



SASQUA

**SOUTHERN AFRICAN SOCIETY
FOR QUATERNARY RESEARCH**

NEWSLETTER • APRIL 2010

PRESIDENT'S REPORT

I am very honoured to be in the position to write this introduction to our 2010 newsletter, but the fact of the matter is that it has come two years too soon. It should instead be Tim Partridge penning these opening words, and it is a deep loss to SASQUA, and indeed southern African science as a whole, that Tim passed away late last year. A remembrance of his full and varied career is included in this newsletter, and I know we have all been deeply influenced by his extraordinary personal and professional contribution to our community.

I'm sure, however, that Tim would have been pleased to see the exciting work that was presented at 2009 SASQUA conference in Knysna. A strong, diverse contingent of delegates from South Africa, Europe and the US presented work that combined the potential of southern Africa's physical and human landscape with state-of-the-art analytical techniques. Special emphasis - as was only proper considering the conference venue - was given to: 1) the recent work of Mark Bateman, Andy Carr, Peter Holmes and Dave Roberts studying the south coast's geomorphic history in response to changing sea levels, and 2) the work of Curtis Marean's team at Pinnacle Point. While being slightly different in terms of scale, these programmes combine the best of both local and international capacity, and show the potential of such collaborations.

Certainly the contents of this newsletter, highlighting the people and projects that currently define SASQUA, shows the co-evolution of local

and international initiatives as a healthy element of SASQUA's development. I have every confidence that in the near future we will see the funding of more such projects, and the effective expansion of southern Africa's research capacity.

I would like to thank the outgoing President, Mike Meadows, for promoting SASQUA's good works, and notably Peter Holmes and Lynne Quick who made the 2009 conference such a success!

For those of you who were not aware of it, the SASQUA website has been jump-started and efforts (again by the omnipresent Lynne Quick, who has also edited this newsletter) are being made to keep it as up-to-date as possible. The address is www.sasqua.net and we urge you to use the site to keep us abreast of advances in your own corners of Quaternary research!

Brian Chase

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Newsletter editor: Lynne Quick

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OBITUARY



IN MEMORIAM

TIMOTHY COOPER PARTRIDGE FRSSAf

7th December 1942 – 8th December 2009

The untimely and sudden death of Professor Timothy Cooper Partridge on 8th December 2009 has robbed the community of geomorphologists, geographers, palaeoclimatologists, palaeontologists and archaeologists of a distinguished scholar and leader in his fields.

Regarded as the leading geomorphologist in South Africa, Partridge's agile mind and his work ventured far beyond southern Africa. In the international scientific arena, his contributions to Quaternary geology were recognised by his election in 1999 as senior Vice-President of the International Union for Quaternary Research (INQUA).

Timothy Cooper Partridge was born in Pretoria, South Africa, on 7th December 1942. His father A. Cooper Partridge was an English scholar who held the chair of English at the Witwatersrand University from 1954. His mother, Isabelle Mary Partridge, enjoyed a career in landscape design. In 1959, Tim Partridge matriculated from Parktown Boys' High School, Johannesburg, with four distinctions.

After his initial graduation from the University of the Witwatersrand, he pursued graduate studies at the University of Natal (now the University of KwaZulu Natal) under the eminent geomorphologist Professor Lester King. Among King's well-known works, he had studied the geomorphology of the South African *Australopithecus*-bearing dolomitic limestone caves. This must have played a part in determining at least one of Partridge's research directions, for he spent some forty years of his life elucidating the geology, stratigraphy and geomorphology of these cave deposits.

He served on the lecturing staff of the Department of Geography at the Witwatersrand University from 1965. For several years he was a research officer in geotechnics with the South African Council for Scientific and Industrial Research. He was Chief Engineering Geologist to Loxton, Hunting and Associates, before setting up his own consultancy, T.C. Partridge and Associates (later Partridge, De Villiers and Associates; and still later Partridge, Maud and Associates). He headed this consultancy for more than a quarter of a century and it produced over five hundred professional reports in engineering geology, pedology, hydrogeology and photogeology. The specialist activities included the geotechnical classification of land for housing and industrial development, the exploitation of groundwater resources for rural development, site evaluation for large dams. He was a photogeologist of international repute. Using aerial photographs, and other remote sensing imagery, he mapped and analysed some 600,000 square kilometres in Western Australia and the Australian Northern Territory. Nearer home, he made similar surveys covering some 100,000 square kilometres in South Africa, as well as substantial areas of Botswana and Angola.

In his deep interest in the processes that gave rise to the unique landforms of Africa, with its elevated interior plateaux, lengthy marginal escarpments and the eastern Rift Valley, Partridge followed in the footsteps of two eminent geomorphologists of the 1940s and 1950s, Sir Frank Dixey and Lester King, but there was a difference. Whereas the findings of these early pioneers were largely limited to the recognition of flights of planation surfaces and the inferences from them of successive tectonic uplifts, Partridge systematically mapped the distribution of these erosional remnants and assessed the deformations which they had experienced since their creation, as well as the timing of both warping and uplift events. This was achieved through wide-ranging field-

work, as well as through his interpretation of remote sensing imagery, in which he was highly skilled.

Partridge paid especial attention to the timing and magnitude of tectonic movements in the East African Rift System. A major motivation for this focus was the fundamental importance which these movements have had in providing the ecological backdrop and environmental stimuli that materially influenced the evolutionary pathways along which the genus, *Homo*, evolved from early hominid progenitors. He claimed that much of the vertical uplift of up to 2000 metres, that had given rise to the elevated plateaux of eastern and southern Africa, was relatively recent, namely post-Miocene. This claim placed Partridge at loggerheads with a cohort of international colleagues, who repeatedly denied the possibility of geologically recent continental uplifts in passive marginal settings. However, in his Alex du Toit Memorial Lecture of 1997, Partridge gathered together and consolidated the evidence delimiting the timing of these movements. He sought to link them to the distribution of deep-seated thermal anomalies in the Earth's mantle (the "African Superplume") revealed by the burgeoning science of seismic tomography.

In defending over more than ten years, in the face of widespread international opposition, his assertion that large-scale uplift of major areas in Africa had occurred during the Neogene, and through his subsequent vindication, on the basis of his own and of independent evidence, Partridge belonged in a small coterie of scientists who were responsible for what has been called "**premature discoveries**" (G.S. Stent, 1971, 1972; P.V. Tobias, 1992, 1996). The validity of their hypotheses and paradigms was, in each case, acknowledged by the scientific world only much later. As examples, Raymond Dart's claim in 1925 that the Taung child represented a creature transitional to humankind was accepted only 25 years later; the pivotal rôle played by *Homo habilis*, that L.S.B. Leakey and his colleagues proclaimed in 1964, took close on twenty years to gain wide acceptance; whilst Alex du Toit's evidence encapsulated in *Our Wandering Continents* (1937), following the work of F.B. Taylor (1910), and A. Wegener (1912), was resuscitated and supported not before the 1960s when the scientific basis of plate tectonics was established. Partridge's claims for the relative recency of uplift in Africa should perhaps be seen as another example of a premature discovery!

Partridge tenaciously maintained his position on the importance of neotectonics, until opposition crumbled in the face of overwhelming evidence. His scientific input seems to have revolutionised conventional wisdom on the geomorphic history of a large part of this continent.

The hominid-bearing cave and tufa deposits of South Africa have, since 1924, produced more early hominid specimens than any other area of the world. However, despite their large number and undeniable importance for an understanding of human origins, these finds have, until recently, been somewhat eclipsed by those from the Rift Valley of East Africa. This was owing in part to the impact of the academic boycott on South African science and scientists, and in part to the fact that, with few exceptions, the Rift Valley deposits were securely dated, in contradistinction with the dolomitic cave deposits of South Africa. In the 1960s, Partridge became consultant to R.A. Dart. In the 1970s he was appointed Honorary Research Associate attached to the author's Palaeo-anthropological Research Unit at the University of the Witwatersrand, and he occupied a similar position in the Sterkfontein Research Unit since its inception. These two research organisations recovered more than six hundred specimens of early hominid fossils since 1966. Partridge was early confronted by the difficulties of dating the South African cave-sites. Yet he knew that it was crucial to place these hominid fossils, and the contemporaneous fauna, in the correct stratigraphic and chronological sequence.

He played a major, and internationally recognised, role in remedying this deficiency by placing the finds from almost all of the major South African sites within a detailed stratigraphic context, thus providing a framework for fixing the provenance of both hominid and other fossils and a basis for establishing comparative palaeontological age ranges. In addition, he determined which materials within the deposits retained an unambiguous palaeomagnetic signal and helped to derive magnetostratigraphies for the important Sterkfontein and Makapansgat sites. Most recently, he headed the team that provided the first absolute dates for major new finds at Sterkfontein, using cosmogenic nuclides.

Tim Partridge made seminal contributions by systematically placing these uniquely important finds within stratigraphic, palaeo-environmental and geochronological frameworks.

In this virtually lifelong endeavour, the successive breakthroughs that Partridge achieved or catalysed made a fundamental contribution to the placement of the early South African hominids in time, and thus to the establishment of phylogenies linking them to their East African counterparts. Equally important was his work on the depositional environments and sedimentologies of these deposits, which, together with evidence gleaned from the species composition of the faunas, plant remains and the stable light isotopes present in tooth enamel, permitted the reconstruction of palaeo-environmental conditions at the times when the deposits were formed. To this evidence Partridge added that derived from the reconstruction of uplift histories for the interior plateaux of South and East Africa. As he observed in several publications, these uplifts were of sufficient amplitude to have had major impacts on African environments during some intervals when species turnover was rapid among animals including hominids. These findings were important, too, for an understanding of the circumstances underlying significant changes in hominid demography (for example, the author's demonstration of the way in which more hostile physical environments altered life expectancy within South African hominid populations).

Partridge's seminal research encompassed most of the important South African sites, including Sterkfontein, Makapansgat, Kromdraai and Taung. He was instrumental in providing a date (based on magnetostratigraphy) for what is arguably the most important hominid specimen yet discovered in South Africa, the 3.3 million year old virtually complete skeleton from Sterkfontein, Stw 573, which is presently being exhumed by R.J. Clarke and co-workers. The recently announced $^{26}\text{Al}/^{10}\text{Be}$ dates, confirming the age of this specimen and of other early hominid remains from Sterkfontein, owe much to Partridge's input, particularly the three-dimensional stratigraphy that he established for this site, which permitted sampling in parallel sections.

Since the mid-1980s Tim Partridge has been deeply immersed in research on Quaternary palaeoclimates. The rapidly increasing importance of his contributions in this field was acknowledged when he was appointed to the Scientific Steering Committee of the PAGES (Past Global Changes) Core Project of the International Geosphere-Biosphere Programme in 1989. Partridge's contributions to the deliberations of this influential committee over six years were significant,

especially in decisions on the scientific strategy for the analysis of the PAGES third Pole-Equator-Pole transect through Europe and Africa. A book synthesising the results of this work, entitled *Past Climate Variability through Europe and Africa*, included an important review of southern Africa by Partridge and co-workers.

In 1992 Partridge was appointed leader of the Palaeoclimates of the Southern Hemisphere (PASH) project of INQUA (International Union of Quaternary Research). In this some 300 scientists from south of the equator participated over 10 years. The resulting dedicated double volume of the journal *Quaternary International* appeared under his editorship.

Arguably the single most important palaeoclimate project initiated by Partridge has been an investigation of the long terrestrial record contained within the sedimentary infilling of the Tswaing impact crater (previously the Pretoria Saltpan). Drilling of the crater began under Partridge's direction in 1988, and by 1989 a lacustrine sequence 90 metres thick had been cored and the impact origin of the crater confirmed. Further analysis showed the sediments to span the past 200 000 years. Apart from important chemical, mineralogical and biological evidence preserved in this sequence, the sediments themselves have yielded one of the best proxy rainfall records from anywhere within the world's mid-latitudes. The transfer function that gave rise to this record was based on granulometry, with calibration from soils sampled along a transect spanning the full range of present southern African climates. No similar quantitative tool had been developed previously. This unique contribution is widely accepted as an important aid in palaeoclimatic reconstruction.

From this record Partridge was able to show that, when insolation forcing due to precessional changes in the earth's orbit was strong, rainfall fluctuations occurred at precessional frequency (23 000 years). When the insolation signal weakened, changes associated with variations in the intensity of the oceanic thermohaline circulation around southern Africa, and in the extent of the circum-Antarctic atmospheric vortex, became dominant. This highly significant finding is contributing materially to an understanding of the global climate system in the tropics and sub-tropics.

Even more arresting in its vision and implications was Partridge's proposition, announced during a

conference in Aix-en-Provence in August 2001. This was based on careful analysis of significant leads and lags in the onset of climatic changes during the Last Glacial Period, observed in Antarctica, in the Kalahari (where they were signalled by the beginning of periods of dune mobility, defined by series of luminescence dates), and in oceanic records from the North Atlantic. He interpreted these substantial and consistent discrepancies as indicating that major climatic events during the Last Glacial were forced from the high latitudes of the southern hemisphere. In particular, he argued that Heinrich Events, associated with massive discharges of icebergs from the ice-sheets fringing the North Atlantic, which repeatedly stalled the oceanic circulation that drives the Gulf Stream, were initiated by an increase in the range and intensity of moisture-bearing winds blowing northwards across the equator. These large-scale changes in atmospheric circulation, in his view, caused the rapid enlargement and ultimate collapse of extensive segments of the northern ice-sheets.

This highly original interpretation is not without its critics, but if correct, as growing evidence appears to indicate, it needs to be taken into account by analysts concerned with scenarios of future climate change in a greenhouse world. Natural changes triggered from the southern hemisphere, particularly those causing variations in oceanic heat transfer, may critically and unexpectedly alter the course of events predicted from modelling experiments based on current paradigms of global atmospheric circulation and the progressive build-up of greenhouse gases. Partridge's proposition that the Antarctic plays a more important role in climatic change than has been acknowledged hitherto is being echoed by others and may yet help to promote a switch of regional focus in the study of global climate change.

Tim Partridge was an earth scientist whose extensive research output over 38 years bore testimony to a broad range of skills. His principal focus was on the recent geological past and his area of interest was Africa, particularly the region south of the equator. His reputation among earth scientists with research interests in this area is unrivalled. But his standing as a scientist of exceptional originality extended far beyond Africa's shores and stemmed from major inputs to several fields of geology. His contributions to an understanding of the geological setting within which our earliest ancestors evolved are admired worldwide – indeed such is his reputation in this field that he was invited to present the opening

public address at a conference of the Royal Swedish Academy of Sciences on *The Origin of Humankind and the Environment* in May 2000. The placement of the world's most important assemblage of early hominid fossils – that from South Africa – within an increasingly precise chronological framework is largely the result of his efforts, and culminated in his announcement early in the new millennium, of the first absolute dates for specimens from Sterkfontein.

