The Palaeontology Newsletter

Contents

Reminder: The deadline for copy for Issue no. 119 is 1st June 2025.

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Editorial

Your Editor, and the entire Association Council, wish you a happy and healthy 2025! I write this on a rainy, gloomy day in Switzerland, where the current ski season is slightly disappointing… But to cheer us all up, we have a new *Newsletter*, full of interesting reports and perspectives!

As the first issue of the year, we have a report on the Annual Meeting, in 2024 held in Erlangen, Germany, by **Princess Aira Buma-at**. I enjoyed the Meeting immensely – congratulations and thank you to the whole organizing team! The next Annual Meeting will be at the University of Portsmouth, UK, organized by a team headed by **Nic Minter**. The next Progressive Palaeontology will be at the University of Edinburgh, UK, organized by a student team represented on Council by **Laura Cooper**. Keep your eyes open for more information about these exciting conferences soon!

At the start of this year, we welcomed a new batch of Council members. **Phil Donoghue** is our new President (Overlord?), with new Vice-President **Barry Lomax**. The editorial team welcomes a new Editor-in-Chief, **Mike Benton**, and Editor Trustee, **Martin Smith**. We were also joined by **Darja Dankina**, filling the role of Publicity Officer for 2025. Welcome to all, and I look forward to working with you! A variety of Council positions come available at the end of 2025 (nomination deadline 1st September): please consider joining us and making your mark on palaeontology.

In addition to our new Council members, we have lots of announcements for this issue. Read short profiles on our 2024 Award winners, **Mike Benton**, **Daniela Schmidt**, **Emilia Jarochowska**, and **Louis Rulleau**, and our 2025/26 Exceptional Lecturer **Yara Haridy**. We also announce the awardees of our many professional grants, and the winners of the 2024 Annual Meeting prizes. The deadline for nominations for this year's Association's awards is 31st March, and we have a brand-new early-career award, so please consider nominating your colleagues!

Of course, this issue also features articles from our membership and palaeontologists across the globe. We go behind the scenes of the Natural History Museum of Zimbabwe with **Michel Zondo**, with some fascinating history about Zimbabwe and palaeontology collecting in the country. **Peter Falkingham** continues his series *Software for Palaeontologists*, presenting some pros and cons of different photogrammetry software. We have the first article of a new short series, *Welcome to the Palaeoverse*, which will follow in the footsteps of the much-loved *R for Palaeontologists* and show you how to use the R package palaeoverse (and others) for some key aspects of analytical palaeontology. We have our long-standing book reviews section, covering a diversity of subjects, and the incomparable **Jan Zalasiewicz** reminiscing about Arran. **Emma Randle** and **Terri Cleary** give us two fascinating perspectives on software and bioinformatics careers after working in academia. Lastly, we have the 2024 Association Diversity Study report by our Diversity Officer **Nidia Alvarez Armada**, and we remember **Stephan Bengtson** and his vast contributions to palaeontology.

Breaking News! The Association is hosting a hybrid workshop in May at the Natural History Museum, London to discuss legislation around fossil collecting in England and Wales; see page 28.

A big thank you, as ever, to all our *Newsletter* contributors, and to you for reading!

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Postcards from the President

Phil Donoghue takes up Rachel Wood's pen to highlight issues of particular topical relevance.

It is with some trepidation that I embark on my term as President of the Palaeontological Association, which I first joined as an undergraduate some time back in the Miocene. However, my year of shadowing the President has shown me that we're all in good hands thanks to the enthusiasm and dedication of the Association's officers and members of Council. I particularly thank the members of Council who stepped down at the end of 2024, including Nicola Vuolo (Publicity Officer), Evelyn Kustatcher (Editor Trustee), Paul Taylor (Editor in Chief), and Emma Dunne and her team who organized the immensely enjoyable Annual Meeting in Erlangen. I'm especially lucky to be following on from the hard work and dedication of Uwe Balthasar (Vice President) and Rachel Wood (President). Uwe completed the Herculean task of integrating the Association's codes of practice, which will be more rewarding for us than it may have seemed to Uwe. Rachel shepherded through a number of important initiatives, perhaps the most important being the Association's new publishing contract which will provide some financial security for the next five years. So as we embark on a new year, I personally thank everyone on Council and the Membership who have contributed to the success of the Association over the last year.

Phil Donoghue

President

#4: Cretaceous
Weald, southern England 125 myr ago
Foreground: *Baryonyx walkeri* (meat-eating dinosaur)
Background: *Mantellisaurus atherfieldensis* (plant-eating dinosaur), *Koumpiodontosuchus aprosdokitii* (small crocodile)

Association Business

New Council Members for 2025

At the AGM the following individuals took up roles on Council:

- Vice-President: **Barry Lomax****
- Editor in Chief: **Michael Benton****
- Editor Trustee: **Martin Smith***
- Publicity Officer: **Darja Dankina*****

*candidate nominated by the Editorial Board as one of two Editor Trustees.

**Council nominee.

***co-opted on to Council to fill the role.

The Association is run by members for members. Without these dedicated and selfless individuals putting themselves forward for Council roles we would not be able to continue our work to promote and support the palaeontological community.

Volunteer opportunities available

The following Council positions become vacant at the end of 2025:

- Vice-President (2-year term)
- Treasurer (5-year term)
- Internet Officer (3-year term)
- Meetings Coordinator (3-year term)
- Outreach Officer (3-year term)
- Early Research Career Officer (3-year term)
- Ordinary Member (3-year term)

If you wish to stand for Council in 2025 please reach out to the current holder of the role for more information and see <**https://www.palass.org/association/how-stand-election-council**>.

The deadline for nominations is **1st September**.

Annual General Meeting 2024 – Awards and Grants

The following awards and grants were announced and summarized at the 2024 AGM held in Erlangen, Germany.

Lapworth Medal – Michael J. Benton

The Lapworth Medal is the most prestigious honour bestowed by the Association, awarded to a palaeontologist who has made a highly significant contribution to the science of palaeontology by means of a substantial body of research and service to the scientific community. It is not normally awarded on the basis of a few good papers, and Council looks for breadth as well as depth of the contributions in choosing suitable candidates.

In 2024 the Lapworth Medal was awarded to Professor **Michael J. Benton** OBE FRS FRSE.

Philip Donoghue and David Harper write in their nomination: "*[Mike] Benton has, through numerous seminal contributions, transformed our understanding of tetrapod evolution, and macroevolutionary patterns and processes in general. His work has done much to establish the philosophy that palaeontological data (fossils) should integrate seamlessly with modern biology. He has done this through developing rigorous quantitative approaches to understanding diversity patterns in the fossil record and protocols for integrating fossil data with molecular data for dating evolutionary events. He was a pioneer in using large phylogenetic datasets to tease out underlying evolutionary patterns leading to important discoveries about the nature of the fossil record and how clades have diverged over geological time. His work continues to shape ideas about how life on land was affected and recovered from the Permian–Triassic mass extinction. He leads a large team that has global influence.*"

Mike Benton's work can be categorized into five main themes:

Dinosaur systematics and phylogeny: Mike is renowned for his contributions to dinosaur systematics, including key taxonomic redescriptions and pioneering large-scale phylogenies. His work on tetrapod and diapsid systematics remains fundamental to the field. He was among the first to use supertree methods to synthesize numerous small-clade analyses, providing a framework for macroevolutionary studies. His research has explored dinosaur diversification and extinction using cutting-edge comparative methods. A major highlight of his career was leading the team that first identified preserved melanosomes in dinosaur feathers, revealing their colouration and shedding light on adaptations like camouflage and sexual dimorphism.

Origins of biodiversity: Mike has revolutionized the study of biodiversity origins, shifting from narrative approaches to quantitative analysis. Since the 1980s, his work has examined dinosaur diversification and post-Permian–Triassic extinction recovery, revealing how clades radiate and acquire innovations. He introduced the concept of the 'Cretaceous/Angiosperm Terrestrial Revolution', highlighting the co-diversification of dinosaurs, reptiles, insects and flowering plants – an idea that continues to influence research in palaeontology, ecology and molecular biology.

Fossil record quality: The reliability of the fossil record has long been debated, but Mike championed a quantitative approach to assess its accuracy. Work using phylogenetic trees demonstrated a strong concordance between cladograms and the fossil record. His findings have also challenged assumptions by showing fossil record quality does not necessarily degrade further back in time, reinforcing its value in studying deep-time biodiversity.

Dating the tree of life: Mike played a key role in resolving disputes between phylogenomic and palaeontological dating methods. He and his colleagues developed novel protocols to integrate molecular and fossil data, refining techniques for calibrating the tree of life to geological time by distinguishing hard minimum from soft maximum age estimates and applying Bayesian models. This approach has become the standard in dating the tree of life, enabling more precise studies of the coevolution of Earth and life.

Public outreach: A passionate educator, Mike founded the Bristol Dinosaur Project (BDP), training students to deliver STEM-focused lessons in schools. Since 2000, the BDP has reached tens of thousands of students, securing major funding and earning Benton an OBE in 2021. He has also authored over 50 books, including acclaimed titles such as *When Life Nearly Died* (2003), *The Dinosaurs Rediscovered* (2019) and *Dinosaurs: New Visions of a Lost World* (2021), broadening public engagement with palaeontology.

Mike has published over 600 papers, with his influence further amplified by major synoptic works like *Fossil Record 2* and widely used textbooks. His *Vertebrate Palaeontology* is the global standard, adopted by hundreds of institutions and translated into multiple languages. His *Introduction to Paleobiology and the Fossil Record* (co-authored with David Harper) is the leading textbook in English-speaking countries.

A key figure in palaeontological training, Mike has supervised 77 PhD students (69 graduated at the time of nomination) and over 30 postdocs, many of whom have built successful academic careers. He founded the University of Bristol MSc in Palaeobiology in 1996, which has trained over 400 students, shaping nearly half of the UK's new palaeobiology researchers, as well as many across Europe and beyond.

Mike has held leadership roles as President of the Palaeontological Association, the Geologists' Association, and the International Palaeontological Association. In recognition of his contributions to palaeontology and evolutionary biology, he was elected a Fellow of the Royal Society of Edinburgh in 2008 and Fellow of the Royal Society in 2014.

Mike's accomplishments make him a truly worthy recipient of the 2024 Palaeontological Association's Lapworth Medal.

President's Medal – Daniela N. Schmidt

Photo courtesy of Daniela Schmidt.

The President's Medal is a mid-career award given by Council to a palaeontologist who has had between 15 and 25 years[1] of full-time experience after their PhD, in recognition of outstanding contributions in their earlier career coupled with an expectation that they will continue to contribute significantly to the subject in their further work.

The President's Medal in 2024 was presented to Professor **Daniela N. Schmidt**.

David Harper and Mike Benton write in their nomination: "*Daniela Schmidt is a sector leader in researching and outreaching both current and deep-time biodiversity and climate change through a palaeontological lens. Daniela completed her undergraduate research in Bremen addressing the faithfulness of proxy reconstructions based on benthic foraminifers, followed by a PhD at ETH Zürich in Earth Science, completed in 2002 on "Size in planktic foraminifers" for which she won ETH's Silver Medal for the best PhD in Earth Science. She was awarded a series of fellowships from the Swiss Science Foundation in 2002, the German Science Foundation in 2003 (both held at Royal Holloway, University of London, UK), a NERC fellowship from 2004 (at the University of Bristol, UK), a Royal Society Research Fellowship (from 2006) and Leverhulme fellowships (2022). She received a Royal Society Wolfson Merit Award from the Royal Society in 2015, and in 2016 was elected a member of the Young Academy of Europe and a fellow of the Royal Society of Biology. Her main high-level research aim is to combine assessments of past climate change and the understanding of modern processes to better assess risk, impacts and potential for adaptation of ecosystems to climate change.*"

Daniela's research focuses on ocean acidification from a deep-time perspective, collaborating with modellers to reconstruct past environments. Her work has characterized biotic responses to past climate change, advanced methodologies for assessing calcification impacts, and applied these to key geological events like the PETM and K-Pg. She has pioneered techniques such as CT scanning of foraminifera, *in situ* geochemical analyses and trait modelling, extending their application to modern oceans. More recently, she has explored the vulnerability of coastal habitat foraminiferas and the socioecological aspects of climate change, collaborating across disciplines on legal, communicative and policy dimensions.

She has published 95 papers (including highly cited works with 9,600 citations) and contributed to five book chapters and eight reports. Her international recognition is evident from keynote invitations (*e.g.* Royal Society Sackler Forum, UKHSA conference) and leadership roles at major conferences (*e.g.* Gordon Research Conference, Commonwealth Conference on Biodiversity).

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[1] Note: The President's Medal rubric has been updated from 2025 and will now be awarded to individuals who have up to 20 years' experience.

Daniela has mentored PhD students (21 at time of nomination) and fellows from around the world, with her students winning prestigious awards like the Geologists' Association Prize and the Charles Downie Award. Many have gone on to careers in academia, industry and government. In recognition of her mentorship, she received the Todd and Low Award for Teaching and Mentorship in 2021. She also ensures open access to research data via international and university portals.

Beyond academia, Daniela has played a key role in translating science into policy. As a Coordinating Lead Author (CLA) for the IPCC, she contributed to the Europe impact assessment and the Summary for Policymakers. She has advised on marine conservation laws, the European Commission's Food from the Ocean report and UK Marine Climate Change Impact reports. She has briefed MPs, participated in expert hearings, and was an invited expert at a G7 summit on inclusion.

She has also been Faculty Research Director at the University of Bristol, shaping research priorities and fostering external partnerships. She serves on editorial boards and grant panels for organizations like AGU, NERC and the Royal Society Dorothy Hodgkin Fellowships, as well as serving as a Council member for the Palaeontological Association.

Committed to public engagement, Daniela has given over 640 interviews, including features in *Time Magazine*, Arte documentaries and BBC World. She co-leads *Waves of Change*, a youth-led climate initiative showcased at COP and Glastonbury. She also collaborates with artists, such as Neville Gabie, to make climate science accessible through exhibitions like the National Trust's *At the Edge*.

Daniela's accomplishments to date make her a deserving recipient of the 2024 Palaeontological Association's President's Medal.

Hodson Award – Emilia Jarochowska

The Hodson Award in 2024 was awarded to a palaeontologist who has had not more than ten years[2] of full-time experience after their PhD and who has made a notable contribution to the science of palaeontology.

The 2024 Hodson Award was presented to Dr **Emilia Jarochowska**.

Photo courtesy of Emilia Jarochowska.

Kenneth De Baets and Christian Klug write in their nomination: "*Throughout her scientific career, Emilia has pursued numerous interdisciplinary research interests, with three main threads standing out. First, the interplay between sedimentation and palaeontological patterns best illustrated by her research on the nature of Silurian crises and harnessing stratigraphic bias in diversity patterns at the section scale. Second, her projects on biomineralization and sclerochronology with her former students highlighted*

[2] Note: The Hodson Award rubric has been updated and from 2025 will be awarded to individuals who have between four and ten years' experience.

by interdisciplinary publications on growth models and chemical characterization of conodont elements. Third, innovative publications on the evolution and feeding ecology of conodonts with impressive work on diversity in hypersaline lagoons, parallel evolution and trophic partitioning in conodont elements. In addition, she consistently worked with colleagues and students to improve methods to document and investigate evolutionary to ecological structures patterns which is illustrated in joint publications on ordination methods, microfossil preparation and XRD spectroscopy."

Emilia joined Utrecht University's Department of Earth Sciences as an Assistant Professor in 2021, where she leads the ERC Starting Grant project 'Mind the Gap', investigating the completeness of the stratigraphic record and its role in evolution. She has been a strong advocate for open science, making all research data and code publicly accessible well before it became standard practice.

Beyond research, Emilia is deeply committed to teaching, outreach and mental health support for early-career palaeontologists. She has developed innovative courses on palaeontological and environmental proxies, breaking traditional moulds, and her Science Communication course equips students with video production skills to share their research. She has engaged in numerous outreach initiatives, including Geology of the Tour de France and Soapbox Science Munich. She also actively supports early-career scientists, helping to secure financial and mental health resources through conferences and workshops.

An Association member since 2010, Emilia has previously served on Council as Newsletter Editor, introducing discussions on gender equality and career challenges. She has consistently championed diversity and inclusion, working to remove barriers for under-represented researchers and fossil enthusiasts from resource-limited regions.

Her commitment to mentorship and equality has left a lasting impact on colleagues and students, creating a welcoming environment in her international Master's programme. Her dedication, combined with her supportive and positive nature, has made a tangible difference in improving opportunities for young researchers and minorities in palaeontology.

Emilia is awarded the 2024 Hodson Award, in recognition of her multiple scientific contributions, but also for her support for our field and community.

Mary Anning Award – Louis Rulleau

The Mary Anning Award is open to all those who are not professionally employed in palaeontology but who have made an outstanding contribution to the subject. Such contributions may range from the compilation of fossil collections and their care and conservation, to published studies in recognized journals.

The 2024 Mary Anning Award is awarded to Dr **Louis Rulleau**.

Vincent Perrier and Christian Klug write in their nomination: "*Louis Rulleau, born in 1937, is a retired schoolteacher, who developed a passion for books, natural history and particularly for fossil cephalopods in parallel to his career path. This passion led Louis to embrace PhD research resulting in a thesis entitled 'Les Grammoceratinae (Ammonitina) de la région lyonnaise' that he defended in 1989 at the Université Claude Bernard-Lyon 1 (UCBL) under the supervision of Professor Serge Elmi who, after supervising his thesis, remained his mentor and friend until his death in 2007.*"

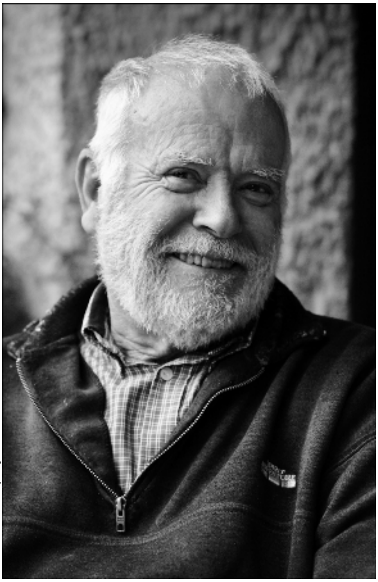


Photo courtesy of Louis Rulleau.

Louis is a highly-regarded non-professional palaeontologist specializing in Toarcian and Aalenian cephalopods. His extensive contributions include 54 publications, with 17 scientific books and numerous peer-reviewed articles. Beyond his research, he has played a key role in fostering collaboration between industrial, amateur and academic communities. He co-founded the 'Section géopaléo' association, strengthening partnerships with the Belmont quarry (Rhône) and contributing to the creation of the 'Espace Pierres Folles' museum, which has welcomed thousands of visitors since 1988. His work with the Paleorhodania association led to significant Jurassic vertebrate discoveries. Additionally, he has been instrumental in curating and preserving extensive fossil collections (> 3,000 specimens), ensuring their conservation for future study.

Despite not being a professional palaeontologist, Louis has been an active member of several prestigious geological and palaeontological societies (Société Géologique de France, the Association Paléontologique Française, the Groupe Français d'Etude du Jurassique, the Société Linnéenne de Lyon, and the Académie du Beaujolais), and served as the collections manager of the Espace Pierres Folles. In recognition of his contributions, he became the first recipient of the Gaston de Saporta Prize in 2013, awarded by the Association Paléontologique Française to non-professional palaeontologists.

Given his remarkable scientific and outreach contributions as a non-professional, he is a highly deserving candidate for the Palaeontological Association's 2024 Mary Anning Award.

PalAss Exceptional Lecture 2025/26 – Yara Haridy

We are pleased to announce that **Dr Yara Haridy** has been appointed as the PalAss Exceptional Lecturer for 2025/26.

Yara is an Egyptian-Canadian palaeontologist and science communicator specializing in the evolution of bone and skeletal tissues using advanced analytical methods. Born in Morocco and raised in Egypt before moving to Canada, she completed a BSc in Biology and an MSc in Ecology and Evolutionary Biology from the University of Toronto, where she studied reptile dentition evolution. Following this she completed her PhD at the Humboldt University of Berlin and the Museum für Naturkunde Berlin in 2021 under Florian Witzmann and Nadia Fröbisch.

Yara's research focuses on bone evolution, dentition and palaeopathology, employing bone histology, CT scanning and focused ion beam scanning electron microscopy (FIB-SEM). Her notable discoveries include the earliest known case of viral-induced metabolic disease (Paget's disease), the earliest bone cancer (osteosarcoma) in an amniote (stem turtle *Pappochelys*), and insights into early fish osteocytes that may explain the dominance of osteocytic bone in vertebrates today.

Photo by Pablo Castagnola.

An active science communicator, Yara has built a strong online following, creating viral hashtags like #GuessTheSkull and #SerialKillerOrScientist, which have gained media attention. She engages in public outreach through podcasts (*e.g.* NPR's Short Wave), events (Soapbox Science, Skype a Scientist), and projects like developing a *Velociraptor* puppet with a Palaeontological Association Engagement Grant. She is also a vocal advocate for equity in international research, pushing for increased local collaboration and the development of natural history infrastructure in non-western countries.

Yara will present the *Innovations in Palaeontology Lecture Series* and we now invite interested institutions to apply to host via the Association's website. Please provide a timeframe (between September 2025 and May 2026) during which you would like Yara to give a lecture at your institution/organization. The list of interested institutions will be forwarded to Yara on 1st June, although any applications from institutions submitted after this date will still be considered depending on the remaining time and budget. The Association will pay for any reasonable travel costs incurred by the Exceptional Lecturer in visiting each of the host institutions (up to a maximum of £500 per lecture). The host institutions are expected to cover costs for accommodation (where necessary) and hospitality.

