PalNews

Biannual newsletter for the Palaeontological Society of Southern Africa



Life reconstruction of Inostrancevia africana depicted as a newcomer to the Karoo Basin, scaring away a member of the 'African' gorgonopsian lineage (Cyonosaurus) from the carcass of a Lystrosaurus maccaigi. Art by Matt Celeskey.

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PalNews returned this April after a three year hiatus. The issue was brimming with news and updates from across the globe, and it was a great pleasure to read about the collective adventures and achievements of our community.

So far 2023 has proven to be a busy year, as evidenced by the multitude of exciting anecdotes and updates in this wonderful October issue. I offer my sincerest thanks to everyone who contributed to PalNews this year. Thank you for regaling us with fascinating stories about your fieldwork, showing us what exciting new projects are underway, and providing a glimpse inside your labs and offices. I hope that everyone has a wonderful holiday season, and I look forward to everything you have in store for our 2024 Autumn Issue.

Sincerely

Caitlin Rabe

PhD Candidate at the University of Cape Town PalNews Editor





PALNEWS OCTOBER 2023



Catching up with Christian Kammerer, North Carolina Museum of Natural Sciences

Christian Kammerer

After a pandemic-induced four year hiatus, it was with great joy that I was able to return to South Africa and continue my research on Permo-Triassic tetrapod faunas of the Karoo Basin this past August-September. The first half of the trip was spent as part of the Qhemegha field team lead by Prof. Jonah Choiniere (University of the Witwatersrand), series working on a of remarkably productive lower Elliot Formation sites in the Eastern Cape. The details of this trip I presume will be covered by ESI-based researchers elsewhere in this issue, but suffice it to say that it was a very successful season, despite disease outbreaks and unexpected weather. Of particular interest to a synapsid specialist such as myself was the recovery of multiple specimens of advanced cynodonts, expanding the record of the group from this assemblage zone beyond the eponymous giant gomphodont Scalenodontoides. Many thanks to all involved for what was certainly a memorable few weeks!

Following fieldwork, I spent a week each working in the collections of the ESI and Iziko, trying to push various ongoing therapsid projects forward. At the ESI, I spent most of my time working on gorgonopsians.



Figure 1: Closing up the quarry for the season, Triassic treasures within. (Volume of earth moved \sim 50% backhoe, \sim 50% Jirah.)

With Prof. Jennifer Botha and Brandon Stuart, I managed to make some progress on comprehensive the description of Inostrancevia africana, the gigantic gorgon known from two specimens (NMQR 3707, a skull and humerus, and NMQR 4000, most of the skeleton) from the upper Daptocephalus AZ in the Free State. Together with Pia Viglietti (Field Museum of Natural History, Chicago) and Elize Butler (formerly of the National Museum, Bloemfontein), Jen and I introduced this taxon in a paper published this past June in Current Biology. It is remarkable for several reasons. One being the first African record of what has, for the past 100 years, been considered a genus

endemic to the Russian Permian fauna. Two being that these specimens represent the only definitive records of large-bodied gorgonopsians in the upper Daptocephalus AZ. The dominant large-bodied gorgonopsians of the late Permian Karoo, the rubidgeines (Rubidgea, Dinogorgon, and the like), have historically been considered Karoo tetrapod the top predators in communities up to the Permo-Triassic boundary.

Using Pia's stratigraphic data, we were able to show that rubidgeines died out before (or very shortly after) the boundary between the lower and upper *Daptocephalus* AZ, and we argue this created a 'power vacuum' permitting takeover of the top predator niche by a different group of gorgonopsians foreign to the basin, the inostranceviines. Of course, additional fossils are needed to test this hypothesis (and there is also the question of what is happening in intervening geographic regions between Russia and South Africa—Chris Sidor has some material from Tanzania that may add wrinkles to this story), but we think it is an interesting idea that fits with what we know about ecosystem destabilization in the latest Permian Karoo.

In addition to working on *Inostrancevia*, I also spent time with Dr. Julien Benoit studying the stratigraphically latest gorgonopsians from the basin (possibly worldwide), a set of three skulls referable to *Cyonosaurus* that had been questionably attributed to Triassic strata, with Zanildo Macungo discussing his dissertation work on the earliest gorgonopsian records from the



Fig. 2. Life reconstruction of Inostrancevia africana depicted as a newcomer to the Karoo Basin, scaring away a member of the 'African' gorgonopsian lineage (Cyonosaurus) from the carcass of a Lystrosaurus maccaigi. Art by Matt Celeskey.

CATCHING UP WITH CHRISTIAN KAMMERER

Eodicynodon and Tapinocephalus AZs, including some spectacular new specimens from recent field trips, and looking at Lycaenops and Aelurognathus specimens as comparative materials for the description of well-preserved Zambian а new. gorgonopsian being described with Fletcher and Chris Sidor (University Levy of Washington, Seattle). It's great that so much work is happening on gorgonopsians now after decades of neglect, and I hope it is not too immodest to attribute this trend to my having finally sorted out large swathes of their taxonomy in recent years.

Speaking of sorting out taxonomy, this year witnessed the publication of several papers

addressing some of the stickier wickets among Karoo therapsids. In the longawaited Rubidge Festschrift issue of Pal. africana, I published a comprehensive revision of the Scylacosauridae, the mostly large-bodied predatory therocephalians of the middle Permian, reducing the 33 species from the Abrahamskraal Fm. to a more manageable seven. The last person to take a crack at this group was Juri van den Heever (professor emeritus, University of Stellenbosch) in his (regrettably neverpublished) PhD thesis, so they were due for a new look, and it is hoped that this group will be more useful biostratigraphically and easier to refer new specimens to from now on.



Figure 3: Back at it again.

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With Mike Day (Natural History Museum, London), I also published a revision of Styracocephalus, describing two specimens formerly referred to this unusual dinocephalian and recognizing that they instead represent middle Permian burnetiamorphs (the other group of weird, pointy-headed therapsids). And as-yetunpublished, but hopefully soon on the way, another contribution, is with David Groenewald (Institut Català de Paleontologia Miquel Crusafont), redescribing and providing stratigraphic context for some truly abysmal but historically important therapsid holotypes from KwaZulu-Natal. Papers like these used to be my bread and butter. I'm finding myself with but progressively less time for them because of other duties, so it was nice to be able to sink some names established by Robert Broom for a scrap of premaxilla again!

Finally, I nominally had some projects I was collecting data for at Iziko, but the vast majority of my time ended up being devoted to identifying the scads of new therapsid specimens collected during the past five years of SAM field work. Lots of important finds among this material, including what will easily be the most complete and bestpreserved/prepared records of several taxa, but of particular interest to me were several new specimens of the obscure dicynodont Digalodon rubidgei, which I redescribed in 2015 with Ken Angielczyk (Field Museum of Natural History, Chicago) and Jörg Fröbisch (Museum für Naturkunde, Berlin) on the basis of the incomplete and distorted holotype (and which Ken revisited in 2019 on the basis of a specimen from Zambia).

Remarkable that less than a decade later it is going to need to be re-redescribed to incorporate all the new data from these much better specimens, given that this taxon had previously been barely mentioned in the literature for the past century. Although there are a great many tribulations in our modern age, the fact that we are living at a time when papers on the anatomy of *Digalodon* are published roughly every four years is certain indication that things are not all bad.

All told, a welcome and productive trip, but not nearly enough time to accomplish everything that I wanted to, so I hope to be returning sooner rather than later.



Updates from The Devonian Ecosystems Project, Albany Museum, Makhanda

Rob Gess

International visitors

The Devonian Ecosystems Project has had an action packed last 6 months, with, amongst other things, visits from a number of international colleagues. In late April and early May Dr Brian Choo of Flinders University in Australia spent three weeks in our lab collaborating on the undescribed Late Devonian (Famennian) Waterloo Farm Ray-finned-fish (Actinopterygian), one on only a handful of Gondwanan Ray-fins known from Gondwana. Brian is the Gondwanan specialist on the subject and has helped to describe the majority of the southern taxa. The Waterloo Farm material includes conspecific examples of wholebodied juveniles as well as disassociated remains of adults. Preliminary results are very exciting, so look out for an interesting story soon.



Top: Artist's impression of the Waterloo Farm Ray-finned fish by Maggie Newman. Bottom: Brian Choo and Rob Gess discussing Ray finned fish anatomy - Ryan Nel.

A week later we welcomed Dr Carole Burrows from Queensland Museum, likewise from our eastward Gondwanan neighbour. Amongst the strings of her bow is being the expert on Gyracanthid (stem chondrichthyan) acanthodians. So, the Waterloo Farm Gyracanthid should soon find its place in Acanthodian/Chondrichthyan taxonomy.



Carole Burrows enjoying the type specimen of Diplacanthus acus during her visit - Ryan Nel.

In September Dr Chris Berry from Cardiff University (Wales) visited us to look at Devonian tree remains from Waterloo Farm, as well as to assist Caitlin Reddy with her MSc project on Waterloo Farm seaweeds. Chris' trip was sponsored by the Uppsala University centred, ERC funded, Tetrapod origins project - that is, amongst other things, studying the environmental settings of the earliest known tetrapods. Chris is the team's palaeobotanist so he was partially out here to get a better idea of the idyllic high latitude home of Tutusius and Umzantsia.

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Left: Chris Berry, Caitlin Reddy, and Rob Gess discussing Waterloo seaweeds that form part of Caitlin's MSc project- Ryan Nel. Right: Chris Berry measuring a piece of *Archaeopteris* trunk in one of the Waterloo Farm rock sheds - Rob Gess.

International visits

Also sponsored by the Tetrapod origins program was my participation in a two week long excavation in Latvia of the Pavari 2 (Famennian, Ketleri Formation) tetrapod bearing site, in July - joining up with Prof Per Ahlberg of Uppsala University and the team of Ervins Lukševičs of the University of Latvia. This was incredibly exciting and interesting. Quite incredibly, compared to our South African Devonian rocks, the sediments of Latvia haven't been subject to any form of diagenesis - Devonian silt is still silt and Devonian mud remains mud. At Pavari, after digging off the overburden we excavated 360-million-year-old bones out of the silt with paintbrushes and out of the clay with the tips of steak knives. It was quite astonishing as the bones are still the mineral portion of the bones themselves, just a bit crumbly due to decay of all the non-mineral component. After being exposed they were stabilised with hardening а agent, pedestalled, jacketed and prepared for in-

the-round preparation in the lab at the University of Latvia in Riga. The site is dominated by the plates of Bothriolepis (placoderm/armour-plated-fish) and the scales and bones of Holoptychius (Lobefinned-fish) - with a smattering of other lobe-finned fish remains, acanthodian spines, and of course tetrapod bones. I also discovered and excavated a bed of wellpreserved plant remains in one of the overlying clay layers, the first ever collected from the Ketleri Formation. I furthermore had the privilege, thanks to GENUS, to spend a few days in Riga, before the fieldtrip, examining the collection at the University. It was unbelievable to, for example, examine an unaltered, original bone, of a Devonian tetrapod jaw with all its original teeth in place.