Partridge's contributions to an understanding of the mechanisms underlying the evolution of passive continental margins, and of palaeoclimatic processes that have impacted the African continent, and, in some cases, sent ripples across the globe, are well known within the relevant international communities and were acknowledged by his election to high office within international and national scientific bodies.

Among the honours that have been accorded to Tim Partridge are fellowships of the South African Geographical Society (1980), the S.A. Institute of Engineering Geologists (1994) and the Royal Society of South Africa (1995). His achievements have further been recognised through the award in 2001 of the Fellowship of the Geological Society of South Africa, and the award of the Geological Society's Jubilee Medal in 1989, which he shared with Dr Rodney R. Maud, for an article entitled *Geomorphic Evolution of Southern Africa since the Mesozoic*. In 1997, Partridge was elected as the 25th Alex L. du Toit Memorial Lecturer. This prestige-laden eponymous lecture is delivered and published under the auspices of the S.A. Geographical Society, the Royal Society of South Africa, the Geological Society of S.A., and the S.A. Association for the Advancement of Science. Partridge was elected an honorary member of the Southern African Society for Quaternary Research in 2001.

The institution to which he was attached for most of his professional life, the University of the Witwatersrand, Johannesburg, recognised his academic achievements by making him Honorary Professor of Physical Geography in 1983 and *ad hominem* Professor of Cainozoic and Engineering Geology in 1987.

His greatest gift lay in his ability to grasp the broad picture without compromising attention to detail or the application of conceptual models of the highest sophistication. He was always mindful of the importance of good field evidence and was quickly able, through his highly developed synoptic

skills, to comprehend its implications in the regional or even global context. This stamped him as a world leader in geology, remarkable for the depth and breadth of his vision in an age of increasingly narrow specialisation.

Tim Partridge at various times held many national and international positions. These included chairmanship of the Cainozoic Task Group of the S.A. Committee on Stratigraphy and of the S.A. National Committee for INQUA. He was President of the Institute for the Study of Mankind in Africa and of the Southern African Society for Quaternary Research. He was leader of the Palaeoclimates of the Southern Hemisphere Project of INQUA, and co-leader of the Pilot Project on Climates of the Past of UNESCO and the International Union of Geological Sciences. As part of the INQUA Commission on Stratigraphy, he chaired the Working Group on the Plio-Pleistocene Boundary. Seriously topical today, he led the project on Long-term Climatic Change of the Foundation for Research Development Special Programme on Southern African Climatic Change. Likewise he led the FRD Special Programme on Palaeoclimates of Southern Africa during the Quaternary. He was a member of the Board of Control of the Bernard Price Institute for Palaeontological Research of the Witwatersrand University.

It would be quite wrong to leave readers of the *Journal* with the impression that Tim Partridge was purely a scientist's scientist. He loved life, sparkled at dinner parties – or around a camp-fire -, could expound knowledgably and often passionately on music, history, art and photography, people, wine and food. He loved travel and he loved people. His gentle and kindly manner, his human skills, made it a joy to work with him, to savour his breadth of experience, his originality of mind and his love of literature and language, and to enjoy his friendship.

He married Marilyn Phillips, a medical practitioner and specialist anaesthetist, in 1973 and they spent 31 years happily and creatively complementing each other's careers. Tim was predeceased by Marilyn and by their son, Astley. Tim Partridge was married to Susan Jordan on 26th September 2009. Less than three months later, they were putting the finishing touches to a book, *Caves of the Apemen*. He turned 67 on Monday, 7th December 2009: a day later, while working on the book with his long-time devoted assistant, Mrs Pat Moon, he was smitten with a severe heart attack and died within minutes. So the last of his books will perform appear posthumously. This book and his

other 150 published works will help to keep Tim Partridge's memory green.

*Phillip V. Tobias FRS, FRSSAf
Institute for Human Evolution
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25th January 2010*

**REPORT ON THE XVIII BIENNIAL
CONGRESS
KNYSNA, SOUTH AFRICA
6th - 10th September 2009**

**Understanding Quaternary Change:
Southern Hemisphere Perspectives**

The XVIII biennial congress of the Southern African Society for Quaternary Research (SASQUA) was held at Phantom View River Resort situated just at the edge of the Knysna lagoon on the Garden Route; southern Cape (figures 1 and 2).

The congress theme; “Understanding Quaternary change: southern hemisphere perspectives” highlighted the significance of southern hemisphere, particularly southern African, environmental dynamics during the Quaternary.

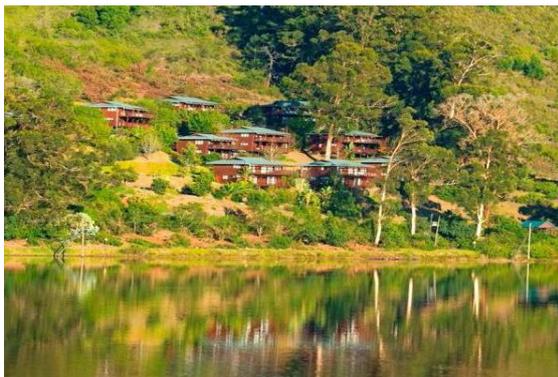


Figure 1: Phantom View River Lodge, Knysna

A total of 45 delegates attended the congress. The majority of the delegates were based in South Africa however there was a fairly significant international presence from the United States, United Kingdom, Germany, Spain, Sweden and Finland. The University of Cape Town and the University of Witwatersrand were well represented at the conference. Many of the oral and poster presentations were multi-institutional, emphasising the strongly collaborative and interdisciplinary nature of southern African Quaternary research.

The SASQUA Committee acknowledges and thanks the Department of Environmental and Geographical Science, University of Cape Town and the Department of Geography, University of the Free State for their generous sponsorship of this event.



Figure 2: View of the Knysna Lagoon from the conference venue

Public lecture and keynote address

The keynote speaker was Dr Mark Bateman from the Sheffield Centre for International Drylands Research, University of Sheffield in the United Kingdom. His presentation entitled: “Dunes aren’t Dumb: The late Quaternary palaeo-archive from coastal dunes on the southern Cape coast, South Africa” described why and how the southern Cape coastline of South Africa is ideally placed to explore long-term coastal geomorphic evolution and sea-level fluctuations. The coastline is frequently punctuated with dunes and sediments relating to former aeolian sand transport. Recent work on these aeolian deposits reveals a history extending from the present to over 250,000 years ago with, in some cases, multiple generations of coastal dune deposits stacked upon one another. The keynote address emphasized what can be learned about when these dunes formed, where the sediment for the dunes came from and what this can tell us in terms of the history of vegetation, animals, climate and sea-levels of the southern Cape coastline.

The conference room was filled with a large number of Knysna locals which highlighted the strong interest among the public.



Figure 3: Keynote presentation by Dr Mark Bateman

Student prizes

Both the oral and poster presentations by postgraduate students were of a high standard and respective prizes were awarded to:

Best student oral presentation: Hayley Cawthra, for the paper: *Quaternary deposits of the Durban Bluff and associated Blood Reef Complex.*

Best student poster presentation: Lara Scisio, for the poster: *Palaeobotany, biogeochemistry and sedimentology of Late Tertiary fluvial deposits, West Coast, South Africa.*



Figure 4: The winner of the best student oral presentation - Ms Hayley Cawthra

Mid-conference field excursion

The half-day field excursion incorporated visits to key Quaternary sites in the region including the Wilderness lakes and Tertiary and Quaternary coastal dune cordons. Mark Bateman was the primary facilitator of the discussions relating to the series of shore-parallel fossil dune cordons. Lunch was spent observing a shell midden that had been exposed along the side of the car park at the Goukamma Nature Reserve and also included a walk down to the beach where a more spatially extensive Pleistocene aeolianite was viewed and discussed (figure 5). Before heading back to Knysna, a brief stop was made at Groenvlei, a closed coastal lake system. The formation and palaeoenvironmental significance of Groenvlei was discussed by Mike Meadows and Kelly Kirsten.



Figure 5: Mid-conference field excursion, beach at the Goukamma Nature Reserve, aeolianite in background.



Figure 6: Conference dinner venue

Report written by: Lynne Quick

Photographs taken by: Kelly Kirsten

RESEARCH NEWS & UPDATES

Marco Andreoli - SASQUA-related activities at Necsca

The South African Nuclear Energy Corporation (Necsca) harbours a small team of geoscientists dedicated to unraveling the changing tectonic, climatic and soil forming processes at Vaalputs, 100 km SE of Springbok. The team is composed of Dr Marco Andreoli, Andrew Logue and Mbuthokazi Mandaba, assisted by an array of consultants drawn from academia and the private profession.

Core elements of such research are the gathering of seismic data through two very sensitive recording stations and the increasing number (15 to date) of ~7 m deep trenches excavated in the

Tertiary alluvial deposits covering the Namaquan basement in the Bushmanland Plateau.

The instrumental data show that the region centered in Bushmanland is currently experiencing a gentle trend of increasing seismic activity, marked by two seismic swarms in 1996 and 2001 when a Magnitude 5.4 was measured close to the ancient course of the Koa River, 70 km E to NE of Vaalputs. The data also show that the Vaalputs site is, however, remarkably stable. These data are then integrated in a broader study of the history of (palaeo) stress and brittle fracturing in the Vaalputs area since the Pan African Orogeny being conducted by Prof. G. Viola (University of Trondheim) and Dr. A. Kounov (Univ. Basel). The problem of the present day stress (onshore and offshore) has been addressed in 2009 by setting up a collaborative research project and a M.Sc. investigation starting in 2010 with Profs. O. Heidbach (GFZ, Potsdam) and others.

The soil profiles exposed by the trenches by the trenches are very difficult to interpret and a collaborative research project has been established with Dr F. Netterberg, Prof. T McCarthy (Wits) and the soil scientists (Dr Cathy Clarke; Profs Jan Lamprecht, Freddie Ellis) with an undergraduate student of the Dept. of Geology at the University of Stellenbosch to explain the peculiar mineralogy, structure, textures and stratigraphy exposed in the trenches down to a depth of 3 to 4 meters. In essence, the trenches walls document striking variations in climatic conditions from semiarid to wet to hyper-arid, and soil-forming processes leading to cracking, horizontal shearing, and the development of networks of barite veins in the siliceous, slightly ferruginous duricrust (dorbank).

Another project deals with the environmental radioactivity of the groundwater of Vaalputs. This research is conducted by Ms. Huibrie Pretorius as part of her M. Sc. dissertation at the University of the Free State under Prof. M. Tredoux. More specifically, this study focuses on the interpretation of 25 years of hydrogeochemical data (including radionuclides such as ^{238}U , ^{232}Th , ^{226}Ra) issued yearly by the Environmental Monitoring Division of Necsa.

The data being generated are eventually used for safety performance modeling of the Vaalputs radioactive waste disposal facility, as required by the National Nuclear regulator and the International Agency for Nuclear Energy.

Marion Bamford - BPI Palaeontology

One of the highlights last year was the conference in Arusha to celebrate the 50th anniversary of the discovery of *Zinjanthropus boisei* by Mary Leakey where, amongst others, the Olduvai Landscape Palaeoanthropology Project team presented an update on their research. The emphasis was on the geology and vegetation and papers will be published in a special issue of the Journal of Human Evolution. As part of the project I also spent time in the field before the conference and during the wet season to do some vegetation studies in the Serengeti National Park. In one of the Serengeti study areas there were 12 humans and 120 lions so we had to be extra vigilant.

Other field trips that I undertook in 2010 were to the Miocene sites on Rusinga and Mfangwano Islands in Lake Victoria, Kenya, with Kieran McNulty (University of Minnesota), Will Harcourt-Smith (American Museum of Natural History), and Thomas Lehmann (Senckenberg Museum) whom some members know from his stay in South Africa. I participated in the Koobi Fora Field School in June and collected more fossil wood. The unrelated workshops at Wonderwerk Cave and Mossel Bay in early June were most interesting and represent a new field for me – charcoal. I also participated in two ROCEEH workshops. This is a new group funded by the Heidelberg Academy of Sciences and Senckenberg Museum, Germany, and they are compiling data on sites, vegetation, mapping and future research in the Role of Culture in Early Expansions of Humans. The next workshop will be at BPI/IHE, Wits University from 8-10 November 2010. Contact Angela Bruch: abruch@senckenberg.de

Lucy Pereira (PhD student) is progressing with her thesis on the phytoliths from Koobi Fora. She has set up a phytolith database which can be accessed at: <http://web.wits.ac.za/Academic/Science/GeoSciences/BPI/Research/WOPD/>

Frank Neumann is busy with several projects on Holocene palynology from Lakes Sibaya and Eteza, Braamhoek (KwaZulu Natal), Princessvlei (Cape) and Israel, and will soon begin work on cores from Langebaanweg. We have a new MSc student working on a core from the Tswaing Crater, and Mandy Esterhuysen and I have a new PhD student looking at the charcoal from Great Zimbabwe.

The BPI and IHE have a greater number of students than ever before so the Van Riet Lowe building is

bursting at the seams. Fortunately extensions and renovations to the building are underway but this means much noise, dust, chaos and moving of fossil collections. Everything should be completed by the end of June this year. Amongst all this we have had the huge build up and publicity around the announcement of the new fossil hominids from Malapa (Sterkfontein Valley), *Australopithecus sediba*, by Lee Berger and his team.

Andrew Carr

Department of Geography, University of Leicester

My research currently has two major foci:

1) Work on the southern and Western Cape coastal geomorphic record continues. We have published new data recording MIS 5e sea-levels and associated dune activity from both south coast and the west coast sites during the last year. A new spin off from this work, being carried out in conjunction with Sue McLaren at Leicester, is the detailed analysis of diagenetic processes occurring in aeolianite systems. We are using samples from a range of climatic contexts, and what is potentially very interesting is that the newly available OSL chronologies will allow us to attach detailed timescales to the cementation/diagenetic processes we observe within the dune systems.

2) A new project in conjunction with Brian Chase and Mike Meadows got funded and began early 2010. It will focus on the development of plant biomarker techniques to enhance palaeoecological reconstructions. This will include the systematic characterisation of fresh plant-derived organic matter and will attempt to chart the mechanisms of OM degradation within dryland environments. This is interesting as it may also allow us to identify the more degradation resistant biomarkers that are most likely to be preserved in Quaternary sedimentary archives. Additionally, we are beginning to apply compound specific stable isotope measurements at a number of sites, along with pyrolysis GC/MS techniques to characterise OM provenance within sedimentary records. I was able to present some results using the latter approach at the Knysna meeting in September.