Please see the website for further details: <**https://www.palass.org/awards-grants/awards/innovations-palaeontology-lecture-series-and-palass-exceptional-lecturer**>.

Career Development Awards

The Career Development Grant is to assist talented early-career researchers who have recently completed their PhD to strengthen their CVs, to help them achieve a career in palaeontology. In 2024 the Association awarded a total of £7,500 in Career Development Grants to three individuals:

- Sergio Martínez Nebreda (£2,500)
- Madleen Grohganz (£2,500)
- Emma Jayne Long (£2,500)

Small Grant Awards

In 2024 the Association awarded £9,912 in Small Grants to eight individuals.

Exploring the future of chitinozoan research: revising collections and databases

Sonia Camina
Sylvester-Bradley Award

Summary: Chitinozoans are marine organic-walled microfossils ranging from the Ordovician to the Devonian. Their significance lies in their application in biostratigraphy, palaeogeography, palaeoenvironments and palaeoclimate studies, making them one of the main fossil groups for Early Palaeozoic biostratigraphy. This project aims to fill gaps in chitinozoan research through three initiatives: revising the chitinozoan collection at the Natural History Museum (NHM), London; digitizing the chitinozoan database from the John Williams Index of Palaeopalynology (JWIP); and developing an open-access chitinozoan database (Chitinotax). The NHM houses significant type material, including several new species that require taxonomic revision. Additionally, this institution hosts a chitinozoan database as part of the JWIP, which is publicly accessible but not yet in digital format. Following the taxonomic revision of the NHM's collection, efforts will be made to digitize the JWIP and develop a new chitinozoan database that will be integrated with existing databases. Ultimately, this initiative seeks to inspire future generations in chitinozoan research, transitioning from traditional methods to a digital framework.

Study of one of the last Hippopotamus amphibius *in Europe and insights into the evolution of the endemic hippopotamus of Sicily*

Roberta Martino
Sylvester-Bradley Award

Summary: The objective of this research project is to reassess the hippopotamus remains discovered in English deposits, with a particular focus on the Late Pleistocene material from Barrington. The abundant hippopotamid collection housed at the Sedgwick Museum of Earth Sciences in Cambridge represents a unicum in Europe. *Hippopotamus amphibius* is documented in Italy, Germany, Spain and Greece. Nevertheless, these records are scarce and do not possess comprehensive documentation. Consequently, the British fossils provide an invaluable opportunity for a detailed examination of the fossil *H. amphibius*. By employing a combination of morphological analyses, morphometric techniques, 3D morphometric geometry and sophisticated statistical methods, this study aims to conduct a comprehensive investigation of these fossils, evaluating potential similarities or differences with the extant African hippopotamus. Given that the species is currently classified as vulnerable by the IUCN Red List, a more profound understanding of the fossil characteristics is crucial for assessing the factors that contributed to its local extinction. Moreover, a comparison of the English specimens with *H. pentlandi*, a Sicilian insular species derived from *H. amphibius*, will facilitate a deeper comprehension of its evolutionary adaptations. The findings of this study will contribute to a better understanding of insular dwarfism, a topic of great interest in the field of evolutionary biology.

Describing Scotland's most complete plesiosaur and exploration of the Jurassic of Raasay

Luke Meade

Sylvester-Bradley Award

Summary: Plesiosaurs were a globally diverse and ecologically significant group of marine reptiles throughout the Mesozoic era. Their remains are a prominent feature of the Jurassic marine fossil record, particularly in England, yet they remain exceedingly rare in the Jurassic strata of Scotland, from which only a handful of specimens have been described. Currently, the most complete plesiosaur specimen from Scotland is from the east of the Isle of Raasay, which has not been described in the scientific literature. The specimen is partially prepared and includes a substantial portion of the lower jaw, a series of articulated dorsal vertebrae, dorsal ribs and a partial scapula, and presents potential for new insights into Jurassic plesiosaur morphology, phylogeny and macroevolution. I plan to µCT-scan this material and produce and publish a detailed 3D description of its anatomy. Secondly, I will conduct targeted fieldwork to re-identify its locality of origin. As the material was collected as loose blocks, I will confirm the stratigraphic provenance of the specimen and whether its origin is the Early Jurassic Scalpay Sandstone Formation. Additionally, Jurassic sedimentary strata outcrop along over 5 km of the east of Raasay and present a promising opportunity for further exploration. By prospecting this rarely visited formation for additional fossil material, I hope to uncover new productive localities, yielding material of significance to the Scottish vertebrate fossil record.

Deciphering decapods: ecological implications of Jurassic decapod appendages from Solnhofen based on geometric morphometrics

Myrthe van der Heide

Sylvester-Bradley Award

Summary: Decapod appendage anatomy is diverse and many of these appendages have adaptations for food gathering, mating and defence. This diversity can be seen in fossils from the Jurassic limestones of Solnhofen (Bavaria) as well. However, little is known about how their pereiopods and maxillipeds were used, despite the insight this can give into the ecology of these animals. Because similar functions often result in similar morphologies, comparing modern appendages to fossil appendages can contribute to this insight. This project aims to further examine and expand the results of a bachelor's thesis on this subject. In this thesis, geometric morphometrics was used to compare the shape of modern (clawed) pereiopods and third maxillipeds (front-facing appendages) to those of fossil decapods from the Jurassic of Bavaria. Most shape variation was seen in clawed first pereiopods, which can be divided into three main groups in the fossil assemblage of Solnhofen. Within third maxillipeds of fossil shrimp, such groups were not seen. While similarities between extant and fossil decapods were observed, structures on the maxillipeds are probably more important factors when describing maxilliped function. Expanding this dataset requires travel to German museums, as specimen information is often lacking in Dutch institutions. Photographs, phylogeny, carapace measurements and other size measurements will be taken into account as well.

A large-bodied enigmatic coleoid from the latest Cretaceous of Denmark

Christian Voiculescu-Holvad
Sylvester-Bradley Award

Summary: Coleoidea is presently an incredibly diverse group of cephalopods comprising squids, octopods and cuttlefish. Among the coleoids, several taxa are distinguished by exceptionally large body proportions, ranging up to 10 m in length. Similarly, during the Late Cretaceous, there is a broad trend towards very large sizes in Coleoidea. Interestingly, following widespread abundance during the Santonian–Campanian, large-bodied coleoids are markedly absent in the Maastrichtian record, and subsequently throughout the Cenozoic up until the present day. I aim to assess the causes of this apparent, sudden termination of coleoid gigantism trends, on the basis of new material from the Maastrichtian (~70 Ma) chalk of Møns Klint, Denmark. This enigmatic specimen consists of a large (~3 cm-long) arm hook, likely representing the first record of a giant coleoid in the Maastrichtian. Preliminary examination suggests affinities with Belemnotheutidae, a group of mostly diminutive belemnites from the Late Jurassic and Early Cretaceous. Further work, using computed tomography analyses, will help confirm this assignment. A 4 m body length has been estimated for this potentially new giant coleoid taxon. The Danish specimen is likely to be significant to coleoid evolutionary history, as its stratigraphic placement would indicate that gigantism trends persisted until the end of the Mesozoic and terminated at the K-Pg boundary, possibly as a result of the end-Cretaceous mass extinction event.

Crassulacean acid metabolism (CAM) photosynthesis: a key trait that survived the Earth's biggest mass extinction?

Zhen Xu
Sylvester-Bradley Award

Summary: The Permian–Triassic mass extinction (PTME) was a critical event that caused massive extinctions, wiping out over 90 % of marine species and reshaping terrestrial ecosystems. Interestingly, herbaceous lycopods, such as *Tomiostrobus*, *Lepacyclotes* (Annalepis) and *Pleuromeia*, survived and thrived globally through the PTME. My project will investigate how these lycopods endured extreme climate conditions, particularly in low-latitude regions where surface temperatures exceeded 40°C. One hypothesis is that these plants may have used Crassulacean acid metabolism (CAM) photosynthesis, enabling them to survive the high temperatures by absorbing CO_2 at night, reducing water loss during the day. The project studied the phylogeny of the whole Phanerozoic lycopod sporophylls, suggesting that the Triassic lycopods were closely related to the extant *Isoetes*, which are known for flexible photosynthesis. Carbon isotope analyses further supported that CAM existed in these herbaceous lycopods. My research will be in cooperation with Prof. Evelyn Kustatscher from the Museum of Nature South Tyrol to study well-preserved Triassic lycopod fossils from the Dolomites, aiming to uncover more evidence of CAM in ancient plants from different latitudes. This research seeks to enhance Earth system models and provide insights into the role of plant physiology in global climate resilience during past warming-induced mass extinctions, helping inform future climate mitigation strategies.

Re-evaluation of possible Ediacaran sponges from South Australia

Xiaopeng Wang
Whittington Award

Summary: Sponges, as the earliest diverging branch of the animal kingdom, play an important role in benthic ecosystems, but their early fossil record is highly incomplete, particularly in the Precambrian. The recent discovery of the Ediacaran hexactinellid *Helicolocellus*, which lacks biomineralized spicules, offers new criteria for identifying non-biomineralized sponges from the Precambrian. These new criteria encourage a re-evaluation of debated fossils like *Palaeophragmodictya* from South Australia, originally interpreted as a sponge, but later reinterpreted as the holdfast of a frond-like organism. The regular grid pattern observed in *Palaeophragmodictya* seems to be similar to that of *Helicolocellus*, suggesting a possible related affinity. Other potential sponges from South Australia, such as *Coronacollina* and *Rugoconites*, are also worthy of reassessment. The type specimens of these fossils are all deposited in the South Australian Museum, and they have not been redescribed since their initial studies. A detailed comparison of these Australian fossils with *Helicolocellus* will provide a more comprehensive understanding of their morphology and affinity, and their place in the Ediacaran–Cambrian diversification of sponges.

The taxonomy and phylogeny of British 'cephalaspids'

Amin El Fassi El Fehri
Stan Wood Award

Summary: Jaws and paired appendages (arms, legs, fins and wings) are among the most important vertebrate innovations. Osteostracans, a group of armoured jawless fish from the Silurian and Devonian periods, are the sister group of jawed vertebrates and the first to evolve true paired fins with muscular and endoskeletal support. They represent a key group in the context of early vertebrate evolution. Unfortunately, our ability to study this clade in a macroevolutionary context is hindered by its rudimentary taxonomy and our imperfect understanding of its phylogenetic tree. In order to resolve this long-standing problem, we aim to conduct a major taxonomic revision of British osteostracan species associated with the problematic genus *Cephalaspis*. We will perform a morphometric study of the Scottish and Welsh 'cephalaspid' faunas to assess the morphological disparity within and between them. A preliminary study of Scottish specimens suggests three distinct morphogroups, including *Janaspis powriei* and two new zenaspid taxa: *Saighead websteri* gen. nov. and *Platyrhakis traquairi* gen. nov. We propose *J. pagei* as a junior synonym of *J. powriei*, revealing possible mechanisms of ontogenetic development in this taxon. We will then use this new taxonomic data to update a phylogenetic dataset of Osteostraci and explore the affinity of the new taxa. By including Welsh specimens in this analysis, I hope to obtain a more complete image of British osteostracan diversity and taxonomy.

Association Awards and Prizes in 2025

The Palaeontological Association recognizes excellence in our profession by the award of medals and other prizes. The Association sees its lists of medals and award winners as a record of the very best palaeontologists worldwide, at different career stages, and offering different kinds of contributions to the field. The Association stresses the importance of nominations and encourages all members to make nominations.

Introducing the new Dorothea Bate Award

The Dorothea Bate Award is a new early-career award that will be conferred on palaeontologists who have had up to four years of full-time experience after their PhD (excluding periods of parental or other leave, but not excluding periods spent working in industry) and who has made a notable contribution to the field during and immediately after their PhD.

Dorothea Bate (from the Hungarian magazine Uj Idok *1932).*

This award is named for Dorothea Minola Alice Bate FGS (1878–1951). Dorothea Bate was a Welsh palaeontologist and a trailblazer in archaeozoology, and dedicated her career to uncovering fossils of recently extinct mammals. Her research aimed to unravel the mysteries behind the evolution of giant and dwarf species.

Nominations are invited by **31st March** each year, please see the website for details.

Summary of all the PalAss Awards

Association professional awards

Award	Who is it aimed at?	Who can nominate?	Deadline	More information…
Lapworth Medal	Someone who has made a highly significant contribution to palaeontology. Has a substantial body of research and service to the scientific community.	Requires nomination by two members of the Association.	**31st March**	
President's Medal	Mid-career award. Up to 20 years of full-time experience after their PhD. In recognition of outstanding contributions in their earlier career, coupled with an expectation that they will continue to contribute significantly to the subject in their future work.	Requires nomination by two members of the Association.	**31st March**	
Hodson Award	Early-career award. Between four and ten years of full-time experience after their PhD. Has made a significant contribution to palaeontology.	Requires nomination by two members of the Association.	**31st March**	
Dorothea Bate Award	Early-career award. Up to four years of full-time experience after their PhD. Has made a notable contribution to the field during and immediately after their PhD.	Requires nomination by two members of the Association.	**31st March**	

Association community awards

Award	Who is it aimed at?	Who can nominate?	Deadline	More information…
Mary Anning Award	Open to all those who are not professionally employed in palaeontology but who have made an outstanding contribution to the subject.	Requires nomination by two members of the Association.	**31st March**	
Gertrude Elles Award	For high quality, amateur or institutional, public engagement projects that promote the discipline.	Nomination by one or more individuals. Individuals do not need to be members of the Association. Can self-nominate.	**31st March**	

Association membership awards and prizes

Award	Who is it aimed at?	Who can nominate?	Deadline	More information…
Honorary Life Membership	Recognizes individuals deemed to have been significant benefactors and/or supporters of the Association.	Requires nomination by two members of the Association.	**31st March**	
Undergraduate Prize Scheme	Talented undergraduates.	Any university departments where a palaeontology course or module is taught after the first year as part of a degree programme.	No deadline. Applications accepted throughout the year.	

The PalAss Exceptional Lecturer

Award	Who is it aimed at?	Who can nominate?	Deadline	More information…
PalAss Exceptional Lecturer (as part of the Innovations in Palaeontology Lecture Series*)	Recognizes outstanding research and science communication in palaeontology among members of the Association.	Self-nomination.	**15th November**	

*If you are interested in hosting the PalAss Exceptional Lecturer a call for institutions is made from January to May each year. See link above for more information.

Association Annual Meeting prizes

Award	Who is it aimed at?	Who qualifies?	Deadline	More information…
Annual Meeting Council Poster Prize	Awarded for the best poster(s) at the Annual Meeting.	All student members of the Association, and all members of the Association who are early-career researchers within one year of the award of a higher degree (PhD or MSc).	N/A	
Annual Meeting President's Prize	Awarded for the best talk(s) at the Annual Meeting.	All student members of the Association, and all members of the Association who are early-career researchers within one year of the award of a higher degree (PhD or MSc).	N/A	

Association publication prizes

Award	Who is it aimed at?	Who qualifies?	Deadline	More information…
Best Paper Awards	To recognize papers published in either *Palaeontology* or *Papers in Palaeontology* and reward excellence in our field.	Open to all authors irrespective of age and nationality; membership of the Association is not required.	N/A	

Association grants in 2025

Palaeontological Association grants are offered to encourage research, education and outreach through different means. Undergraduates, early-stage researchers, and otherwise unfunded persons are particularly encouraged to apply. All of these awards and grants are core to the charitable aims of the Palaeontological Association. A full list of the Association's grants may be found on the Association's website at <**https://www.palass.org/awards-grants**>.

A summary of our grants throughout the year is given below. (Deadlines for all grants are included in the Association Diary on the inside front cover of the *Newsletter*.)

Association Grants

Grant Name	Who is it aimed at?	Who can apply?	Maximum Funded	Deadline	More information…
Undergraduate Research Bursaries (URB)	Aimed at giving undergraduate students the opportunity to acquire research skills and experience.	Applications must be submitted by the principal supervisor. Principal supervisor must be a member of the Association.	£400.40 per week. Maximum of 8 weeks.	**1st February**	
Grant-in-aid	Aimed at organizers of scientific meetings, workshops and short courses.	Organizers of scientific meetings, workshops and short courses.	Up to £2,000.	**1st March and 1st September** (Apply at least six months prior to the event)	

Association Grants (continued)

Grant Name	**Who is it aimed at?**	**Who can apply?**	**Maximum Funded**	**Deadline**	**More information…**
Research Grants	To support a single research project, or a 'proof of concept' proposal.	Principal applicant must be a member of the Association.	Up to £10,000.	**1st March**	
Small Grants Scheme	To fund palaeontological research, travel and fieldwork.	Principal applicant must be a member of the Association. Preference is given to students, early career researchers, and members of the Association who are retired.	Up to £1,500.	**1st November**	
Postgraduate Travel Fund	To support attendance of international meetings.	Postgraduate students who are members of the Association.	Up to £300.	No deadline. Applications accepted throughout the year.	
Engagement Grants	To encourage educational outreach, public engagement, and related initiatives in palaeontological themes.	Open to all.	Normally up to £5,000. Up to £8,000 under exceptional circumstances.	**1st September** In rare cases applications submitted outside the normal deadlines may be considered.	

Association Grants (continued)

Grant Name	Who is it aimed at?	Who can apply?	Maximum Funded	Deadline	More information…
Career Development Grant	To assist talented early career researchers who have recently completed their PhD to strengthen their CVs.	Postgraduate students who are members of the Association, about to submit a PhD thesis or within one year of submission.	Up to £2,500.	**7th October**	
Palaeontological Association Carer's Bursary	To support attendance at Association meetings by researchers with caring responsibilities.	All members of the Association.	Up to £250.	The deadline varies – normally a few weeks before ProgPal and the Annual Meeting each year.	

Other Grants administered by the Association

Grant Name	Who is it aimed at?	Who can apply?	Maximum Funded	Deadline	More information…
Jones-Fenleigh Fund – SVPCA	To provide bursaries to individuals with no access to funding to attend the Symposium of Vertebrate Palaeontology and Comparative Anatomy (SVPCA).	All delegates who wish to attend SVPCA are eligible to apply. Those intending to present a verbal or poster presentation will be given priority.	Up to £500.	The deadline varies – normally the close of meeting registration each year.	

Association announcements

The new PalAss President

Photo courtesy of Phil Donoghue.

Our new President, Philip Donoghue FRS, is Professor of Palaeobiology at the University of Bristol, UK where he has been a member of the faculty for 22 years, following teaching and research positions at the universities of Leicester and Birmingham. Phil studied for his BSc and PhD at the University of Leicester, and an MSc at the University of Sheffield. His research focuses on major transitions in evolutionary history, including the origin and diversification of animals, plants and early microbial evolution. He does this by integrating anatomy and molecular evidence from living and fossil species to determine the timing and sequence of evolutionary innovations. Phil has served in a number of positions on PalAss Council previously, including Newsletter Editor, Vice-President and Editor Trustee, as well as serving on the Councils of the Systematics Association, the Palaeontographical Society, Micropalaeontological Society and the European Society for Evolutionary Developmental Biology. He was awarded the Bigsby Medal of the Geological Society in 2007, the President's Medal of the Palaeontological Association in 2014, and was made a Fellow of the Royal Society in 2015. We warmly welcome him to his new position as President of the Palaeontological Association.

PalAss Council also welcomes new members Barry Lomax (Vice-President), Michael Benton (Editor-in-Chief), Martin Smith (Editor Trustee) and Darja Dankina (Publicity Officer).

We are very grateful for the time and efforts of departing Council members Rachel Wood, Uwe Balthasar, Evelyn Kustatscher, Christian Klug, Nicola Vuolo and Shane Wheatley. We are also sincerely grateful to Emma Dunne and Kirsten Flett for their input into Council meetings while leading the organizing committees of the Annual Meeting and Progressive Palaeontology, respectively.

Jo Hellawell
Executive Officer

ASSOCIATION MEETINGS

69th Annual Meeting of the Palaeontological Association
University of Portsmouth, UK *11 – 15 December 2025*

The 69th Annual Meeting of the Palaeontological Association will be held at the University of Portsmouth, on the south coast of the UK. The organizing committee is chaired by Dr Nicholas Minter, with support from colleagues in the Palaeontology, Evolution and Biodiversity Research Group in the School of the Environment and Life Sciences.

Registration is expected to open in July. Enquiries regarding the meeting should be addressed to <**annualmeeting2025@palass.org**>.

Programme outline

The meeting will take place from 11th to 15th December 2025, with an early-career researcher event on the afternoon of Thursday 11th December and a one-day post-conference field-trip on Monday 15th December. An assortment of workshops will be held across teaching rooms and laboratories on the University of Portsmouth campus during the morning of Friday 12th December, followed by a themed symposium on 'Experimental Palaeontology' during the afternoon and an icebreaker reception in the early evening. The symposium will include a diverse range of researchers at different career stages to showcase the breadth of activities where experimental methods and hypothesis testing are being used to address questions in palaeontology. The main scientific sessions of talks and posters will be held on Saturday 13th and Sunday 14th December across the Richmond and Portland buildings on the University of Portsmouth campus. The Annual Address will be given in the Richmond Building in the late afternoon of Saturday 13th December and will be followed in the evening by the Annual Dinner on board *HMS Warrior* in Portsmouth's Historic Dockyard.