Ryan Nel also had the benefit of an international study tour, going over to Perth (Australia) for the Palaeo Down Under conference, where he presented on his PhD work on Waterloo Farm placoderms. He was



Top Left: Excavating at Pavari - Ervins Lukševičs. Bottom Left: An immaculately preserved Ventastega (Famennian tetrapod) jaw from Pavari - Rob Gess. Right: Rob with Ervins Lukševičs at Pavari, Latvia - Ligita Lukševičs.

generously hosted by his co supervisor, Prof. Kate Trinajstic (a prominent placoderms specialist), who also facilitated his study, at the West Australian Museum. of 3dimensionally preserved placoderm material from the iconic Frasnian Gogo Formation, some of it with soft-tissue preserved. After the conference Ryan and Kate Trinajstic flew to Sydney to visit the Australian and the Castle Hill Museums, where Ryan spent a week studying an assortment of relevant placoderm material - including specimens from the Mount Howitt and Canowindra localities. Handling three dimensionally preserved placoderm material and discussing it with Kate proved very enlightening towards his quest to understand the flattened material from South Africa. As a result, his project has been progressing by leaps and bounds since his return.

Postgraduate Research

As mentioned above Ryan Nel and Caitlin Reddy are both making excellent progress on their projects, respectively on Devonian placoderms and seaweeds, benefitting from the assistance of international specialist cosupervisors. Broadening his skills Ryan has done segmentation course through а Stellenbosch and is making progress on segmenting three dimensionally preserved placoderm remains from the Bokkeveld Group. Caitlin has also discovered that it is possible to recover some anatomical detail from Waterloo Farm plants using SEM despite the material having undergone lower greenschist metamorphism !

Cait has also written up her 2022 honours project on Gondwana's earliest brittle stars, with added assistance on up-to-date taxonomy from Dr Ben Thuy of the National Museum of Luxemborg, the current expert on the subject. Look out for publication on the 25th October this year in PlosOne.

Chris Harris has been in and out of the lab, looking at (and adding to) our trace fossil collection, as well as measuring Witpoort sections – whilst working towards completing his PhD on Witpoort Formation stratigraphy and sedimentology.





Top: Ryan examining a placoderm fossil from Mount Howitt in the Australian Museum in Sydney - Kate Trinajstic. Bottom: Chris Harris pondering the sedimentology of the Witpoort Formation near Steytleville - Rob Gess.

Curation

Shawn Johnstone (employed with Millennium Trust funding) has been very busy, amongst other things, with updating the cataloguing system of our several thousand specimens, addition in to integrating the steady trickle of additional material coming into the lab. Shawn has benefitted from training workshops by the NSCF and participated in the national NSCF collections audit. He is hoping to acquire funding for 2024 in order to migrate our catalogue and metadata onto Specify.

Outreach

Our outreach program continues to bring awareness of our Devonian fossil heritage to both adults and learners. Our gallery enjoys a steady stream of visitors with (Millennium Trust sponsored) outreach officer Khokela Camagu always a great hit with visitors. Over the National Arts festival we had hundreds of visitors who also showed their enthusiasm by snapping up our range of coffee mugs, fridge magnets and stickers – the latter items being one of the various creative initiatives of Shawn Johnstone. Shawn, with the assistance of other lab members, is also working on exciting extensions to our gallery which should be unveiled soon.

Apart from school groups visiting our gallery, project members have also taken our research out to schools. Khokela and Caitlin, for example, enthused 160 learners from the Good Shepherd primary school in March, leading many of them to later visit our lab. Ryan has been to Queenstown/Komani to present to Queens College Boys High School in April. I have also given a number of public talks on the Waterloo farm ecosystem and

UPDATES FROM THE DEVONIAN ECOSTYSTEMS PROJECT

have been busy presenting Palaeontology and Evolutionary Biology modules to Rhodes Zoology and Geology undergraduates; whilst Ryan taught the Geology/Palaeontology component of Rhodes Extended Studies program.



Top Left: Khokela Camagu teaching a school group in the Devonian gallery – Ryan Nel. Bottom Left: Ryan Nel teaching at Queens College. Top Right: Cait Reddy and Shawn Johnstone manning a display at Rhodes Rocsoc function – Sherily Ndlovu. Bottom Right: Rob and Ryan at Provincial Museum Day discussing Waterloo Farm with DSRAC MEC Nonceba Kontsiwe – Linda Dyani.



News from the Mass Extinction Lab at Wits

Jennifer Botha and Brandon Stuart

News from Jennifer Botha

It's been aeons since I last contributed to Palnews and, unfortunately, I did not manage to give a detailed account of my news in the last issue as too much was happening at once, but now I'm finally able to formally announce my move from the National Museum in Bloemfontein to the University of the Witwatersrand in Johannesburg (for those who do not already know). I have taken up a Professorship at the Evolutionary Studies Institute and have been heartily welcomed by ESI staff. It is wonderful to feel a part of a system that actively encourages research, and it already feels like home. It is also fantastic to finally work under the same roof as all three of my PhD students, Bailey Weiss, Brandon Stuart and Atashni Moopen.



Extinction lab at PSSA 2022. From left to right, top row: Bailey Weiss, Prof Jennifer Botha, Brandon Stuart, Dr Kimberley Chapelle (past PhD student). Bottom row: Enele Twala (past honours student), Atashni Moopen.

However, in a way I have taken up two positions at Wits as from January 2023 I was made Interim Director and then a few months later, Director of GENUS: DSI-NRF Centre of Excellence in Palaeosciences. This is a very different position to anything I have done previously and there has been much to learn this year. I spent some time travelling to our various partners around the country to assess the status of GENUS palaeoscience researchers. students. and other stakeholders, as well as getting to know our colleagues at the Department of Science and Innovation and National Research Foundation. Trying to balance what is needed by grantees with what is expected by our funders is not easy, but I will do whatever is within my power to make research easier for the South African palaeosciences community. We still have a long way to go, but I am cautiously optimistic that GENUS will be around for some time yet and our motto is "We're here to help".

News from the Chop Shop

As part of the ESI position, I am very grateful to have been given laboratory space (twice as large as my previous lab!) for my osteohistology laboratory, which my students now fondly refer to as "The Chop Shop". Unfortunately, due to some rather bureaucratic delays my laboratory only became functional in September, so some of my projects are rather far behind. However, now that the lab is up and running again, I am hoping to catch up very soon and continue with my current main focus, which is investigating the Triassic continental ecological reorganization from a nonmammalian synapsid to an essentially archosauromorph dominated landscape.



Jennifer Botha showing Nathan Sassman and Malekgotla Finger (RCCE: NRF Research Chairs and Centres of Excellence) the new osteohistology laboratory at the University of the Witwatersrand.

My colleagues, students and I still managed to complete several projects during 2023 from data that had already been collected prior to the move; some osteohistology projects such as the smallest known sauropodomorph and a new giant species of crocodylomorph, as well as several nonosteohistological projects such as the new species of gorgonopsian *Inostrancevia africana* and new data on the end-Permian mass extinction.

News from Brandon Stuart

I completed my MSc thesis at the University of the Free State in Bloemfontein under the supervision of Prof Botha in 2022. My MSc research focused on describing the postcranial anatomy of two of the most wellknown therocephalians from the Karoo



Reconstruction of the new giant species of gorgonopsian, Inostrancevia africana, the latest surviving gorgonopsian in South Africa, eating a Lystrosaurus. Art by Matt Celeskey.

Basin, Moschorhinus kitchingi and Theriognathus microps. This year, I joined Prof Botha at the University of the Witwatersrand in Johannesburg to pursue a PhD degree through the Evolutionary Studies Institute. Building on the work from my MSc, my PhD research is focused on understanding the palaeobiology and evolutionary history of therocephalians.

The therocephalians were a diverse and ecologically important clade of eutheriodont therapsids that lived from the middle Permian to the Middle Triassic. I am studying new material that spans the entire temporal range of the clade to supplement morphometric and functional analyses and building a robust phylogenetic dataset that primarily concerns the inclusion of new postcranial characters. Ultimately, this will light on the evolution of shed the therocephalian skeleton and reveal the underlying evolutionary trends that contributed to their success during global biodiversity crises.

While this year has gone by in a flash, it has been filled with wonderful experiences including multiple excursions to incredible field sites in South Africa, a research visit to the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, good times with new friends at Wits, and the greater palaeoscience community as a whole. As for the rest of the year, I am wrapping up some projects that stem from my MSc research and am continuing to work towards my PhD.



Brandon Stuart and a partially complete skeleton of *Theriognathus microps.*

Fieldwork at Nooitgedacht 68

One of the highlights of this year was a longawaited expedition to the Permo-Triassic boundary (PTB), nestled on the slopes of Loskop and Spitskop on the farm Nooitgedacht 68 just outside of Bethulie in the Free State. This trip formed part of previous work that has been done at this locality concerning the stratigraphy, chronology, and faunal assemblages of the PTB. As my (Brandon) entire postgraduate career has solely revolved around studying therocephalians from the late Permian and Early Triassic, including specimens that have been recovered from this site, it was

particularly special for me to walk among the outcrops of this magnificent locality.



Top: Nooitgedacht 68 farm gate with Spitskop in the background - Brandon Stuart. Bottom: The Permo-Triassic boundary section of outcrop on Loskop - Brandon Stuart.

Our team consisted of the prolific scientists and fossil finders Jennifer Botha, Roger Smith, and Derik Wolvaardt, а geochronologist Scott Maclennan, the GENUS science communicator Mariëtte van der Walt, and my fellow PhD student Bailey Weiss. The primary goal of this trip was to collect sediment samples for radiometric dating to better constrain the chronology of the PTB as well as the overlying Katberg

Formation. However, as Bailey and I are by no means sedimentologists, our main goal was to find as many fossils as we could. I was on the hunt for therocephalians in particular to find a second specimen of a new peculiar Triassic therocephalian taxon that is forming a component of my PhD, which was recovered from this locality.

Of course, as going into the field in the middle of July in the Free State is a perfectly sane idea, we were greeted in the mornings by the icy winter wind and found ourselves navigating around the slopes of Loskop and Spitskop trying to follow the path of the warm sun. Across several days Jennifer, Roger, and Scott carefully surveyed the stratigraphy of the koppies to identify the best sections to sample while Bailey, Derik, and I were trying to find anything, but Undoubtedly, Lystrosaurus. we found multiple specimens of Lystrosaurus, including some nice articulated skeletons found by Derik, and multiple skulls found by the rest of us.

Some other notable finds were а therocephalian lower jaw and partial skeleton, therocephalian anterior two skeletons in the same nodule, a theriodont some archosaur snout. and remains. Although, I did not find another specimen of our new therocephalian taxon affectionately called 'stubby nose', I did manage to find a small nodule that encased a tiny skull and skeleton of, you guessed it, Lystrosaurus.

At the end of the day, it was a spectacular trip. Our nights were spent with good food next to an inviting fire and, while surrounded by the book lined walls of the Royal Hotel Bethulie, we contemplated the amount the hotel must pay for fire insurance! For more scenic content of this trip please go check out the GENUS <u>article</u> and <u>video</u> from the talented Mariëtte van der Walt.



Partially prepared, tiny, articulated juvenile *Lystrosaurus* discovered by Brandon Stuart on the slopes of Nooitgedacht 68, prepared by Tiffany van Zyl.



The hallway of the Royal Hotel Bethulie - Bailey Weiss.