Brian Chase

University of Bergen;

Institute des Sciences de l'Evolution, Montpellier

My research remit for the 2007 – 2009 period was dominated by the development and (sadly)

completion of the Leverhulme Trust Grant "Fossilised Herbivore Middens: New Perspectives on SW African Climate Change", which was run through the University of Oxford in collaboration with David Thomas, Michael Meadows, Louis Scott and Paula Reimer, and with Lynne Quick, Rahab Kinyanjui and Joanne Perry as postgraduate students. Truly successful beyond expectation, the first papers have been published ([A record of rapid Holocene climate change preserved in hyrax middens from SW Africa](#). *Geology* 37, 703-706, figure 1; [Holocene palaeoenvironments of the Cederberg and Swartuggens mountains, Western Cape, South Africa: Pollen and stable isotope evidence from hyrax dung middens](#) *Journal of Arid Environments* 74, 786-793), and others (Evidence for Holocene aridification in southern Africa recorded in Namibian hyrax middens: implications for African Monsoon dynamics and the 'African Humid Period'. *Quaternary Research*; Late-glacial interhemispheric climate dynamics revealed in South African hyrax middens. *Geology*) are in press and in review respectively. Considering the massive amount of data we have obtained, this is just the tip of the iceberg, and indeed other corollary studies, exploring new avenues of midden research have, have already been published ([The potential of plant biomarker evidence derived from rock hyrax middens as an indicator of palaeoenvironmental change](#). *Palaeogeography, Palaeoclimatology, Palaeoecology* 285. 321-330).



Figure 1: Spitzkoppe, Namibia; the subject of the paper: A record of rapid Holocene climate change preserved in hyrax middens from SW Africa.

This period also saw my Parthian shots at sand dunes as proxies for palaeo-aridity published ([Evaluating the use of dune sediments as a proxy for palaeo-aridity: a southern African case study](#). *Earth-Science Reviews* 93, 31-45; [Last Glacial Maximum dune activity in the Kalahari Desert of southern Africa: observations and simulations](#).

Quaternary Science Reviews 28, 301-307), as well as forays into defining the context for South African chameleon speciation ([Speciation and radiations track climate transitions since the Miocene Climatic Optimum: a case study of southern African chameleons](#). *Journal of Biogeography* 35, 1402-1414.), and my at least apparent return to the world of archaeology ([South African palaeoenvironments during marine oxygen isotope stage 4: a context for the Howiesons Poort and Still Bay industries](#). *Journal of Archaeological Science* 37, 1359-1366), which saw me move from Oxford to Wits, and now my present position at the University of Bergen.

While I may not yet have the flaky beard or the collection of fuzzy jumpers, my diversion into archaeology has been at least temporarily cemented by my participation in two grants focussed on southern Africa's Middle Stone Age: 1) an Australian Research Discovery project entitled "Technological, settlement and subsistence adaptations to late Pleistocene climatic change in southern Africa", collaborating with Alexander Mackay and Peter Hiscock at the Australian National University, and 2) a European Research Council Advanced Grant entitled "Tracing the evolution of symbolically mediated behaviours within variable environments in Africa and Europe", collaborating with Chris Henshilwood at the universities of Bergen and the Witswatersrand and Francesco d'Errico and colleagues at the University of Bordeaux.

Other ongoing projects include:

- "Novel biomolecular insights into dryland ecosystem dynamics", which seeks to assess the potential of plant-derived macromolecules for palaeoenvironmental reconstructions in dryland systems. Collaborating with Andrew Carr, Arnoud Boom and Michael Meadows.
- studies of lake and wetland palaeoenvironmental archives of the Western Cape, South Africa with particular emphasis on extending the functional chronologies of pollen and stable isotope records through the application of luminescence dating techniques. Collaborating with Mark Bateman, Andrew Carr, Michael Meadows, David Roberts and Lynne Quick.
- a project expanding the palaeoenvironmental records from Verlorenvlei in the Western Cape, South Africa. Emphasis is on the last 2,000 years and the comparison of submodern - Little Ice Age signals between temperate (Verlorenvlei) and tropical (Lake Sibaya, South

Africa) systems. Collaborating with Curt Stager, Frank Neumann and Michael Meadows.

- a project comparing the full suite of available palaeoenvironmental records from southern Africa with atmospheric general circulation model simulations. Exploring similarities between the palaeoenvironmental records and the 6 and 21 ka simulations of the Paleoclimate Modelling Intercomparison Project (PMIP) in an effort to better identify the roles and dynamics of the major climatic controls. Collaborating with Simon Brewer.



Figure 2: a hyrax *Procavia capensis* basking in the sun

My primary research focus, however, continues to be hyrax middens, with recent developments being the offer of a permanent position as a research scientist with the French Centre National de la Recherche Scientifique (CNRS) to work on hyrax middens across Africa, and a recent trip to present a five-year project to the ERC as part of the final stages of their evaluation process. Fingers crossed.

Carlos Cordova

Oklahoma State University

My study on phytoliths is moving slowly, but it is moving. I am currently processing samples collected during 2007, 2008, 2009 and early 2010 field seasons. I have nearly 130 samples from two transects running from the winter rainfall zone to the summer rainfall zone. I have a set of about 60 soil samples from reserves and parks, where I have been testing various microfossil proxies for reconstructing paleofires, paleoherbivore density, and herbivore paleodiets. Additionally, I am working on a phytolith reference collection that includes grasses, restios, sedges and a number of dicots.

I am also collaborating with Graham Avery at the Iziko South African Museum, Cape Town, where I

sampled tooth calculi (tartar) for phytoliths from specimens in the fossil and modern vertebrate collection. The specimens include elephant, zebra, and buffalo teeth recovered from Pleistocene and Holocene sites. The Pleistocene specimens are from the west coast sites of Spreeuwal and Elandsfontein. The aim of the project is to use phytoliths to extend our understanding of the diets of the species concerned and their contemporaneous vegetation. Figure 1 shows phytoliths recovered from one of the elephant specimens from Elandsfontein. They represent the three diagnostic morphotypes produced in restio leaves and stems.

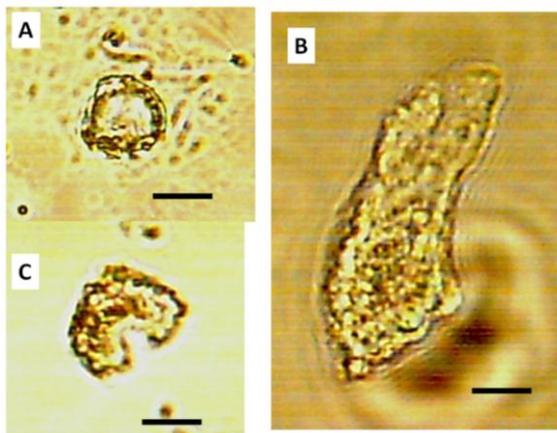


Figure 1. Restio phytoliths obtained from dental calculus, *Loxodonta africana* from Elandsfontein. Bar equals 10 μ m. A) flat-topped rondel; B, fragment of long paddle-shaped phytolith, C) volcano-shaped rondel.

Louis Scott from the UOVS and I are cooperating on other projects, including the study of wetland and alluvial deposits near Uniondale and Louterwater, the Western and Eastern Cape, and a 13-ka sediment core from Lake Ngami, Botswana. From this core we are getting pollen, phytoliths, and carbon stable isotopes.

We don't as yet have any publications, but Louis and I have submitted a manuscript to the *Palaeoecology of Africa* volume with the proceedings of the 2009 SASQUA entitled *The Potential of Poaceae, Cyperaceae and Restionaceae phytoliths to reflect past environmental conditions in South Africa*.

Council for Geoscience News

Rebekah Singh

In November 2009, Rebekah G. Singh obtained her MSc degree in Geology through the University of the Witwatersrand. Her dissertation was entitled

“Landslide classification, characterization and susceptibility modelling in Kwazulu-Natal”.

The KwaZulu-Natal landslide research programme by Rebekah Singh entailed a holistic approach to regional landslide classification, mapping and susceptibility modelling. The adopted methodology, based on international best practice, was subsequently used to map the northern region of the Eastern Cape province since this area is characterized by similar geological, climatic and terrain to that of southern Kwazulu-Natal.

The landslide susceptibility modelling involved the weighting of various critical landslide causal factors and ranking of their subclasses. The weighting values of these landslide causal factors were derived using the Analytical Hierarchy Process which is based on the fuzzy set theory. The landslide susceptibility map of the northern region of the Eastern Cape indicates that approximately 9287 km² or 16 % of the study area comprises zones that have a high potential for slope failure.

Medium-to large landslides were mapped by Rebekah Singh and Nonbuso Khanyile from a regional, aerial photograph interpretation that focussed on areas with steep slopes. Large-sized palaeo-landslides are a revelation in the context of southeastern Africa where large landslides have been rarely reported in modern times. Some palaeo-landslides are located within the Cedarville seismic zone which suggests that seismicity, a high energy triggering mechanism, might have exacerbated local slope threshold conditions.

Greg Botha

The long-term Maputaland coastal plain research programme has yielded publications describing the soil development index (SDI) approach to characterisation and relative dating comparison of a wide range of dune deposits. The luminescence dating framework by Naomi Porat of Geological Survey of Israel provided a temporal framework for the regional mapping and lithostratigraphic subdivision of the Maputaland Group. Naomi has derived OSL dates from the raised beach ridge sets surrounding Lake St Lucia in the iSimangaliso Wetland Park, World Heritage Site. We are ready to publish this work describing the apparent Holocene marine link in what is now an estuarine environment with a restricted marine link. The evolution of the coastal barrier dune through successive pulses of parabolic dune accretion and the progressive shrinking and shallowing of the lake system marked by late Holocene beach ridges show good correspondence.

A workshop was held in St Lucia from 15-19 March 2010, hosted by Friedrich Schiller University of Jena, Germany and the University of KwaZulu-Natal, to discuss the potential for establishing a bilateral scientific research collaboration platform concerning the iSimangaliso Wetland Basin. The lake is facing severe threats from catchment degradation and declining runoff, exacerbated by the engineered separation of the St Lucia estuary and Mfolozi River mouth. Researchers presented over 25 talks that demonstrated the state-of-the-art with regard to knowledge of the St Lucia system and the range of techniques that have been used by German counterparts to study similar catchments.

Dave Roberts

NRF –funded African Origins Platform Project (Iziko Museum, Council for Geoscience, University of Cape Town)

Stratigraphy: Maximising the research, educational and tourism potential of the West Coast Fossil Park; palaeogeography and age determination of Cenozoic deposits of the Cape West Coast

Collaborators: Dave Roberts, Lara Sciscio (MSc) and Claire Boulter (Post Doc)

In December 2009 a 3.5cm diameter core was drilled to ~50 m depth into known Late Cenozoic deposits in Noordhoek valley (Cape Town) near the site of a previously drilled core that intersected several peat horizons, the deepest of which was palynologically dated to Early-Middle Miocene age. Lara Sciscio is an AOP Masters student supervised by Dave Roberts and Hari Tskos working on peat cores from the Noordhoek Valley, Rietvlei (southern coast), Rondeberg near Malmesbury and LBW. She recently worked at the department of Marine Biogeochemistry & Toxicology of the Netherlands Institute for Sea Research, producing data from the Noordhoek, Rietvlei, Rondeberg and Langebaanweg cores. These are mainly MAT (mean annual temperature) values from tetraether lipids in peat horizons, as well as biomarker distributions from the same samples which inform about the nature of the organic matter and environment of accumulation. Lara has been able to get interesting mean annual temperatures (MAT) over the entire Miocene- Pliocene Noordhoek core drilled by the AOP/WCFP project in December 2009. In addition, she has also collected exciting MAT results from samples from the Langebaanweg and Rietvlei cores. She's been doing so under the guidance and mentorships of two world leaders in the field, namely Prof Jaap Damste and Dr Stefan Schouten at the Marine

Biogeochemistry & Toxicology of the Netherlands Institute for Sea Research.

Claire Boulter's research on novel variations of Optical Stimulated Luminescence (OSL), namely TT-OSL and ITOSL has moved forward significantly with the completion of her postdoc at Sheffield which has resulted in the dating of sediments of which no actual dates were previously available. A total of 15 samples have been dated from seven different stratigraphic units. Older sediments beyond the range of normal luminescence dating have been given absolute or minimum dates for the first time using the advanced methodologies mentioned above.

Dave Roberts has submitted a multi-authored paper centering on the West Coast Fossil Park to Quaternary Science Reviews entitled: Regional and Global Context of the Late Cenozoic Langebaanweg (LBW) Palaeontological Site: West Coast of South Africa.

Research in Gabon: Equatorial West Africa

A paper was submitted to Nature Geoscience on aeolian deposits in humid tropical Gabon indicating extreme climate change during glacial: A Pan-African dryland during glacial?

Hayley Cawthra

Hanyley Cawthra recently submitted her MSc thesis entitled; The Cenozoic evolution of the Durban Bluff and adjacent continental shelf, through the University of KwaZulu-Natal. During the XVIII SASQUA Congress, Hayley Cawthra received an Award for Excellence; Best Student Oral Presentation.

Research on Blood Reef, the offshore extension of the Durban Bluff, has been conducted over the past 2.5 years by Hayley Cawthra. This project involved a comprehensive geological investigation by the integration of seismic data, multibeam bathymetry and geological mapping by extensive SCUBA diving to -50 m. Seismic stratigraphy of the upper continental shelf was interpreted; a diagenetic history of beachrock and aeolianite cementation established; correlation of depths of sea level indicators with local and global sea level curves, and the Holocene sediment wedge of the shelf sampled and described.

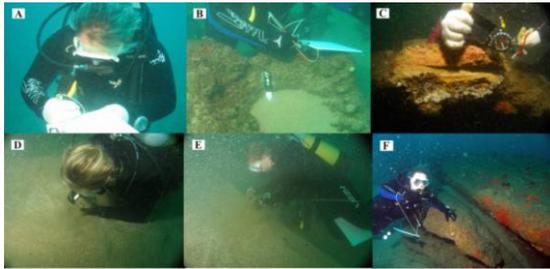


Figure 1. Geological mapping by SCUBA diving. A: Observations are recorded on a Perspex diver 'slate'; B: Erosional pothole encrusted with in situ oysters, 12 m below Mean Sea Level; C: Dip and strike readings of aeolian foresets can be taken under water, using a compass-clinometer; D and E: Sediment sampling 26 m below Mean Sea Level; F: Beachrock, 19 m below Mean Sea Level.