Workshops and field-trip

We are currently aiming to offer four workshops, including the topics of: capacity building in palaeontology; digital methods in palaeontology; and stratigraphic palaeobiology in R. A post-conference field-trip will visit the Isle of Wight on Monday 15th December. The trip will be led by experts on the geology and palaeontology of the Isle of Wight and the itinerary will take in classic localities, including the Cretaceous section from the Wealden Group to Chalk Group at Yaverland. Further details regarding the workshops and field-trip will be made available on the Association's website in due course.

Annual Dinner

The Annual Dinner will be held on board *HMS Warrior*. The *HMS Warrior* was the first iron-hulled naval vessel; launched in 1860 as part of Queen Victoria's Navy, she acted as a strategic deterrent at the time. During the Annual Dinner, delegates will dine at the mess tables amongst the cannons on the main gun deck, with a bar serving from the galley of the ship. This promises to be an entertaining evening in a unique and atmospheric venue.

The city of Portsmouth

Portsmouth is a compact waterfront city with good transport links and several hotels and areas for eating and drinking within walking distance of the meeting venue. There are numerous areas close to the university campus that have cafes, restaurants, pubs and bars. Gunwharf Quays has many chain restaurants and bars, whilst Guildhall Walk has several pubs that serve food. Further afield is Southsea, with the Palmerston Road and Albert Road areas. All the conference venues, main hotels and travel hubs are within an approximately 20-minute walk of each other. Portsmouth has traditionally been known as a naval city and, as well as being the home of the modern British Navy, it is home to the historic *Mary Rose*, *HMS Victory* and *HMS Warrior*. In more recent years, Portsmouth has welcomed a vibrant student population, and has become a colourful city with a great selection of street art where everyone can feel confident and safe to express themselves without prejudice.

Getting to Portsmouth

Getting to Portsmouth by train: there are two train stations in Portsmouth – Portsmouth and Southsea and Portsmouth Harbour. All trains stop at Portsmouth and Southsea, and, depending on the line, some continue to Portsmouth Harbour. There are direct train links from London Waterloo, London Victoria, Cardiff, Bristol and Southampton.

Getting to Portsmouth by air: Portsmouth can be reached easily from London Gatwick, London Heathrow and Southampton airports. There is a direct train from London Gatwick to Portsmouth and from Southampton Airport Parkway to Portsmouth. A coach and rail service links London Heathrow and Portsmouth via Woking.

Accommodation

There are five main hotels close to the conference venue: Premier Inn Portsmouth City Centre, Premier Inn Portsmouth Dockyard, Holiday Inn Express Portsmouth, Travelodge Portsmouth City Centre and Ibis Portsmouth Centre. All are within a 10- to 15-minute walk of Portland and Richmond buildings where the main scientific sessions will be held. Within this radius there are also several smaller independent hotels. Accommodation may be booked through the usual online resources, and delegates are strongly encouraged to book their accommodation as early as possible to avoid disappointment and to get the best rates.

Palaeontological Association Carer's Bursary

Bursaries are made to support attendance at the Annual Meeting by researchers with caring responsibilities. Normally the budget for an individual bursary will be a maximum of £250. Applications must include a supporting statement and a breakdown of anticipated expenses. Appropriate costs include attendance of a carer or use of local childcare facilities (for care of accompanying young children), or other caring costs at home. Applications will be assessed by the PalAss Diversity Group; if there are several eligible applicants, awards will be made on a first-come first-served basis. Successful awards will be paid retrospectively on the submission of receipts. The applicant must be a member of the Association. For more information and to submit an application see the **Association's website**. Deadline is **14th November 2025**.

Student travel grants

The Palaeontological Association runs a programme of travel grants to assist student members (doctoral and earlier) to attend the Annual Meeting in order to present a talk or poster. Grants of up to £200 will be available to student presenters who are travelling from outside Portsmouth. The actual amount available will depend on the number of applicants and the distance travelled. Payment of these awards is given as a disbursement at the Meeting, not as an advance payment. Students interested in applying for a PalAss travel grant should contact the Executive Officer, Dr Jo Hellawell (e-mail <**executive@palass.org**>) once the organizers have confirmed that their abstract is accepted. Please title the e-mail "Travel Grant Request". No awards can be made to those who have not followed this procedure. Deadline is **14th November 2025**.

Our logo

Our logo has been designed by Mariem Saavedra-Pellitero and incorporates one of the icons of the Portsmouth skyline, the Spinnaker Tower. Additionally, it emphasizes our coastal location through the simulation of sedimentary processes in a flume tank and depicts many of the interests of the members of the Palaeontology, Evolution and Biodiversity Research Group, including vertebrate palaeontology, micropalaeontology and biostratigraphy, and experimental taphonomy.

PORTSMOUTH

PALASS '25

Symposium on "Experimental Palaeontology" | Two days of talks and posters | Annual dinner on board the HMS Warrior | Field trip to the Isle of Wight

Fossil collecting in England and Wales: do we need more legislation?
Flett Theatre, Natural History Museum, London, UK *15 May 2025*

This is a workshop organized by the Palaeontological Association and the *Evolution of Life Theme* at the Natural History Museum, on Thursday 15th May 2025 from 2pm to 4pm.

The aim of the workshop is to develop a position for the Palaeontological Association on whether more legislation is needed regarding fossil collecting in England and Wales. The workshop is free and there is no need to register. The workshop will be hybrid, but we encourage those interested to attend in-person to facilitate discussion.

The workshop will take the form of four talks by the following speakers:

- **Josh Smith**, palaeontologist for Natural England
- **Chris Reedman**, former palaeontologist for the Jurassic Coast Trust
- **Richard Butler**, Professor of palaeontology at the University of Birmingham
- **Martin Simpson**, fossil collector and avocational palaeontologist, Isle of Wight

The talks will be followed by a panel discussion.

For more information, and to receive a link to join online, please e-mail <**susannah.maidment@nhm.ac.uk**>.

Image CC-BY-SA 3.0 from Wikimedia Commons of Lyme Regis.

Progressive Palaeontology Edinburgh 2025

Talks, Posters & Pre-Conference Events!

Relaxed and social icebreaker event

Plant peels & Fossil jacketing workshops

Annual Dinner @ Montpeliers

Visit to the NMS Collections

Field Trip to a local fossil site!

Palaeontology Student Conference
17th - 20th June 2025

Registration open!

Non-PalAss Members: £20

PalAss Members: Free!

Follow our socials

Scan to register!

17:30 (BST) ON ZOOM

We invite you to join our new online series.

MEMBERS EXCLUSIVE WEBINARS

19th February: PalAss Research Grant Panel Discussion

Coming soon: Peer Review Training Programme*

23rd April: PalAss Engagement Grant

04th June: Careers in Palaeontology Panel Discussion

Register via our website, social media platforms and our newsflash emails!

Meet other members of the Palaeontological Association Community and exchange knowledge!

*Limited spaces available on this webinar course

The Palaeontological Association

Reg. Charity No. 1168330

Code of Conduct for Palaeontological Association Events

The Palaeontological Association holds regular meetings and events throughout the year. The Association's Events Code of Conduct relates to the behaviour of all participants and attendees at all events run by the Association, and acts alongside the Code of Conduct for Members.

Behavioural expectations: It is the expectation of the Palaeontological Association that meeting attendees behave in a courteous, collegial and respectful fashion to each other, volunteers, exhibitors and meeting facility staff.

Attendees should respect common-sense rules for professional and personal interactions, public behaviour (including behaviour in public electronic communications), common courtesy, and respect for private property.

Demeaning, abusive, harassing or threatening behaviour, discrimination on the basis of race, ethnic origins, immigration status, religion, age, marital status, parental status, sex, sexual orientation, gender identity or expression, socioeconomic background, educational background, or disability will not be tolerated. Inappropriate physical contact, unwelcome sexual attention, including verbal or physical actions of a sexual nature towards other attendees or towards meeting volunteers, exhibitors or facilities staff and security will not be tolerated, in either personal or electronic interactions.

Digital images and social media: Respect for the intellectual property of presenters should be maintained at all times. Photographing or recording a talk without the author's express permission is forbidden. While the default assumption is to allow open discussion of presentations on social media, attendees are expected to respect any request by an author to not disseminate the contents of their talk or poster. Questions and discussion should be constructive, respectful, and focus on data and ideas rather than individuals.

Reporting unacceptable behaviour: If you are the subject of unacceptable behaviour, or have witnessed any such behaviour, you can report it (anonymously if you choose to) via the **Report code of conduct violation form**[1].

Anyone experiencing or witnessing behaviour that constitutes an immediate or serious threat to public safety, or a criminal act, is expected to contact the appropriate law enforcement agency (in the UK dial 999 for all emergency services). Those witnessing a potential criminal act should also take actions necessary to maintain their own personal safety.

[1] <**https://www.palass.org/meetings-events/report-code-conduct-violation**>.

news

News bites

If teeth could speak…

The theropod dinosaurs from the Waldhurst Clay Formation (Lower Cretaceous) are represented only by fragments, mostly teeth. Barker *et al*. decided to investigate these teeth to analyse the diversity of fauna in the lower English Wealden. To do so, they used a mix of phylogenetic, discriminant and machine-learning methods. What the teeth had to say, in the end, is that among the theropod dinosaurs from the Waldhurst Clay Formation, there were early spinosaurs, tyrannosaurs and dromaeosaurs. A fauna that has much in common with those found in younger deposits elsewhere in the UK.

BARKER, C. T., HANDFORD, L., NAISH, D., WILLS, S., HENDRICKX, C, HADLAND, P., BROCKHURST, D. and GOSTLING, N. J. Theropod dinosaur diversity of the lower English Wealden: analysis of a tooth-based fauna from the Wadhurst Clay Formation (Lower Cretaceous: Valanginian) via phylogenetic, discriminant and machine learning methods. *Papers in Palaeontology* **10**, e1604. <**https://doi.org/10.1002/spp2.1604**>.

… they could tell many stories

Procolophonids are small parareptiles that diversified across Pangaea after the end-Permian mass extinction. Meade *et al.* describe a new species of procolophonid, *Threordatoth chasmatos* gen. et sp. nov., from the Cromhall Quarry (southwest England) based on partial remains with unique tooth morphology. *Threordatoth chasmatos* is characterized by upper jaws with more complex three-cusped teeth and may have fed or processed food differently from other procolophonids.

MEADE, L. E., BUTLER, R. J, JONES, M. E. H. and FRASER, N. A new procolophonid with complex dentition from the Late Triassic of southwest England. *Papers in Palaeontology* **10,** e1605. <**https://doi.org/10.1002/spp2.1605**>.

Sauropods and fruits

More than 66 million years ago, when the world still had big lumbering dinosaurs, the average seed size of plants was small, and fruits were rare. After the extinction of non-avian dinosaurs, seeds and fruits increased exponentially in size. New research shows that the evolution of fruit – and the evolution of fruit-eating primates, the early ancestors of humans – was influenced by the 'ecosystem engineering' of large sauropods.

Sauropods, the largest terrestrial animals to have walked on Earth, were ecosystem engineers, profoundly changing their environments by knocking down trees and eating high volumes of vegetation. Following the extinction of non-avian dinosaurs, the forests grew back thicker, blocking the sun from reaching the ground, which, many generations later, led to the growth of large seeds and fruit. In time, these fruits became a primary food source for many animal species, including our primate ancestors. "At first glance, the darker forest understory caused by dinosaur extinctions may seem unimportant, but it could have directly led to the evolution of our fruit-eating primate ancestors," Doughty said.

DOUGHTY, C. E., WIEBE, B. C., KEANY, J. M., GAILLARD, C., ABRAHAM, A, J. and KRISTENSEN, J. A. Ecosystem engineers alter the evolution of seed size by impacting fertility and the understory light environment. *Palaeontology* **68,** e70002. <**https://doi.org/10.1111/pala.70002**>.

Palaeontology in the news

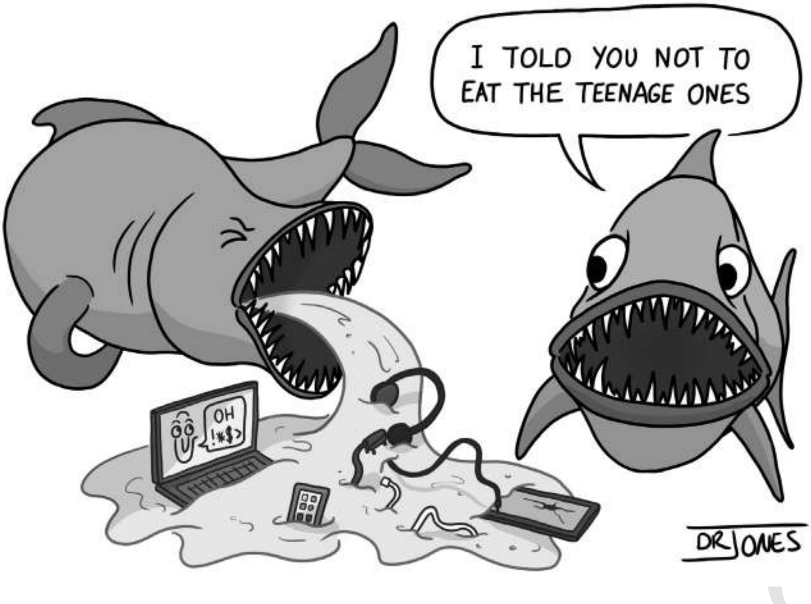
Fossil vomit

If you were at the Annual Meeting conference dinner in Erlangen, you are now familiar with the definition of 'regurgitalite', also known as fossil vomit. Maybe lesser known than their cousins the coprolites, regurgitalites can be valuable tools for palaeoecological reconstructions.

Peter Bennicke was hunting fossils at Stevns Klint in eastern Denmark when he noticed a "strange small cluster of lily pieces in a piece of chalk". Intrigued by the strange finding, Bennicke brought it to the Geomuseum Faxe to be examined by John Jagt, a sea lily expert from the Netherlands. The fossil assemblage turned out to be a puke pile, and a very interesting one! While sea lilies are not particularly nutritious, some animals, probably fish, did not disregard that food: creatures 66 million years ago, on the seabed of the Cretaceous Sea, ate a bunch of sea lilies and then vomited the skeletal parts. The regurgitalites are being studied at Geomuseum Faxe and promise to bring valuable information about food chains in the Cretaceous seas.

Agence France-Presse. 'An unusual find': 66m-year-old animal vomit discovered in Denmark. *The Guardian*, 28 Jan 2025. <**https://www.theguardian.com/science/2025/jan/28/an-unusual-find-66m-year-old-animal-vomit-discovered-in-denmark**>.

GUY, J. Amateur fossil hunter finds 66-million-year-old animal vomit. CNN, 29 Jan 2025. <**https://edition.cnn.com/2025/01/29/science/ancient-animal-vomit-denmark-scli-intl/index.html**>.



<**http://www.ratbotcomics.com/**>

Make way, dinosaurs passing!

What can bring together quarry workers and more than a hundred scientists, students and other volunteers? The biggest trackway of dinosaur footprints in the UK did!

When Gary Johnson found a bump in the clay at the Oxfordshire quarry, he thought it was just uneven terrain. It turned out to be part of an enormous dinosaur trackway dated to around 166 million years ago. At that time, the quarry was a warm lagoon. The water was shallow enough to allow dinosaurs to walk through it, leaving footprints that were preserved to the present day.

Nowadays modern technologies, like photogrammetry and drone photography, permit the capturing of every significant detail, sharing and preserving information about the footprints even if something happens to the original ones. Scientists took more than 20,000 photographs and built 3D models of the footprints. But who were the mysterious walkers? The footprints belong to two different dinosaurs: the herbivorous *Cetiosaurus*, a sauropod that walked on four legs, and the smaller carnivorous *Megalosaurus*.

Thinking that these extinct creatures from a distant past walked where humans now do is moving, but these footprints also have great scientific value. By studying these kinds of tracks, palaeontologists can learn more about how these animals moved and the environment they lived in; information that cannot be inferred from bones alone.

ADDLEY, E. and ABDUL, G. Biggest trackway of dinosaur footprints found in Oxfordshire quarry. *The Guardian*, 2 Jan 2025. <**https://www.theguardian.com/science/2025/jan/02/large-dinosaur-footprints-oxfordshire-quarry-cetiosaurus-megalosaurus**>.

PITTS, M. I can just see those dinosaurs plodding through the Cotswold mud. *The Observer*, 5 Jan 2025. <**https://www.theguardian.com/commentisfree/2025/jan/05/i-can-just-see-those-dinosaurs-plodding-through-the-cotswold-mud**>.

Nicola Vuolo
Retiring Publicity Officer

Medals and awards from other bodies

Recently several palaeontologists from among our membership have been recognized with medals and awards from other societies:

Society of Vertebrate Palaeontology medal and award

Prof. Christine Janis was awarded the Romer-Simpson Medal at the Society of Vertebrate Paleontology Annual Meeting in Minneapolis, USA. The medal is the highest award issued by the Society for “sustained and outstanding scholarly excellence and service” to the discipline of vertebrate palaeontology and is named in honour of influential American palaeontologists Alfred S. Romer (1894–1973) and George G. Simpson (1902–1984). Christine’s early career focused on mammalian craniodental anatomy and the correlation of ungulate anatomy to diet. She created a large database for mammalian hypsodonty (tooth crown height) and also published a number of papers on the relation of the composition of mammalian palaeocommunities with climatic change.

Christine then switched focus from teeth to the biomechanics of locomotion and has produced seminal works on the relationships between the morphology of limb bones in mammals and their locomotion, including the discovery that some extinct kangaroos walked bipedally rather than hopped. Christine has worked on both sides of the Atlantic throughout her career and is currently Honorary Professor at the University of Bristol, UK and Professor Emerita at Brown University, USA.

Photo by Elsa Panciroli, licensed under CC BY-SA 4.0.

Photo courtesy of Anubhav Preet Kaur.

Dr Anubhav Preet Kaur was given the Jon C. Graff International Paleontology Award to present work on the taphonomy of an Early Pleistocene hyena den in northern Pakistan. Anubhav's PhD research at the Indian Institute of Science Education and Research, Mohali focused on hominins from the Siwalik Hills of northwestern India; she is currently based at Ashoka University, India.

The Micropalaeontological Society medal and award

Prof. John Marshall was awarded the Brady Medal of The Micropalaeontological Society (TMS) at their Annual General Meeting in Kraków, Poland. The Brady Medal is the highest award of TMS and is named in honour of George Stewardson Brady (1832–1921) and Henry Bowman Brady (1835–1891) in recognition of their outstanding pioneering studies in micropalaeontology and natural history. The Medal is awarded to scientists who have had a major influence on micropalaeontology by means of a substantial body of excellent research. Service to the scientific community may also be a factor for consideration by the Award Committee. As a palynologist at the University of Southampton, UK, John uses fossil pollen and spores to date deposits and reconstruct Devonian climate and environments, identify and map the world's first forests, and better understand mass extinctions. John works closely with vertebrate palaeontologists, palaeobotanists and sedimentologists to understand tetrapod origins, taking part in major projects in both the Latest Devonian and the earliest Carboniferous. John has also played an important role in understanding the age and palaeoenvironment of the late Triassic vertebrates from the famous fissure fill deposits of southwest Britain. Further, he has a parallel research career in using palynomorphs for thermal maturity determination and understanding burial histories.

Photo by Chris Berry.

Photo by Frazer Aze.

Prof. Tracy Aze was awarded the TMS Todd and Low Award as a mid-career scientist, in recognition of her commitment to fostering positive and inclusive environments. The Todd and Low Award is named in honour of Ruth Todd (1913–1984) and Doris Low (1920–2008) because of their positive mentor–mentee relationship and commitment to equity, diversity and inclusion (EDI). Tracy has led initiatives to make fieldwork more inclusive by removing credit-bearing assessments, ensuring equitable learning opportunities for all students. Her leadership in curriculum design has focused on accessibility, student-centred learning and assessment reform. Tracy has also championed diverse representation in geoscience through public engagement projects, including the Future Learn MOOC, which highlights geoscientists from under-represented backgrounds. As a dedicated mentor and leader, she has supervised PhD students, guided faculty-wide EDI initiatives, and actively fostered a more inclusive academic and professional environment. Tracy's research is at the interface of palaeobiology and palaeoclimatology, using the marine plankton fossil record to investigate evolutionary trends, the interactions between species and the response of organisms to environmental change. Tracy held a faculty position at the University of Leeds, UK for ten years where she was made professor. She has recently taken up a position in marine ecology at the University of Plymouth, UK, and is currently Chair of the Neogene and Quaternary Planktonic Foraminifera Working Group of the International Commission on Stratigraphy.

Please let us know of any other recent medal and award recipients who should be featured, by contacting <**newsletter@palass.org**>. Don't forget to nominate your colleagues for these and for the Association medals and awards. The deadline for nominations for our medals and awards is 31st March each year and you can find details of each on pages 17 to 22 of this *Newsletter*.

Jo Hellawell
Executive Officer

Is there news that you'd like to see included in the **Newsletter**? *Let us know by e-mailing Darja at* <**publicity@palass.org**>, *sending a link to the news and explaining its significance.*

From our Correspondents

Behind the Scenes at the Museum

The Natural History Museum of Zimbabwe

The Natural History Museum of Zimbabwe. Photo courtesy of Michel Zondo.