2023 publications

- 1. Botha, J., B. M. Weiss, K. Dollman, P. M. Barrett, R. B. J. Benson and J. N. Choiniere. 2023. Origins of slow growth on the crocodilian stem-lineage. *Current Biology* 33:1-8. <u>https://doi.org/10.1016/j.cub.2023.08.057</u>
- 2. Chapelle, K. E. J., J. Botha, and J. N. Choiniere. 2023. Small bodied sauropodomorph from the upper Elliot Formation of South Africa. Royal Society Open Science 10: 221565. <u>https://doi.org/10.1098/rsos.221565</u>
- Kammerer, C. F., P. A. Viglietti, E. Butler and J. Botha. 2023. Rapid turnover of top predators in African terrestrial faunas around the end-Permian mass extinction. *Current Biology* 33: 1-8. <u>https://doi.org/10.1016/j.cub.2023.04.007</u>
- 4. Groenewald, D. P, R. M. H. Smith and J. Botha. 2023. Fossil millipedes associated with articulated tetrapod skeletons in the Early Triassic Karoo Basin, South Africa. Palaeogeography, Palaeoclimatology, Palaeoecology 617: 111508. https://doi.org/10.1016/j.palaeo.2023.111508
- 5.F. Abdala, L. Norton, S. C. Jasinoski, J. Botha, V. Fernandez, B. Rubidge, P. G. Gill and A. G. Martinelli. 2023. On taxonomic issues, ontogenetic series and tooth replacements. Comments on Diphyodont tooth replacement of *Brasilodon*—A Late Triassic eucynodont that challenges the time of origin of mammalsby Cabreira et al. *Journal of Anatomy*. <u>https://doi.org/10.1111/joa.13803</u>
- 6.Shen, J., J. Chen, J. Yu, T. J. Algeo, R. M. H. Smith, J. Botha, T. D. Frank, C. R. Fielding, P. Ward and T. A. Mather. 2023. Mercury evidence from southern Pangea terrestrial sections for end-Permian global volcanic effects. *Nature Communications*. <u>https://doi.org/10.1038/s41467-022-35272-8</u>



News from Kimi Chapelle at GeoBerlin 2023

Kimberley Chapelle

In December 2022, I was invited by Mike Benton (University of Bristol, UK) and Emma Dunne (Friedrich-Alexander-Universität Erlangen-Nürnber, Germany) to be the kevnote speaker for their symposium entitled "Triassic Revolution" at the GeoBerlin meeting (3-7 September 2023). As this was my first keynote talk invitation, I jumped on the occasion. Also, any opportunity to talk about the Triassic of South Africa is one that I cannot pass up!

I arrived in Berlin on Sunday the 3rd of September, where I met up with ESI alum Kathleen Dollman (now at the European Synchrotron Radiation Facility) at Berlin Brandenburg Airport. We jumped on the train to our accommodation, a small but charming hotel southwest of the centre of Berlin. Once freshened up, we took a 25minute stroll towards Freie Universität Berlin to register for the meeting and join the ice breakers. There, we ran into some friends and colleagues and went to a nearby beer garden for dinner where we got to try our first flammkuchen (the German equivalent of pizza) and spaetzle and cheese.

Monday was the first day of the "Triassic Revolution" symposium where we enjoyed listening to talks on a variety of Triassic topics, including Kathleen's talk on "From the field to the synchrotron, investigating the early Triassic recovery fauna from Driefontein, South Africa", "Tetrapods from the German Buntsandstein (Triassic: Olenekian-Anisian): evidence on tetrapod

diversification in Laurasia following the end-Permian extinction" (by Rainer Schoch), "In a while it will be a crocodile: the early evolution of Crocodylomorpha in Europe" (Stephan Spiekman). "The Triassic Revolution on land" (by Mike Benton), and "An armored marine reptile from the Early Triassic of south China and the phylogeny of Archelosauria" (by Jun Liu). I ended the day with my keynote presentation on "Novel insights into the end-Triassic extinction from contemporaneous southern African sedimentary basins" where I got to showcase some of the work we have been doing in the Eastern Cape and Free State of South Africa as well as Lake Kariba in Zimbabwe.



Getting ready to give my keynote presentation at the "Triassic Revolution" symposium the GeoBerlin 2023.

GEOBERLIN 2023

Tuesday, the second and final day of the symposium was filled with exciting talks (although I may be biased) on Germany's famous sauropodomorph Plateosaurus, including "Reappraisal of the environmental setting and taphonomy of the Trossingen Plateosaurus bonebeds" (by Joep Schaeffer) and "A taxonomic Gordian Knot - the sauropodomorph diversity in the Germanic Basin during the Late Triassic" (by Omar Rafael Regalado Fernández). I was thrilled to see so much work happening on this important taxon! Emma Dunne ended the symposium off with her presentation on "Climatic controls on the ecological ascendancy of dinosaurs".



With Mike Benton and Emma Dunne, organisers of the "Triassic Revolution" symposium.

Everyone parted ways in the afternoon, and Kathleen and I went to visit the Museum für Naturkunde, Berlin's natural history museum. There, we got to see the towering **Brachiosaurus** brancai, the iconic Archaeopteryx lithographica slab specimen, some fantastic taxidermy (and some not so fabulous taxidermy) as well as the jaw dropping wet collection which is displayed (probably one of my favourite exhibits in the world).



Top: Brachiosaurus brancai; Middle: sad taxidermy example; Bottom: the amazing wet collection – all on display at the Museum für Naturkunde.

We also managed to sneak in a day of exploring the Museum Island area where Christian Kammerer, South African palaeo fan/friend/colleague had given us step by step recommendations. We followed them, as one would follow a scavenger hunt, and had an unforgettable day!

All in all, I am extremely grateful to have the chance to give my first keynote, to have exchanged knowledge and ideas with other Triassic enthusiasts, to have met up with friends and colleagues from around the world (especially Kathleen) and to have explored the wonderful city of Berlin!

Prost! And until next time.

Kimi





Left: Prost from Berlin with ESI alum Kathleen Dollman; Top Right: The Victory Column; Bottom Right: The Brandenburg Gate.



Updates from the Trace Team

Miengah Abrahams

When our small research group reflected on the past year, it brough us all much joy to see how many positives we had as a collective and as individuals. For each of us, of the many highlights, our primary high was linked to "a first-time experience": first time publishing, first time hosting international scientists. first time travelling internationally. As an emerging academic, it filled me with great pride to revisit my group's achievements. I never would have thought when I first became a member of the PSSA as a first-year MSc student in 2016, that 7 years later I'd be writing an article for PalNews about a group that I lead.

Miengah Abrahams

One of my favourite research elements is fieldwork: the thrill of finding new fossils, the bonding over cheese-cracker-filled lunches and that first sweet, sweet sip of chilled coke in the midday heat. In September, we hosted Mark Howson, a PhD candidate from the University of Bristol visiting South Africa to look at tentative Early Jurassic insect traces. His local travels saw him go from Cape Town (with visits to Iziko Museum- thank you Claire and Roger!) all the way to Musina.

Here, I will briefly mention our stops in the eastern Free State, where I'd like to give a shout to all the farmers with a curiosity for rocks. Often, getting permission to visit someone's land is a quick phone call or a brief chat at their farmhouse. Other times,

though rarely, that quick chat concludes with "hang on, let me get my shoes and walk with you". No one knows their land like a farmer and it's always such an honour and pleasure to have them show you around, pointing out all the rocks they think are weird and wonderful. Farmer Jessie walked us through the Elliot and Clarens formations, telling us of the numerous dinosaur fossils she knew had been discovered in the area. With a black and white photograph of a termite nest, our group ventured out on our relocation mission. We were unsuccessful maybe the unusually strong winds, or the angle of the sun wasn't in our favour on that day. But to Jessie's delight we did find fossil wood and bone fragments. Next, we visited Johann, his farm nestled in the Clarens Formation, with a cool sundowner spot featuring striking, large sandstone pillars. I always love a feature that's taller than me. Are they traces? Are they weathering products? Either way, our time with the farmer was precious. We learnt he was a city folk before making this big change with only 6 cows to his name, a cluster of the pillars are fondly referred to as the three wise men by him and his wife, and he collects agate crystals on his walks.

Sometimes fieldwork leads to amazing scientific discoveries. Sometimes it does not. But always, one makes treasured memories. It never fails to invigorate my scientist's soul when I meet people who share an enthusiasm for the Earth Sciences and are eager to soak in whatever knowledge they can.



Unusual sandstone pillars from the Clarens Formation. From left to right: Mark (University of Bristol), Miengah (UCT), Johann, Robert (UFS).

Loyce Mpangala

Loyce is my first MSc student, co-supervised by Prof. Emese Bordy (UCT). When we first teamed up, I don't think either one of us would have been able to predict the highlight after highlight we'd experience across our 18 months together, all starting with another memorable fieldtrip (getting lost, getting stuck in the mud, and having unwelcomed spider travel companions). This year Loyce was on a roll. She co-authored her first article (see below for details), submitted a second article (we'll definitely let you know when it's published!), and passed her MSc with distinction (we're so forward graduation looking to in December!!). But of all the awesome things Loyce has achieved this year, one of her highlights was attending the International Meeting of Sedimentology in Croatia: "It was an exciting experience as I presented my MSc research for the very first time at an

international conference. The conference brought together sedimentologists from around the world, creating a dynamic and vibrant atmosphere. During the conference, I gave an oral presentation on the role of substrate on the anatomical fidelity of dinosaur tracks in the upper Stormberg Group, southern Africa. A notable highlight for me was the positive feedback I received from four individuals who approached me after my talk. It was truly a proud and fulfilling moment. I also had the opportunity to create long-lasting memories and establish valuable connections with peers and professionals in the field." It was during this trip that Loyce submitted her MSc and to celebrate she, a die-hard Harry Potter fan, visited platform 9 ³/₄. This is a gentle reminder to all to take the time to celebrate your successes, big or small, throughout your academic journey. Want to know more about Loyce? Check out our latest departmental episode "Geologist on a Rock".

UPDATES FROM THE TRACE TEAM



Loyce Mpangala (MSc) sharing her research with an oral presentation at the International Meeting of Sedimentology (left) and visiting platform 9 ¾ (right).

Rabia Jacobs

Rabia is in her first year of MSc, cosupervised by Prof. Chris Harris (UCT. Yes, a different CH. It was confusing when they met at Geocongress - which Chris are we referring to??). In March, we visited the Calitzdorp area to record some new fossil termite nests we found on a previous scouting trip. To our surprise, the normally dry landscape was covered in greenery, a lovely sight marking the recent rainfall the area has experienced. Our keen Cape Nature rangers, Willem and Abraham, excitedly pointed out local succulents that plant lovers from around the world visit the Klein Karoo to see. For Rabia's research, she is assessing how these fossil nests vary geochemically from their host sediments and she's determining what climate signals are captured in the calcretised nests

themselves. Unusual for a first year MSc candidate, Rabia presented her ongoing findings at the International Quaternary conference in Italy earlier this year: "This was my first international travel experience and I was enriched by the entire journey. From a scientific viewpoint, engaging with numerous scientists from around the world who work on palaeoclimate and palaeoenvironment, opened my eyes to a variety of methodologies and climate proxies. One of the most captivating aspects was the extent to which I gained insights into African and South African research from both local and international researchers. This experience instilled a deep sense of in South African identity pride my throughout the conference. A personal highlight is that the conference also afforded me the opportunity to travel Italy and immerse myself in European culture.

Exploring the enchanting ancient ruins of Rome was surreal, with the experience heightened by the warmth and hospitality of the locals. One of these locals kindly offered to give me a tour, and through them I learnt that many ancient Roman structures were constructed using travertine, a type of terrestrial limestone deposit, which fascinated me as a carbonate enthusiast."



For more from our group check out:

Abrahams, M., Rampersadh, A. Mpangala, L. 2023. Riches of the Roma valley: theropod and ornithischian tracks from the Early Jurassic southern Africa, Historical Biology, DOI: 10.1080/08912963.2023.2221306

Abrahams, M. and Bordy, E.M. Accepted. The oldest fossil bird-like footprints from the Upper Triassic of southern Africa. Plos One. https://theconversation.com/dinosaurtracksite-in-lesotho-how-a-wrong-turnled-to-an-exciting-find-208963

Geologist on a Rock https://www.youtube.com/watch? v=M4xufbu8XWU



Rabia Jacobs (MSc) on fieldwork with Miengah, Senate and Rob (left) and sharing her research at the International Quaternary conference (right).