High resolution seismic data revealed a complex evolution of the Durban Basin initiated by tectonic subsidence during Late Cretaceous drift sedimentation; uplift during the Tertiary and eustatic sea level oscillations which characterise the Quaternary. Detailed geophysical surveys (side-scan sonar; multibeam bathymetry) and seafloor mapping by SCUBA diving of Blood Reef have revealed an extensive base of aeolianite and a complex history of sea level rise since the Last Glacial Maximum. This history is preserved as a series of beachrock platforms and wave-cut platforms incised into the underlying aeolianite. Samples have been collected from different lithologies and Calcareous nanofossils preserved in the aeolianites reveal a late Pleistocene to Holocene (Zone NN21) age, providing an upper age limit of ~290 000 years for the deposits of the Bluff Ridge and Blood Reef. Samples from selected depths will be dated using the technique of Infrared Stimulated Luminescence by collaborators at the University of Montreal.

The sediments of the seafloor form the Holocene sediment wedge. This unit is defined by large-scale shoreface-attached ridges shaped by a northward-flowing eddy of the geostrophic Agulhas Current. Although interpreted to be mostly relict features associated with lowered sea levels, the northward growth of a ridge by entrained sediment has resulted in the burial of a 42-year old pipeline, indicating ongoing sedimentary activity. Bioclastic sediment fields, underlying migrating sand waves and large-scale subaqueous dunes, reflect a wave ravinement surface of gravel lag deposits remnant of the Holocene Transgression. Localised mud deposits occur in the troughs of shoreface-attached ridges and are interpreted as back-barrier deposits which were drowned by the Holocene Transgression.

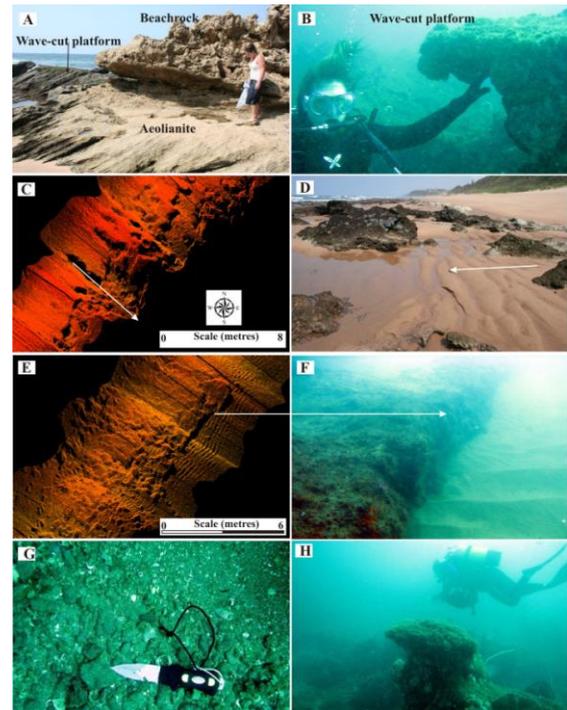


Figure 2. Sea level indicators in the study area. A: Wave-cut platform incised into aeolianite of the Isipingo Formation, ~1 m above Mean Sea Level and beachrock deposited on the erosional surface. B: Wave-cut platform 12 m below Mean Sea Level. C: Multibeam point cloud image of soundings, illustrating eroded gullies of a drowned palaeo-shoreline, 9 m below Mean Sea Level. The arrow points seaward. D: Gullies of the modern shoreline. E: Multibeam point cloud image of soundings, illustrating a linguoid ridge 9 m below MSL. F: A photograph from the same site. G: Relict deposit of the ravinement surface associated with the Holocene Transgression, 26 m below Mean Sea Level. H: Rugged structure of aeolianite on the seafloor, 27 m below Mean Sea Level.

Marc Goedhart

Marc Goedhart of the Eastern Cape unit of Council for Geoscience in Port Elizabeth continues with his PhD project under the supervision of Prof Peter Booth of the Department of Geoscience, Nelson Mandela Metropole University. The project focuses on the Late Quaternary reactivation of the Kango fault, South Africa.

Palaeoseismic results obtained along the Kango fault, several recently-published deep seismic sections across the region, as well as the distribution of local seismicity, have contributed to the determination of several potential seismic source zones for the main fault strands in the southern and eastern Cape Fold Belt. These results were presented together with trench stratigraphy, age-dating, and geophysics, at the South African Geophysical Association and Inkaba ye Africa

conference and workshop, held in Swaziland from 13-18 September 2009. Considerable interest was generated as little work has been done on neotectonics in South Africa, in particular in the Eastern Cape. This led to collaboration with Potsdam University in Germany (and possibly also Jena University) regarding modeling of gravity data across the Cape Isostatic Anomaly, in order to estimate potential uplift rates. In addition, despite a shortage of funds, the University of Pretoria's Space Geodesy centre volunteered to install a GPS station on the anomaly, to determine real uplift, if any. Monitoring for vertical movement is likely to be long term, but it is a start, and the station location will also improve the current national geodetic network.

The geophysical character of Late Quaternary fault-ruptured alluvium at sites along the Kango Fault is being investigated in conjunction with C.J.S. Fourie, C.J. de W. Raath, L. Mare, and Dr. N.J. Cassidy. The electric and gravimetric methods were able to resolve most faults mapped in the trench wall, although to varying degree of success, depending on instrument settings. While seismic refraction was able to detect the main stratigraphic and structural features, detail was not as easily resolved as with the other methods. Of all methods, the ground penetrating radar was least successful, due to high ground conductance. Of interest, using the same interpretive methodology, two additional structures were located in an unexcavated area to the south of the trench, suggesting there are additional fractures in this area that are not evident on the land surface.

A new research collaboration has been initiated with Keele University in the United Kingdom after several additional features were observed in the Ground Penetrating Radar data collected at the trench. The magnetic susceptibility of several stratigraphic samples from the trench were analyzed at the Council for Geoscience geophysical laboratory. This was done to determine which mapped horizons acted as main conductors for the induced electromagnetic fields. Results confirm that the main flood deposit (unit 2e), composed of coarse gravel and sand, and minor clay in the interstitial matrix, was the main horizontal conductor in the exposed trench stratigraphy. The magnetic results also confirm the location of a subsurface unconformity which was discovered while mapping the trench wall sediments. This unconformity was subsequently dated, and found to correspond to the last glacial low-stand between 115,000 and 10,000 years ago, reflecting a period of increased aridity in the little Karoo. The

magnetic susceptibility results probably reflect the degree of weathering, as the pre-Holocene in age strata below the unconformity have only about half the magnetic susceptibility of the younger Holocene-aged units above it. This suggests the laboratory technique could be applied to samples of drill core from the area to differentiate between older weathered deposits and younger cover sediments and so map out the last glacial unconformity in the little Karoo.

Jemma Finch - Research into the palaeoecology of the Drakensberg Mountains

Currently Jemma Finch is working on Holocene vegetation and fire dynamics in the Drakensberg Mountains as part of a postdoctoral fellowship through Prof. Mike Meadows at the University of Cape Town. The Drakensberg region lacks palaeoecological studies and this project aims to address this deficit. This research is funded by the African Origins Platform of the NRF and the University of Cape Town.

As part of this research project, Jared Lodder (UKZN) is working on a c. 12,000 year old pollen and charcoal record from Catchment XI of Cathedral Peak as the topic of his MSc research project. Jared has recently been awarded funding for the second year running from the Palaeontological Scientific Trust (PAST) to continue this research.

For more information visit:

<http://sites.google.com/site/drakensbergpalaeoecology/>

Antonieta Jerardino

Department of Prehistory, Ancient History and Archaeology, University of Barcelona

As from March 2010, I joined the Catalan Institute for Research and Advanced Studies (ICREA) at the Department of Prehistory, Ancient History and Archaeology, University of Barcelona (UB), Spain. As part of GEPEG (Research Group for Palaeoecological and Geoarchaeological Studies) led by Prof. Rosa Maria Albert, I will continue with my research interests on the Later Stone Age along the West Coast and on Middle Stone Age studies in the Mossel Bay area. Local projects in the Mediterranean basin are also being considered for medium and long term. A detailed survey and test excavations just north of Lamberts Bay are planned for October this year, which will see the

collaboration of specialists in Botany and the Archaeology of food producing societies in South Africa. Opportunities for palaeoenvironmental research into the mid-Holocene climatic optimum (c. 8000 - 4500 BP), second Neoglacial episode (c. 3000 - 2400 BP) and Medieval Warm epoch (c. 1100 - 900 BP) will be sought. Research into MSA studies in the Mossel Bay area will continue with the analysis of marine shell remains from Cave PP13B. Important palaeoecological and behavioural observations have already been derived from my archaeozoological analyses so far, which will be soon published in a special issue of the Journal of Human Evolution dedicated to this multidisciplinary project at Mossel Bay.

Geeske H.J. Langejans

Institute for Human Evolution at the University of the Witwatersrand

In May 2009 I started as archaeology post-doc at the Institute for Human Evolution at the University of the Witwatersrand. I am working on Blombos shellfish from the Middle Stone Age with Christopher Henshilwood and Karen van Niekerk. In June 2009 I officially graduated at the University of the Witwatersrand. The title of my thesis is: *Testing residues – an experimental approach*. After visiting and enjoying the SASQUA conference in September 2009 I was kindly accepted as a SASQUA member. In February 2010 I took over as book review editor for the South African Archaeological Bulletin from Johanna Behrens and in March the first publication based on my PhD was published in the Journal of Archaeological Science. Below you find a list of my publications.

Mike Meadows - Quaternary Research Highlights in the Department of Environmental & Geographical Science at the University of Cape Town

Research on various aspects of Quaternary environmental change continued in the department during 2009 and 2010 with a focus on palaeoecological proxies, in particular pollen and diatoms. This work is underway in collaboration with several researchers based locally and internationally, including Brian Chase of the University of Bergen, Andy Carr at the University of Leicester, Curt Stager from Smiths College, Dr Frank Neumann (Wits), Professor Louis Scott (UFS) and Dr Lindsey Gillson (UCT). The accumulation of wetland sediments provides opportunities for 'conventional' palaeoecological analyses. Key wetland sites under investigation include Vankervelsvlei near Knysna, Rietvlei near

Stilbaai, several sites in the Drakensberg, Verlorenvlei near Elands Bay and Princess Vlei in Cape Town. In addition, phytoliths preserved in fluvial and colluvial sediments in association with archaeological material in Kenya are being examined. There have also been interesting developments in the palynology and geochemistry of hyrax middens from a range of sites in the Cederberg and beyond.

Catherine Grey was awarded her doctoral degree at the end of 2009. Currently there are two full-time PhD students, Lynne Quick (pollen) and Kelly Kirsten (diatoms), and MSc student Rahab Kinyanjui (phytoliths) who is visiting from the National Museum of Kenya and co-supervised by Lindsey Gillson in the Department of Botany at UCT. Jemma Finch has commenced her work as a postdoc on Drakensberg wetland settings, although she is based in Pietermaritzburg (see her entry for more details). An exciting development has been the award of a grant by the NRF-DFG for a joint project in collaboration with Quaternarists from the University of Jena, Germany. The project will kick off with a workshop in Knysna in October this year. A Leverhulme award to Dr Andy Carr and collaborators is to be applied to understanding dryland vegetation dynamics through molecular biomarkers, a relatively new methodology that hold much promise.

Other noteworthy activities include the fieldwork conducted following the SASQUA biennial meeting in September 2009 when several Honours and senior postgraduate students assisted with a sediment coring exercise at Vankervelsvlei – a unique floating bog that has previously been the focus of palynological work but which surely warrants further attention: watch this space!

Third year students participated in vibracoring at Princess Vlei, an urban wetland near the False Bay coast that can be expected to reveal evidence of climate and sea level change and human activity during the second half of the Holocene.

RECENT PUBLICATIONS

Palaeoecological significance of palms at Olduvai Gorge, Tanzania, based on phytolith remains.

Rosa M. Albert^a, Marion K. Bamford^b, Dan Cabanes^c

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ABSTRACT: Palms are among the most abundant, diverse and economically important families of plants in tropical and subtropical regions of the world; their number and diversity make them an important part of the ecosystem. Phytoliths are abundantly produced in palms, mainly the spheroid echinate type and, although their number decreases notably after their deposition in soils, they remain stable for long periods of time. Palm phytoliths were recovered from sediments at HWKEE, on the eastern palaeolake margin of the Olduvai basin during Lowermost Bed II (between Tuffs IF and IIA, 1.795–1.71 Ma). Their abundance in trench 107 (the only freshwater source recognised to date) occurs in three stratigraphically consecutive layers, the first one located immediately above the incision layer (40 cm above Tuff IF). Above these samples there are no palm phytoliths in the fossil record. The identification of the type of palms represented will be useful for determining the landscape distribution and nature of hominin activities along the lake margin and alluvial fan of the central Olduvai Basin. Here we use morphometric analysis of spheroid echinate phytoliths from fossil and modern palms (*Phoenix reclinata* and *Hyphaene petersiana*) and their corresponding soils to determine if the differences are significant and can be confidently applied to the fossil samples. Fossil and modern soil samples were found to be very similar to each other but the spheroid echinates from the fossil soils were bigger than the modern soil samples. Either the palms from the samples were different or there is a strong bias towards preserving phytoliths from the smaller end of the range. If this is the case then the implication would

be that the fossil samples are the leaves and inflorescences of *Phoenix reclinata*. A wider variety of modern palms needs to be analysed.

History of stress at Vaalputs, Namaqualand, South Africa: evidence for a Mid-Cretaceous “Wegener –type Orogeny” in western southern Africa.

Andreoli, M.A.G., Viola, G., Kounov, a., Scheepers, J., Heidbach, O., and Stengel, I., 2009.

In: S. Fourie (ed.) *Proceedings 11th SAGA Biennial Technical Meeting and Exhibition, Royal Swazi Sun, 16-18 September 2009* (6 pp.), ISBN: ISBN-978-0-620-44602-0.

The intraplate seismicity of Namaqualand, South Africa: evidence for a long lived, anomalous stress field

Marco A.G. Andreoli¹, Johann Scheepers², Oliver Heidbach³, Ingrid Stengel⁴, Terence S. McCarthy⁵, Alexandre Kounov⁶, and Giulio Viola⁷

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International Association of Seismology and Physics of the Earth’s Interior, 2009 General Assembly, 12-16 January, Cape Town (Abstract only).