The Natural History Museum of Zimbabwe is in Bulawayo, the second largest city in the country and popular for its cultural and arts tourism. Bulawayo was an ancient settlement of the Ndebele people under King Lobengula in 1870. The current city was established by Cecil John Rhodes' men in 1893 about 14 miles from where Lobengula's settlement was, after defeating the Ndebele people. The city is close to the scenic Matopo Hills in the Matobo National Park, which boasts of amazing bushmen rock paintings, and the Cecil John Rhodes grave, a popular tourist attraction managed by the Natural History Museum of Zimbabwe.

The Natural History Museum of Zimbabwe was established in1901 through joint efforts of the Rhodesia Scientific Association and the Chamber of Mines, which formed a museum committee that founded the Rhodesia Museum (later National Museum and then changed to Natural History Museum of Zimbabwe) with the blessing of Cecil John Rhodes who was at the time the leader of the country. At the time mining was growing rapidly, especially gold mining, and was the main economic activity. The Museum started off with a minerals collection curated by F. P. Mennell, a geologist. When Mennell resigned in 1905, he was replaced by A. E. V. Zealley, another geologist.

It was the culture that the curator of the Museum was to be a geologist, the reason being to help prospectors and miners in the region. The Museum was established by renting a space for its collections at the Public Library, but the collections soon outgrew the room. Before the Museum moved to its present location, it had operated from four different sites with each site eventually becoming too small for the collections that were rapidly growing. In 1911, George Arnold, an entomologist, was appointed as the Curator and at that time the Museum incorporated more departments. As the museum collections continued to outgrow the limited space available, it became obvious there was a need for a bigger space that would accommodate all the collected material and have space for future collections. A much bigger building, which was to become the permanent and current home of the Museum, was constructed at the Centenary Park municipal gardens and the Museum moved to this new site upon its completion in 1964.

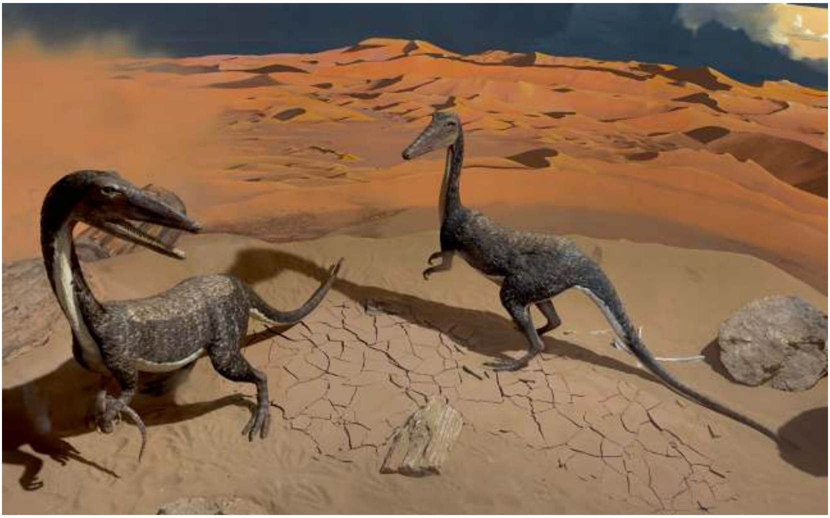
Mammalian skulls kept at the Mammals Department storeroom. Photo courtesy of Michel Zondo.

The Geological Department (now mainly focusing on palaeontology) continues to be one of the most active departments to-date. At present, the Museum has eight active research departments, each managed by a Curator who executes research activities and curates departmental specimens. Specimens and artefacts from all the departments are displayed in the galleries. The Geology Gallery is named F. P. Mennell (after the first Curator of the Museum) and showcases the history of the Earth, including some fossil material found in Zimbabwe, and minerals and gemstones collected from around the country. The departments are Arachnids, Geology, Entomology, Mammalogy, Ornithology, Ichthyology, Herpetology and Monuments. Historical sites and monuments located in Matabeleland provinces are also supervised by the Natural History Museum.

I oversee the Geology Department, holding the position of Assistant Curator of Palaeontology. The department now mainly focuses on palaeontology because there are several other institutions in the country focusing on geology. The department has carried out numerous research expeditions around the country led by successive curators, and in some cases working with collaborators, during which many important fossils have been collected. The Geology Department has a small laboratory where fossils are prepared when they are brought in from the field and conservation work is done. There are over 3,000 fossil specimens and over 9,000 minerals registered in the accession register. The first dinosaur fossil bones in Zimbabwe were discovered at Chelmer and neighbouring places in Nyamandlovu District from the early Jurassic-aged Forest Sandstone Formation (equivalent to Clarens Formation in the main Karoo Basin), about 25 kilometres from Bulawayo, and these were assigned to *Massospondylus*.

Holotype specimens and numerous other important fossil specimens have been collected during the research expeditions carried out by the department. The holotype specimens that have been discovered are:

- *Syntarsus rhodesiensis* (Megapnosaurus rhodesiensis) – mid-Zambezi Basin.
- *Vulcanodon karibaensis* – mid-Zambezi Basin.
- *Mbiresaurus raathi* – lower Zambezi Basin.
- *Musankwa sanyatiensis* – mid-Zambezi Basin.
- *Ferganoceratodus edwardsi* – mid-Zambezi Basin.



Reconstructed Syntarsus *dinosaurs on display in the Geology Gallery. Image courtesy of Michel Zondo.*

Syntarsus rhodesiensis is a small theropod dinosaur that was first discovered in Nyamandlovu District near Bulawayo, in the upper Forest Sandstone Formation, by one of the prominent palaeontologists, Prof. M. A. Raath, and I. K. Stewart together with his students from Northlea school in 1964. Bones of *Syntarsus* were also found at Chitake in the Zambezi Valley. *Vulcanodon karibaensis* is a sauropodiform dinosaur that was discovered on the island in Lake Kariba in the mid-Zambezi Basin, also from the upper Forest Sandstone Formation. This important genus reveals the evolutionary path between the sauropodomorphs and sauropods as an intermediate transitional taxon. The discovery was made by Prof. Mike Raath in 1974 when he was the Curator of Palaeontology at the Queen Victoria Museum (later Museum of Human Sciences). The department has been very active in recent years going out on several expeditions, mostly to the mid-Zambezi Basin and the Tuli Basin, some of which were conducted in collaboration with international scientists. A lot of fossil material has been found in these expeditions, some of which are holotype specimens such as *Mbiresaurus raathi*, an early sauropodomorph discovered in Mbire District in the Zambezi Valley, from the Pebbly Arkose Formation, during a field-trip undertaken with Dr Chris Griffin from the USA. An expedition in collaboration with a team led by Prof. Jonah Choiniere and Prof. Paul Barrett to Lake Kariba in 2017 resulted in the discovery of *Musankwa sanyatiensis*, a sauropodomorph, and *Ferganoceratodus edwardsi*, an ancestral lungfish.

The team working on a bone bed during the expedition to the Tuli Basin, Sentinel Ranch, in 2022. Photo courtesy of Michel Zondo.

For many years fossils have been collected from the Sentinel Ranch in the Tuli Basin. In my recent project on fossils from Sentinel, I identified fossil material belonging to dinosaurs such as *Melanorosaurus*, *Massospondylus*, *Pulanesaura* and some theropods. All the fossils from around the country are kept in the museum storerooms. These fossils have been useful in correlating the Zimbabwean formations to those of the main Karoo Basin of South Africa and other basins elsewhere. *Massospondylus* fossil bones have also been found at Nyamandlovu, near Bulawayo, Manapools and Chitake, in northern Zimbabwe. There is also fossil bone material of *Gorgonopsis* and dinocephalians, which were collected from the Permian-aged Madumabisa mudstones in the mid-Zambezi Basin, Zambezi Valley. Phytosaur, rhynchosaur, aetosaur and robust sauropod fossil material found during previous trips are also kept at the Museum, as well as fossil plant material from the Zambezi and the Limpopo valleys.

A campsite during the 2017 Dande field expedition in the Zambezi valley. The Mbiresaurus, *rhynchosaur, and aetosaur specimens were discovered during the trip. Photo courtesy of Michel Zondo.*

Michel Zondo
Assistant Curator of Palaeontology
Natural History Museum of Zimbabwe

The Natural History Museum of Zimbabwe's website is at:

<**https://naturalhistorymuseumzimbabwe.com**>.

E-mail: <**natmuse@netconnect.co.zw**>

The Museum is open every day from 9am to 5pm.

Natural History Museum of Zimbabwe

Spotlight on Diversity

Palaeontological Association Members Diversity Report 2024

This report represents quantitative and qualitative data collected from members of the Palaeontological Association (PalAss) between February and June 2024 via a JISC online survey launched by the Diversity Officer. The study was aimed to determine the current diversity of the PalAss membership during 2024. The intention was to highlight any under-represented groups and to explore factors that promote or impede diversity in the PalAss.

Key findings

This study was warmly welcomed by 2024 PalAss members. Benchmarking proved to be problematic because this information is not generally publicly available from comparable organizations. The Diversity Officer believes that making these data publicly available will both support the growth of PalAss as an organization and provide useful benchmarking information for future studies by creating a baseline of diversity information that will validate these types of statistical studies and actions generated from them, even to the more sceptical groups in the population. Diversity data from the HESA, WISE campaign, England and Wales National Census 2021 and other sources have been quoted to assist with benchmarking. These are some of the key findings of this report:

The PalAss is relatively diverse but there are a few areas that need improvement, such as more financial aid for early-career researchers and support for members with caring responsibilities. The average age of the PalAss membership is likely increasing, with 29% of the respondents aged 65+, which is an indication that we are not retaining young researchers as members.

Introduction

Diversity studies are important tools to highlight discrimination and can serve as wake-up calls for organizations to set counter-actions in place. Higher diversity will allow scientific organizations to thrive by enabling contributions and ideas from broader perspectives and attracting new talents. The PalAss has the responsibility to ensure that all their members have access to the available services and activities and that no members are excluded or marginalized.

"There never were in the world two opinions alike, no more than two hairs or two grains; the most universal quality is diversity."
Michel de Montaigne

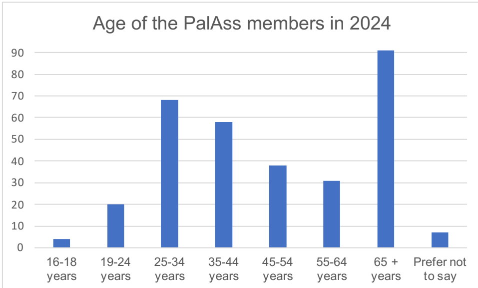
The 2010 UK Equality Act[1] aims to eliminate discrimination against people with nine listed protected characteristics. These protected characteristics are *age*, *disability*, *gender reassignment*, *marriage and civil partnership*, *pregnancy and maternity*, *race/ethnicity*, *religion or belief*, *sex or gender* and *sexual orientation*. In order to be proactive in addressing any potentially discriminating policies or practices, organizations in the UK are encouraged to monitor the protected characteristics of their stakeholders and to use these monitoring data to inform their planning and decision-making. The 2024 PalAss Diversity Survey therefore invited respondents to disclose their protected characteristics but, being mindful of members' rights to withhold this personal information, the survey was conducted anonymously and a ‘prefer not to say’ option was provided in each case.

Participation

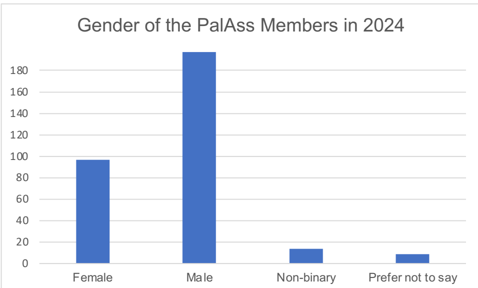
The 2024 PalAss Diversity Survey was completed by 317 respondents representing 31.7 % of the total members. The Diversity Survey in 2018 was the first conducted by PalAss (study available at <**https://www.palass.org/association/diversity-study**>), with 463 participants. Here I report on the 2024 PalAss Diversity Survey and compare it to the 2018 survey, where possible. The PalAss Council Diversity Survey 2024 was completed by 15 people, accounting for 65% of Council members, the same number as in 2023.

Age

The age of PalAss members in 2024 was distributed from 16 to 65+ years (see plot). This is a large shift from 2018, when 189 respondents (41 %) were in the 25–34 years group. According to the Higher Education Statistics Agency (HESA)[2], 3% of academic staff were aged 25 and under in the UK in 2021/22, while 20 % of academic staff were aged 56 and over.

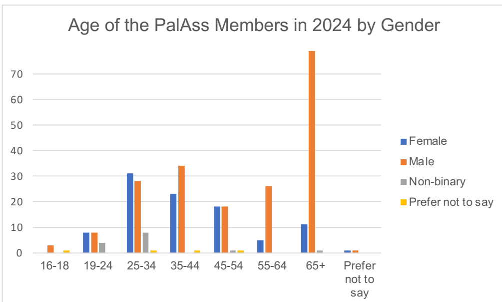


Sex



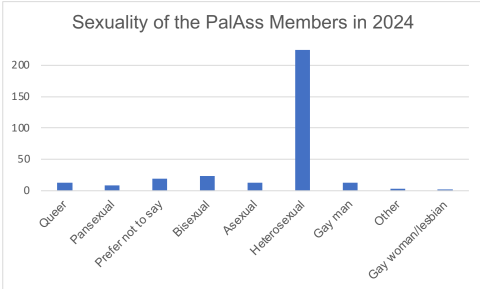
The majority of respondents identify as male, 30 % as female and 4 % as non-binary (see plot). In 2018, 63 % identified as male, 35 % as female and <1 % as non-binary. However, female representation on Council is at a record 60 %. According to the Women in the STEM Workforce 2023 benchmarking data published by the WISE Campaign[3], 25.2 % of the core STEM force and 43.7 % science professionals across the STEM workforce in the UK were female.

Most female respondents are 25–34 years of age (see plot), whereas the majority of males are 65+ years of age. This might reflect the ageing of long-time members of the PalAss, so this imbalance might be addressed naturally in time.



93 % of 2024 respondents said that their gender identity was the same as that assigned to them at birth, whilst 3 % said this was not the case. In 2018, 98 % said their gender identity was the same as assigned at birth, and 1 % that it was different.

Sexual orientation



Asking people to disclose their sexual orientation is thought to be good practice in the UK, USA and Europe where rights are protected, but can be problematic elsewhere. In 64 states, private, consensual, same-sex activity is criminalized, according to the Human Dignity Trust[4]. In 2024, 23 % of respondents identified as part of the LGBTQ+ community (see plot for a break-down), an increase of 6 % since 2018. According to the National Census figures for England and Wales from 2021 published by the Office for National Statistics[5], 89.37 % of the population identified as straight or heterosexual in England, while 3.18 % identified with any other sexual orientation.

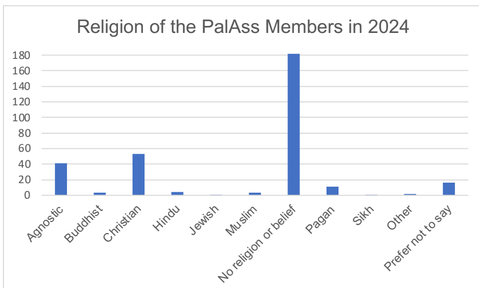
Disability or health conditions

In 2024, 24 % of respondents disclosed a disability, long-term illness or health condition. Of these, 17 % have a mental illness, 13 % ADHD and 12 % autism. According to HESA[2], 6 % of academic staff in the UK were known to have a disability in 2021/22.

Ethnicity

Some respondents identified with two or more ethnicities, so for this section the total responses were 341 instead of the 317 survey participants. In 2024, 78 % of respondents identified as white, 5 % Latino/Latina/Latinx, 4 % mixed and 2 % Hispanic. The lowest representation in ethnic groups is Arab and Black to which 1 % of respondents identified as belonging to each. Additionally, nine respondents preferred not to reveal their ethnicity, with one saying that they identified as Human. In 2018, 86 % respondents said white, 4 % Hispanic/Latinx, 4 % mixed/multiple ethnic groups, and 3 % Asian. Additionally, 13 preferred not to reveal their ethnicity, with one saying that they did not believe that ethnic groups really exist. Two respondents were Arab and just one was Black. According to the 2021 National Census figures[5], 81.7 % of usual residents in England identified as white, the next most common ethnic group was Asian, Asian British or Asian Welsh accounting for 9.3 % of the population. Additionally, according to HESA[2], 22 % of academic staff in the UK identified as belonging to ethnic minority backgrounds in 2021/22, which was an increase from 16 % in 2017/18.

Religion



57 % of 2024 respondents have no religion or beliefs, 17 % identify as Christian and 13 % as agnostic, with one Jewish respondent (see plot). In 2020, 70 % described themselves as having no religion or belief, with a few commenting that they did have belief in something but this did not align with an organized religion,

and 18 % as Christian. The National Census in 2021[5] indicates that 46.2 % of England and Wales described themselves as Christian and 37.2 % as having no religion.

Marriage and civil partnership

54 % of 2024 respondents are married or in a civil partnership. In 2018, 47 % were either married or in a civil partnership. According to the 2021 National Census figures for England and Wales[5], 49.7 % of the population in England was married or in a civil partnership.

Caring responsibilities

Some respondents disclosed two or more caring responsibilities, consequently the total responses for this section were 323 instead of the 317 survey participants. In 2024, 31 % of respondents disclosed caring responsibilities. Of these 63 % were male, 29 % female, and 4 % non-binary. In 2018, 73 % of respondents did not have any caring responsibilities. According to the 2021 National Census figures for England and Wales[5], 41.5 % of families have dependent children and 9 % of usual residents in England are unpaid carers of adult(s).

Parental leave

In 2024, 9 % of the respondents had taken parental leave for three months or more. Of these 29 respondents, 41 % were male, 55 % were female and one respondent non-binary. This is a decrease from 2018 when 67 respondents had taken parental leave for three months or more. According to the STEM Returners Index 2023[6], 44 % of the participants in the UK cited family care responsibilities as the primary reason for a career break, which disproportionately affected women.

School history

In 2024, 29 % of the respondents attended a fee-paying school; this was lower in 2018 at 11 %, with the proportion higher in younger age groups. According to the ISC Annual Census 2023 published by the Independent Schools Council[7], 5.9 % of all school attendees in the UK are enrolled in private schools.

Socio-economic status

In 2024, 73 % of respondents identify as not being from a disadvantaged socio-economic group, 16 % said they are from a disadvantaged group, and 9 % were unsure. 41 % of the respondents were the first person in their immediate family to go to university. According to HESA[2], 37.5 % of 18-year-olds in England entered full-time higher education in 2022.

Nationality

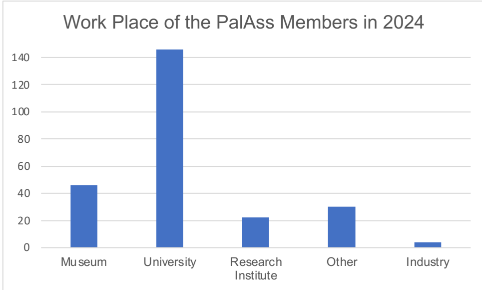
2024 PalAss members held 38 nationalities: 149 (47 %) held UK nationality, of whom 90 were from England. The next most abundant nationality in PalAss members is the United States with 34 respondents, Germany with 11 and Canada and Spain both with eight respondents. According to HESA[2], 67 % of academic staff in the UK held British Nationality in 2021/22.

Country of employment

Of the 2024 respondents, PalAss members reside in 37 countries, with 50 % in the United Kingdom, of which 85 % are in England. 39 of the respondents reside in the United States and 17 in Germany. 57 % of Council members are based at a UK institution, down from 66 % in 2023.

Sector of employment

46 % of 2024 respondents were currently employed by a university, which is similar to 2018. The second most common employment sector is in museums, where 14.5 % of respondents are currently employed.



Type of contract

In 2024, most members (18 %) were retired. This was followed by full-time staff with a permanent contract (13 %). According to HESA[2], 33 % of academic staff in the UK were employed on a fixed-term contract in 2021/22, of whom 51 % were hired on a part-time basis.

Languages

The most spoken languages are, in descending order, English, French and German. PalAss members speak 45 languages, of which about half are spoken by only one PalAss member. According to the 2021 National Census figures for England and Wales[5], 91.1 % of usual UK residents aged three years or over had English as a main language. The most common other languages were Polish (1.1 %) and Romanian (0.8 %).

The 2025 PalAss Diversity Survey is currently open for submissions, if you would like to be included in the statistics follow the QR code or link below:

<**https://app.onlinesurveys.jisc.ac.uk/s/palass/2025-diversity-survey-2024-palass-annual-meeting**>

Nidia Alvarez Armada
Diversity Officer

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1: <**https://www.legislation.gov.uk/ukpga/2010/15/contents**>

2: <**https://www.hesa.ac.uk/**>.

3: <**https://www.wisecampaign.org.uk/updated-workforce-statistics-august-2022/**>.

4: <**https://www.humandignitytrust.org/lgbt-the-law/map-of-criminalisation/**>.

5: <**https://www.ons.gov.uk/census**>.

6: <**https://www.stemreturners.com/the-stem-returners-index-2023/**>.

7: <**https://www.isc.co.uk/research/annual-census/**>.