News from the Stormberg Giants

Jonah Choiniere

Some of you have marked the absence of the Stormberg Giants research group in the last PalNews, for which I apologize. Please also pardon my lengthy entry to this volume, which contains updates on students, visiting researchers, scientific meetings, and fieldwork. I hope this will make up for my autumnal omission!

Students

The early part of 2023 saw the graduation of Enele Twala (Honours) and Atashni Moopen (MSc with Distinction), who completed their respective research on a new armoured archosaur and a new sauropodomorph species from the lower Elliot Formation. PhD students Chandelé Montgomery and Bailey Weiss kicked off 2023 with a grant-funded month at the ESRF in Grenoble, France, where they received expert training in tomography from their co-supervisor Dr Kathleen Dollman (PhD, Wits-ESI; senior Stormberg Giants member) and Vincent Fernandez on the new BM-18 beamline. Chandelé and Bailey's visit to Grenoble started a year in which six Stormberg Giants students (and one tired supervisor) had a chance to visit Grenoble and take part in experiments using the synchrotron. You can read more about this amazing instrument and South Africa's involvement in their article in this volume.

PhD student Rick Tolchard submitted his monstrous dissertation on the evolution of diet in Amniota (>500 pages, >30,000 data points!) and is now awaiting examiners. Bailey Weiss is continuing his research on early crocodylomorph evolution, and is now preparing a manuscript on "Erythrochampsa" longipes (neé Notochampsa) which he has promised to finish before the end of the annum. Bailey was awarded a prestigious Philip Tobias scholarship from Wits University to help fund his studies.

Chandelé Montgomery is continuing her PhD research on Early Triassic coprolites and is busy segmenting them like a fiend.

PhD student Atashni Moopen has almost finished the first year of her project on the systematics and anatomy of early sauropodomorphs. She spent dozens of hours segmenting the first articulated skull of a South African Triassic sauropodomorph.

MSc student Wade Harris is in the throes of final data analysis for her project on the tooth complexity and jaw shape of living mammals and their close cynodont relatives.

MSc student Lutendo Mukwevho is nearing completion of her project, co-supervised with Prof Roger Smith, studying an aggregation of Youngina (spoiler alert...it's probably not Youngina). Lutendo presented aspects of her research at a user meeting for the SESAME synchrotron in Jordan. Both Wade and Lutendo will submit at the end of the year.

MSc student Mike Zondo, co-supervised with Lara Sciscio (Jura Museum, Switzerland), Darlington Munyikwa and Tim

NEWS FROM THE STORMBERG GIANTS

Broderick (Zimbabwe), is wrapping up his project on the biostratigraphy, sedimentology, and age assessment of Sentinel Ranch in Zimbabwe's Tuli Basin while he continues his duties at the Natural History Museum of Zimbabwe. Mike has discovered fossils that provide a much broader snapshot of vertebrate life in the upper Karoo of Zimbabwe.

Enele Twala has stayed in the Stormberg Giants and is in the first year of her MSc, studying the evolution of hearing in owls and its applicability to their deep ancestry among theropod dinosaurs.

You can read more about the research of Stormberg Giant students in their individual sections below.





Above: Honours Graduate Enele Twala and Jonah Choiniere in their festive graduation garb.

Below: Fresh from Atashni's Graduation; from left to right - Wade Harris, Ajay Baraw, MSc Graduate Atashni Moopen, Jonah Choiniere, Kimi Chapelle, Rick Tolchard, and Lutendo Mukwevho.



Kimberley Chapelle

Our students in their own words

Kimberley Chapelle, Postdoctoral Fellow

Ι South African am vertebrate а palaeontologist who studies dinosaur growth and development. I am currently postdoctoral fellow at the Evolutionary Studies Institute at the University of the Witwatersrand, but will be starting as an assistant professor at Stony Brook University (NY) in the next few months. My research has mainly focused on basal sauropodomorphs, like the proudly South African Massospondylus carinatus. I explore how these creatures grew, moved, and evolved using a multidisciplinary toolkit comprising micro-computed tomography scanning, osteohistology, multivariate functional statistics. as well as and comparative anatomy.



Frederick Tolchard

Frederick Tolchard, PhD Candidate

My research focuses on macroevolution and phylogenetic comparative methods. My doctoral thesis provides a comprehensive investigation of diet in major amniote lineages. This includes the pace, tempo, and polarity of evolutionary transitions between dietary guilds, and the nature of the statistical relationship between diet and body size.

I also have research interests in vertebrate palaeontology and the palaeobiology of the Triassic period. I have published on fossil material of some non-crocodylomorph crocodylomorphs, and on gomphodont cynodonts from southern African Middle and Late Triassic-aged strata.

NEWS FROM THE STORMBERG GIANTS



Bailey Weiss

Bailey Weiss, PhD Candidate

I joined the ESI at the start of 2022. I completed my undergraduate, Hons, and MSc at the University of the Free State, supervised by Jennifer Botha. My Hons focused on the osteohistology of two Jurassic theropod dinosaurs from South Africa. During my MSc, I studied the bone microanatomy and life habits of a large sample of dicynodonts from the Karoo. My PhD focuses on early crocodylomorphs, mostly from the Jurassic of South Africa, supervised by Jonah Choiniore, Jennifer Botha, and Kathleen Dollman. Using traditional techniques such as comparative photography, morphology, and thin sectioning as well as modern synchrotron imaging, I investigate their morphology and growth patterns. Many species from this group are extremely rare in the fossil record and are poorly understood. I hope to shed light on some of the strange morphologies



Chandelé Montgomery

this group exhibited early on in its evolution.

Chandelé Montgomery, PhD Candidate

To date, my postgraduate research focuses characterising coprolites on from an understudied Early Triassic microfossil site in South Africa using a combination of micro tomography and synchrotron imaging. These techniques allow for the visualisation and characterize the coprolites external morphologies and internal coprofabrics which are indicative of digestive anatomies and processes. Additionally, 3D digital visualizations of partially digested or undigested food materials or inclusions helps identify them at more precise taxonomic levels. My research aims to use these coprolites to further our knowledge of the taxa that survived the Permo-Triassic extinction event, their feeding behaviours and how these ecosystems were structured.

Atashni Moopen, PhD Candidate

My current research focuses on early branching sauropodomorphs, their evolution, and palaeobiology. I am describing new specimens from the lower Elliot Formation, revising the phylogeny of early branching sauropodomorphs, and how their bone microanatomy in limb elements changes with posture and body mass. One of the specimens that I am looking at is a beautifully preserved sauropodomorph skull from the Late Triassic that was scanned at the ESRF, which I had the opportunity to visit earlier this year, and which I have been segmenting the scans from ever since. I defended my master's dissertation earlier this year (with distinction), started my doctoral research, and have an opportunity to virtually present at SVP. I had the chance to go on two field seasons this year with amazing crews, views, and tons of bones.



Atashni Moopen

Wade Harris, MSc Candidate

My research focuses on exploring the macroevolutionary trends in diet. There is a suite of cranial and dental features associated with different diets, and a big part of my research is about assessing these quantitatively whether features correspond to these diets. My master's project entails understanding whether there is a relationship between jaw shape, tooth complexity and diet in mammals and whether this can be used to make reliable predictions of the diets of gomphodont taxa. using geometric morphometrics, orientation patch count rotated, and multivariate statistics. My research aims to expand our understanding of the interplay between form and function and test whether this can be applied to fossils.



Wade Harris

Lutendo Mukwevho, MSc Candidate

I am currently completing my MSc at the University of Witwatersrand. My research focuses on intraspecific aggregation of multiple individuals interacting with one another. Aggregations are a significant indicator of sociality in animals. То accurately evaluate the behaviour depicted by a monospecific aggregation, I employ a multidisciplinary approach that includes synchrotron imaging, comparative anatomy, taphonomy and comparisons with modern analogues. Despite there being a significant number of group aggregations in the reptile lineage, reptiles have always been viewed as non-social. Investigating aggregations in reptiles will allow us to explore the evolution of sociality and form models that explore the transition of simple social behaviours to more complex forms. It will also give us an opportunity to monitor changes along the social spectrum of reptiles, as observed in other taxonomic groups.

Enele Twala, MSc Candidate

My research aims to investigate cranial asymmetry and basilar papilla evolution across the living owl lineage and other birds to understand how these features correlate with hearing ability and nocturnal habits. The findings of this study can be extended to the fossil record, where they can be used to understand hearing adaptations of the extinct dinosaurian lineages that led to owls. This study feeds into my overall research interests which include using а macroevolutionary approach to ask critical palaeobiological questions.



Lutendo Mukwevho



Enele Twala

Michel Zondo, MSc student

I am a palaeontologist working for the Natural History Museum of Zimbabwe, in the Geology/Palaeontology department. I am also an MSc student in Palaeontology at Wits. My study focuses on examining the stratigraphy of the upper Karoo rocks of the Tuli Basin, with my study area being the vertebrate fossil-rich Sentinel Ranch. I am working on identifying all the fossils I am collecting, and those historically collected from that place. I am conducting both biostratigraphic and U-Pb dating methods in determining ages of the Tuli Basin sediments. I am also examining the rock facies together with sedimentary structures found on those sediments to help in the reconstruction of the palaeoenvironments at the Tuli Basin.

I have more than two decades of work experience, which includes prospecting for fossils, collecting in various environments, fossil preparation and preservation, and curation among other activities. I enjoy being out in the field prospecting, collecting dinosaur fossils and I am forever thrilled by finding new material that precisely defines our palaeo status and paleoenvironments.

Visiting Friends and Colleagues

American Museum of Natural History **Professor Meng Jin** visited the ESI in May, following on his visit in late 2022, to do fieldwork in Qhemegha. He is interested in the earliest mammaliamorphs and mammaliaforms from the Elliot Formation.



Michel Zondo



Meng Jin inspecting a new mammaliamorph jaw near Qhemegha Village - Bailey Weiss.

NEWS FROM THE STORMBERG GIANTS

Nic Campione and **Phil Bell** (collectively known as "Baloney"; University of New England Australia), visited the Wits-ESI for a week of studying dinosaur teeth in early May, and were able to hang out long enough to spend a few days in the field. Based on their Canadian research focus, we made them defend Caleb Brown's recent paper on taphonomic biases in the Late Cretaceous as part of the Wits-ESI discussion group series.



Phil Bell (left) and Nic Campione (right) attempting to fuse together to become a unified Baloney at the Big Bridge Quarry, Qhemegha Village – Kimi Chapelle.

Professor Paul Barrett (NHM London, check out their new logo) visited Wits-ESI for two weeks in July to advance projects on *Melanorosaurus*, sauropodomorphs from the lower Elliot Formation, and fossils we collected during our two Lake Kariba expeditions. He extends warm greetings to all. Paul returned in August for the Qhemegha field trip and brought along his PhD students Cassius Morrison and Jack Lovegrove. Jack spent a week at Wits-ESI prior to our fieldwork collecting data on early dinosaurs.



From left to right: Roger Benson, Bailey Weiss, Kimi Chapelle, Paul Barrett, and Jonah Choiniere in traditional garb at Qhemegha Village - Atashni Moopen.

Professor Roger Benson has visited the Stormberg Giants twice this year, helping lead field seasons in the lower Elliot Formation, and he also spent a few days identifying fossils collected over our years previous seven of Qhemegha fieldwork. Roger has now taken up his new position as Curator at the American Museum of Natural History. In May, Roger brought along Carolyn Merrill, a senior palaeotechnician at the American Museum.In August, Roger brought along PhD student Spencer Prevsner, who joined the fieldwork and spent a week in the Wits-ESI collections collecting data on the tails of therapsids.