ABSTRACT: The seismicity of the Namaqualand-Karoo region in South Africa displays typical intraplate features, namely events of low to moderate intensity, with a random scattering of epicenters distant from plate boundaries. Our study of this seismicity combines the seismic records from 1989 to 2008 collected by two seismometers (3-components TELS) located at Vaalputs with both on-shore and off-shore stress measurements (in mine, borehole breakouts), remote sensing and morphotectonic analysis, trench mapping, fault plane analysis and other techniques.

Our data indicate that even though many of the seismic epicenters are scattered, a significant number cluster along known or inferred faults. Important parameters that describe the seismicity of the Namaqualand seismic region within a radius

of 100 km around Vaalputs are: average number of events/year ~12-15 (65 events swarm in 1996); b factor = 0.83 ± 0.07 ; recorded maximum magnitude $M_{max} \sim 5.8$. There is now compelling evidence that the Namaqualand seismicity is governed by a NNW-SSE oriented horizontal σ_1 typical of an Andersonian strike-slip ($\sigma_1 > \sigma_v > \sigma_3$) regime. This stress orientation, referred to in the literature as the Wegener stress regime/anomaly, extends over an area of at least $2 \times 10^6 \text{ km}^2$ in the western parts of southern Africa, possibly also including the adjacent offshore domains. Its intensity and general orientation display both spatial and temporal variability, e.g. decreasing toward the east (e.g. in the Witwatersrand basin) where $\sigma_v \geq \sigma_2 > \sigma_3$ and average $\sigma_2 \sim \text{N}280\text{-}290^\circ$. Wegener stress conditions were probably attained in the mid to Late Cretaceous (ca. $85 \pm 15 \text{ Ma}$) as indicated by kinematically compatible thrusting, reverse faulting and folding of Karoo and even younger sedimentary rocks in parts of Namibia (e.g.: Waterberg; forelands of Klein and Groot Karas Mts.), by respective drainage system trends and their re-orientation, by faulting along the Namaqualand escarpment, and by the orientation of swarms of Type I kimberlite dykes in the Kaapvaal Craton. Evidence for periodic suppression of the Wegener stress field may be inferred from ~NE oriented, 130-114 Ma Type II kimberlite dykes (Kaapvaal craton) and 70 – 67 Ma melilitite dykes (Vaalputs area). A similar, ~ENE orientation of S_{HMax} / σ_1 was also derived from slickensides on <65 Ma fault near Vaalputs. More recently, small thrust faults cutting the Late Pleistocene duricrust observed in trenches in the Vaalputs area suggest that central Namaqualand experienced renewed Wegener stress conditions between ~15ka and 8 Ka.

We conclude that seismicity of the Atlantic seaboard from Angola to South Africa is largely governed by the Wegener stress field. The origin of the latter is difficult to explain by numerical models based on the southerly propagation of the East African Rift because related strains may be traced tens of millions of years (mid-Cretaceous) before the beginning of rifting. Finally, because the stress anomaly is long lived and contemporaneous to an important cluster of (~80 Ma) kimberlite ages, it is likely to have affected the deep lithosphere too. More intriguingly, the Wegener stress field overlaps the deep (D'') thermochemical plume held responsible for the African Superswell.

[Past and present vegetation ecology of Laetoli, Tanzania.](#)

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ABSTRACT: We are attempting to set up a new protocol for palaeoecological reconstruction in relation to the fossil hominin site Laetoli, Tanzania. This is based on the premise that habitat variability in the past was at least as great as at present; that this variability at the landscape level is a function of variations in geology, soils, and topography rather than climate; and that vegetation type at the landscape level can be reconstructed from these environmental variables. Measurable variation in climate in tropical Africa today occurs over distances of at least 100 km, so that ranges of habitat variation within the limited area of Laetoli today can be reconstructed in relation to soils and topography, and the effects of climate changes are then estimated in relation to these other factors.

In order to document the modern vegetation, we have made voucher collections of plants in the Laetoli region, recorded distributions of plants by habitat, climate, soil, and topography, and mapped the vegetation distributions. Results show that areas of low relief have soils with impeded drainage and dense *Acacia drepanolobium* woodland, having low canopies when disturbed by human action, higher when not; shallow brown soils on volcanic lavas have four woodland associations, two dominated by *Acacia* species, two by *Combretum-Albizia* species; shallow volcanic soils to the east have a woodland association with *Croton-Dombeya-Albizia* species; elevated land to the east on volcanic soils has two associations of montane-edge species, one with *Croton-Celtis-Lepidotrichilia*, and the other with *Acacia lahai*; the eastern highlands above 2,750 m have montane forest; seasonal water channels flowing from east to west have three *Acacia* riverine woodland associations; three deep valleys to the north of the area have dense riverine woodland with *Celtis, Albizia, Euclea, Combretum, Acacia* spp.;

emergence of springs at Endulen feed a perennial stream with closed gallery forest with *Ficus-Croton-Lepidotrichilia*; and, finally, recent ash falls have produced immature alkaline soils with calcrete formation and short grass vegetation. All of these vegetation associations have been modified by human disturbance to greater or lesser degrees, and we have attempted to allow for this both by basing the associations on the

least modified areas and by predicting how the associations, or parts of associations, have been altered by human action.

Past land forms at Laetoli have been based on the geology and geomorphology of the area. Past vegetation patterns were estimated by superimposing present distributions of plant associations on equivalent landforms in the past, assuming similar climate to the present. This indicates the overall pattern of vegetation at Laetoli to have been a mosaic of low and tall deciduous woodlands and with riverine woodland and forest associations along water courses. Low woodlands would have been dominated by *Acacia* species, and tall woodlands by *Combretum-Albizia* species, with increasing increments of montane species, such as *Croton* species, to the east of the area. Riverine woodlands would have been dominated by *Acacia-Euclea* species, with wetter associations (downriver or linked with spring activity) supporting gallery forest with *Ficus*, *Celtis*, and *Croton* species. These are all species associations common in the area today, and with landforms little changed in the past, and assuming similar climate, there is every reason to predict that they would have been present in the past. Moreover, Pliocene environments lack the human disturbance that has destroyed much of the present day vegetation. Presence of woodlands is supported by fossil wood attributed to several of the tree species present in the area today and by similarities in the mammalian community structure between past and present. Having established the pattern for Pliocene vegetation based on climatic variables existing today, we then predict the effects of past variations in climate.

[Late Pliocene grassland from Olduvai Gorge, Tanzania.](#)

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ABSTRACT: The Olduvai fossil plants documented by us in this paper are the first direct evidence for open grassland in the late Neogene of Africa based on macroplant remains. Silicified remains of herbaceous ground cover are exceptionally well preserved *in situ* within Late Pliocene sediments below the initial pyroclastic ash surge unit of Tuff IF in the uppermost part of Bed I, Olduvai Gorge, northern Tanzania. Published radiometric and palaeomagnetic dates place this grass layer between 1.839 ± 0.005 Ma and 1.785 ± 0.01 Ma. Exposed at localities on the south side of the Gorge this herbaceous ground cover grew on a floodplain developed on a dried out lake bed, following pronounced lake retreat of saline-alkaline palaeo-Lake Olduvai during a developing dry climatic phase. Sheathed basal culms, rhizomes and roots are interpreted as those of one or more small mat-forming grasses or less likely, sedges. Small dicotyledonous herbs were probably also present. The proximity of adjacent plants indicates a relatively dense ground cover. Roots extended at least 8 cm below the ground surface. Aerial parts of the plants were absent or were not preserved when the weathered basal culms were covered by a thin layer of brown waxy clay, followed by fallout of pyroclastic ash. Both units were mostly eroded away prior to emplacement of a wet, cool pyroclastic surge which then buried and preserved *in situ* remnants of the herbaceous ground cover. Preservation of the semi-woody rhizomes implies well-drained soils, otherwise the plant material would have quickly rotted. Collections from discontinuous exposures indicate the grassland covered an area of at least a few hectares. This open grassland would have provided grazing for the Late Pliocene fauna.

[Structure of corystospermaceous ovules from Upper Triassic of Zimbabwe.](#)

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ABSTRACT: Isolated ovules from the Upper Triassic of Zimbabwe were observed using three complementary approaches: light microscopy and, for the first time, scanning electron microscopy and transmission electron microscopy. Complete ovules showed a curved bifid micropylar tube. Three envelopes were present: integument, nucellus, and megaspore. The integument appeared resiniferous. The nucellus was made up of bulging cells around the pollen chamber, which

contained bisaccate pollen grains. The ultrastructure of the nucellus revealed a lamellar organization in their microsinuosities. The megaspore membrane was made up of agglomerate rounded bodies more or less closely arranged and surrounded by two layers. The material may be attributed to Umkomasiaceae. A comparison with ovules of different related groups (seed ferns, Caytoniales, Ginkgoales, Nilssoniales, and Coniferales) was made. The Umkomasiales are considered to be a more primitive group than the Pteridospermales with regard to integument and nucellus.

The last interglacial sea-level highstand on the southern Cape coastline of South Africa.

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ABSTRACT: The continental margin of southern South Africa exhibits an array of emergent marginal marine sediments permitting the reconstruction of long-term eustatic sea-level changes. We report a suite of optical luminescence ages and supplementary amino acid racemization data, which provide paleosea-level index points for three sites on this coastline. Deposits in the Swartvlei and Groot Brak estuaries display tidal inlet facies overlain by shoreface or eolian facies. Contemporary facies relations suggest a probable high stand 6.0–8.5 m above modern sea level (amsl). At Cape Agulhas, evidence of a past sea-level high stand comprises a gravel beach (ca. 3.8 m amsl) and an overlying sandy shoreface facies (up to 7.5 m amsl). OSL ages between 138 ± 7 ka and 118 ± 7 ka confirm a last interglacial age for all marginal marine facies. The high stand was followed by a sea-level regression that was associated with the accumulation of eolian dunes dating to between 122 ± 7 ka and 113 ± 6 ka. These data provide the first rigorous numerical age constraints for last interglacial sea-level fluctuations in this region, revealing the timing and

elevation of the last interglacial high stand to broadly mirror a number of other far-field locations.

[Geological evolution and palaeoenvironments of the Bazaruto island archipelago.](#) Botha, G.A., Armitage, S.J., Duller, G.A.T. (2008).

In, B.I. Everett, R.P. van der Elst, M.H. Schleyer (Eds.), A Natural History of the Bazaruto Archipelago, Mozambique. Special Publication No. 8, Oceanographic Research Institute. South African Association for Marine Biological Research.

Soil chronosequence development on the southeast African coastal plain, Maputaland, South Africa.

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ABSTRACT: Dunes have accreted on the southeast African coastal plain in coast-parallel patterns of degraded whaleback ridges, sand megaridges and extended parabolic dunes since the Pliocene. In the Maputaland dune field, relative dating is complicated by soil degradation, erosion and vegetation cover. This project assessed alternative relative and numeric dating techniques that can be used to differentiate dune systems and eolian sand bodies. Soil profile characteristics were used to calculate soil development indices (SDI) for soil horizons sampled from hand augered holes and rare exposures. Infrared stimulated luminescence (IRSL) dating of representative dunes and sand units helped define the pedogenesis achieved since deposition.

The quartzose dune sands have weathered to form very deep soil profiles. Enhanced SDI values for horizons or sampled intervals down the profile reflect pH decrease, advanced rubification or distinct mottling, clay increase and harder consistency with depth. The youngest Holocene profiles exhibit decreasing horizon index values with depth below the A horizon whereas late Pleistocene profiles display SDI values increasing with depth within the upper 3 m of the profile. Within some Mid- to Late Pleistocene eolian sands greater profile-horizonation and catena complexity manifests as complex soil profiles or distinctly mottled, clay-enriched horizons, at depths of 2–5 m below the surface. The SDI profiles from specific dune systems or stratigraphic units cluster

well and effectively characterize soil development in dune sand units of different ages. Depositional age plotted against sampled horizon index values makes it possible to determine generalized rates of soil profile development, and to compare pedogenic processes on the high-rainfall, coastal barrier dunes to those found in the drier interior. Sampled horizon index values distinguish buried soil profiles and highlight possible localized surficial reworking.

[The potential of plant biomarker evidence derived from rock hyrax middens as an indicator of palaeoenvironmental change.](#)

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ABSTRACT: Hyrax middens are unique environmental archives with the potential to provide unprecedented high-resolution palaeoenvironmental records, particularly in the arid regions of southern Africa. This study provides the first detailed characterisation of the organic matter composition of hyraceum and aims to identify biomarker evidence capable of providing new or supplementary palaeoenvironmental data from these novel archives. Pyrolysis gas chromatography mass spectrometry reveals hyraceum to be dominated by nitrogen-containing aromatic compounds, notably benzamide. This is almost certainly derived directly from the hyrax urine and is probably the main source of nitrogen as measured in bulk $\delta^{15}\text{N}$ measurements. Solvent-extractable lipids comprise homologous suites of long-chain *n*-alkanes (C_{24} – C_{34}) and *n*-alkanols (C_{16} – C_{26}), characteristic of higher plant leaf waxes, along with an abundance of animal-derived sterols, higher plant sterols and terpenoids; as well as the ubiquitous benzamide.

n-alkane distributions and compound specific $\delta^{13}\text{C}$ clearly differentiate samples from the C_3 vegetation dominated Cape Floristic Region, and the more arid, C_4 grass-rich savannas of central Namibia (Klein Spitzkoppe). Distinct changes in *n*-alkane distribution and $\delta^{13}\text{C}$ are observed within the Spitzkoppe midden; most notably the mid to late Holocene period (c. 6000–2000 cal yr BP), which records a progressive reduction in grass-derived organic matter inputs. Based on the animal's feeding behaviour and contemporary site ecology, a phase of increasing aridity is inferred, which is consistent with other proxy data from this site (e.g. bulk $\delta^{15}\text{N}$). The excellent preservation of

plant and animal biomarkers suggests that there is significant potential for midden-derived biomarkers to provide long-term palaeoenvironmental proxies

[South African palaeoenvironments during marine oxygen isotope stage 4: a context for the Howiesons Poort and Still Bay industries](#)

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ABSTRACT: Spanning the period from ~74–58 ka, and being broadly coeval with marine oxygen isotope stage 4 (MIS 4), the Still Bay and Howiesons Poort industries represent important phases in the development of the material culture of early modern humans. How and why these industries occurred when they did, however, remain matters for speculation. A key element of this debate has been the question of what role environmental change during the early stages of the last glacial period may have had on influencing human activity. Unfortunately, well-dated palaeoenvironmental evidence from this period is limited, and the debate has, out of necessity, been driven by the application of conceptual models of environmental change, many of which associate colder and warmer global climates with increased aridity and humidity respectively. In this paper, the regional marine and terrestrial evidence is synthesised to create an evidence-based palaeoenvironmental context. Based on the information available to date, it appears that rather than being characterised by dry conditions, MIS 4 was a period of relatively cool, moist climates, the ubiquity of which transcends the modern regional climate boundaries. It is suggested that orbital parameters at this time created greater interaction between tropical and temperate circulation systems, bringing more moisture to the subcontinent. These findings highlight the distinct nature of southern African climate systems, and caution against the application extra-regional conceptual models or inferring linear relationships with polar records.