Software for palaeontologists

Photogrammetry

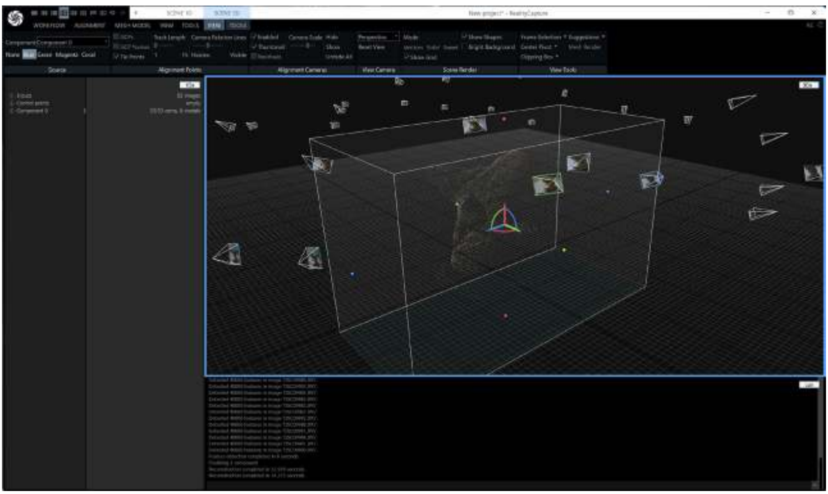
Digitizing fossils has become quite commonplace, and the rise of photogrammetry over the last 20 years has been a real boon for palaeontologists who don't have a spare £100k for a laser scanner or CT scanner. With just a digital camera (even a phone camera these days), you can make very accurate, detailed models. The process used to be incredibly labour-intensive, involving manually aligning photos by picking points between images. Advances in algorithms in the early 2010s made this process automatic, but still required high computing power. This was where I started dabbling with photogrammetry with my 2012 *Palaeontologica Electronica* paper. Since then, I've carried out a whole bunch of tests on all the free and commercial software I could get my hands on, all of which you can find on my blog (links below).

This article isn't to tell you how to do photogrammetry, or to cover all the available options, but to point out the best software options available to you.

Best software overall: Reality Capture

Absolutely no contest in my eyes – Reality Capture (with all features unlocked) is free for educational institutions and students, or for individuals and businesses accruing less than $1,000,000 a year. I think those terms apply to most palaeontologists reading this.

Reality Capture is faster than anything else I've tried, and it can incorporate control points for manual alignment or scaling, generate ortho-photos (2D top-down images of a model), and output models in a wide range of formats. The interface is a little complex at first, but doesn't take long to get used to.



Reality Capture. Not as immediately intuitive as Agisoft Metashape, but it does have the advantage that all you really need to do is drop your photos in it, then hit start.

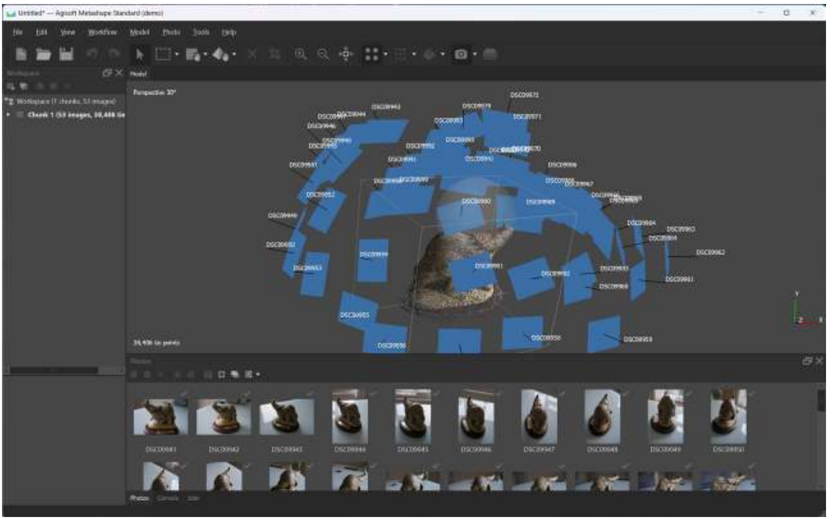
The one caveat here is that you need an Nvidia graphics card, or GPU. That means this software is not going to run on a Mac even if you emulate Windows. It should run on Linux with emulation, but the biggest barrier there is that you have to download it through the Epic Games client, which also isn't available on MacOS or Linux (though I believe that will work via Wine or emulation). On a machine without an Nvidia GPU, it will only get as far as aligning cameras – you can't generate a mesh with it.

Alternative commercial software: Agisoft Metashape

Until recently, Metashape was the easy alternative choice. Available for just $59 for the educational version, Metashape is fast and easy to use (with a nice clean UI) and will work on MacOS, Windows and Linux, and it doesn't need an Nvidia GPU. In fact, Metashape takes good advantage of the M-series chips in Mac computers, and can run quicker on a Macbook than a big Windows desktop.

There's two caveats to Metashape – firstly, that $59 only gets you the standard edition, which can't do georeferencing or scaling (that's also the educational price, the normal standard edition is $179). To get all the features you need to pay $549 for a full educational licence, or $3,499 otherwise. Not the end of the world – most commercial scientific software costs more than that. Plus it's a one-off payment, no subscriptions here.

However, the second caveat that has come to light recently is that, because Agisoft is a Russian company, many institutions in the USA are no longer allowed to use it. I've received lots of emails from people working for US federal agencies (*e.g.*, the Bureau of Land Management) asking for alternatives, because they are banned from using Metashape. This is a shame, because it was the only real solution for Mac users.

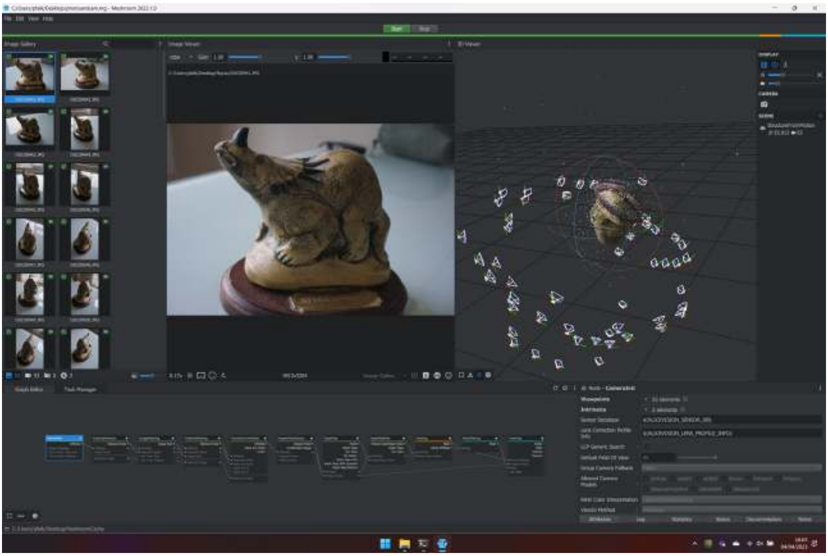


Agisoft Metashape. Takes a few more clicks to set up a full process from alignment to meshing to texturing, but ultimately it's a clean interface, and it runs on anything.

Free Software

I have spent years advocating for the amazing open-source photogrammetry packages available, but the truth is they've been completely and utterly eclipsed by Reality Capture and Metashape (and even a couple of other commercial softwares). The two that remain worth mentioning are AliceVision Meshroom and COLMAP.

The first of these, Meshroom, has a node-based workflow for setting up your reconstruction and is really quite powerful. It contains most of the features you might use, and is available for Windows or Linux. It does technically require an Nvidia GPU for all of the features, but a version is available that uses Open-CL instead of CUDA, so will run without an Nvidia GPU. Unfortunately, it hasn't seen an update since late 2023, and it's very clearly slower and less reliable than Metashape or Reality Capture, so frankly it's hard to recommend today.



AliceVision Meshroom. The node-based workflow is interesting and lends a lot of flexibility, particularly around trying different parameters. But ultimately its speed and output quality don't keep up with the commercial closed-source options.

The other option is COLMAP. I wouldn't have mentioned this, because it's finicky to use and really doesn't go all the way through the process (it will generate a dense point cloud very well, but lags behind in meshing, and can't produce textured meshes). But COLMAP forms the basis of a *lot* of modern computer vision research; it is very much the standard in aligning cameras and producing sparse point clouds. It's also easy to incorporate into other workflows, so you might find use for this if you're doing something more complex with your data than just generating meshes.

Mobile applications

A recent development is the emergence of apps available for phones and tablets that can do photogrammetry directly. The convenience of this is immediately apparent, but I advise some caution. I've tried a few of these apps, and while the results can look pretty good on a small screen, it usually turns out that the texturing (that is, the colouring applied to the underlying polygonal model) is doing a lot of heavy lifting and hiding the fact that the mesh itself is either quite low resolution or poor in quality (or both). This isn't just an issue with processing power; in fact, a lot of these upload the images to produce the model in the cloud, then download it again (thus needing a strong Internet connection, which isn't always available in the field). Instead, while phone cameras have been constantly improving, we're starting to hit physical limits on image quality determined by the small sensors, and the AI post-processing that phones are starting to use is not great for photogrammetry.

Some programs, like Polycam, actually use the LiDAR/depth sensor on the back of iPads, which provides a much greater level of accuracy over the purely photogrammetry-based mobile apps, and I have seen decent results with it. For Android, RealityScan (made by the same people as Reality Capture) is about as good as it gets, but I wouldn't recommend it for digitizing anything you want to analyse or archive.

Summary

If you have time to play around with different software packages, I do suggest giving a few a try to see what works for you. Whilst I have preferred software, I still find some datasets work better with one than another, so I usually keep both Metashape and Reality Capture installed. But if you just want something to get started with, my advice is as follows:

- If you have a Windows PC with an Nvidia graphics card, get Reality Capture.
- If you don't have an Nvidia card, and you're not otherwise prevented from using it, give Agisoft Metashape a go (they do a free trial version).
- If you can't use either (because you're using a Mac and work for a US federal agency), then give Meshroom-CL a shot.
- Use mobile apps with caution, and ideally not for primary data collection (best used for contingency scans, or preliminary scans in the field).

If you do generate models for research, please make them available when you publish. There's been a couple of standards papers now that recommend making both the model and the original photos available (Davies *et al.* 2017; Falkingham *et al.* 2018). That way, you present the data you worked from, but also the parameters you used so that other people can potentially make better models in the future.

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Reality Capture: <**https://www.capturingreality.com/**>

Agisoft Metashape: <**https://www.agisoft.com/**>

Meshroom: <**https://alicevision.org/#meshroom**>

MeshroomCL for those without an Nvidia card:
<**https://github.com/openphotogrammetry/meshroomcl**>

COLMAP: <**https://colmap.github.io/**>

PolyCam: <**https://apps.apple.com/us/app/polycam-3d-scanner-lidar-360**>

RealityScan: <**https://www.unrealengine.com/en-US/realityscan**>

You can also check out my blog, where I've spent a lot of time over the past ten years posting about photogrammetry and different software: <**https://peterfalkingham.com/?s=photogrammetry**>

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Sailing shoes

"The best-laid schemes o' mice an' men gang aft agley", said Robert Burns. Never a truer word, though mice had no blame whatsoever for the recent saga of the ferry service to the Isle of Arran, in Scotland, as reported on by the BBC over the past few months. It's a fine example of the difficulty of trying to adapt normal life to an ever-more-abnormal climate, in that the brand-new ferry designs, hi-tech and super-expensive – and embarrassingly late in delivery – managed to have a *larger* carbon footprint than the old, noisy, diesel-powered tub[1]. It's a common-enough cautionary tale, as hopeful but fallible humans try, and generally fail, to steer an ever-hungrier technosphere away from its addiction to fossil fuels. But for some who read these reports, I'd guess these serious considerations would have been hijacked by a deal of unserious reminiscence, Arran being the nonpareil place of pilgrimage for geology teachers with flocks of first-year students in tow.

The naming of the new ships was a piece of corporate strategizing seemingly aimed four-square at those afflicted with such geological nostalgia. The *Glen Sannox*! Though, importantly, one isn't told whether we're dealing with north Glen Sannox or south Glen Sannox. Well, they're both gems in their different ways, but I have a special fondness for south Sannox, perhaps because it has a tiny but perfectly formed geological mapping exercise, hidden away in plain sight. Tiny? It's an island set within a stream, that takes just twenty seconds to walk along and three to stride across, with some 50 % solid rock exposure, of entirely unsubtle and gently dipping sandstone and conglomerate, to set the students on. Their first task is to realize that *it doesn't make sense*. The second is to work out *why* it doesn't make sense. The third and crucial step is to figure out how it *does* make sense after all, and most beautifully too, once the tectonic faults are discovered and their geometrical rearrangements deduced. In between there's much head-scratching and frowning and chasing of red herrings and fervent discussion and scribbling of diagrams: it can take a good couple of hours before the pennies successively drop. Sannox's 'island' is an exercise in solid rock geology so perfect that one wishes to take it home (excavated, one could lay it out in a modest back garden), just for old time's sake.

[1] <**https://www.bbc.co.uk/news/articles/cwy87e72yg3o**>

But, oh, the drift geology that lies around this gem. A nightmare. Each successive year I tried to make sense of it, without ever getting more than a quarter way, if that, to any sensible understanding. Most of it seemed to be lumpy patches of boulder clay masquerading, with malice aforethought, as solid rock ridges. The worst possible ambassadors for the ice ages, for sure, especially for the more tenderfoot of students.

But, here the other new ship[1] sails to the rescue. If south Sannox is the villainous Mr Hyde of drift geology, then the *Glen Rosa* represents Dr Jekyll, halo firmly in place and shining brightly. Everything behaves in this equally picturesque valley – and in the most uncanny way, too, as if in deep apology for the curmudgeonly ways of the Sannox. There's a wide stretch of satisfyingly flat river alluvium here, its edge dotted with tiny but perfectly-formed alluvial fans. There's boulder clay as textbook lower-valley drapes, that give way upslope with satisfactory sharpness to the solifluction 'head' deposits above. These, in turn, part with topographic eloquence to show the solid rock islands peeping through this cover. Heavens! The danger here is that the students will think all upland drift deposits will have such good, and even better such *mappable*, manners, which, of course, is not always the case.

Arran has long attracted geologists in droves. Its first celebrated geo-tourist was, of course, James Hutton way back in 1787, when he recognized an example of *that* unconformity on its northern coast with its succinct demonstration of the impossible depths of geological time, as a kind of rock-formed haiku. It's still a beautiful locality, and rather easier to get to than the more famous and more scrambly Siccar Point example on the mainland. And, even better, it's another *perfect* student micro-mapping exercise (though a rather larger garden would be necessary if you wanted to steal it away), with its own tectonic faults being perfectly adjusted for maximum pedagogic effect, one being nicely adorned with a dolerite dyke to boot. Perhaps even more impressively, Hutton in his short visit divined the island's structure in the classic cross-section he drew, the granite shouldering the strata aside as an example of the planetary heat engine that was growing in his mind.

A century later in 1882, Edward Wünsch, a stalwart (founding member, indeed) of the Geological Society of Glasgow (GSG), described Arran's "inexhaustible" geology as already attracting many "English, French and German travellers", who were then making the crossing – clearly in some style – aboard "the magnificent screw-steamer *Arbutus*". Wünsch was providing a translation for the GSG members of *A German Professor's Views of the Geology of Arran*, the professor in question being the mineralogist Arnold von Lasaulx. It's a beautiful example of the most courtly manners ("I may be allowed … to express my admiration of Prof. von Lasaulx as an accomplished geologist and author"), combined with outright disagreement on points of geology ("the sweeping generalization of Prof. von Lasaulx becomes untenable") and a combative wish that the Glasgow geologists "meet him once more … and show ourselves foemen worthy of his steel."

Wünsch made a contribution to Arran's palaeontology that seems to have fallen out of the usual itineraries: a volcanic ash-buried fossil forest with roots and trunks *in situ* in the Coal Measures strata in the north east of the island. Or rather, two superposed forests in successive ash layers, as his 1866 diagram shows. He even had his name attached to a new species found there, *Lepidophloios wunschianus*, the 'hollow tree trunks' of these 'petrified lepidodendroid trees' at

[1] <**https://www.bbc.co.uk/news/articles/cw074333d2zo**>

this locality being described in more detail some 70 years later by John Walton in 1935. After that the trail seems to go cold, at least to my cursory sleuthing.

Do these fossil trees still exist? Or are they now eroded away, or overgrown, or built over? Perhaps they are still there, ripe for rediscovery. It would be nice to add a little more of this kind of thing to Arran's geological palette, for among the magnificent volcanic rocks, the fabulously intricate metamorphic rocks and the ever-so-eloquent strata, fossils are just a little thin on the ground. There are, one admits, those massed ranks of *Gigantoproductus* in the limestone caves at the top of the entertainingly steep and muddy path above the village of Corrie, showing that brachiopods can be just as good as corals in claiming and holding sea floor territory to the exclusion of virtually all competitors. Otherwise, fossils are few and far between. But what Arran's fossils lack in frequency they more than make up for in star quality.

Arran's arguably most famous fossil is the myriapod trackway discovered by Laggan Harbour in 1975 and described by Derek Briggs and colleagues. It's of an *Arthropleura*, though not as gigantic as some, with this particular beast being estimated as 'only' a metre long. Briggs and co. did some lovely work on inferring how this majestic myriapod walked from the footprints it left behind. The stride length for each 10 cm leg, they worked out, was about 22 cm, this being "the distance between footfalls of the same appendage". Now, as each myriapod has its own army of legs, the densely packed mass of footprints that is left behind makes for trickier interpretation than, say, the average set of Pleistocene hominid footprints or a dinosaur trackway. Interpretation of this kind of thing is difficult even with modern millipedes, and the authors quoted that classic investigator of everything arthropod, Sidnie Manton, as putting a boot on just a single leg of a millipede she was observing, to allow it to leave a footprint that would stand out from those made by all of the many unbooted legs of the animal. That ingenious device was a very Sidnie Manton kind of thing to do, something her Royal Society biographer (Fryer 1980) ascribed to an upbringing in a family where crafts were seriously and skilfully applied, from dentistry to carving to the production of celebrated flintlock guns. Whatever the familial inspiration was, it clearly worked, for it produced the first and perhaps still the only example of two sisters (Sidnie and her sister Irene, a botanist) being elected as Fellows of the Royal Society. And the poor millipedes were not only saddled with solitary boots by Sidnie in the interests of science – they were also made to pull hand-crafted millipede sledges and to carry loads to measure their strength and endurance. Luckily for the Arran *Arthropleura*, there was no redoubtable Sidnie Manton on hand in its day to carry out experiments on its walking habits, so it could, quite literally, be footloose and fancy-free as it made its way across the wet river sand-bed along which it strolled into posterity.

What kind of air did it breathe? The gigantic size of *Arthropleura* and other terrestrial arthropods of the Carboniferous, not least that equally iconic dragonfly[2] *Meganeura*[3] with its 60 cm wingspan, has long been linked with an upswing in atmospheric oxygen levels, the corollary to those coal swamp forests burying all that carbon. It's an idea that has had its share of criticism, but was found plausible though not conclusive by Jon Harrison and colleagues (2010). It's not a simple story, not least because most Carboniferous land-based arthropods were pretty much normal-sized, the epic monstrosities being rarities. Other reasons for gigantism can be surmised, too, like

[2] Actually a griffinfly, if one is being picky about names, and its own strange story is told in Bug Hunt, *Newsletter* **97**.

[3] Alas, not yet unearthed on Arran.

Arthropleura and its ilk filling a niche that was open to them just for a while, and that then closed when other animals (vertebrates, most obviously) evolved to outcompete (or eat) them.

The other fossil highlight that springs to mind is another set of footprints that has comparable amounts of palaeo-superstar aura. These are a bit younger, being in Triassic strata, and suffer less from over-trampling, with only four legs involved per animal. The odd iffy example has long been on field-trip itineraries on Arran: there's a length of quagmire by the aptly named Blackwaterfoot cliffs that marks an amusingly (or annoyingly, depending on mood and weather) sploshy annual pilgrimage for many teachers and students to get to a somewhat dubious fossil footprint. But more, and better, examples have been unearthed in recent years (Clark 2011). They turn out to be of that classic 'hand-beast' itself, *Chirotherium*[4].

Now, this fossil has a ridiculous amount of what Terry Pratchett used to call narrativium, or the capacity to provide good stories. It was a shoo-in, indeed, to be among the list of characters that Richard Carrington compiled when writing his classic 'unnatural history' that is *Mermaids and Mastodons*, joining the kraken, roc, *Aepyornis*, *Iguanodon*, phoenix and many other charismatic kin in pages that are still a delight some 70 years after they were published. For a start, *Chirotherium* footprints have been long encountered here and there, their first 'scientific' discovery near Göttingen being in 1834, long enough ago for its spookily human-hand-like impressions to have been interpreted in all manner of ways: as those of bears, giant toads, kangaroo-relatives, cave bears, mandrills and so on. Not, though, as those of some ur-humans – at least as far as I know – because the hand-prints come in pairs, one about twice the size of the other; obviously the back and front feet respectively. And, in the tracks, *the thumb was always on the outside* (cue spine-tingling music), and not on the inside as it would be if made by humans walking on all fours. Best of all, *no skeletons were ever found* (the music rises a notch), so all that we have left are the tracks, and that seems to hold true today.

