms at Drimolen. I examined 24 randomly selected modified fossil bones from the Main Quarry assemblage using SZX16 light microscopy. The results indicated a range of both anthropological and non-hominin taphonomy. This indicates that the accumulation of the Drimolen assemblage was subject to multiple taphonomic agents, which suggests that the site's use was more complex than previously thought.

USING MICROFAUNA FROM BOLT'S FARM CAVE SYSTEM (CRADLE OF HUMANKIND) TO UNDERSTAND THE SYSTEM'S PALAEO-ENVIRONMENT

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Abstract:
The Plio-Pleistocene sites of the Cradle of Humankind (UNESCO site), South Africa, have yielded a rich collection of macrofauna but also an abundance of microfauna. This has been showcased by numerous publications on rodents, insectivores, elephant shrews and birds. The palaeokarst system of Bolt's Farm, is no different as it is endowed with numerous fossiliferous Plio-Pleistocene deposits. This system has yielded fossils such as the *Mylomygale*, *Agama* sp., *Hemachatus haemachatus*, and *Geronticus* cf. *calvus*. These fossils play a role in our understanding of the palaeo-environment as they seem to suggest a predominantly grassy area with rocky outcrops at the Bolt's Farm Cave System.