[A record of rapid Holocene climate change preserved in hyrax middens from southwestern Africa](#)

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ABSTRACT: The discovery of sensitive paleoenvironmental proxies contained within fossilized rock hyrax middens from the margin of the central Namib Desert, Africa, is providing unprecedented insight into the region's environmental history. High-resolution stable carbon and nitrogen isotope records spanning 0–11,700 cal (calibrated) yr B.P. indicate phases of relatively humid conditions from 8700–7500, 6900–6700, 5600–4900, and 4200–3500 cal yr B.P., with a period of marked aridity occurring from 3500 until ca. 300 cal yr B.P. Transitions between these phases appear to have occurred very rapidly, often within <200 years. Of particular importance are: (1) the observed relationship between regional aridification and the decline in Northern Hemisphere insolation across the Holocene, and (2) the significance of suborbital scale variations in climate that covary strongly with fluctuations in solar forcing. Together, these elements call for a fundamental re-examination of the role of orbital forcing on tropical African systems, and a reconsideration of what factors drive climate change in the region. The quality and resolution of these data far surpass any other evidence available from the region, and the continued development of this unique archive promises to revolutionize paleoenvironmental studies in southern Africa.

[Evaluating the use of dune sediments as a proxy for palae-aridity: a southern African case study](#)

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ABSTRACT: The dominance of dryland environments in the Southern Hemisphere makes the study of these regions of critical importance

for the development of regional, hemispheric and global models of environmental change. Unfortunately, the wetting and drying cycles associated with semi-hyperarid climates are not conducive to the preservation of traditional organic proxy data sources. The last decade, however, has seen the development of a number of alternative archives including the application of luminescence dating techniques to dunes and other aeolian deposits. In continental situations, the existence of relict dune fields has long been thought to be evidence of drier conditions during the Pleistocene, and direct ages from these features have been interpreted almost exclusively as indicating phases of aridity. However, an increasing number of ages from a broader range of environments are calling into question the assumption that aeolian activity can be simply equated with aridity. Presented here is a comparison of dune ages that have been obtained from across southern Africa with a range of proxies from both terrestrial and marine records. Taken as a whole, three primary phases of activity can be identified at ~60–40, 35–20 and 17–4 ka. The frequent discordance with other terrestrial records indicating coeval increases in humidity and the close correlation of these phases with wind strength proxies suggest that aridity is unlikely to be the sole, or even primary, forcing mechanism for aeolian activity in the region, and the palaeoclimatic significance of these sedimentary archives needs to be reassessed.

[Last Glacial Maximum dune activity in the Kalahari Desert of southern Africa: observations and simulations](#)

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ABSTRACT: It has long been understood that as ephemeral landscape features sand dunes are highly sensitive to environmental change, and thus their distribution and the timing of their development may provide clues to past climate dynamics. The relationship between climate and dune activity, however, is neither simple nor straightforward, with a range of controls affecting the balance between erodibility (the availability of sediment for deflation) and erosivity (the potential

for sediment transport). To explore such complex systems over large spatial and temporal scales, a number of dune activity indices (DAI) have been created that incorporate wind speed and moisture balances to calculate the potential for, and degree of dune mobilisation. Using modern weather station data, these indices have generally been shown to provide reasonable indications of dune activity potential. Until recently, however, the detailed quantitative data required to inform these equations has not been available for past climate scenarios, and attempts to determine the relative importance of the various controls of dune activity have relied on rough estimations of climatic parameters. This paper combines data from monthly general circulation model (GCM) outputs from the coupled Ocean-Atmosphere GCMs for 21 ka with the most detailed DAI equation presently available to calculate the potential for dune reactivation in southern Africa during the Last Glacial Maximum (LGM, 18–24 ka). Based on these data and calculations it is indicated that there was significantly less potential for dune activity across southern Africa at 21 ka. When compared to the aeolian sediment records from the region, this study poses serious and fundamental questions about: 1) the reliability of the model outputs, 2) the degree to which DAIs are able to account for the complexity and dynamics of aeolian systems, and/or 3) the interpretation of dune records as palaeoclimatic proxies at millennial time scales.

[Taphonomy of the Early Miocene flora, Hiwegi Formation, Rusinga Island, Kenya.](#)

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ABSTRACT: A fossil flora was collected in situ from early Miocene deposits at site R117 in the Hiwegi Formation of Rusinga Island contemporaneous with and in close proximity to the sites from where the anthropoid primates were recovered. The flora exhibits a spatially and temporally patchy distribution of fruits and seeds, mixed with twigs of various sizes, fragments of wood, bark, and leaves, all with random orientations and very low depositional dips. There has been minimal transport and the flora evidently accumulated as in

situ litter beneath local vegetation. Based on Nearest Living Relatives (NLR) of fruits and seeds, the vegetation represented is a deciduous broad-leaved woodland with continuous canopy, with trees, shrubs, lianas, and climbers, reminiscent of the structure of the modern vegetation in the steep-sided protected valleys in the Laetoli-Endulen area. The interpretation of the vegetation is supported by the presence of twigs, wood, and bark fragments from larger diameter axes. Climbers are represented by twining stem fragments as well as by a wide variety of distinctive fruits and seeds. The proportion of fossilised thorny twigs represents only 3% of the twig collections, and there are no unequivocal forest trees amongst the NLR. No grasses were present; monocotyledons are only represented by a single date palm stone. No conifer seeds or cones have been recovered, and there are no coniferous leafy shoots.

[A tenfold increase in the Orange River mean Holocene mud flux: implications for soil erosion in South Africa.](#)

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ABSTRACT: Soil erosion poses a major threat to sustainable agriculture in southern Africa but is difficult to quantify. One measure of soil erosion is the sediment flux of rivers. The Orange River is the principal source of sediment to the western margin of South Africa with an estimated mean mud flux over the last 11 500 years (the Holocene epoch) of 5.1 (3.2–7.4) million metric tons/year (Mt/yr). A total of 43 gigatons (Gt; 10^{15} g) representing 72% of the Holocene mud flux has accumulated on the shelf in the Orange River prodelta and mudbelt, a clayey fine-silt deposit focused on the inner to middle shelf. Only 8% (5 Gt) of the mud flux occurs in Holocene calcareous ooze on the slope. Comparison of the clay to mud ratio of offshore deposits with Orange River suspended sediment and catchment soils indicates that 20% (11 Gt) of the Holocene mud flux has

been lost as clay beyond the margin. The Orange River mud flux prior to the building of large dams (1930–1969) is ten times greater than the mean Holocene mud flux and is reconciled with estimates of soil erosion within the catchment. A tenfold increase in the Orange River mud flux implies up to a hundredfold increase in total soil erosion depending on the extent of mud storage over periods of decades to centuries within the catchment. Erosion has shifted from areas of high relief and rainfall of the Drakensberg escarpment during the Holocene to intensely cultivated lands of low relief having moderate to high rainfall in the eastern catchment and to a lesser extent, grazing areas of the southern Orange River catchment.

[Holocene organic-rich terrigenous mud on the western margin of South Africa: Nutrient source to the Southern Ocean?](#)

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ABSTRACT: The biological pump plays a major role in the transfer of CO₂ from the atmosphere to the deep Southern Ocean, a transfer which is largely controlled by the supply of iron and which may partially explain glacial to interglacial variations in pCO₂. Analogous to the well-documented, smaller-scale “island mass effect,” we propose that the lateral advection of iron by south flowing intermediate waters along the southern African margin may sustain high-productivity blooms of the Subtropical Convergence Zone (SCZ) between 10 and 70°E. We assess the present-day interglacial (Holocene) reservoirs and fluxes of organic carbon (OC) and terrigenous mud on the western margin of southern Africa in order to estimate the potential supply of Fe to the Southern Ocean. The highly productive Benguela Upwelling System (BUS) appears to be a relatively inefficient coastal biological pump. Repeated sediment resuspension by wave and tidal energy dissipation limits OC burial to <0.2% of net primary production (NPP) in the southern BUS and to between 0.2 to 2.4% in the northern BUS. Productivity and OC-rich mud accumulation are focused on the inner portion of the 100–200 km wide shelf which, combined with south flowing bottom currents, limits the export of OC beyond the shelf break to 1.2–8.4% of NPP. However, winnowing of 1 million tons yr⁻¹ of clay particles

and the potential early diagenetic benthic (dissolved) Fe flux may supply 10 times more Fe than is transported by dust to the open ocean biological pump of the SCZ. Lowering sea level during glacial periods disperses interglacial mud deposits off the shelf and increases particulate Fe export by as much as a factor of 4. Glacial pulses of margin export may enhance the efficiency of the subantarctic Southern Ocean biological pump and contribute to the initial as well as glacial maximum drawdown in pCO₂.

[Terrigenous sediment export from the western margin of South Africa on glacial/interglacial cycles.](#)

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ABSTRACT: Similar to many shelves globally, Pleistocene terrigenous sediment deposition on the western shelf of South Africa is strongly influenced by high-amplitude sea-level fluctuations over glacial to interglacial climate cycles. Here, variations in the glauconitic quartzose sand and terrigenous mud content of gravity cores from the western slope of South Africa are used to evaluate the dynamics of shelf sediment export over climate cycles of the last 450 kyr. Calcareous ooze on the slope contains a mean of 0.2 to 8 wt.% glauconitic quartzose sand derived from erosion of Neogene outer shelf sediments and 13 to 40 wt.% terrigenous mud sourced from the Orange River. Quartz sand content on the slope increases during glacial periods and is sharply reduced across glacial terminations and throughout interglacial highstands. Relative sea-level changes on the margin estimated from the quartz sand content on the slope are consistent with the timing, but not amplitude, of proposed eustatic sea-level records. A possible mechanism of sand erosion on the outer shelf is the vertical mixing forced by internal tides which may intensify over the shelf break as sea level is lowered during glacials. Turbidites are rare and bottom currents are generally capable of suspending mud but not sand except locally along the margin. Estimated variations in the bulk sedimentation rate and terrigenous mud mass accumulation rate on the slope suggest that export of terrigenous mud off the shelf during glacial lowstands is transported beyond the slope at intermediate and deeper water depths to the Southern Ocean.

[The significance of the Cretaceous Diamondiferous gravel deposit at Mahura Muthla](#)

[in the Vryburg District of the Northern Cape Province in South Africa.](#)

De Wit, M.C.J., Ward, J.D., Bamford, M.K., Roberts, M

ABSTRACT: Remnants of diamond-bearing fluvial gravels of Cretaceous age have been preserved on the Ghaap Plateau north-west of Reivilo at 1455 m above sea level. The alluvial deposit contains well preserved fossil woods representing at least four periods: Post-Permian (Upper Karoo), Early Cretaceous, Late Cretaceous and Tertiary. The Karoo specimen has been derived from Beaufort Group sediments, now eroded from the Ghaap Plateau. More significant are the presence of Early and Late Cretaceous woods, both periods believed to have been wetter in the interior of southern Africa. In addition to the diamonds, other kimberlite derived minerals such as ilmenite and garnet have also been recovered from these gravels. Detailed mineral chemical analyses of the ilmenites and those occurring in primary sources within a radius of 120 km of the Mahura Muthla area indicate that the most likely source are kimberlites occurring to the south-south-east, indicating that the palaeo-channel was flowing from the south-east to the north-west. This is supported by the presence of ironstone and red chert cobbles and pebbles derived from the Proterozoic Kanguru Member outcropping directly south of the channel. Further evidence comes from a palaeo-tributary on Laurika which joined the main Mahura Muthla trunk stream from the south-west; limited pebble imbrications; and a decrease in the sizes of wood, agate and ironstone cobbles and pebbles in a northerly direction associated with an increase of roundness of these clasts. At the start of the Cretaceous the area was covered by sandstones of the Beaufort Group with overlying flood basalts of the Drakensberg Group. First during the Early Cretaceous the Mahura Muthla channel was incising into an easterly retreating palaeo-escarpment of Karoo basalts. Group 2 kimberlites such as Finch, Darleston and Duivelskop, had already intruded these basalts around 120 Ma. The north-westerly orientated drainage was directly linked to the drainage basin of the Kalahari River draining the northern part of the northern Cape and southern Botswana via the palaeo-Molopo and lower Orange River. This period of erosion would have released an abundance of agates from the basalts that are so abundantly present in the gravels and also diamonds from these Group 2 kimberlites. On comparing the mineral chemistry of the ilmenites the most likely source for these kimberlitic minerals is the area to the south east of

Mahura Muthla. Kimberlites occurring in this area include the Duivelskop Group, X 154, Pienaarspoort, the Bellsbank Group, Bull Hill and Mayeng. At least some of these could have provided diamonds to the gravels. Later during Upper Cretaceous times the Karoo basalts had been removed and the drainage stripped the remaining sediments of the Beaufort Group before the sinuous channel became locked and preserved within the Transvaal dolomites. Subsequently the channel became calcretised during the development of the African Surface in the Early Tertiary. Mahura Muthla remained part of the Kalahari River basin which fed the Molopo River and the lower Orange drainage network and by the Early Tertiary the latter had captured the Vaal and the upper and middle Orange River drainage basin which had been part of the Karoo River drainage for most of the Cretaceous.

[Siliceous microfossils as Late Quaternary paleo-environmental indicators at Braamhoek wetland, South Africa.](#)

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ABSTRACT: A peat-sequence covering the last 16 ka (16 000 cal. yr BP) from Braamhoek wetland, eastern South Africa, was analysed in terms of phytolith and diatom composition. The fossil peat was rich in phytoliths, while diatoms were less prominent, probably as a result of degradation during wetland plant growth associated with silica uptake. With this study we present the first continuous phytolith and diatom record from South Africa covering the Late Pleistocene and Holocene period. The phytolith assemblages indicate a clear dominance of C3-grasses within the wetland throughout the sequence. The fossil diatom record infer changes in past moisture conditions. Unlike the modern wetland, which is dominated by benthic and aerophilic diatoms, the Late Pleistocene– early Holocene wetland favoured growth of planktonic species. Abundance of planktonic diatoms suggests three main phases when water depth was deeper than today; at c.13.6 ka, 11.3 ka and 10.4–10.0 ka. These indications of past fluctuations in humidity mostly provide confirmation of previously published indications of pollen, charcoal fragments and isotopes in the same core, but the siliceous

microfossil data also help to refine the paleo-environmental interpretation of the sequence.