Professor Andy Heckert (Appalachian State University) spent ten days at Wits-ESI doing research on the Driefontein 11 fauna, together with John Hancox. Data collected by Kathleen Dollman, Chandelé Montgomery, and Bailey Weiss during the February ESRF visit will provide virtual histology for intriguing archosaur limb bones that form part of this research.

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From left to right: Roger Benson, Jonah Choiniere, Kimi Chapelle, Wade Harris, Chandelé Montgomery, Bailey Weiss, Brandon Stuart, Meng Jin, Kimi Chapelle, Jonah Choiniere, Wade Harris, Chandelé Montgomery, Brandon Stuart, Bailey Weiss and Roger Benson enjoying some R&R near N'dofela, Eastern Cape – Atashni Moopen.



Andy Heckert and a kudu, spotted at the Wilds in Johannesburg – Jonah Choiniere.



Christian Kammerer digging for fossils at the Big Bridge Quarry, Qhemegha Village - Kimi Chapelle.

Dr Christian Kammerer was at the WITS-ESI in early September, reviewing dicynodonts and working with Brandon Stuart on *Inostrancevia* anatomy. Before his time in collections, he joined our August field season, where he was lauded for his prowess in feats of strength and rock-sawing.

Scientific Meetings

In June, Kimi Chapelle and I traveled to Salt Lake City, Utah to present our work on the Elliot Formation at the Mesozoic Terrestrial Ecosystems meeting. We also used the opportunity to stock up on Mexican ingredients that are so hard to find in Johannesburg. There was a surprising contingent of South African palaeontologists at the event, including Emese Bordy, Anusuya Chinsamy-Turan, Roger Smith, Ryan Tucker, and Charl Cilliers. We were also joined by many honorary Stormberg Giants, including Lara Sciscio, Andy Heckert, Simon Wills, Roger Benson and Paul Barrett. Simon and Paul were kind enough to let Kimi and I tag along on a trip to Antelope Island in their rented Ford Mustang convertible, where we saw American Bison.



American Bison grazing, Antelope Island - Jonah Choiniere.



South African invasion at the MTE meeting, Salt Lake City. From left to right: Kimi Chapelle, Jonah Choiniere, Roger MH Smith, Ryan Tucker, Charl Cilliers, Emese Bordy, Anusuya Chinsamy-Turan - Simon Wills.

Field Trips and Traveling Research

Qhemegha Village Project

This year has seen the Stormberg Giants put a near-singular focus on our lower Elliot field sites in the rural village of Qhemegha, Eastern Cape. In March, Chandelé Montgomery, Brandon Stuart, and I spent a week documenting sites of cultural heritage and scenic beauty in the area, as well as This additional fossil prospecting. information forms part of a larger report to ECPHRA to be integrated into the tourism development plan, which is now moving forward.

Six weeks later, we were back with a full crew, including MSc Student Jessica Logie from Anusuya Chinsamy's lab at UCT, Wits-ESI preparator Mabote Louw, and Nic Campione, Phil Bell, Roger Benson, Kimi Chapelle, Bailey Weiss, Chandelé Montgomery, Wade Harris, Atashni Moopen, Carolyn Merrill, Meng Jin, and Brandon Stuart. During that field trip, we removed nearly six tonnes of jackets from the Big Bridge Quarry containing the nearly complete, partially articulated skull and postcranial skeleton of what is either a latebranching rauisuchian or early branching crocodylomorph.

Qhemegha Field Crew, May 2023, at the ZZ Top Quarry.

From left to right, back row: Carolyn Merrill, Chandelé Montgomery, Atashni Moopen, Sginyane Ralane, Wade Harris, Kimi Chapelle, Jessica Logie, Bailey Weiss, Jonah Choiniere, Nic Campione, Brandon Stuart, Phil Bell, Mabote Louw, Meng Jin, Roger Benson. -Brandon Stuart





Qhemegha Field Crew, August 2023, at the ZZ Top Quarry. From left to right: Roger Benson, Mike Zondo, Paul Barrett, Jack Lovegrove, Spencer Prevsner, Cassius Morrison, Sifelani Jirah, Enele Twala, Christian Kammerer, Atashni Moopen, Dominic Stratford, Kimi Chapelle, Simon Wills, Jonah Choiniere. (Unknown photographer)

We went back for a third field season in August, this time with the crew including Paul Barrett, Christian Kammerer, Atashni Moopen, Kimi Chapelle, Dominic Stratford, Lee Stevens, Simon Wills, Mike Zondo, Roger Benson, Sifelani Jirah, Bailey Weiss, Jack Lovegrove, Cassius Morrison, Lutendo Mukwevho, Enele Twala, and Spencer Prevsner. During the August field season we developed the ZZ Top Quarry, discovered by Bailey Weiss, and in the process of getting its jacket ready we uncovered at least fifty small teeth and three early various mammaliamorph jaws. These jaws are in New York City getting specialist conservation. They are the lowest-known occurrences of mammaliamorphs in the Elliot Formation.

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A giant crane truck lifts jackets out of the Big Bridge Quarry, Qhemegha Village, during the May field season - Bailey Weiss.



Prepared fossils from the Big Bridge Quarry - Jonah Choiniere

NEWS FROM THE STORMBERG GIANTS

Jack Lovegrove, Cassius Morrison, Lutendo Mukwevho, Enele Twala, and Spencer Prevsner. During the August field season we developed the ZZ Top Quarry, discovered by Bailey Weiss, and in the process of getting its jacket ready we uncovered at least fifty various small teeth and three early mammaliamorph jaws. These jaws are in New York City getting specialist conservation. They are the lowest-known occurrences of mammaliamorphs in the Elliot Formation.



A mammaliamorph jaw from the ZZ Top quarry - Kimi Chapelle.



Children of Qhemegha Village practicing dance for Heritage Day - Jonah Choiniere.

During the August field trip, we helped host an ECPHRA workshop and community information session, which was wellattended and even attracted some local archaeologists (from the Albany Museum and UCT). We also were able to bring down nearly an entire Hilux load of donated toys, books, and clothing for the various creches and orphanages in the Qhemegha area. With these donations, sourced from many of our colleagues and neighbors, we were also able to help a local family whose home had burned prior to our arrival. We finished the fieldwork year in Qhemegha with а community braai (what else!?) where I delivered a status update on the project and the children in the community put on a display of traditional dances in anticipation of Heritage Month.

In late September, Jennifer Botha, Brandon Stuart, Claire Browning, Brandon Peecook and I joined students Bailey Weiss and Xavier Jenkins (PhD student, Idaho State University at the European Synchrotron Radiation Facility (ESRF). Bailey and Xavier led winning applications and received almost a week of beamtime to scan early crocodylomorphs and stem reptiles on BM05 and BM18.



Team picture from the September ESRF trip. From left to right: Kathleen Dollman, Claire Browning, Bailey Weiss, Jennifer Botha, Brandon Peecook, Vincent Fernandez, Jonah Choiniere, Brandon Stuart, Xavier Jenkins.

Visiting the ESRF is always a pleasure, especially because it now employs Stormberg Giants Drs Kathleen Dollman and Vincent Fernandez, the most formidable palaeo-imaging team on the planet. Needless to say, the scans were amazing, and we got to sample the incredible foods of the Dauphinoise Region (and watch the Springboks victory over Tonga while quenching our robust thirst).





The Cape South Coast Ichnology Project in review

Charles Helm

From humble beginnings in 2008, the Cape south coast ichnology project has evolved to feature a multidisciplinary team of scientists based out of the African Centre for Coastal Palaeoscience at Nelson Mandela University. The team is aided by 'citizen-scientists' with their eyes on the rocks on the ground, who make important discoveries of freshly exposed sites and report them to us. The project has exceeded all initial expectations, and more than 350 vertebrate tracksites have now been identified on the 350 km stretch of coastline between Arniston in the west and the Robberg Peninsula in the east. The tracks and traces are evident in aeolianites and cemented foreshore having deposits, been registered on Pleistocene dune and beach surfaces.

Central to the project has been the ability to accurately date the track-bearing surfaces. This has been achieved by means of Optically Stimulated Luminescence (OSL) through much-appreciated collaboration with Dr Andrew Carr at the University of Leicester. We have also been privileged to work closely with renowned ichnologist Dr Martin Lockley of University of Colorado Denver, who has visited in person on two occasions, reviewed our sites with us, provided valuable insights, and led some of the published papers. The overarching question has addressed how ichnology, the study of fossil tracks and traces, can inform the understanding of the region during the Pleistocene. Ichnology has the potential to provide an independent dataset that is not available from other fields of research, and can thus complement the region's body fossil record as well as provide palaeoenvironmental and palaeocological inferences. Moreover, while ichnology has its biases, they are different from the biases of other disciplines.

There have been a number of resulting, unexpected 'firsts' in the global ichnology record: the first seal traces, the first snake traces, the first sand-swimming golden mole traces (Fig 1), the first record of the tracks of hatchling turtles making a run for the sea, the first elephant trunk drag impressions (Fig 2), and the first tortoise tracks (Fig 3), which were important also because some were made by a trackmaker at least 50% larger than the largest leopard tortoises today. In addition, range extensions can be important: finding and describing the tracks of giraffe, the extinct giant Cape horse and the Nile crocodile all have palaeoenvironmental implications. For example, giraffe need treed environments, sand-swimming golden moles imply the presence of substantial dune fields, and

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Figure 1: 3D photogrammetry image of sand-swimming golden mole traces in the Garden Route National Park – horizontal and vertical scales are in metres.

crocodiles require warm environments (the crocodile tracks happened to occur on the same surface as Middle Stone Age lithics). In many cases there is no Pleistocene body fossil evidence in the region of these creatures. Other highlights include many avian tracksites (some of which hint at the likelihood of large 'chrono-subspecies' (Fig 4), the tracks of lion, black rhinoceros and hippopotamus, and coprolites. The numerous elephant tracksites suggest a substantial presence on the landscape. Some elephant tracks at Robberg are among the

largest post-Mesozoic tracks ever to be described. We were also able to report on how many coastal potholes appear to have begun their existence as elephant tracks.

However, the hominin sites arguably have the most profound implications, which complement the corpus of palaeoanthropological knowledge that has accumulated through the body fossil record and archaeological record. At a global level, hominin tracksites older than 70,000 years are relatively rare. The South African



Figure 2: Elephant trunk drag impression beside an elephant trackway in the Goukamma Nature Reserve. Scale bar = 10 cm.



Figure 3. Giant tortoise trackway east of Still Bay. Scale bar = 10 cm.

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CAPE SOUTH COAST ICHNOLOGY PROJECT



Figure 4. Large flamingo tracks in the Garden Route National Park – scale bar = 10 cm.

coastline contains twelve of the twenty-six sites that have been reported from this age (two of these, Nahoon and Langebaan, had been reported prior to our work). Furthermore, with a single exception they are also the only sites older than 40,000 years that have been attributed to our own species, Homo sapiens. We have reported that the oldest known footprint of our species lies within the Garden Route National Park and has been dated to ~153,000 years (Figure 5). Given that the materials from which the first footwear fashioned by ancestral humans will have long-since perished long ago, ichnology potentially holds the answer as to when this may have occurred. Indeed, we have found evidence to suggest that this may have happened on the Cape south coast. Our neoichnological studies, whereby we analyse our own tracks made in sand using various types of footwear, may help in this analysis.