Like all good stories, it includes a certain amount of discomfiture of the high and mighty, in this case of Richard Owen, that famous and brilliant scientist who was all too often on the dark side, and who proffered an interpretation in 1851 for the 3rd edition of Charles Lyell's *Principles of Geology*. To explain the weirdly placed thumb, he had the animal crossing one leg in front of the other at each step, illustrating these complicated gymnastics by a drawing of "the tottering *Chirotherium* making tracks, regarding the reader awhile with an apprehensive stare. The creature's dismay would seem to be well-founded when one reflects on the hazards of this unorthodox mode of progression" (Carrington 1960, pp. 150–1). By the 6th edition this deliciously ill-advised interpretation had been 'tactfully dropped' from *Principles*.

The well-advised solution to this conundrum came in 1923 when Wolfgang Soergel published *Die Fährten der Chirotheria*. Many reptiles, he said, had one digit pointing away from the others on the *outside*, not the inside, of the foot – that single insight did away with the need for anything like Owen's vision of an animal trying to advance in the fashion of a nervous tightrope walker. Soergel went on to reconstruct the size, shape, stride, and eating habits of *Chirotherium* from the footprints alone. It remains a classic deduction, beautiful enough that one secretly wishes that *Chirotherium* bones stay hidden and undiscovered, so as not to dilute the narrativium factor.

4 Or, more precisely, *Isochirotherium* rather than *Chirotherium*, though the two genera are closely, if not inextricably, related.

So in fossils as in rocks Arran remains the ideal educational microcosm, with so much to chew over in its modest crustal frame that one can spend all day among the rocks and then continue discussions with the students in the hotel bar until the small hours: perhaps over a modest glass of beer (also perfectly formed) from the island's own brewery, naturally. And now, the whole exercise has been brought so neatly into today's pressing geological concerns, as quintessentially represented by those shiny new ferries. Was it a good decision to plump for liquefied natural gas, or should one have simply stuck with diesel? Where did the metals to make the new ships come from, and what were the environmental consequences of extracting them? How much of the old ferry was recycled, and how much simply went into landfill? Why, one could spend the whole week on the boat just chasing these and related questions (and devise a nice exercise to, say, map the plastics on board). Then, of course, one would have to book another trip to finally turn one's attention to the ancient rocks. As new geology meets old, business looks set to boom on the isle. Ships ahoy, indeed.

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Introducing the Palaeoverse

What is the Palaeoverse?

The **Palaeoverse** is an initiative which aims to bring together the palaeobiological community to share resources, reach agreed standards, and improve reproducibility in palaeobiological research. The project started in early 2022 when a group of early-career researchers came together to develop the ***palaeoverse*** R package. After noticing that many of us were repeatedly 'reinventing the wheel' when cleaning and preparing palaeontological data due to a lack of standardized protocol, we began developing a software toolkit to support data preparation and exploration for palaeobiological analysis. Through the development of *palaeoverse*, our hope was to encourage the broader community to move towards establishing agreed standards in palaeobiological research. Since then, we have more formally organized ourselves as 'the Palaeoverse' and expanded our horizons, developing additional R packages (*e.g.*, ***rmacrostrat***, ***rphylopic***, ***sepkoski***), producing a variety of resources (*e.g.*, **Palaeontology CRAN Task View**, **resource library**), establishing community spaces (*e.g.*, **Google Group** and **YouTube**), and organizing a variety of events to assist palaeontologists at all career stages (*e.g.*, workshops, hackathons, **lecture series**). Below we provide a quick introduction to the different R packages available under the Palaeoverse banner and to what this series is about.

R packages

Palaeoverse currently has four core R packages that are actively maintained and developed by the team: palaeoverse, rmacrostrat, rphylopic and sepkoski. All packages are (and always will be) open-source and freely available to download from the Comprehensive R Archive Network (CRAN) with source code available via our **GitHub Organization**.

palaeoverse

The ***palaeoverse*** R package is a community-driven toolkit to support the preparation and exploration of palaeobiological data. The package has three core principles: (1) streamline data preparation and exploration; (2) enhance code readability; and (3) improve reproducibility of results.

rmacrostrat

The ***rmacrostrat*** R package allows users to interface with the **Macrostrat** database to access and retrieve a variety of geological, palaeontological and economic data directly to the R environment. The package provides straightforward functionality for accessing and retrieving a variety of geological, palaeontological and economic data hosted by Macrostrat.

rphylopic

The ***rphylopic*** R package allows users to add silhouettes of organisms from the **PhyloPic** website to plots generated in base R and ggplot2. The package was originally developed and maintained by **Scott Chamberlain**. From version 1.0.0, the package is now developed and maintained by the Palaeoverse team.

sepkoski

The ***sepkoski*** R package is a light and easy solution to access Sepkoski's fossil marine animal genera compendium. The package provides access to the raw dataset, a dataset with intervals standardized to the International Geological Time Scale, and plotting functionality for reproducing Sepkoski's Phanerozoic curve.

What are we going to cover in this series?

In this *Newsletter* series, we – the Palaeoverse team – will expand upon the building-blocks provided by the outstanding '**R for Palaeontologists**' *Newsletter* series put together by Mark Bell some years ago. Whilst Mark provided an overview of some of the basic functionality of R, we will provide tutorials on specific issues faced by palaeobiologists when conducting analyses: *How should you clean fossil occurrence data? How should fossil occurrence data be temporally binned? How do you palaeogeographically reconstruct the distribution of extinct taxa?* And much more. Our aim is to provide short but informative tutorials to help users get started with palaeobiological analysis in R and demonstrate how the Palaeoverse software toolkits (and others) can be leveraged to make your life easier!

Who is this series for?

It's for anyone getting started with analysing fossil occurrence data, whether you are a student starting out, or a researcher moving into this type of analysis for the first time! By occurrence data, we refer to records of taxa found at specific locations and within specific geological contexts, that is, the presence of a particular taxonomic occurrence at that unique location in space and geological time. This contrasts with specimen-level data, which provide information about each individual fossil specimen found at a given location and geological time interval. Occurrence data are commonly the basis of large palaeontological databases such as the **Paleobiology Database** (PBDB) or **Neotoma**, and these data are frequently leveraged to ask a variety of palaeobiological questions (as can be seen in the **extensive list of publications** using data from the PBDB).

Keep an eye out for the first tutorial in the next issue, focused on temporal binning of fossil occurrence data.

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Details of the Palaeoverse, the R packages we maintain, resources, and our other activities are available at <**palaeoverse.org**>. Our Github can be found at <**github.com/palaeoverse**> and the CRAN Task View for Palaeontology at <**cran.r-project.org/web/views/Paleontology.html**>.

The series 'R for Palaeontologists' can be viewed on the *Association* website in the *Newsletter* archive.

Careers Q & A

Professional palaeontologists in the wider world: Emma Randle

Emma carried out her PhD at the University of Manchester, UK, reconstructing the evolutionary relationships and patterns of the ostracoderms Heterostraci. She then had several Research Associate roles within the UK, and now works in software development.

Photo courtesy of Emma Randle.

When you were a child, what did you want to become when you grew up?
When I was a child I wanted to be a vet.

How did you first get interested in palaeontology?
I studied Geology with Biology at the University of Birmingham (course later changed name to Palaeobiology and Palaeoenvironments) as I enjoyed biology at school and geology appealed to me. I really enjoyed the palaeontology modules, but it wasn't until I undertook an internship at the Lapworth Museum, University of Birmingham, during my first-year summer holidays that I really fell in love with palaeontology and fossils.

What is the biggest highlight of your work as a palaeontologist so far?
The highlight of my career in palaeontology was being invited to do fieldwork in the Arctic. We spent five weeks camping, found some pretty amazing and new fossils and I had a blast with an awesome team.

How did you make the transition from a PhD to your career outside academia?
The transition wasn't straight away, I undertook two short term (six-month) postdocs and spent months to a year applying for grants and postdocs whilst doing short-term temping jobs. It was during Covid that I decided to try something new and applied for a free 16-week coding bootcamp. This was very full-on, but was an amazing opportunity to retrain and gain insight into a completely new industry. The skills I learnt and developed during my research career were highly valued in industry and allowed me to go from knowing relatively little about coding to being a senior software developer in three years. The most important transferable skills that helped me in my new career included curiosity, the ability to research and work independently, and the confidence to ask questions and make my voice heard, which all come from my time in palaeontology.

What does your job involve on a daily basis?
I am a senior software developer. My day includes a daily standup meeting with my team, where we discuss what we did the day before, what our plan is for the rest of the day, and anyone can ask for help for any problems they are facing. Then I work on project work, which can include interpreting and planning work assigned from project managers, research,

coding implementation, user testing, meetings to discuss blockers, company meetings, and conducting interviews for new team members.

Can you tell me more about your current role, and what its significance is?
My current role is in a software company in the fibre broadband industry. Our aim is to revolutionize outdated and manual processes while transforming the market to be more customer-centric, whilst optimizing speed and broadband experiences. I am in the Integrations team, which is responsible for human to machine and machine to machine communication via an online portal and APIs (application programming interfaces).

What gives you the most satisfaction in your current work, and what do you not enjoy so much?
The greatest satisfaction I get from my job is the collaborative nature of software development and daily problem solving whilst working towards a larger project/overall aim. I work fully remotely, so I do miss social interactions, especially ones in palaeontology like fieldwork, conferences, *etc*.

Do you have any opportunity to still work in research areas of interest to you, or if not, do you miss the 'hands on' aspect of being a palaeontologist?
I still undertake palaeo-fieldwork with friends, and have some research papers that I still need to finish. I do miss the hands-on aspect of palaeontology, including fieldwork, museum visits and conferences. However, I do not miss grant and paper writing.

Do you have any tips for anyone wishing to transition into a role like yours?
Remember your transferable skills. We were told many times during our PhD that we had loads of transferable skills, and I had no clue what these were. However, since entering a new industry I have seen employers really value independent thinking and working, curiosity, ability to plan and manage projects, the pace academics can work at, and communication (be it written or oral). Another bit of advice I would offer when looking for a non-academic career is to really evaluate what you enjoy doing day to day, and what gives you energy. Whilst deciding a new direction for my career, I was advised to go into teaching, but I knew this wouldn't have aligned well with my personality and energy levels. Take your time, find something that excites you and remember you will be an asset to any company you join.

If you could take a workplace habit from one field to the other, what would it be?
I really enjoy the way software teams manage projects (agile methodology), with daily standups, breaking large projects down into smaller two-week sprints, and planning and retrospectives during this time. I think this would be a great habit for research teams.

Is there a skill you wish you had been taught at university that would be useful in industry? What turned out to not be useful at all?
This is a tough one; a non-academic skill I think that would have been useful to learn whilst at university would be greater training in how to get jobs, interviews, *etc*. I went to the career service quite often, but felt they were not very useful when hearing my degree. This is my own experience and I'm sure some universities do this better than others. To be honest most skills learned during my time at university are super useful when applied in the right situation.

What are your future ambitions?
I would like to work my way up to team lead where I would drive the direction of projects, whilst managing projects and people.

Careers Q & A

Professional palaeontologists in the wider world: Terri Cleary

Photo courtesy of Terri Cleary.

Terri started out as an undergraduate in Biology at the University of Sheffield, then specialized with a Masters in Palaeobiology from the University of Bristol, and a PhD shared between University College London and the Natural History Museum, London. Her research revolved around fossil record biases, with a focus on the fossil records of modern non-archosaur reptiles (lizards, snakes, turtles). She did a brief stint as a postdoc at the University of Birmingham before deciding on a career change into bioinformatics, and now works as a Bioinformatics Scientist for a cell engineering company in Cambridge, UK.

When you were a child, what did you want to become when you grew up?
I don't think I ever had a concrete goal, I just liked to learn. I was that kid who devoured educational books and wanted to tell everyone about the fun facts I'd found!

How did you first get interested in palaeontology?
I think the bits I did about evolutionary biology during my undergrad really sparked the interest. When I realized I wanted to keep going in academia I started looking into Masters and PhD programmes.

How did you make the transition from a PhD to your career outside academia?
I came to the end of my postdoc right in the middle of the pandemic high tide in 2020, and was honestly feeling so burned out. I applied for a few postdocs, did some interviews, but things just weren't really working out. So I decided to branch out a little, polished up my non-academic CV, and started looking for coding jobs, because my PhD and postdoc had involved coding with the R language. I applied to the company I work for now, learned Python from scratch on the job, and I've been here for three and a half years!

What does your job involve on a daily basis?
My team provides support for all R&D in the company. We maintain a large number of (Python) code pipelines that process raw data into polished outputs, to save scientists' time, so I help maintain and add new features to these. I query databases using the SQL language. I'll also be asked to sit in on meetings with scientists to discuss the feasibility of new projects from a data-processing perspective. I run a lot of the meetings for scheduling my team's work. Sometimes I'll give presentations to the company on things the team has made; it's pretty varied! But at its heart a lot of it is about problem-solving, so it's very similar to the kinds of things I enjoyed about academia.

What gives you the most satisfaction in your current work, and what do you not enjoy so much?
I really enjoy being able to solve discrete problems, and I like the variety of things I get to

work on. I do wish I could leave my computer sometimes though. I like to travel to make up for that!

Do you have any opportunity to still work in research areas of interest to you, or if not, do you miss the 'hands on' aspect of being a palaeontologist?
I've transitioned from learning about the past to helping with the future (our company does R&D for the medical field), so I don't really get to work in my old research areas any more. From a 'hands on' perspective I can't really miss what I didn't have as an analytical palaeontologist! I was always chained to my desk, but I do miss the conference field-trips!

Do you have any tips for anyone wishing to transition into a role like yours?
It's pretty competitive out there for coding jobs, so I'd recommend picking up the basics in a language like Python before you apply. A lot of coding jobs will send you a coding challenge as part of the application. Do your best and don't be intimidated – you don't have to do perfectly on these to get an interview, it's to assess HOW you approach a problem as well as your knowledge. Having a good knowledge of statistics also helps a lot, especially if you're looking into bioinformatics.

Also, a general tip from someone who has run a few interviews: apply for jobs even if you don't fit ALL of the criteria! Sell the skills you do have, and express a desire to learn those you don't!

If you could take a workplace habit from one field to the other, what would it be?
Always have snacks in your desk. A snackless 3pm is no joke.

>>*Future* Meetings of Other Bodies

3rd Geobiology Society Conference (Geobiology 2025)
Banff Park Lodge, Canada *20 – 24 May 2025*

Following the success of the conferences held in Banff in 2017 and 2019, the Geobiology Society has announced its 3rd international conference on geobiology, also to be held in Banff, Alberta, within the Banff National Park in Canada's Rocky Mountains. With around 300 delegates anticipated to attend from around the world, Geobiology 2025 will provide an opportunity to explore the latest advances in the field in a relaxed but engaging setting. A key focus of this conference will be fostering connections across the diverse disciplines within geobiology, particularly bridging the gaps between geological and biological perspectives. The main conference theme is 'Tracing the biosphere through time', and this will guide discussions over the course of the three-day meeting, with the three days focusing on the Archean, Proterozoic and Phanerozoic eons respectively. The meeting will showcase the work of early-career scientists and will include professional development talks on topics such as giving effective interview presentations, writing successful grant applications and overcoming career challenges. Registration is open until 31st March, and all attendees are encouraged to submit an abstract for a lightning talk by 30th April 2025.

See the website: <**https://cms.eas.ualberta.ca/geobiology2025/**>.

9th Symposium on Fossil Decapod Crustaceans
Faxe, Denmark *9 – 13 June 2025*

This conference in Faxe is co-organized by the Geomuseum Faxe and the University of Alabama (Department of Museum Research and Collections and Alabama Museum of Natural History). Although the conference is focused on decapod crustaceans, research on other crustaceans is also welcome. The conference consists of an icebreaker followed by two conference days full of talks and posters, followed by two field-trip days. The conference venue is very close to the Faxe Limestone quarry, which is the type locality for the Danian age, and has preserved the remains of a 63-million-year-old fossil cold-water coral reef. The quarry is famous for its high number of well-preserved fossils, including abundant decapod fossils that have been formally reported from Faxe since 1820. Geomuseum Faxe has an extensive collection of Maastrichtian and particularly Danian crustaceans from Denmark. The collection will be available for participants to study during the conference.

For more information see <**https://collections.museums.ua.edu/9th-fossil-decapod-symposium/**>.

10th International Meeting on Taphonomy and Fossilization (TAPHOS 2025)
Ferrara, Italy *17 – 19 June 2025*

Taphos 2025 will be the 10th International Meeting on Taphonomy and Fossilization, and continues the tradition of taphonomic meetings that have been held regularly in Spain since 1990, with more recent meetings in Tübingen (2011), Ferrara (2014), Vienna (2017) and Madrid (2022). The aims of the Taphos meetings have been to integrate all aspects of current taphonomic research from both palaeontological and archaeological contexts: biostratinomy, taphonomy in archaeology and anthropology, taphonomy in the analysis of patterns of evolution and extinction, taphonomy in biostratigraphy, theory of taphonomy, taphonomy in palaeoecology and sedimentology, Lagerstätten and exceptional preservation, taphosystems, historical ecology, conservation palaeobiology and mudlarking taphonomy. Taphos 2025 will be held in Ferrara in June with two days dedicated to scientific sessions and a one-day field-trip. Delegates will be able to sample the best of Ferrarese cuisine and Italian wines in the centre of the European Renaissance. Early bird registration is available until 31st March and the abstract deadline is 25th April 2025.

Details will become available on the website: <**https://sites.google.com/unife.it/taphos-2025-ferrara/home-page**>.

22nd Annual Meeting of the European Association of Vertebrate Palaeontologists (EAVP)
Kraków, Poland *30 June – 7 July 2025*

The 22nd Annual Meeting of the European Association of Vertebrate Palaeontologists (EAVP) will be hosted by the Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences (ISEA PAS) in Kraków. ISEA PAS has a long tradition in zoological and palaeontological research, dating back to 1865. The Vertebrate Zoology Department of ISEA PAS has a diverse research focus in palaeontological studies, encompassing an array of different vertebrate groups. The Department's collections form an integral and quintessential part of the Institute; they comprise an array of fossil and extant specimens pertaining to all groups of vertebrates, originating from all parts of the globe, including many type specimens. The ISEA PAS is situated in the very heart of Kraków, next to the main market square. Kraków is the second largest city of Poland, with a population of 800,000 people. The city has a rich history, being recognized as a UNESCO World Heritage Site. The 22nd EAVP Meeting there will represent a great opportunity to present and discuss novel palaeontological discoveries and create new projects and collaborations. Early-bird registration ends and abstract submission closes on 15th April 2025.

See the website: <**https://eavp2025.wixsite.com/eavp2025**>.

IGCP735 regional meeting
Llandrindod Wells, Wales, UK *4 – 11 July 2025*

This regional meeting of IGCP735 (Rocks and the Rise of Ordovician Life) will take place in the Mid-Wales spa town of Llandrindod Wells, on the edge of the Ordovician Builth–Llandrindod Inlier. The Inlier is a key area of historical geology that represents an ancient volcanic island system, studied by Sir Roderick Murchison, John William Salter, Gertrude Elles, O.T. Jones, Alwyn Williams, Peter Sheldon and many others. The first trilobites were described from this area by Edward Llwyd in 1699. In recent years, it has been shown to have several sites with exceptional preservation of organisms such as sponges, echinoderms and palaeoscolecid worms. These sites include Llandegley Rocks, Llanfawr and now the diverse Burgess Shale-type assemblage of Castle Bank. In keeping with the theme of IGCP735, we would like to focus on filling gaps in the fossil record: in this case, with an emphasis on exceptional preservation, total communities and neglected fossil groups. The meeting will have three days of talks interspersed with two days of field-trips visiting local sites of exceptional preservation, and probably also an optional final day of workshops on important but poorly understood groups such as bivalved arthropods and sponges. Registration is open until 31st March.

For more information see: <**https://igcp735.wales/**>.

Life and Planet 2025
London, UK *14 – 16 July 2025*

Life and Planet is the annual meeting of the Earth System Science Group of the Geological Society of London which takes place at the historic Burlington House in Piccadilly each year. The theme of co-evolution is broad and cross-disciplinary, and the meeting will showcase work that spans the fields of palaeontology, (bio)geochemistry, sedimentology, geobiology, palaeoclimate, geodynamics, tectonics, astrobiology and any scientific work that aims to understand how life has shaped the global environment and/or how the global environment has shaped life on Earth, or how it may do so on planets in general. Presentations will feature work from the field, the laboratory and from numerical simulation. The three-day meeting will include talks, posters, discussions, early- and mid-career workshops, the group AGM, and plenty of time for collaboration and network building in the wonderful surroundings of Burlington House. Researchers from all career stages as well as other interested parties and individuals are encouraged to attend, in particular early-career researchers. The meeting will feature selected 'highlight' talks from early-career submissions rather than invited talks from senior colleagues.

Visit the website: <**https://lifeandplanet.com**>.

4th Crossing the Palaeontological–Ecological Gap (CPEG) and
3rd Conservation Paleobiology Symposium
Zurich, Switzerland *27 July – 1 August 2025*

The CPEG meeting aims to bring together palaeontologists and ecologists to share ideas, data and methods in research areas that are studied by both, but typically independently, for example community and population ecology, food web dynamics, extinction mechanisms and conservation. In 2025 the meeting will be merged with the 3rd Conservation Paleobiology Symposium to promote the application of palaeobiological and ecological records to the conservation, management and restoration of biodiversity. The meeting will be held at the University of Zurich, but will be hybrid with the option for virtual participants to deliver pre-recorded talks with questions from the audience, and all talks will be streamed to accommodate participants who cannot attend in-person due to geo-political, financial or other logistical constraints. This will be a six-day meeting with no parallel sessions, two in-person workshops and a field-trip. Two additional virtual workshops will be offered prior to the meeting. The main conference will include keynote addresses, full oral presentations and lightning talks, plus posters. A welcome reception and poster session will take place at the Natural History Museum of the University of Zurich. Awards will be given for the best student presentations, and for delegates who have travelled with the lowest carbon footprint (corrected for distance). Early bird registration is open until 1st April 2025.