[Early Acheulean technology in the Rietputs Formation, South Africa, dated with cosmogenic nuclides.](#)

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ABSTRACT: An absolute dating technique based on the build-up and decay of ²⁶Al and ¹⁰Be in the mineral quartz provides crucial evidence regarding early Acheulean hominid distribution in South Africa. Cosmogenic nuclide burial dating of an ancient alluvial deposit of the Vaal River (Rietputs Formation) in the western interior of South Africa shows that coarse gravel and sand aggradation there occurred ca 1.57_ 0.22 Ma, with individual ages of samples ranging from 1.89 _ 0.19 to 1.34_ 0.22 Ma. This was followed by aggradation of laminated and cross-bedded fine alluvium at ca 1.26 _ 0.10 Ma. The Rietputs Formation provides an ideal situation for the use of the cosmogenic nuclide burial dating method, as samples could be obtained from deep mining pits at depths ranging from 7 to 16 meters. Individual dates provide only a minimum age for the stone tool technology preserved within the deposits. Each assemblage represents a time averaged collection. Bifacial tools distributed throughout the coarse gravel and sand unit can be assigned to an early phase of the Acheulean. This is the first absolute radiometric dated evidence for early Acheulean artefacts in South Africa that have been found outside of the early hominid sites of the Gauteng Province. These absolute dates also indicate that handaxe-using hominids inhabited southern Africa as early as their counterparts in East Africa. The simultaneous appearance of the Acheulean in different parts of the continent implies relatively rapid technology development and the widespread use of large cutting tools in the African continent by ca 1.6 Ma.

[Early Holocene extensional tectonics in the south-eastern Cape Fold Belt, South Africa. Short Paper in proceedings of the 11th South African Geophysical Association \(SAGA\) Biennial Technical Meeting and Exhibition, and Inkaba yeAfrika Phase II workshop.](#)

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[Desert flash flood series - Slackwater deposits and floodouts in Namibia: their significance for palaeoclimatic reconstructions.](#)

Klaus Heine, Jörg Völkel (2009). *Zbl. Geol. Paläont. Teil I* **2007**, 287-308

[Soil clay minerals in Namibia and their significance for the terrestrial and marine past global change research.](#)

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African Study Monographs, Suppl.40: 31-50, March 2010 31

ABSTRACT: We delineated seven soil clay mineral provinces in Namibia. Many individual clay mineral assemblages occur in fluvial, pan, cave and other environments. Previous researchers have used clay mineral compositions as evidence for palaeoenvironmental reconstructions, often without analyzing the formation, the transport and the deposition of these clay minerals. In Namibia, rates of erosion and denudation by water and wind have been very small since early Quaternary times. During the Quaternary, the clay mineral assemblages of the seven provinces and of individual clay mineral deposits did not change significantly. Palaeoenvironmental reconstructions have to consider these small rates of erosion, especially if clay minerals were transported by water and/or wind from their source area to distant regions (e.g., the ocean). Changes in marine clay mineral compositions may not reflect climate change, but can be caused by changes in the ratio of fluvial to aeolian transport. If the changes in the transport mode are known, these changes can be interpreted palaeoenvironmentally. Future researchers have to decipher quantity and quality of the fluvial and aeolian dust transport (clay minerals, pollen, etc.) over southwestern Africa and the Benguela Current area.

[Opportunistic subsistence strategies among Late Holocene coastal hunter-gatherers, Elands Bay, South Africa](#)

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ABSTRACT: Hunting and gathering was practiced for many hundreds of thousands of years in South Africa's Western Cape region, until ceramics and a stock-keeping economy first appeared c. 2000 years ago, and in the Elands Bay and Lamberts Bay areas 200 years later. Subsistence and settlement patterns in this part of the West Coast of South Africa changed dramatically after this date, but the nature of interactions between indigenous groups engaging with these two types of subsistence practices is still poorly understood. The cultural-contact scenarios so far proposed view this interaction as basically competitive, with forager groups living at the margins of herder society and compelled to change their subsistence and settlement choices by focusing on small food parcels and having to move to less accessible areas. Observations from Borrow Pit Midden and other sites in the study area do not support this scenario. Instead, their records suggest flexible adaptive responses among foragers when at coastal and pericoastal locations. Overall, an opportunistic subsistence strategy was practiced mostly within the immediate surrounding environment of camps with high mobility, characterizing forager settlement. The components of a new cultural-contact model are emerging, but much remains to be done before it is established on a reliable empirical foundation.

Just Before Van Riebeck: Glimpses into terminal LSA lifestyle at Connies Limpet Bar, West Coast of South Africa

Jerardino, A., Horwitz, L. K., Mazel, A. and Navarro, R. 2009.

South African Archaeological Bulletin 64(189): 75-86.

Stone Age signatures in northernmost South Africa: archaeology of the Vhembe-Dongola National Park and Vicinity.

Kuman, K., Gibbon, R.J., Kempton, H., Langejans, G., Le Baron, J., Pollarolo, L., Sutton, M. (2005).

In: Backwell, L., D'Errico, F. (Eds.), *From Tools to Symbols: From Early Hominids to Modern Humans*. Witwatersrand University Press, Johannesburg: 163-182.

ABSTRACT: The oldest archaeological sites currently known in northernmost South Africa are

found in the Mapungubwe National Park (formerly known as the Vhembe-Dongola National Park) and neighbouring farms, where there is a widespread distribution of open-air sites in deflated contexts. They are sealed by Holocene sands, which at some of the sites contain Later Stone Age (LSA) artefacts. The industry to which the older assemblages are most comparable is final Earlier Stone Age (ESA) in character, with parallels to the Sangoan Industry, or what has locally been proposed as the Charaman from Zimbabwe. A developed phase of the Middle Stone Age (MSA) with segments and retouched points is also represented on one landscape. Rockshelter sites are being investigated to locate stratified deposits to which the open sites may be compared. In the interim, the material provides a form of 'archaeological signature' that can contribute to the overall evaluation of Stone Age occupations in northernmost South Africa. Large-scale climatic fluctuations during the course of the Pleistocene have influenced occupations across southern Africa. The archaeology of the Mapungubwe area appears to have more in common with developments north of the Limpopo than it does with the South African sequence.

Remains of the day-preservation of organic micro-residues on stone tools.

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ABSTRACT: Here I report on the decay processes of microscopic organic residues left on stone tool surfaces after their use. Residue analysis on ancient stone tools facilitates reconstruction of past activities. This study enables predictions about the circumstances under which ancient residues preserve. Experimental tool sets with modern residues were buried for a year in separate deposits at Sterkfontein, Sibudu (South Africa) and Zelhem (the Netherlands) whose pH and geomorphology varied, they were then analysed using light microscopy. Biological weathering mainly causes residue decay. In unstable environments rich in microbes and micro-organisms, residues decay quickly. From an archaeological perspective this means that sites that are stable, desiccated, waterlogged, extremely acidic or alkaline and extremely cold or hot sites. Different residue types have different preservation optima and this may lead to a preservation and perhaps interpretation bias. The

preliminary predictive models presented in this paper could aid in the considered selection of sites and samples.

PIXE and residues: examples from Sterkfontein and Sibudu, South Africa.

Langejans, G.H.J. (2007). South African Archaeological Bulletin, 62: 71-73.

ABSTRACT: This study used micro-PIXE (Proton Induced X-ray Emission) to examine microscopic residues from experimental and archaeological samples. In contrast to previous studies, which analysed the tool surface, residues were extracted and then mounted on custom made mylar slides. The first results are not conclusive and future research should focus on using chemical methods. The study contributes to the debate on the composition of use-wear polish on stone tools. Polish layers are too thin to be analysed with PIXE, and a form of extraction may therefore be better.

Starch grain analysis on Late Iron Age grindstones from South Africa

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ABSTRACT: This study examined starch grains from a number of Late Iron Age grindstones to verify the presence of maize at Thabazimbi 2427 CB14, a sixteenth/seventeenth century site in Limpopo Province, South Africa. To analyse the archaeological samples, it was necessary to create a comparative collection and secondly a starch grain typology. Typical starch grain assemblages helped to identify different storage organs, such as tubers, beans and seeds. I analysed samples from 18 grindstones, including some from Mgoduyanuka, the oldest site so far to yield carbonised maize cobs. Because maize and sorghum overlap in grain shape and size, and because the archaeological samples contained few starch grains, I was unable to verify the presence of maize at the Thabazimbi site.

Holocene palaeoenvironments of the Cederberg and Swartruggens mountains, Western Cape, South Africa: Pollen and stable isotope evidence from hyrax dung middens

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ABSTRACT: The use of pollen analysis of herbivore middens in arid and semi-arid areas has facilitated palaeoenvironmental reconstruction and interpretation in places where this may otherwise be impossible due to the absence of organic sediments. This paper presents evidence based on pollen analysis and stable isotope data of hyrax (*Procavia capensis*) dung middens in the reconstruction and interpretation of the Holocene vegetation history of the Cederberg and Swartruggens mountains. Hyrax middens from upland sites in the Cape Fold Mountains, specifically at Katbakkies Pass (KB) in the Swartruggens and Truitjes Kraal (TK) in the Cederberg, are used to reconstruct past vegetation and palaeoenvironments. Radiocarbon dating of a 20 cm sample at Katbakkies confirms a late Holocene sequence, with sedimentation commencing around 3700 cal yr BP and terminating within the last 600 years. At Truitjes Kraal, a smaller (11 cm) section appears to represent much of the Holocene, with accumulation spanning the period from around 9500 to 1300 cal yr BP. Stable isotope and pollen analyses concur in indicating only relatively subtle changes in vegetation conditions over the Holocene, a conclusion that is compared with and supported by other palaeoecological evidence from the region.

Reconstruction of environmental and climate changes at Braamhoek wetland, eastern escarpment South Africa, during the last 16 000 years with emphasis on the Pleistocene-Holocene transition.

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ABSTRACT: A paleo-environmental record covering the last 16 ka (16,000 cal yrs BP) from the eastern areas of the summer rainfall region in South Africa is presented. This area is until now sparsely investigated due to the lack of well preserved

natural archives. For this study, we used a peat section from a wetland situated close to the Drakensberg escarpment, where the high annual rainfall amounts supported a continuous peat accumulation since c. 16 ka. One peat core was analysed in terms of fossil pollen composition, carbon and nitrogen content, isotope composition and microscopic charcoal concentration. The greatest degree of temporal resolution was achieved from the late Pleistocene and early Holocene section, where proxy-records indicate relatively dry conditions between ca. 16–13.7 ka, 12.8–10.5 ka, 9.5–8.2 ka, and wet conditions between c. 13.7–12.8 ka and 10.5–9.5 ka. A weak moisture signal is also evident at c. 8.2–7.5 ka. The late Pleistocene to early Holocene period was relatively cool, while conditions became generally warmer after 11–8 ka. The interpretation of the mid- and late-Holocene sequence is limited due to a slow accumulation and low sample resolution, but the available data suggest relatively dry conditions until c. 1.5 ka, followed by more humid conditions until c. 0.5 ka. We suggest that the millennial scale variability within the record can be attributed to shifts in the circulation systems dominating the region, i.e. the latitudinal movements of the inter-tropical convergence zone (ITCZ) and the dynamics of the mid-latitude low pressure belts.

[A key to morphogenera used for Mesozoic conifer-like woods.](#)

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ABSTRACT: There are many problems encountered in the literature in fossil wood taxonomy and nomenclature because the early descriptions and typifications do not match up to the rigors of modern methods and the much larger database that we now have. Redescriptions of specimens and misinterpretation of diagnoses have compounded the problems. In an attempt to correct these problems, we have reviewed the literature for the Mesozoic conifer woods, checked type material wherever possible and listed the most up to date and correct generic names (according to the IBCN). To make wood taxonomy easier to apply we have provided some clarity on terminology not covered by the IAWA Committee

[IAWA Committee, 2004. IAWA list of microscopic features for softwood identification. IAWA J. 25, 1–70.] and produced a key for identification.

Houlbert's types for fossil wood: lectotypification and taxonomic reappraisal of *Abietoxylon*, *Ambaroxylon* and *Taxoxylon*.

Philippe, M., Bamford, M.K. 2009. *Taxon* 58, 1349–1356.

ABSTRACT: In 1910 Houlbert validly published five names for wood morphogenera: *Abietoxylon*, *Ambaroxylon*, *Cupressoxylon*, *Juniperoxylon* and *Taxoxylon*. The material on which these five names were based has never been reviewed and was considered as lost. We located the repository of Houlbert's material, and had the opportunity to study original slides. However slides are lacking for two of these five morphogenera (*Cupressoxylon*, *Juniperoxylon*). We were able to determine which slides were used for the original illustrations for the remaining three genera and to choose lectotypes. Only short *descriptiones generico-specifica* were given by Houlbert for these names, without any details of characteristic features. Taxonomic reappraisal of the material on which the names are based provided evidence that their systematic relationships are dubious since sample preservation is poor and Houlbert misinterpreted some crystallographic features as features of the wood structure. We therefore advise against the use of the names *Abietoxylon*, *Ambaroxylon* and *Taxoxylon*. From our observations and the original descriptions Houlbert's type samples for *Abietoxylon*, *Cupressoxylon*, *Juniperoxylon* and *Taxoxylon* very probably belong to a single morphogenus.

Site formation at Kudu Koppie: A late Earlier and Middle Stone Age site in northern Limpopo Province, South Africa

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ABSTRACT: In the Mapungubwe National Park, near the confluence of the Shashe and Limpopo Rivers along South Africa's northernmost borders with Botswana and Zimbabwe, the site of Kudu Koppie is characterized by three lithologically and archaeologically distinct Stone Age units. From bottom to the top, these units are: (1) the Lower Kudu Koppie Unit (LKKU), which includes large tools such as handaxes, picks and cleavers, characteristic of a late Earlier Stone Age phase; (2) the Middle Kudu Koppie Unit (MKKU), which contains bifacially retouched points characteristic of a Middle Stone Age (MSA) industry; and (3) the Upper Kudu Koppie Unit (UKKU), which has sporadic segments and other tools characteristic of the Later Stone Age (LSA). A refitting and nodule analysis, which matches lithic pieces based on microscopic similarities in colour, texture, and other visible characteristics, demonstrates that site formation processes have caused some vertical displacement of material within, but not between the LKKU and MKKU. Within the national park, the Kudu Koppie sandstone outcrop is unusual in that it has an overhanging structure, which undoubtedly contributed to the initial formation and eventual preservation of the archaeological deposits. This paper presents several lines of evidence indicating that stratigraphic integrity at Kudu Koppie has been preserved and that the three horizons are in primary or near-primary context.