We have been obliged to coin the term 'ammoglyph' to describe patterns (e.g., circular, triangular, radial, cross-hatched) made by our ancestors in dune and beach sand, and now evident in the rock surfaces (Figure 6).



Figure 5. The oldest known Homo sapiens footprint (~153,000 years), in the Garden Route National Park.



Figure 6. 3D photogrammetry image of triangular ammoglyph east of Still Bay – horizontal and vertical scales are in metres.

Clearly, if our ancestors' footprints can be preserved, so can other evidence of their activity, such as palaeoart; sand may thus have been the original canvas. Whenever feasible, purported ammoglyphs have been recovered and accessioned in the Blombos Museum of Archaeology in Still Bay, where they are available for analysis by other researchers.

Looking to the future, we envisage our work involving a number of directions. Firstly, once exposed, tracksites are ephemeral as known sites disappear and new ones are exposed. Consequently, we will remain vigilant in returning to prime track-bearing areas, especially after storm surges and cliffcollapse events. Secondly, we plan to extend the search into older deposits, such as the Pliocene Wankoe Formation - preliminary work suggests that these deposits also harbour vertebrate tracks (who knows, perhaps there is southern African а of equivalent Laetoli. containing australopithecine tracks). Thirdly, we plan to continue our geographic expansion, as our initial forays to the west coast and east coast have yielded positive results. We hope to extend our field of study to include invertebrate traces. which occur in abundance. with view а to possibly describing new ichnofacies. We hope to expand our OSL dating program to as many sites as possible, in order to improve our geochronological understanding of the Cape coast. Finally, we recognise our obligation to try recover and safely accession as many specimens as possible that are of scientific and heritage importance.

While ichnology has had a relatively late start in the scientific investigation of the Cape coastal deposits, the thirty-five peerreviewed scientific papers that have been published through our work (with another three currently under review) bear testimony to the richness of this field. We refer to 'the great serendipity', whereby one of the places where our hominin ancestors 'found their feet' in the Pleistocene happens to be where such a faithful record of their activities and those of their fellow-creatures is preserved in stone, ready to be discovered and interpreted.





Mrs Ples (Sts 5) and Stw 53 from the Sterkfontein Caves, South Africa

Lazarus Kgasi and Francis Thackeray

"Mrs Ples" (Sts 5) is the nickname of a Plio-Pleistocene skull (Fig. 1) of Australopithecus africanus, from the Sterkfontein Caves in the Cradle of Humankind World Heritage Site. It is curated by the Ditsong National Museum of Natural History in Pretoria. The fossil was discovered by Broom (1947) and Robinson (his assistant). Rak (1983) thought that Mrs Ples was male on the basis of anterior pillars associated with canine roots. Tawane and Thackeray (2018) agreed that it represents a male, based on canine socket dimensions measured by Broom before destructive acid preparation. This counters the claim by Grine et al (2012) that Mrs Ples was female, an opinion also held by Villmoare et al (2013) and by Broom.

Unfortunately Mrs Ples was not preserved with teeth, but roots of some of the maxillary dentition can be recognised from CT scans. In a pioneering study it was suggested that Mrs Ples was young because roots of the third molars appeared to be open (Thackeray et al, 2002). Later studies (Bonmati et al, 2008; Grine et al, 2012; Villmoare et al, 2013) have shown that third molar roots were in fact closed at the time of death. Villmoare et al (2013) claimed from roots of anterior dentition that Mrs Ples was very old (extremely "senescent"), but this seems unlikely since Potze and Thackeray (2010) could demonstrate that cranial sutures were still open. The views expressed by Villmoare et al need to be assessed in the

light of evidence obtained from temporal lines of Sts 5 reconstructed by Potze and Thackeray (Fig. 2). The distance estimated between right and left temporal lines across the approximate position of bregma (DBTL) is 22 mm. This can be compared to mean DBTL values obtained from male chimpanzees (*Pan troglodytes*) based on data published by Thackeray et al (2005, Table 2):

Stage 4 M3 in slight wear, mean DBTL = 33.2 mm Stage 5 M3 moderate or heavier wear, mean DBTL = 13.5 mm

If the data for male chimpanzees are considered to be analogous to the condition in male A. *africanus*, we can recognise that a DBTL value of 22 mm for Mrs Ples must have corresponded to M3 wear that was more than slight. The extent of wear on its third molars has been unknown until now, using Stw 53 as a frame of reference.

Stw 53 is another skull from Sterkfontein, described initially as Homo habilis (Hughes and Tobias, 1977). However it has been regarded instead as a male A. africanus (Clarke, 2008), a view with which we agree. Our estimate of DBTL based on Clarke's reconstruction of Stw 53 is 25 mm, corresponding closely to a value of 22 mm in the case of Mrs Ples (Fig. 2). We infer that the two specimens had reached a similar stage of development at the time of death.



Figure 1: Mrs Ples (Sts 5, cast) from Sterkfontein – Lazarus Kgasi, Ditsong (DNMNH).



Figure 2: Sts 5 (Potze and Thackeray, 2010) and Stw 53 (Clarke reconstruction), showing the approximate position of temporal lines on casts.

Whereas Sts 5 is edentulous, Stw 53 has intact dentition. The right M3 of Stw 53 has erupted, with about 90% of the enamel in moderate wear. The second upper molar is worn with dentine exposed on almost 50% of the occlusal surface. In human terms this would correspond to an age of between 40years. The implication that 50 is (colloquially) Mrs Ples had reached "middle age", assuming that Sts 5 and Stw 53 were both males at a similar stage of development at the time of death.

A partial skeleton of A. *africanus* from Sterkfontein (Sts 14) is subadult (Gommery and Thackeray, 2006) and as such Sts 5 must be considered as representing a different individual (Bonmati et al, 2008). Thackeray et al (2002) had previously questioned whether Sts 14 was the skeleton of Mrs Ples, especially since both were considered to be male and in proximity to each other when they were excavated in 1947 (Thackeray and Gommery 2002).

Geological ages

The exact geological ages for Sts 5 and Stw 53 are uncertain. Mrs Ples is known to have come from Member 4, and faunal dates for this Member range between 2 and 3 million years ago (Ma), based in part on bovids studied by Vrba (1982); suids studied by Cooke (1974); and cercopithecids studied by Frost et al (2022, 2023). Cosmogenic dates as early as 3.4 Ma for Member 4 have been estimated by Granger et al (2022, 2023), using chert samples near the base of an extensive excavation by Alun Hughes.

biochronological Using approach, а Thackeray and Dykes (2023) have suggested (from calculations based on first molars) that Member 4 can be dated to a period between about 2 and 3.5 Ma, thereby reconciling the "Sterkfontein Debate" between Granger et al (2022, 2023) and Frost et al (2022, 2023). The mean age for Member 4 determined by Thackeray and Dykes (2023) is 2.7 Ma. It has been claimed by Andy Herries and his colleagues that the top of Member 4 dates to about 2 Ma; in fact they claim that the age for Mrs Ples ranges between 2.01 and 2.05 Ma, based on palaeomagnetic and uraniumlead analyses (Herries and Shaw, 2011; Pickering and Kramers, 2010, Herries et al, 2013).

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Extremes: From long (Palaeo-) to short (Quintillio-) periods of time

Francis Thackeray, ESI

Palaeontologists study species of life over long periods of time, typically in millions if not billions of years. But this month (October, 2023) the Nobel Prize for Physics was awarded to three researchers who study "the shortest of time, associated with moments" the movement of electrons. Here is an extract from a BBC report: "This year's Nobel Prize in Physics goes to Pierre Agostini (USA), Ferenc Krausz (Max Planck Institute, Germany) and Anne L'Huillier (Sweden). Their work demonstrated a way to create extremely short pulses of light that can be used to capture and study rapid processes inside atoms. The winners will share prize money of 10m Swedish krona (£800,000). The Royal Swedish Academy of Sciences said the three laureates' experiments produced "pulses of light so short that they are measured in attoseconds". One attosecond is a quintillionth of a second - it is to a second what one second Universe". is to the age of the https://www.bbc.com/news/scienceenvironment-66964430



Storming France

Chandelé Montgomery and Bailey Weiss

The European Synchrotron Radiation Facility

The European Synchrotron Radiation Facility (ESRF) is a joint research facility situated in Grenoble, France. This facility is the first-ofa-kind, generating low-emittance, highenergy X-rays (synchrotron light), enabling researchers to 3D image materials and living matter at exceptionally high resolutions. The ESRF allows researchers from member and associate countries to apply for beam time. These applications go through various review committees and are scored. The highestapplications are accepted scoring and allocated beam time shifts (1 shift = 8 hours). The ESRF funds the entire trip to and from the facility and the scanning itself for three users. With South Africa being an associate member of the ESRF, researchers can apply for scanning time at no cost to the researcher or institutes they work at. This gives South African researchers access to the best synchrotron facility in the world with no financial burden.



The European Synchrotron Radiation Facility (Credit ESRF)

The Extremely Brilliant Source upgrade of the ESRF (EBS-ESRF) and the introduction of a new large-field imaging beamline, BM18, offers a new opportunity to push the limits of non-destructive fossil imaging. Multibroadest resolution scans across the possible sample of vertebrates allow for the study of diversity, growth and development patterns, organismal biology, evolutionary history, and ecosystem function (e.g., food of levels webs) all trophic in а paleoenvironment.

high-resolution, non-destructive As а methodology, X-ray imaging has become increasingly important in characterising the external and internal morphologies of paleontological specimens. The synchrotron produces X-rays 10 trillion times brighter than the X-rays used in hospitals and thus provides with unprecedented us visualisation of fossil material. This is important when working on type specimens, rare fossils and small specimens.

Over the last year-and-a-half, we have made three successful applications and taken five trips to the ESRF, a cumulative 39 shifts (312 scanning hours) on 2 beamlines (BM05 and BM18) that have resulted in the generation of over 3TB of final reconstructed data. During this time Jonah also had an additional 15 shifts (120 hours) allocated to him for an experiment on parareptiles with Xavier Idaho Jenkins (PhD student, State University). These trips allowed us to take eight other researchers with to the facility

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(Jonah Choiniere, Jennifer Botha, Claire Browning, Brandon Stuart, Wade Harris, Lutendo Mukwevho, Atashni Moopen, and Enele Twala). In total, we have scanned 9 crocodylomorph specimens (30 scans in total) and 134 disarticulated vertebrate fossils/coprolites from Driefontein 11, at resolutions ranging from 700 nanometers to 60 micrometers.

Crocodylomorph osteohistology & morphology Bailey Weiss

The objectives of my PhD research are to study the osteohistology and morphology of crocodylomorphs. Studying the osteohistology of this group will allow us to understand where slow growth first evolved in the ancestors of crocodiles, how old they were at maturity, and aspects of their ecological niches. Using these osteohistological data it may be possible to identify specimens that were previously unassigned to a taxon. The gross morphology, especially postcrania, of the basal crocodylomorphs, is severely understudied, making difficult it to understand the complex evolutionary history of the group.

Unfortunately, crocodylomorphs are extremely rare in the fossil record and most are known from only a single specimen (e.g. *Sphenosuchus* and *Litargosuchus*). This rarity means classical osteohistology (destructively thin-sectioning) is not possible. The EBS upgrade at the ESRF allows researchers to get almost the same histological information from the bones without destroying the fossils at all.