For more details see: <**https://www.cpeg-cpb25.uzh.ch/en.html**>.

International Congress on Palaeontological Heritage IX (ICHP-9)

Settat, Morocco *24 – 28 September 2025*

The International Congress on Palaeontological Heritage is dedicated to both palaeontological and palaeoarchaeological heritage, communicating and exchanging research on topics linked with the preservation and enhancement of this heritage. It will be a meeting place for international researchers, socio-economic operators and activists, as well as activists in the legislation of palaeontological heritage, and will offer the opportunity for early-career researchers to forge links with these various stakeholders. It will also be a meeting place for the different generations of Moroccan palaeontologists to discuss the creation of an association of Moroccan palaeontologists. The Higher School of Education and Training of Berrechid and Hassan First University will organize this scientific and cultural event during late September 2025 in the Reception and Conference Centre in Settat, an attractive and easily accessible city in central western Morocco. The Congress aims to promote cooperation and collaboration between international researchers and socio-economic operators, with a programme encompassing new research, new methods and techniques, geoconservation strategies, and raising awareness of geoheritage protection with local communities and authorities through the creation of reserves, museums and geoparks.

Registration is open online. See the website: <**https://sites.google.com/view/icph-9/home**>.

85th Annual Meeting of the Society of Vertebrate Paleontology (SVP)

Birmingham, UK *12 – 15 November 2025*

The 2025 Annual Meeting of the Society of Vertebrate Paleontology will be held in Birmingham, UK, hosted by researchers from the University of Birmingham. This is only the fourth time that the meeting has been hosted outside of North America, and the second time in the UK. Birmingham is located centrally in England with an international airport and direct train connections to London and all other major UK cities. The meeting will take place at the International Convention Centre (ICC) in the heart of the city, conveniently surrounded by hotels, restaurants, bars and cafes, and a short walk from the central train station. SVP will run an open call for symposia proposals. Field-trips are being planned and will include options to classic palaeontological hotspots such as the Isle of Wight or the Jurassic Coast. Birmingham itself is surrounded by significant heritage attractions and natural landscapes, including Shakespeare's birthplace at Stratford-upon-Avon, Ironbridge Gorge World Heritage Site, and the Peak District National Park.

More information will be on the website in due course: <**https://vertpaleo.org/svp-annual-meeting-2/**>.

7th International Palaeontological Congress (IPC7)

Cape Town, South Africa *30 November – 3 December 2026*

The 7th International Palaeontological Congress will be held in South Africa in 2026, only the second time that this meeting will be held in the global South and the first time in Africa. The meeting will be held during the height of the very pleasant summer season at the University of Cape Town (UCT), which has the capacity to host hundreds of delegates, in both large rooms and smaller breakaway rooms. UCT is located in the leafy suburb of Rondebosch, which has several guest houses and hotels (some within easy walking distance), and in addition the organizing committee is making arrangements for accommodation at the University residences. The fossil heritage of South Africa is renowned globally for its importance in understanding the history of life on Earth and extends from the very beginnings of life to the world-famous hominin relatives that have been recovered there. There are 29 confirmed symposia topics listed on the conference website; please note that the symposia are still open for participation. A series of field-trips will give delegates a feel for the rich fossiliferous rocks in South Africa that span significant periods of time. Furthermore, delegates attending IPC7 will have the opportunity to visit some of the most important museum collections of South Africa, including the Iziko South African Museum and the Albany Museum (featured in *Newsletter* **115**). Circulars are now available online as well as preliminary registration.

Congress website: <**https://ipc7.site/**>.

3rd Asian Palaeontological Congress (APC3)

Bangkok, Thailand *2 – 5 March 2027*

After successful meetings in China in 2019 and Tokyo in 2023, the 3rd Asian Palaeontological Congress will be held in 2027 in Bangkok, Thailand under the auspices of the Asian Palaeontological Association. The congress will be organized by the Palaeontological Research and Education Centre of Mahasarakham University, in cooperation with the Department of Mineral Resources, the Geological Society of Thailand and other Thai universities. APC3 will be a venue for brainstorming sessions that will contribute to the advancement of Asian palaeontology. This congress will provide opportunities for experts, young researchers and students from Asia and around the world to collaborate and share their knowledge for a better understanding of the evolution of life. Field excursions to fossil sites along the beaches in the south and to mountainous areas in the north of Thailand will be organized before and after the conference. A one-day trip within Bangkok is also planned for participants who would like to explore its history and culture. The congress will also feature a palaeoart competition open to all, including non-delegates.

Congress website: <**https://apc3.org/**>

Please help us to help you! Add your own meeting using the link on the Association's web page:
<**https://www.palass.org/meetingsevents/future-meetings/add-future-meeting**>.

Meeting REPORTS

68th Annual Meeting of the Palaeontological Association
Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg, Germany
9 – 13 December 2024

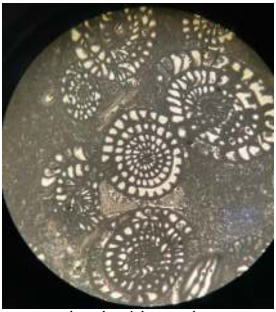
For the first time in its history, the Palaeontological Association's Annual Meeting was held in Germany, hosted by a fantastic team at Friedrich-Alexander-Universität (FAU) in Erlangen. The exceptional efforts of co-chairs **Emma Dunne**, **Thomas Clements** and **Rachel Warnock**, alongside a dedicated committee and enthusiastic student volunteers, ensured the resounding success of this meeting. With 402 participants and a densely packed programme including 120 talks and 120 poster presentations, the 68th Annual Meeting marked a historic milestone as the largest-attended Annual Meeting to date.

The conference began on 9th December with two pre-conference field-trips, one to explore the Naturkundemuseum Bamberg (Bamberg Natural History Museum), and the other to Solnhofen, a historic and world-renowned Jurassic Konservat-Lagerstätte in Bavaria. I was fortunate enough to join the latter. Our first stop was the nearby Bürgermeister-Müller-Museum, where we were treated to a private tour by the museum's scientific manager **Valentina Rosina**. The museum houses a remarkable collection of exceptionally preserved fossils from the local Solnhofen deposits, including two *Archaeopteryx* specimens. No. 6 is a complete skeleton and No. 9 was aptly described as a 'chicken wing', representing a disarticulated *Archaeopteryx* wing. Other stunning fossil highlights included soft tissue preservation in jellyfish (*e.g.* rhizostomes slabs), a wide diversity of fishes, and incredible trace fossils like a long ammonite drag mark.

Next, we visited the Solnhofen limestone quarry, and it was amusing to see how quickly we all slipped into 'fossil-hunting mode.' As soon as we got off the coach, many of us instinctively bent down to inspect the offcuts on the side, eagerly searching for fossils. After containing our excitement, we were provided with a brief geological overview of the area, followed by a demonstration of how to split the limestone slabs. Despite the chilly weather, everyone was incredibly enthusiastic, and we were rewarded with many coprolites and crinoids, and a few very lucky individuals discovered fish fossils. We then visited the lithographic factory, where we observed the machinery used to prepare and smooth rocks for lithographic printing plates. I was particularly surprised to learn that one of the lithographic slabs was valued at a staggering €10,000! Overall, it was truly an unforgettable experience and was an excellent start to the conference.


The author (middle) and friends in the Solnhofen quarry. Photo: Thomas Clements.

The next morning, participants had the opportunity to attend one of four concurrent workshops focused on palaeontological research methods. The workshops covered a diverse range of topics including *Fossils in thin section*, *Fossil sampling biases and phylogenetics*, *Rotten fossils: Experimental design in taphonomy*, and *Deep time palaeogeography in R*. All sessions were well attended and although it was a difficult decision, I ultimately chose to take part in the *Fossils in thin section* workshop, led by **Axel Munnecke**, **Anna Merkel** and **Patrycja Dworczak**. During their presentations I gained a deeper understanding of the diagnostic features for identifying invertebrate fossils in thin sections, the mineralogical changes during diagenesis, and the advantages of fluorescence microscopy. I thoroughly enjoyed the hands-on experience, as it was exciting to explore a wide array of thin sections from diverse palaeoenvironmental settings across the Phanerozoic. Additionally, I had the opportunity to use a smartphone microscope set-up to capture beautiful photographs of the invertebrate fossils, with my personal favourites being foraminifera, trilobite cross-sections and belemnites.



Ammonites in thin section.
Photo by Princess Aira Buma-at.

After a lunch break at the Erlangen Christmas market, where I indulged in Drei im Weggla and non-alcoholic glühwein, the *Extinction* symposium began with a warm welcome from the co-chairs. Held in the beautiful Großer Saal at the Heinrich-Lades-Halle, the symposium featured innovative research from early- to mid-career researchers across Europe. Firstly, **Baran Karapunar** showcased exciting new fossil material from the Permian–Triassic of Türkiye and explored community robustness across the P–T mass extinction in equatorial palaeolatitudes. **Bethany Allen** followed with a thought-provoking presentation on overcoming challenges in inferring extinction rates using a fossilized birth–death skyline model. **Simon Darroch** then delivered an engaging talk on Ediacaran turnover pulses, using Bayesian methods to accommodate uncertainty in fossil appearance dates. After a short break, **Eileen Straube** captivated us with valuable insights on how palaeontological traits and range loss can help inform modern conservation efforts. Next, **James Witts** took us to Seymour Island in Antarctica to present how quantitative collection data can reveal community changes across the K–Pg mass extinction event. Lastly, **Evelyn Kustatscher** delivered a fascinating presentation on plant recovery and resilience across the P–T mass extinction. The icebreaker event that followed sparked lively discussions and reunited old friends, whilst fostering new connections over drinks and cheesy pretzels.

To accommodate the 120 talks, the two-day conference featured three parallel sessions, frequently leaving me indecisive about which presentation to attend. My morning on Wednesday 11th December began with Session 1C, chaired by **Michela Johnson**, which included a range of many fascinating talks: Palaeozoic scorpion gigantism (**Richard Howard**), data imputation methods and trilobites (**Harriet Drage**), Phanerozoic bivalves and brachiopods (**Thomas Smith**), New Zealand bryozoans (**Meghan Balk**), cetacean feeding strategies (**Travis Park**), and Cretaceous neornithines (**Juan Benito**). During the break I made use of the quiet room to prepare for my own presentation, with the large window providing a peaceful space to gather my thoughts. The following Session 2A, chaired by **Lin Na**, focused primarily on the Ediacaran, with talks on the morphometric analyses of *Charniodiscus* (me, **Princess Aira Buma-at**), *Megaclonophycus* developmental biology (**Kirsten Flett**), Ediacaran ecosystem stability (**Euan Furness**), basement membrane assembly (**Philip Vixseboxse**), and Svalbard molecular fossils (**Stella Zora Buchwald**). After lunch, Session 3B was chaired by **Kat Jordan** and highlighted exciting talks ranging from Early Devonian arachnids (**Emma Long**), Cretaceous freshwater prawns (**Sinéad Lynch**), Cambrian ichnofossils (**Yorick Veenma**), Pleiocene–Pleistocene functional trait extinction selectivity (**Sarah Gale**), Jurassic *Seebachia* from India (**Ranita Saha**), and new fossils from the Shibantan Lagerstätte (**Xiaopeng Wang**).

In the late afternoon, Association retiring-President **Rachel Wood** chaired the Annual General Meeting, and this was followed by the 2024 Annual Address delivered by **Sarah Gabbott** from the University of Leicester. Her captivating talk, entitled *Fossils of the future: how palaeontological thinking can help predict humanity's legacy on Earth*, explored how taphonomy can provide valuable insights into the preservation potential of modern materials such as plastics. The presentation was engaging throughout, especially at the start, when Sarah introduced purple underpants to illustrate how preservation can affect fossil morphology. A short walk from the conference hall led us to the Redoutensaal, a Baroque-styled theatre, where the Annual Dinner was held. Guests were welcomed with drinks and enjoyed a delicious three-course meal, complete with a dessert buffet. During the dinner, **Rachel Wood** gave a brief speech and presented the Association's prestigious awards to deserving recipients, including the Hodson Award to **Emilia Jarochowska**, the President's Award to **Daniela Schmidt**, and the Lapworth Medal to **Mike Benton**. As is now tradition, an exciting palaeontological quiz was held, igniting everyone's competitive spirit, with the winning team receiving fossils. The evening was rounded off with some photobooth fun and traditional German dancing.

The second day of conference presentations began with Session 4C, chaired by **Lewis Jones**. Although I missed the first two talks, I attended several highly interesting presentations, including those on Ediacaran climate and biosphere dynamics (**Thomas Wong Hearing**), Phanerozoic ocean biogeochemistry (**Richard Stockey**), and ecological communities (**Björn Kröger**). **Andrej Spiridonov** chaired Session 5B, which featured compelling talks on Ordovician–Silurian biogeographic shifts (**Shasha Liu** and **Quijian Li**), temporal trends in phenotypic evolution (**Marion Thaureau**), and the early animal fossil record (**Lara J. Uttinger**). I then switched to Session 5C to attend **Omar Rafael Regalado Fernandez**'s talk on coding confidence in taxonomic identifications. During the 6th session, I alternated between Sessions 6A and 6B, enjoying presentations on foraminifera (**Yan Feng**), acritarchs (**Pjotr Meyvisch**), Antarctic invertebrates (**Tasnuva Ming Khan**), Rhynie Chert plants (**Laura Cooper**), and ostracods (**Monica Alejandra Gomez Correa**). This was followed by a dedicated one-hour poster session on Thursday afternoon, providing an interactive forum that encouraged feedback and facilitated networking with poster presenters. The final session of talks, Session 7B, was chaired by **Mark Patzkowsky** and included talks from a diverse range of topics including disparity metrics (**Thomas Guillerme**), graptoloid extinctions (**James Crampton**), neoselachian extinction (**Gregor Mathes**), trilobite growth rates (**Melanie Hopkins**), and the marine carbonate record (**Emilia Jarochowska**).

Following a busy day of fantastic posters and presentations, the closing remarks were delivered, along with some exciting announcements: Progressive Palaeontology 2025 will be hosted by the University of Edinburgh, and the next Annual Meeting will be held at the University of Portsmouth, UK. The conference concluded with the announcement of the Annual Meeting Council Poster Prize recipients: **Amy Shipley** (University of Leeds), **Isaak Eijkelboom** (Naturalis, Leiden) and **Erick Miguel Díaz de León-Muñoz** (University of Tübingen). The Annual Meeting President's Prize was awarded to **Beatriz Carazo del Hoyo** (University College Cork), **Yan Feng** (China University of Geosciences Wuhan and NHM Oslo), **Princess Aira Buma-at** (University of Cambridge), **Emma**

Long (Natural History Museum, London), **Elizabeth Steell** (University of Cambridge), and **Die Wen** (Nanjing University and University College London).

Although I was unable to attend the post-conference field-trip to the Messel Lagerstätte, I am sure that all participants thoroughly enjoyed the experience. Many thanks and heartfelt congratulations to Emma Dunne, Thomas Clements, Rachel Warnock and the entire FAU organizing team and all student volunteers for hosting such an exceptional conference. I'm eagerly looking forward to the next one!

Princess Aira Buma-at
University of Cambridge, UK

The poster prize-winners with retiring Vice-President Uwe (left). Photo by Nicola Vuolo.

The talk prize-winners with retiring President Rachel (left). Photo by Nicola Vuolo.

Winners! The annual dinner palaeo-quiz is always a laugh. (The Newsletter Editor is at the far left.) Photo by Nicola Vuolo.

The post-conference field-trip to the Messel Pit looks a bit chilly! Photo by Nicola Vuolo.

Ecological uniformitarianism – help or hindrance to palaeoecology, palaeoclimatology and conservation biology?
Online, hosted by the Palaeontological Association *2 – 3 July 2024*

One can observe the bedform (symmetrical ripples) developed in modern wave-influenced sediments and reliably infer wave action during the deposition of ancient sediments exhibiting the same bedform. Why? Because here we are dealing with a fundamental process (the circular motion of water in a wave) which may reasonably be taken as invariant ('uniform') over time. In contrast to symmetrical ripples, we cannot be so sure that the environmental setting of ancient examples of a (morphological) species was the same as modern examples. There are no precise laws relating organismal morphology to niche, yet palaeontologists have long tacitly assumed that there are, adopting the philosophy of ecological uniformitarianism to interpret past environments from the taxa in fossil assemblages by reference to the ecology of modern counterparts. Might this insecure basis sometimes lead to false conclusions?

At least some modern invasive species show major shifts in realized niche (see Figure 1), confirming that we should be wary of interpreting the ecology of fossil organisms from that of living forms. But not all modern invasive species display significant niche change, and very many modern species are not (currently) invasive. It may therefore be the case that niche stability is the norm, and that ecological uniformitarianism is a reasonable basis for palaeoenvironmental reconstruction. Whether this is the case demands an honest and wide-ranging assessment of niche parameters over time and space, incorporating independent evidence of the environments occupied by species. Last July's online meeting was a follow-up to one convened in 2022 under the auspices of the Geological Society of London to initiate such an assessment; links to the programmes and video-recordings of the meetings are given below. While the task is far from complete, the 14 presentations at 'Ecological Uniformitarianism 2' showed that it is being seriously addressed, and the sizeable audience (over 70, based in 17 countries) promised further attention to it.

Andrew Townsend Peterson (University of Kansas, USA) emphasized in the opening talk that most niche changes exhibited by invasive species do not represent shifts in fundamental niche (as defined by the tolerable limits of environmental variables). Nevertheless, it is the modern realized niches of species (as constrained by dispersal ability and various forms of biological interaction, as well as tolerance of physical variables) that are the typical basis for 'uniformitarian' interpretations of palaeoenvironment from fossil assemblages. It is therefore of no consequence whether shifts are demonstrated in fundamental or realized niche: instances of *either* strike at the heart of ecological uniformitarianism.

Diverse examples of niche change presented at this meeting – in a marine bivalve by **Jean-François Cudennec** (University of Derby, UK), a marine gastropod by **Sierra Peterson** (University of Michigan, USA), a lacustrine ostracod by **David Horne** (Queen Mary University of London, UK), a terrestrial reptile by **Rafael Marquina-Blasco** (University of Valencia, Spain), and terrestrial mammals by **Neil Adams** (Natural History Museum, London, UK) and **Kate Britton** (University of Aberdeen, UK – indicate that we cannot close our eyes to the possibility of frequent occurrence, but equally we cannot rule out that these instances are rare exceptions to a general rule of niche stability: we need more comprehensive data to fully evaluate ecological uniformitarianism.

*Figure 1. The ring-necked parakeet (*Psittacula krameri*), emblem of the Ecological Uniformitarianism meetings, is native to tropical and equatorial latitudes in Africa and the Indian subcontinent. Since the nineteenth century its range has expanded to much colder settings. European populations have 87 % of their distribution outside the native climatic niche (Strubbe* et al. *2015). Photo credit: Charles J. Sharp,* <**sharpphotography.co.uk**>.

Interestingly, where representative datasets are available for taxonomic groups – as for planktonic and benthic foraminifera, discussed respectively by **Harry Dowsett** (US Geological Survey, USA) and **Malcolm Hart** (University of Plymouth, UK – niche stability does seem to be the norm. But might migration be relatively easy in these organisms, enabling continued occupation of specific niches as environmental change alters where they are available – *e.g.* particular thermal niches as global climate changes? **Joanne Bennett** (The Australian National University, Australia) and **Bruce Lieberman** (University of Kansas, UK) showed respectively that phylogenetic history and metabolic rate influence how and whether organisms can adapt to changing conditions, so we should take these factors, as well as the capacity to migrate, into account before generalizing about niche stability/lability from data supplied by a limited range of groups.

An appreciation of whether niches are stable or labile is important not only for interpreting past environments but also for effective management (*i.e.* conservation) of species and communities in the face of anthropogenic environmental change. Conservation practice is usually based on an understanding of tolerances derived from the range of environments in which species occur now. However, as demonstrated by **Greg Dietl** (Cornell University, USA) from a study of benthic communities of the northeastern US seaboard, knowledge of this range may be incomplete, providing a false impression of niche breadth. Furthermore, knowledge of responses to past environmental change can add confidence to predictions of responses to future change, as shown by **Paolo Albano** (Anton Dohrn Zoological Station, Italy) and **Lynn Wingard** (US Geological Survey, USA) from studies of Pleistocene marine communities in the Mediterranean and Florida, respectively. The issue of confidence figured large in general discussions following the conservation-focused talks, emphasizing the need for more data, which was evident from the talks relating to palaeoenvironmental inference. It is to be hoped that this meeting will stimulate further research on the stability of ecological niches and that the level of confidence attaching to both environmental retrodictions and community predictions will be thereby increased, or at least made clearer.