[The luminescence chronology of dune development on the Maputaland coastal plain, southeast Africa](#) Naomi Porat^a and Greg Botha^b

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ABSTRACT: Geomorphological and lithostratigraphic mapping of dune systems on the Maputaland coastal plain of northeastern KwaZulu-Natal Province, South Africa has defined the relative-age relationships between the complex pattern of Quaternary parabolic and hummocky dunes, sand megaridges and the composite coastal barrier dune cordon. Here infrared-stimulated luminescence (IRSL) ages are presented in the context of regional stratigraphic relationships and serve to bracket the period of accumulation of the main dune systems. The luminescence ages challenge the widely held belief that the north-south aligned dune pattern reflects a coastward-younging sequence. The framework of ages highlights the spatial variations in dune mobilization and long accretion history on some

dune forms. Weathered dune and interdune wetland sediments spanning from prior to marine isotope stages (MIS) 11 and up to MIS 7 underlie the coastal plain. At least two generations of decalcified aeolianite of MIS 5 and 4 form the core of the complex coastal barrier dune. On the coastal plain, frequent sand mobilization events during MIS 3-2 resulted in the development of discrete complexes of highly extended, northward directed parabolic dune systems and reworking of the crest of the central sand megaridge. The luminescence-dated dune mobilization history brackets the period of formation of interdune and lacustrine peat and diatomite deposits. During the Holocene marine transgression at least four laterally extensive, complex transverse ridges of coalesced ascending parabolic dunes accreted against the aeolianite core of the coastal barrier. Polyphase dune formation and remobilization is discussed in the context of the regional groundwater and vegetation responses to global climatic changes, wind regimes and glacio-eustatic sea-level fluctuations.

[Novel double wing morphology revealed in a South African ovuliferous glossopterid fructification: *Bifaria intermittens* \(Plumstead 1958\) comb. nov.](#)

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ABSTRACT: Plumstead (1958) established *Hirsutum intermittens* for glossopterid fructifications with a putative bi-sporangiate, bi-valved architecture but later workers reinterpreted the fossils predominantly as ovuliferous, dorsiventrally flattened, bilaterally symmetrical organs, with a central seed-bearing receptacle and a single finely striate peripheral wing. The wing morphology is central to both the generic and specific diagnoses. New analysis of many South African impressions reveals the presence of two superposed wings flanking the flattened receptacle of *H. intermittens*. One wing is radially fluted and striated with rounded basal lobes, whereas the other has distinctive distally arched striations and an extended apex. The double-winged structure is unlike that of other glossopterid fertile organs and probably accounts for Plumstead's misinterpretation of the fructification as bivalvate.

The specimens are assigned to *Bifariola intermittens* (Plumstead, 1958) comb. nov., emend. Prevec because *Hirsutum* is unacceptable according to ICBN rules. Revelation of novel architectural details highlights the value of impression fossils for resolving the gross structure of gymnosperm fertile organs. The newly defined second wing provides an additional character to be considered in the search for homologies of the ovule outer integument or cupules in derived seed-plants.

[Portrait of a Gondwanan ecosystem: A new Late Permian locality from KwaZulu-Natal, South Africa.](#)

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ABSTRACT: The Clouston Farm locality, assigned to the Lopingian Epoch and occurring within the Normandien Formation of the northeastern Karoo Basin, provides evidence for a community of diverse vascular plants occupying riparian woodland. The depositional environment is interpreted as an abandoned trunk channel that preserved a megaf flora in slack-water phases punctuated by overbank deposits from rare flood events. Of 9772 plant specimens tabulated from an unbiased census of all fragments greater than ~ 1 cm², there are 51 distinct organ morphotypes, including glossopterids, sphenopsids, and ferns, collectively represented as foliage, axes, fructifications, and dispersed seeds. Of the 11 most abundant morphotypes 10 are glossopterid morphotypes or variant subtypes, in addition to a sphenopsid. Glossopterid morphotype dominance also is reflected in the palynoflora. Palynological data indicate a Wuchiapingian age for the locality. A specimen of the dicynodont '*Oudenodon*,' found in a nearby stratigraphically equivalent outcrop, is attributable to the *Dicynodon* Assemblage Zone, assigned a younger Changhsingian age. A rich record of plant–insect associations demonstrates

an elevated frequency of external foliage feeding by mandibulate insects and lower incidence of oviposition by palaeodictyopteroïd and odonatopteroïd taxa. Evidence for piercing-and-sucking and galling is rare. The most abundant plant taxon (glossopterid Morphotype C2a) is the most intensively herbivorized, overwhelmingly by external feeding and ovipositing insects. Insect damage on this host is beyond that predicted by floristic abundance alone. This specificity, and high herbivory levels on other glossopterid taxa, demonstrates extension of the Euramerican pattern toward the preferential targeting of pteridosperms. The Clouston Farm site provides a glimpse into a late Permian ecosystem of primary producers, herbivores, and insectivores—a prelude to the crisis that engulfed life at the end of the period.

[The engineering and geotechnical conditions for the Pietermaritzburg 2930CB 1:50,000-scale map sheet.](#)

Richards, N.P., Botha, G.A., Schoeman, P., Clarke, B.M., Kota, M.W., Ngcobo, F.N. (2008). Council for Geoscience, 76 pp.

[West Coast Dune Plumes: Climate driven contrasts in dunefield morphogenesis along the western and southern South African Coasts.](#)

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ABSTRACT: This study examines two major late Quaternary coastal dune systems situated in the southwestern-most extremity of Africa. The False Bay and Duinefontyn dune plumes formed in close proximity, but under contrasting oceanographic regimes (warm Agulhas and cold Benguela oceanic current systems respectively). The False Bay and Duinefontyn dune plumes have hitherto lacked the objective, numerical chronology required to realize their full potential in unraveling the complex

palaeo-oceanographic and palaeoclimatic history of the region. Here we present a dual amino acid racemization (AAR) and optically stimulated luminescence (OSL) chronological framework from the extensive three dimensional exposures in sea cliffs.

At False Bay, three generations of dune deposition, corresponding with orbitally forced climatic/sea level cycles (MIS 7, MIS 5 and Holocene) were resolved, whereas the Duinefontyn Plume is dominated by MIS 5 and Holocene sedimentation. At False Bay and Duinefontyn, glacial periods are marked by the development of mature palaeosols, confirming the link between glacio-eustasy and dune deposition determined previously on the west and southern coasts of South Africa.

Along the west coast dune plumes typify dunefield morphology, whereas shoreline-parallel dune cordons are commonly developed on the southern coast. These regional variations in dune system morphogenesis are largely controlled by contrasting wind and rainfall patterns. The attenuated dimensions of the MIS 5 plumes at False Bay and Duinefontyn may indicate a weakening of the South Atlantic Anticyclone during the Last Interglacial. At False Bay, stone artifacts illustrate a human presence in the region during MIS 7.

[Holocene landslides in KwaZulu-Natal, South Africa](#)

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ABSTRACT: The devastating impact of landslides and secondary instability associated with their unconsolidated debris deposits due to weathering, settlement and groundwater seepage are significant geological threats. Mass movements can impact negatively on urbanisation and represent a critical factor determining land use zonation during town and regional planning.

Mapping and classification of mass movement deposits in the KwaZulu-Natal Province highlighted the more widespread extent of these Quaternary geomorphic disequilibrium indicators than is commonly appreciated. Many of the largest occurrences mapped are palaeo-landslides located in areas of high relief and steep slopes in the Ukhahlamba-Drakensberg footslopes and the major river valleys. Some of these events

temporarily blocked river channels resulting in changed channel and floodplain morphology. However, the majority of the landslides identified are smaller, more recent, localized occurrences associated with high intensity rainfall events. Accelerator Mass Spectrometry (AMS) or radiocarbon dating of bulk organic material derived from ponds on back-tilted surfaces (sag ponds) of the palaeo-landslides has yielded minimum ages for the landslide events.

[Newly discovered fossil- and artifact-bearing deposits, uranium-series ages, and Plio-Pleistocene hominids at Swartkrans Cave, South Africa.](#)

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ABSTRACT: We report on new research at Swartkrans Cave, South Africa, that provides evidence of two previously unrealized artifact- and fossil-bearing deposits. These deposits underlie a speleothem dated by the uranium-thorium disequilibrium technique to 110,000_1,980 years old, the first tightly constrained, geochronological date available for the site. Recovered fauna from the two underlying deposits including, prominently, the dental remains of *Paranthropus (Australopithecus) robustus* from the uppermost layer (Talus Cone Deposit) indicate a significantly older, late Pliocene or early Pleistocene age for these units. The lowest unit (LB East Extension) is inferred to be an eastward extension of the well-known Lower Bank of Member 1, the earliest surviving infill represented at the site. The date acquired from the speleothem also sets the maximum age of a rich Middle Stone Age lithic assemblage.

[Climate controls on late Pleistocene landscape evolution of the Okhombe valley, KwaZulu-Natal, South Africa](#)

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ABSTRACT: Hillslopes in central and western parts of KwaZulu-Natal, South Africa are often mantled by colluvial sediments of the Masotcheni Formation. These sediments have accreted in response to several cycles of deposition, pedogenesis and incomplete erosion. Climatic controls on these cycles are incompletely known. Results from fieldwork, micromorphology, stable carbon isotope analysis and Optically Stimulated Luminescence dating of Masotcheni Formation sediments from Okhombe valley in the Drakensberg foothills are combined. Deposition in the area had at least 11 phases, starting before 42 ka and ending before 0.17 ka. The first six deposits (from before 42 ka to after 29 ka) resulted from the interplay between slope processes and fluvial redistribution under cold conditions. Solifluction was the most important slope process. No deposits have been found from the Last Glacial Maximum, arguably because this period was too dry. The last five deposits (from about 11 ka to before 0.17 ka) resulted from fluvial redistribution of upslope material and older deposits under increasing precipitation. Current extreme gully erosion in the Masotcheni Formation indicates a lack of available upslope material, leaving downslope deposits as the only sediment source for fluvial redistribution. This model for landscape response to climate change may be able to explain how climate controlled landscape processes in other Masotcheni Formation sites in KwaZulu-Natal. In the research area and elsewhere, this proposition may be tested with numerical landscape evolution models.

[Isotopic evidence for contrasting diets of early hominins *Homo habilis* and *Australopithecus boisei* of Tanzania.](#)

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ABSTRACT: Isotopic dietary studies of early hominins have hitherto been confined to specimens from South Africa. We are now able to report isotopic analyses of two species of early hominins from Tanzania: *Homo habilis* and *Australopithecus boisei*. The results show that these two species had very different diets. The isotopic analyses of three South African species of early hominins, in contrast, show considerable variation in individual diets, but no marked differences between species.

[Prepared core reduction at the site of Kudu Koppie in northern South Africa: temporal patterns across the Earlier and Middle Stone Age boundary](#)

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ABSTRACT: Kudu Koppie is a stratified late Earlier Stone Age and Middle Stone Age archaeological site located in the northern Limpopo Province of South Africa. The prepared core reduction strategies are described and temporal trends across the ESA–MSA boundary are presented. The prepared cores and endproducts of Kudu Koppie suggest that both the late ESA and MSA toolmakers employed the Levallois Volumetric Concept, but they often exploited a nodule's natural convexities and form. The MSA toolmakers used a greater variety of prepared core methods and more intensively exploited cryptocrystalline and microcrystalline nodules, the scarcity of which may have resulted in a more "formalized" application of the Levallois Volumetric Concept. These observations are considered within the context of human behavioural evolution.

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FIRST CIRCULAR AND CALL FOR PAPERS
EASTERN AFRICAN QUATERNARY RESEARCH
ASSOCIATION (EAQUA) 3rd WORKSHOP



AND THE PAGES PALEO-SCIENCE OUTLOOK
THE EAST AFRICAN QUATERNARY:

On- and off-shore: Eastern Africa during the last 100 ka

Zanzibar, Tanzania, 8-13 February 2011

BACKGROUND

EAQUA was established on June 7, 2007 in Kampala, Uganda with the mission of enhancing the growth of Quaternary Science community in the eastern and central African region through training, promotion of collaborative research and information exchange on Quaternary Science issues. The 3rd Workshop of EAQUA is planned to be held on 8-13 February 2011 at the Institute of Marine Sciences, University of Dar es Salaam, Tanzania. The primary objective of the third meeting is to unite and enhance active communication on Quaternary research issues on palaeoclimate, palaeoenvironment, archaeology, palaeontology and palaeoanthropology under a general theme of On- and off-shore: Eastern Africa during the last 100 ka.

Over the last one hundred thousand years (100 ka) Eastern Africa had experienced glacial-interglacial climatic cycles. These changes had impact on social and cultural structure. Furthermore, for the last 1000 years interaction of the Eastern African people with the rest of the world has been high and to a certain degree influenced by the monsoon winds variability. These climatic changes and exposure of the Eastern African people to the rest of the world forced communities to adopt various resources management strategies to cope with overexploitation problems. However, documentation of these events in the region is poor. Thus, the Workshop is expected to bring

together East African Quaternary scientists and students for exchanging information and to assess the opportunities and challenges in research, training and capacity building. The workshop is also expected to be a forum for strengthening and networking the East African Quaternary community.

The sub-theme of the On- and off-shore: Eastern Africa during the last 100 ka are

- i) Late Pleistocene-Holocene climate variability –forcing and proxies
- ii) Trade and archaeological record in Eastern Africa
- iii) Recent trends in climate change – impacts, adaptation and vulnerability assessment for Eastern Africa

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DATES

Registration: Monday, 8 February 2011

Scientific Sessions: Monday 8 February – Wednesday 10 2011

Association Matters: Thursday, 11 February 2011

Field Excursion: Friday, 12 February – Saturday, 13 February 2011.

Details of hotels, cost of registration, etc. will be communicated later.

EXPRESSION OF INTEREST

Please fill in the form of intention of attending and/or contributing to the conference

Name

Institution

Email address

Likely/possible attendance

Likely/possible to offer presentation

Likely topic and/or title

Likely to request funding