These experiments were extremely successful and will, for the first time, document the growth rates and life histories of all the known species of crocodylomorphs from South







Top: The control room of BM05 at the ESRF. Vincent Fernandez is preparing to scan the histology of SAM-PK-K410. Bottom: Example of the virtual osteohistological scans - Bailey Weiss

Africa. In particular, Orthosuchus produced beautiful scans of 8 different bones and once published will be the most complete osteohistological study of any single species of crocodylomorph globally. The first paper making use of these results was recently published in Current Biology: Botha et al. Origins of slow growth on the crocodilian stem lineage. This is just the first of many papers that will stem from the results of these experiments.

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The postcrania of Litargosuchus were scanned using the phase contrast and higher resolution that the ESRF provides. Previous scans using lab-based μ CT struggled with the thin slab specimen. This will allow for a detailed postcranial description of this important taxon that has not been given the attention it deserves.





Litargosuchus (BP/1/5237) on the tomograph of BM05 at the ESRF (top), and partially segmented (bottom) - Bailey Weiss.

Three-shits-fontein

Chandelé Montgomery

The farm Driefontein 11, in South Africa's Free State Province, preserves a fossil lagerstattë in the Burgersdorp Formation of the Karoo's Beaufort Group. Among its most important palaeontological resources are the morphologically, ecologically, and taxonomically diverse set of vertebrate and invertebrate fossils, ranging in size from insects to the largest animals, and earliest ichnofossils from the Triassic. Driefontein 11 documents the earliest radiation of the most iconic vertebrate groups; including dinosaurs, crocodilians, mammals, squamates, and frogs and so it is considered the 'dawn of modern ecosystems'. Despite the importance of these fossils, the fauna of Driefontein remains incompletely known - reflecting the sheer numbers of specimens (±30,000 coprolites alone) as well as the fragile nature and microscopic size of many of its remains. Moreover, while taxonomic revisions are underway, the contributions these fossils make to understanding palaeoecology analysis through other methods are completely untapped.



Overview of the fossiliferous outcrop at Driefontein 11, Free State, South Africa - John Hancox.

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scanning project is currently A large underway for material from Driefontein 11 (134 specimens scanned thus far) aimed at addressing these deficiencies and my PhD research focuses on characterising a subset of the large coprolite collection. Fossilized faeces, known as "coprolites", selectively preserve microfossils and soft tissues, addressing specific taphonomic deficiencies in the fossil record. Additionally, coprolites palaeobiological contain exceptional information. providing а unique palaeoecological window on the diet, feeding behaviours, trophic relationships, parasitism, and digestive systems of extinct organisms.

A total of 90 coprolites have been scanned at multiple resolutions with the aim of developing 3D digital visualisations of these inclusions to identify them at more precise taxonomic levels, and to use material crosssections and 3D properties to study the fabric of the coprolites to determine their origins. By imaging these coprolites, we can gain information on the microfauna and a preliminary view on ecological recovery in the Early Triassic following the catastrophic end-Permian extinction, when 95% of all species on Earth went extinct.



Coprolite collection example - Chandelé Montgomery.

Data analysis training at the ESRF

Thanks to a research grant from GENUS we were able to complete a month-long internship at the ESRF in February of 2023. Here we received advanced instruction from Kathleen Dollman and Vincent Fernandez on using VG Studio Max and Dragonfly to process and segment large tomographic datasets and the use of AI for processing CTscans.

While at the ESRF we were delighted to attend the 2023 ESRF User Meeting at which we both presented a poster. Chandelé's poster was entitled: "Understanding Early Triassic palaeoecology with PPC-SRµCT visualisation of coprolite micro-inclusions coprofabrics" and showcased and the importance of synchrotron scanning in characterising the internal and external morphologies of coprolites. Bailey's was entitled "Classical vs Virtual Osteohistology: A Crocodylomorph Case Study " and detailed the pros and cons of the two osteohistological methodologies.

Lastly, we were invited to present as part of the ongoing Geobridge Series at the ESRF where members of the ESRF geoscience community share their scientific achievements achieved through synchrotron scanning. Bailey presented on "Visualising morphology osteohistology the and of Litargosuchus leptorhynchus using PPC-SRµCT" and Chandelé presented under the same title as the User Meeting poster.



Examples of how we can visualise the coprolite's external and internal features and fossil inclusions. A: Rendering of coprolite BP/21/484 B: Transparent render of coprolite BP/21/2 showing the distribution of inclusions, C: Cross-section through coprolite BP/21/362, D: Vertical section through coprolite BP/21/275, E: Partially digested hexapod, F-G: Jaws yet to be assigned to taxa, H-I: Example of the fish scale morphologies, J: Fully articulated bivalve - Chandelé Montgomery.

Conclusion

The ongoing contribution by the South African NRF to the ESRF facility makes it possible for researchers of disparate socioeconomic backgrounds to take full advantage of multibillion-Euro scientific infrastructure. By exporting fossils to the ESRF, we have clear scientific rationale for promoting the South African fossil record with large international collaborative teams. Our new findings would not have been possible without the scientific expertise and instrumentation this NRF-ESRF relationship provides.

None of this would have been possible without the help and support of our supervisors Jonah Choiniere, Kathleen Dollman, Jennifer Botha, and John Hancox. We would like to thank Claire Browning for her time transporting Iziko fossil material and helping with the experiments. Further, Bernhard Zipfel, Zaituna Skosana, and the SAHRA are thanked for allowing us to export these fossils for valuable scientific research. We acknowledge the European Synchrotron Radiation for provision Facility of synchrotron radiation facilities, and we would like to thank Vincent Fernandez and Kathleen Dollman for assistance in using BM05 and BM18.



The Heyday of the Gymnosperms & the Heyday of the Angiosperms

John Anderson

The two primary projects that I'm working on currently, the '**Molteno Palaeoflora**' and the '**Africa Alive Corridors**', portray the mid-Triassic 'Heyday of the Gymnosperms' (conebearing plants) and today's 'Heyday of the Angiosperms' (flowering plants) respectively! Let me touch briefly on the two projects.

Molteno Palaeoflora

This has occupied me, together with Heidi Anderson, throughout my professional and retired career of 56 years since 1967 (when we made our first Molteno field trip, to Little Switzerland)! The current volume, Molteno <u>Kannaskoppia</u> (345 pages), completed earlier this year and on the verge of being published, is number 8 in the series.



"Heyday of the Gymnosperms" - *Kannaskoppia* growing on the sandbanks within the Molteno meandering-river system. Painting by Heidi Anderson. Particularly special about *Kannaskoppia* and affiliated taxa, is that of all the Molteno and Gondwana Triassic gymnospermous plants, it is by far the best represented by attached foliage, along with attached female and male strobili (fructifications). This allows an unusually convincing study of the diversity within the group.

The overall aim is to describe the entire flora (and associated fauna, mainly insects). We have recently completed the 8th volume

in the series.

Volumes published (over the past 40 years):

- 1. 1983—"Dicroidium"
- 2. 1985—"Prodromus of South African megafloras"
- 3. 1989–"Gymnosperms"
- 4. 2003--"Heyday of the Gymnosperms"
- 5. 2007–"Brief History of the Gymnosperms"
- 6. 2008–"Molteno Ferns"
- 7. 2018–"Molteno Sphenophytes"
- 8: 2023-"Molteno Kannaskoppia" (in press)

There remain 4 volumes in the pipeline (to be completed before I'm 95)!

Africa Alive Corridors

Though evolved from our Gondwana Alive project initiated in 1999, the AAC project, in particular, was first presented by myself and Maarten de Wit at the International Year of Planet Earth (IYPE) conference held in Arusha, Tanzania, in May 2008—just a month before my official retirement at age 65. It has occupied a good part of my 15 retirement years since. Our wall poster—planned as the cover to the volume when published--dates to 9 Jan 2013 (a bit over 10 years ago now).

AAC explores the biography of Africa, geologically, biologically and culturally along a selection of 20 Heritage Corridors crisscrossing the continent and crossing all 50plus countries; each with a selection of 20 Heritage Nodes. A key theme, explored in each of the 20 Corridors, is 'Celebrating Biodiversity', plant and animal. Our Goldilocks-zone (just-right) planet revolving around the sun, is as rich in species as can be imagined, somewhere between 10 and 100 million-following explosion the of macroscopic life, on land and at sea, after the melting of Snowball Earth around 640 million years ago.

Our Amphitheatre home garden (see photo taken this early Summer) tells me daily of the "Heyday of the Angiosperms", with their wonderful diversity (some 220,000 species) and grandeur, clothing the continents of our Earth. And aside from the full spectrum of colours displayed by the flowers, there's the incredibly range of green of their leaves; with every species seeming to show a different shade of green.

And once this multi-authored AAC volume (c500 pages) is completed (we're aiming at mid-next year, 2024), there's our "<u>Homo</u> <u>sapiens</u> Corridor" (along the Southern Cape coast) and our "First Person Short Stories" (written by multiple people) to complete; and then there's a volume on each of the other 19 Corridors for others to plan and see into the world. Africa is, of course, the womb of humanity, where we evolved from our primate stock along with the gorillas and the chimpanzees, and the continent from which we spread about the planet.

And I do have a few further projects on the go as well, "The Angiosperm Timetree Cookbook" and "A Journey through Earth-Time", amongst others.

I guess I might reflect that my retirement is pretty fully occupied!



Our Amphitheatre Garden.

PALNEWS OCTOBER 2023

Julien Benoit

Alfred 'Gogga' Brown (1834-1920), often known as the "Hermit-Naturalist" from Aliwal North, was a pioneer of Karoo palaeontology (Drennan, 1939). He discovered some 28 holotypes of karoo reptiles and corresponded with the greatest palaeontological minds of his time, such as Huxley, Lartet, Kannemeyer, Seeley, Haugthon, and Broom. He kept track of all his discoveries, scientific observations, and correspondence in the 21 volumes of his notes, written between 1867 and 1920. Among them three rather uncommon are occurrences: three fossil shells found near Burgersdorp and Aliwal North that seemingly transported from the Jurassicwere Cretaceous beds of the Uitenhage Group.

Below are the transcripts from volume 9 of his notes that I could access at the Iziko Museum of Natural History thanks to Zaituna Skosan, Claire Browning and Roger Smith, to whom I am grateful.

First fossil:

"(entry 312) An ammonite Walter Robert's elder son (has one arm) from Jamestown paid me a visit on Oct 4, 1894 and among other matters told me that he has an ammonite which was picked up on a farm occupied by Piet Wagenaar twenty five years ago. Jamestown now occupies the site which was formerly Wagenaar's farm. I cannot think that it came from rocks in situ. It may have been casually dropped there." "(entry 313) On enquiry special made find that the ammonite was given to Mr. Roberts 23 years ago [in 1871]. Mrs Wagenaar says that she does not know whether it was found at their farm near Burgersdorp or on the farm which now forms the township of Jamestown. She had no children at that time likely to find any specimens and as many persons visited the place it may have been left by one of them."

"(entry 314) The ammonite, loan of Mrs. Wagenaar was shown this morning Oct 11, 1894 about 10.15 am the ammonite from Jamestown which was send in to Mr. A. Dugmore, per post cart for my information. He Told A.D. on receiving it that she remembered it quite well and that it was picked up on their farm Witkop near Burgersdorp and that on seeing it at the hours they all thought it was a fossil snake (a common belief in the British islands). She is quite certain that it was not given to them and that it was picked upon the farm.

The outer whorl is only missing, the specimen is in fine preservation and occupied the centre of a piece of indurated black shale, cemented like the clay slats, which has been indurated by igneous action. The piece after being broken from the parent rock has this igneous action been rounded into a pebble and highly polished. The pebble subsequently broke into halves leaving the ammonite intact on one half of the pebble which is somewhat weathered, hard, but less affected by waters. From the hardness,

roundedness and polished state of the matrix (pebble) it may have come from a long distance. The pebble contains a large percentage of lime. It was tested with hydrochloric acid - one drop in sooner touched the polished surface of the pebble than it effervesced rapidly and showingly with a cone showing that it contained a large percentage of lime. The acid was applied on the opposite side to that in which the ammonite was embedded. From the fine grain of the stone, it appears to be really an indurated marl. Have two photos of the stone ammonite taken by A.D. for one and recovered on Oct 13th. The greatest width across the ammonite is two inches. The greatest thickness of pebble 3/4 inch and a small piece of the ammonite is broken off.

Letter received by Mr. A. Dugmore from A. E. Roberts Jamestown, dated Oct. 16th in which he gives the ammonite to me and among other things adds "I do not want anything for it" A.D. gave me the letter. Gave A.D. "pages advanced leased book of Geology" to send to A.E. Roberts on loan.

The ammonite is found in the Uitenhage beds of Sundays River. It is probable that the specimen was brought up by a transport rider, or perhaps by some person leaving on the farm Witkop, when it was subsequently lost on the farm and afterwards found by the children of Mrs. Wagenaar. There was formerly a large amount of traffic by transport riders from Port Elizabeth to Burgersdorp."

"(**entry 315)** The ammonite. received this A.D. the missing portion of ammonite, send in by A.E. Roberts from Johannesburg Oct. 24th, 1894." "(entry 318) Dr. Kannemeyer visited me once at the library this evening Nov. 2nd, 1894. [...] Did not see the ammonite but believe it came from Uitenhage. There are Estheria found near Burgersdorp. He also tells me there are also fossil shells found near Burgersdorp. The Estheria and ammonite are found in Triassic beds in Europe. Why not in Cape Colony? But the Estheria dates from the Devonian Period up to present day."

Second fossil:

"(entry 580, repeated 512) A fossil bivalve shell picked up by Berker's young daughter on the surface on the Free State side of the Orange River. At the foot of the hill in a straight line with the bridge. I search the locality after crossing the Bridge keep straight on until you reach the hill which is a short distance to the south end of the bridge. Some persons think the specimen is either a cockle or a clam. A later account says the child picked the shell from the sand at Maalkat."

"(516) The fossil bivalve shell of 512a. The child who picked up this shell said Mr. A. Dugmore today, July 12th, 1897, that she got it by the Maalkat (or so-called whirlpool) on the other side of the 'falls' in the bed of the Orange River. She told him that she was tossing sand about where she saw the shell. It is probably a lost european specimen."

"(517) Across the Orange River and from thence, slowly grased deposits in the bed of river to Maalkat (17 July 1897). a piece of silicified wood showing lines of growth with waterworn. A bead polished stone, probably pseudo rain spots. Young Pradshow went with me."

Third fossil:

"(entry 12) A fossil Echinus, received on 12 January 1910 from Mr. William Robertson of the Albert Jessie newspaper at Burgersdorp, through Mr. Croll photographer, Aliwal North, a fossil shell Echinus, similar to Fig 267 p 389, vol 1 of Nicholson's Palaeontology. Mr Robertson when lately at Aliwal North told me that he found the shell in the bed of a sluit in neighbourhood of Burgersdorp. He also said he could send it to me. Since ascertained that the spot is a picnic locality. I have now three special shells ["of marine origin" added in entry 1305 only] found near here. An ammonite, a bivalve shell, an Echinus None of these are found in Aliwal and Burgersdorp aluvial beds."

Discussion

All three specimens were kept by Brown alongside "special stone tools as anthropological specimens"; however, despite our best efforts with the curators of the Iziko Natural History Museum, we could confirm not relocate them to their identification. The same goes for the photos of the ammonite mentioned by Brown. Kannemeyer seems to have questioned that the first fossil was actually an ammonite, as he identifies it as a crustacean. However, according to Brown, he did not look at the specimen. As such, there is no reason to give more credence to his words than Brown's, the last of which being a competent amateur palaeontologist.

The sea urchin is compared by Brown to a figure in H. Alleyne Nicholson's "A Manual of Palæontology, for the Use of Students. With a General Introduction on the Principles of Palæontology" published in 1879. This figure

very similar to e.g. Hemiaster forbesi found commonly in the Sundays River Formation of the Uitenhagen Group (MacRae, 1999). The bivalve could be anything, although its preservation style, like a modern "cockle or a clam", is not typical of the abundant bivalves' internal moulds found in the Karoo. Brown's final conclusions that these fossils were transported by people is thus well supported. Although they could come from anywhere given the absence of identification, there is little reason to doubt Brown's conclusion that they are from the Uitenhage Group, most likely from the fossiliferous beds of the Cretaceous Sundays River Formation. At his time, Brown hypothesised that the fossils were recently transported by European settlers, but more recent works have demonstrated that precolonial inhabitants of Southern Africa have manuported geological items, including fossils, for centuries (Helm al., 2019). Here, the absence et of archaeological context with the manuports does not enable to exclude any of the two hypotheses. Though anecdotal, the strange occurrence of these, likely Cretaceous, transported fossils in the Karoo remains an invitation to all of us to keep an eye open for out-of-place fossils.

pictures a Micraster coranguinum, which is

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Three suspects behind the Piltdown Man fossil hoax

Francis Thackeray

The "Piltdown Case" relates to an English hoax or joke in which someone at Piltdown in Sussex buried an unusual human skull (stained brown) with a modified orangutan jaw (also stained brown), to look as if the relatively modern specimens represented a fossilised "ape-man", apparently associated with the fossilised bones and teeth of animals known to have existed more than a million years ago. This Piltdown Man "fossil" was discovered in 1912, and announced with much acclaim at the end of the year in London as *Eoanthropus*, the "Dawn Man", otherwise referred to as "The Earliest Englishman".

Many people have been suspected as fraudsters, especially <u>Charles Dawson</u>, an amateur archaeologist who lived near the site of Piltdown, but more than a century later the case is still not closed.

In addition to Dawson I have been interested in the possible role of <u>Pierre Teilhard de</u> <u>Chardin</u>, a French palaeontologist, Jesuit priest and philosopher who had taken part in excavations at Piltdown in 1912, and who had visited the site again the following year, when he picked up an isolated orangutan canine tooth. De Chardin had discovered the specimen in an area which had already been thoroughly searched, which has raised suspicion. I am not claiming that De Chardin was the "principal perpetrator", but he does deserve attention. In particular, one may ask whether he was aware of a joke in which he was an accomplice. Evidently something had gone wrong with the hoax in 1912 after it was taken seriously by Smith Woodward, the head of the geology division at the Natural History Museum in London.

In the <u>South African Journal of Science</u> and in <u>Evolutionary Anthropology</u> I have presented a scenario in which De Chardin knew that a certain Edgar Willett was the main perpetrator. Willett was a retired medical man, trained in Oxford. He had been a curator of a museum at St Bartholomew's Hospital in London, had a knowledge of anatomy and had access to unusual human skulls. In early retirement he lived near Piltdown. Notably, he had assisted with excavations at the Piltdown site in 1912. By 1913 he had apparently become a member of an "inner circle".

After a period when no fossils had been found, the orangutan canine was picked up by De Chardin on 30 August 1913. Perhaps not coincidentally, it was the very day when he joined the excavation that year. Of particular interest is the source of the tooth. In 2016 Isabelle de Groote, Chris Stringer and their colleagues were able to demonstrate from DNA that it must have come from the Sarawak region of Borneo. An expedition to that area was undertaken by Alfred Everett in 1875, sponsored by, among others, Charles Darwin and three members of the Willett family, including Edgar and his Henry (Sherratt, 2002). The father expedition brought back orangutan material, most of which went to The Natural History Museum (BMNH), but it had been agreed in advance that "duplicates" could go to collectors. It would seem entirely probable that such "duplicates" would go to sponsors of the expedition.

Tom Harrisson (curator of the Sarawak Museum) informed Kenneth Oakley (at The History Museum) that Natural some orangutan specimens collected by Everett would have gone to "dealers" (De Vries, H and Oakley, KP, 1959). Thereafter such material would have been distributed to private collectors. This brings us to the question as to whether Willett was the "collector" to whom De Chardin referred in correspondence with Henri Breuil (IPH Institute of Human Palaeontology, Paris) and Oakley. As someone who claimed that he knew the identity of the principal perpetrator, and as a priest whose honesty would be expected to have been unquestionable, De Chardin was most certainly suggesting to Breuil and Oakley that a collector other than Dawson had planted ape material in the Piltdown pit.

Remarkably, in an essay on human evolution published in January 1913 in the Jesuit journal *Études*, De Chardin wrote that: "There was a time when prehistory deserved to be suspect and the subject of jokes." Even more remarkable is the fact that De Chardin In 1920 De Chardin wrote only his publication on Piltdown, in which he mentions that the condyle of the orangutan jaw was broken "as if on purpose". Without this critical condyle, it would not have been immediately obvious that the ape jaw did not articulate with a human skull. In 1920, nobody at the time had as yet suspected a forgery, but in this short phrase ("broken as if on purpose") we see the hint of a hoax. Stephen Jay Gould considered this as a smoking gun, indicating De Chardin's singlehanded complicity. I do not go so far. Instead I consider that Piltdown Man was intended as a simple joke that went wrong, too quickly, involving at least three people: Willett principally, aided by De Chardin and Martin Hinton who is known to have stained bones experimentally at The Natural History Museum. I suggest that the motive was to hoist the ambitious Dawson (a serial fraudster) on his own petard. At least potentially, Willett had access to the necessary materials, including unusual human skulls (from the museum which he had curated in London), orangutan jaws and teeth (from Borneo), and fossils of a diversity of animals (from his father's extensive antiquarian collections in Brighton).

The wealthy Willett in early retirement had the means, had free time on his hands and the necessary background in anatomy from Oxford. De Chardin had basic а understanding palaeoanthropology. of Hinton contributed his experience from experimenting with the chemical staining of bones. I regard them all as suspects, with Willett having been the orchestrator.

In New York in 1914, William King Gregory wrote the following with regard to Piltdown "fossils" (published in The American Museum Journal, 14:189-200): "It has been suspected by some that geologically they are not old at all; that they may even represent a deliberate hoax, a Negro or Australian skull and an ape jaw artificially fossilised and 'planted' in the gravel-bed to fool scientists". From whom did he get this rumour ? I propose that it was none other than Teilhard De Chardin. The two of them had met during a dinner with Smith Woodward in London in 1913. Just imagine them having a discussion about Piltdown, after more than one glass of wine. Teilhard might have jokingly seized the opportunity to tell Gregory the truth about the joke, but to pass it off as a rumour he had heard (without implicating himself), in the hope that this "rumour" would be taken seriously, helping to expose the hoax. That's my scenario. Teilhard was a joker. And it has been said that at that time, Jesuits were allowed to lie, providing it was a joke (Thackeray, 2012).

I am grateful to the Trustees of The Natural History Museum for the opportunity to examine archives relating to Piltdown. I am also grateful to the Teilhard de Chardin Foundation and the Jesuit Archives in Paris for access to material in their care. Stephen Jay Gould enthusiastically encouraged me to pursue the Piltdown Case. I have enjoyed animated discussions with Chris Stringer and Chris Dean, and correspondence with Martin Pickford. This item for PalaeoPalaver is primarily an extract of an article that appeared in the *Mail and Guardian* in February, 2022. Thackeray, J.F.2012. Deceiver, joker or innocent? Teilhard de Chardin and Piltdown Man. *Antiquity* 86:228–234.

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Dawson and Woodward's finds are announced in the Illustrated London News, December 28, 1912.



Electron: behaves as a wave Human being: watches closer Electron:



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