The convenors (Andrew Johnson, Jean-François Cudennec, Liz Harper, Jan Hennissen, Richard Twitchett and Tom White) express their thanks to the Palaeontological Association for

hosting the meeting at a very reasonable cost, and for providing excellent administrative and technical support. They are also grateful to the Leverhulme Trust, Quaternary Research Association (QRA), and the History of Geology Group of the Geological Society of London for other forms of assistance. It is planned to publish a set of papers relating to the meeting in a special issue of *Palaeontology*. Meanwhile, readers whose interest in the subject has been piqued may wish to access the longer report on the meeting in Newsletter 164 of the QRA (available, including to non-members, at <**https://www.qra.org.uk/quaternary-newsletter/**>), as well as the materials under the following links:

'Ecological Uniformitarianism 1'

Programme:

<**https://www.geolsoc.org.uk/expired/3-GSL-Ecological-uniformitarianism-key-or-lock**>

Video recording:

<**https://www.youtube.com/watch?v=kYEP1-aF4sQ**>

'Ecological Uniformitarianism 2'

Programme:

<**https://www.palass.org/meetings-events/ecological-uniformitarianism**>

Video recordings:

Day 1: <**https://youtu.be/0zTQe4lc4W0**>

Day 2: <**https://youtu.be/y4LOrTMKkp0**>

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Small Grant REPORTS

The effects of wave action on arthropod taphonomy: comparative analysis between Sirius Passet and taphonomic experiments

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Introduction

Taphonomy is the study of the biological, chemical and physical processes that lead to the remains of an organism becoming a fossil. Arthropods are one of the most diverse and evolutionarily significant phyla of animals on Earth, so it is important to determine if there are any processes biasing their fossil record. This project aims to determine if certain arthropod groups are more likely to be preserved as complete specimens or as fragmented small carbonaceous fossils (SCFs) and compare these findings to the results of taphonomic experiments on the effects of wave processes on arthropod preservation potential. The marine Palaeozoic Sirius Passet Lagerstätte of North Greenland was chosen for this study because it is unique in that it contains both complete, articulated fossils including trilobites and bivalved branchiopods (Taylor 2002; Babcock and Peel 2007) as well as disarticulated and fragmented arthropod SCFs such as non-bivalved branchiopods (Slater *et al*. 2018).

Material and methods

Sirius Passet material housed at the Natural History Museum of Denmark consists of three named collections: the Geological Museum 2009 and 2011 collections, and the Uppsala collection. In this project, the range of arthropod genera in Sirius Passet were divided into two anatomical groups; segmented, multipodus arthropods (SMA), and bivalved branchiopods (BB). Seventeen specimens from each anatomical group were randomly selected to be photographed from each of the three Sirius Passet collections, giving a total of 34 specimens from each collection, and 102 specimens from the entire collection. Specimens were photographed using a Nikon D800E camera with a Nikon AF-S Micro Nikkor 105 mm 1:2:8 G ED lens. Each specimen was grouped based on anatomy, identified to genus level, and assigned a taphonomic state (1-5) from complete and articulated (1) to disarticulated, isolated remains (5).

Results and discussion

Across the three collections, SMA were more abundant than BB. A total of nine genera, seven SMA (*Buenellus, Kiisortoqia, Arthroaspis, Buenaspis, Molaria, Campanamuta, Kleptothule*) and two BB (*Isoxys* and *Pauloterminus*, plus *Arthropoda* sp. (SMA)), were identified. *Buenellus* was the most abundant SMA and *Isoxys* was the most abundant BB. Taphonomic variation was observed, with 89 % of the whole sample consisting of intact specimens (state 1), and 4 %, 2 %, and 5 % comprising specimens in taphonomic states 2, 3, and 4 respectively (Figure 1). Only three genera, comprising

11 % of specimens, were preserved with evidence of taphonomic degradation (Figure 2): *Isoxys* (BB), *Buenellus,* and *Kiisortoqia* (SMA). Only one specimen of *Isoxys* and one *Kiisortoqia* were identified as taphonomic state 2. The remaining nine taphonomically degraded specimens were *Buenellus* which were recorded as being between taphonomic states 2 and 5.

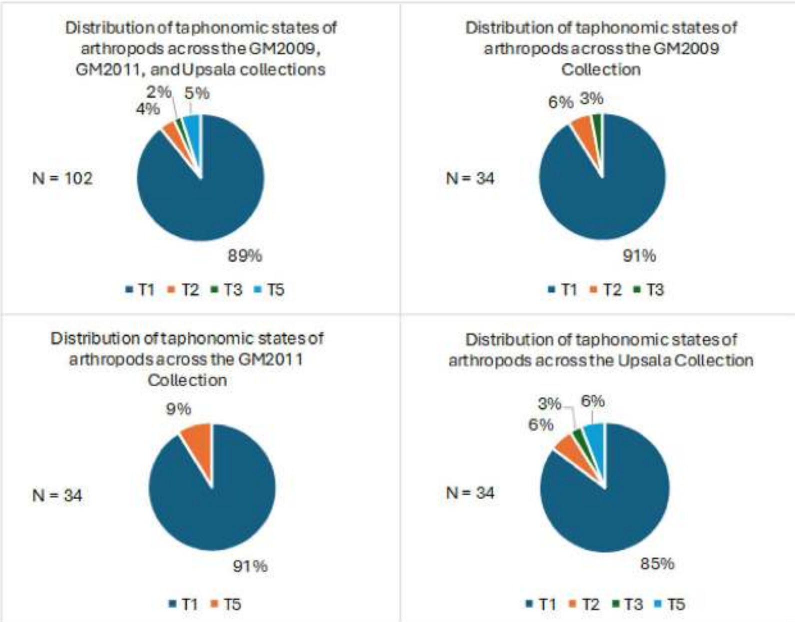

Figure 1. Pie charts displaying the distribution of taphonomic states of Sirius Passet arthropods, collectively and independently across the three Sirius Passet Collections.

The distribution of anatomical groups suggests a preservational bias towards segmented arthropods (SMA) in Sirius Passet compared to bivalved forms (BB). Segmented multipodus arthropods were preserved more often and in a larger range of taphonomic states across the three collections, suggesting SMA may be more likely to be preserved as disarticulated or fragmented carcasses or remains compared to bivalved branchiopods. The variation in the taphonomic states of arthropods was mostly represented by *Buenellus* specimens compared to one *Kiisortoqia* and one *Isoxys* specimen. This suggests it is the more heavily mineralized arthropods such as trilobites that will be preserved in varying taphonomic states as their individual components can survive the range of taphonomic processes, including disarticulation, that occur between the death of an organism and its fossilization. However, once less mineralized arthropod carcasses become disarticulated, they will degrade too quickly to survive the remaining taphonomic processes so they are more commonly observed only as complete and articulated specimens and not as disarticulated specimens. The final preserved assemblage will therefore suggest that less mineralized arthropods are more robust due to their abundance as complete specimens, compared to heavily mineralized arthropods that are preserved more often as taphonomically degraded specimens. These results are similar to those from taphonomic experiments on the effects of wave processes on the preservation potential of segmented and bivalved arthropods with differing levels of mineralization to their exoskeletons.

Acknowledgements

I would like to thank Laura Cotton for allowing me to access and analyse Sirius Passet specimens at the Natural History Museum of Denmark; Arden Bashforth for their immense help during my analysis; and the Palaeontological Association for the Sylvester-Bradley Award (PA-SB202302) that allowed me to analyse the anatomical, taxonomic and taphonomic distribution of Sirius Passet arthropods.

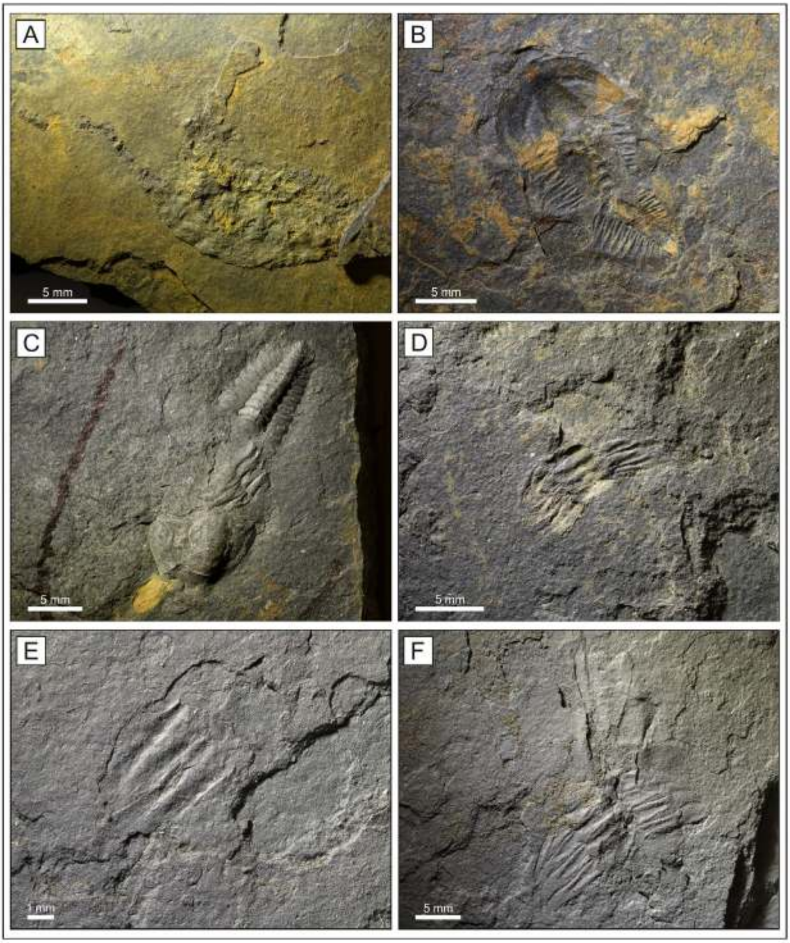

Figure 2. Taphonomic variation of arthropods in the Sirius Passet Lagerstätte housed at the Natural History Museum of Denmark. A) Disarticulated Kiisortoqia *sp., SP-2009-0670. B) Disarticulated* Buenellus *sp., SP-2009-0389. C) Disarticulated* Buenellus *sp., SP-2009-0722. D)* Buenellus *sp., isolated segments, SP-2011-0094 (241-270-280) (30/7). E)* Buenellus *sp., isolated segments, SP-2011-0840. F)* Buenellus *sp., isolated segments, SP-2011-0840.*

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Palaeontological research in the middle Miocene of Gers (southwestern France)

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Introduction

The Gers region of southwestern France has yielded a rich early-middle Miocene fossil record with *c.* 60 sites spanning the last 20–14 Ma (Antoine *et al.* 1997). The late Middle Miocene is a crucial time interval, notably as it witnessed the dispersion and radiation of catarrhine primates in Eurasia under conjoint favourable climatic conditions of the Middle Miocene Climatic Optimum and tectonic changes (Sen 2013; Holbourn *et al.* 2015; Bouchal *et al.* 2018), thus greatly contributing to the mammalian biodiversity in Eurasia. Nevertheless, the African components of Eurasian mammalian faunas have had variable success in their diversification and survival. The Afro-Arabian plate remained separated from Eurasia by the Tethyan seaway, which was definitely closed in the Burdigalian, some 20myr ago. Before its closure, the marine barrier between the Afro-Arabian and Eurasian plates did not totally prevent mammalian exchanges between these landmasses, as documented by the arrival of rodents and primates in Africa in the late Paleocene–early Eocene, the dispersal of embrithopods on both sides of the Tethyan seaway during the Eocene, and the immigration of elephantoids from Africa to Asia in late Oligocene.

These events seem to be restricted to some groups of mammals, which apparently had abilities to use sweepstake dispersal routes. The massive mammalian dispersal from Africa to Eurasia started sometime in the early Miocene, involving several groups of African mammals, in particular proboscideans, hyracoids, tubulidentates and anthropoids. This contribution discusses the timing of these events under the light of recent discoveries of Africa-originated mammals in Eurasia. The impact of the evolving palaeogeography of the area situated between the Afro-Arabian and Eurasian plates on the mammalian dispersal is reconsidered. The dispersal of land mammals from Africa to Eurasia is controlled not only by the palaeogeographic changes (sea level changes, dispersal routes, terrestrial bridges, *etc.*. Pliopithecoids are documented in eastern Eurasia as early as *c.* 18 Ma, while the earliest evidence of hominoids is from Turkey (*c.* 14 Ma), followed by a dispersal in western Eurasia around 13 Ma (Casanovas-Vilar *et al.* 2011).

Discoveries of Miocene primate remains in the Gers region are limited to scarce dental and postcranial remains of pliopithecoids dating solely to the 16–14 Ma time period, of which the most remarkable specimen is a partial mandible from Sansan (Lartet 1837). The paucity of data in the Gers contrasts with the extensive primate fossil record from the Ebro Basin (northeastern Spain), which could be explained by greater excavation efforts and distinct state regulations on fossil discoveries. Indeed, most of the fossil localities from Gers were discovered and excavated by amateur palaeontologists, with little contextual data and strong collection bias towards large specimens (*e.g.* proboscideans, rhinoceros). This project sought to renew field prospections and excavations, with intra-site spatial data, in previously referenced middle Miocene sites to document new geochronological, palaeoclimatic and palaeobiological data on the Middle Miocene Climatic Optimum and its associated fauna, including primates.

Main findings

Field prospections in August 2023 led to the surface recovery of large mammal bones, isolated teeth and a partial mandible of a suid at the locality of En Bertranon in Polastron. This *c.* 15 Ma locality was previously known by a partial crocodile rostrum (Buffetaut *et al.* 1984), with several excavation campaigns in the 1980s carried out by amateur palaeontologists yielding a middle Miocene fauna, including rodents, carnivorans, artiodactyls, perissodactyls and proboscideans. Such context led us to excavate a new locus (Figure 1) in order to recover *in situ* and spatialized fossil vertebrate remains with precise geochronological and sedimentological details of the locality.

Figure 1. Photo of the new locus excavated at En Bertranon (Polastron, France) with several members of the team. From left to right: J. Menon, A. Assemat, M. Hullot, Y. Rollot and C. Robinet.

The *ex-situ* partial suid mandible exhibits the characteristic sectorial lower premolars of *Hyotherium*, with a remarkably thin P_4 compared to other *Hyotherium* species. *In situ* excavation yielded, among the best preserved specimens: a fairly complete rib and cervical vertebra of a large herbivore (Figure 2) consistent in size and morphology with the rhinocerotid *Brachypotherium brachypus*; a partial artiodactyl mandible preserving the complete postcanine dentition and showing the bunoselenodont occlusal pattern, moderate P3-P4 breadth differential and corpus dimensions at M1-M2 typical of *Dorcatherium crassum*; a complete artiodactyl metapodial; a partial coxa and ulna of a small mammal; and a partial artiodactyl elbow including a distal humerus and proximal radius. Sediments from fossiliferous layers were also collected for future sieving.

Sedimentological and taphonomic data confirm the fluviatile origin of the locality, and more precisely an anastomosing fluvial facies, with lateral alternation of sands and cobbles attesting to progressively reduced depositional energy conditions, as well as fossils ranging from pristine to highly altered conditions. The partial artiodactyl elbow associated *in situ* is also a remarkable find, given the absence of anatomically associated specimens hitherto reported from Polastron.

Figure 2. Cervical rib of a rhinocerotid with a pen as scale.

Perspectives

The exceptional state of preservation of several specimens, notably the partial elbow and partial coxa, fully demonstrates the scientific potential of the site, which will be further enhanced by sieving the sediments for micro-vertebrate remains and by in-depth studies of newly and previously excavated specimens. A new excavation campaign is planned for 2025, in a new locus within the sandy deposits, from which most of the best-preserved fossils originate. On a longer term, other promising sites have been prospected during this campaign and will be the subject of future excavations.

Acknowledgements

We are grateful to the Palaeontological Association for the Stan Wood Award (PA-SW202301) that financially supported this project. We thank Pascal Tassy and Francis Juillard for their help and guidance, and the team of scientists and excavators supporting us: Alexandre Assemat, Céline Robinet, Yann Rollot, Juliette Menon and Jérémie Aubineau. Lastly, we greatly acknowledge the Natural History Museum of Toulouse (Yves Laurent, Alexandre Mille and Francis Duranthon) for technical guidance.

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Undergraduate Bursary REPORTS

Exploring the evolution of calcite shell layers in muricid gastropods

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Introduction

Muricidae is a diverse family of predatory marine gastropods with interesting variation in shell ultrastructure. The author set out to examine the microstructure and mineralogy throughout the family, attempting to observe the evolutionary trends in calcite formation. Following two recently published mitochondrial phylogenies by Barco *et al.* (2010) and Russini *et al.* (2023), there was an opportunity to construct a phylogeny based on online databases as well. Shell mineralogy has been proposed to link with water temperature (Lowenstam 1954; Taylor and Reid 1990) and to be influential in resisting endolith pressure (Zardi *et al*. 2009). To begin to look at the question in Muricidae, I performed a preliminary sweep of microstructure and mineralogy. Understanding the diversity of microstructure may enable further inferences of links between function and morphology in the future.

Methods

Coverage of the family reached 28.4 % (55/194) of genera, with literature specimens included. I directly observed the mineralogy of 49 species, with 17 specimens taken to the SEM. I learned how to prepare and cut samples, make and use Fiegl's stain for differentiating calcite and aragonite, use an SEM and phylogenetic programs, including both python and R packages. Thermogravimetric analysis (TGA) was performed on three specimens to give a preliminary link between the mineralogy of the microstructure and the organic content. The results were then analysed in R (R Core Team 2023), and I spent some time constructing a phylogeny using PASTA alignment (Mirarab *et al*. 2014) and MrBayes (Huelsenbeck and Ronquist 2001). The phylogeny will be completed soon. For this report, a cladogram based on Russini *et al.* (2023) is used.

Results and discussion

Spatial Distribution
The results confirmed an increased presence of calcite further from the equator (t-test, p=0.0023, n = 71). Despite the tendency, there were many ecoregions where both calcite-expressing and aragonite forms coexisted. Coexistence of the forms was particularly prevalent in intertidal species, leading to further questions (Zardi *et al*. 2009).

Depth distribution
Three species, considered deep-water forms (>300m depth), all exhibited non-prismatic calcite. All other species exhibited prismatic calcite. This preliminary result presents a set of additional questions into why.

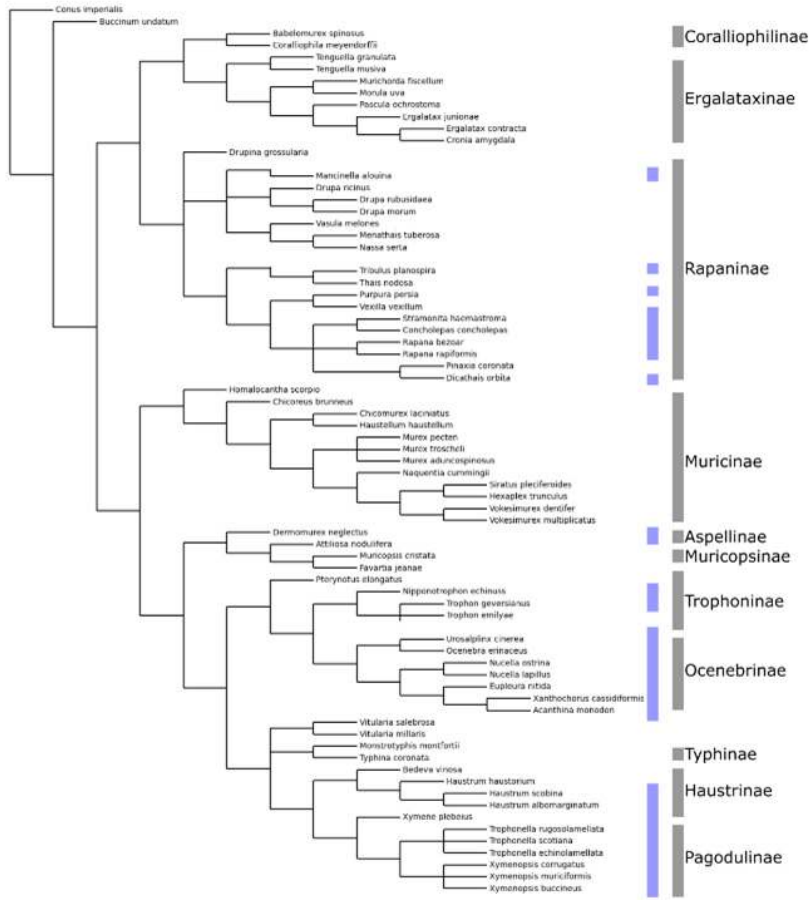

Figure 1. A cladogram based on Russini et al.*'s (2023) phylogeny of Muricidae indicating which species secrete calcite. Blue indicates calcite.*

Phylogenetic distribution

The results suggest multiple independent evolutions of calcite in Muricidae, despite many morphologies sharing striking similarities. There are recent (*e.g. Haustrum haustorium*) losses and possibly ancient losses as well (*e.g.* Muricopsinae), although it seems that becoming calcitic is more common. It is proposed there are at least four to five independent evolutions of calcite within Muricidae. The situation in Rapaninae requires further attention; it could be the result of poor phylogenetic data and the results are not as obscure on the tree by Barco *et al.* (2010), which has a restricted number of leaves. To explore the eco-evolutionary origins of calcite, looking at recent losses may provide an insight into the evolutionary dynamics of calcite. Here, two are identified – one within the genus *Haustrum* and another within *Trophon*.

Organic content

The relationship between organic content and shell mineralogy was universally low compared to microstructures such as nacre (~0.5–1.5 % compared with ~2.3 %; Addadi *et al.* 2006) and species dependent. TGA of *Concholepas concholepas* was corroborated by a study online (Dauphin *et al.* 2003). To investigate the link further, looking at a microstructural scale is required. Shell organic content is a separate, interesting, research question.

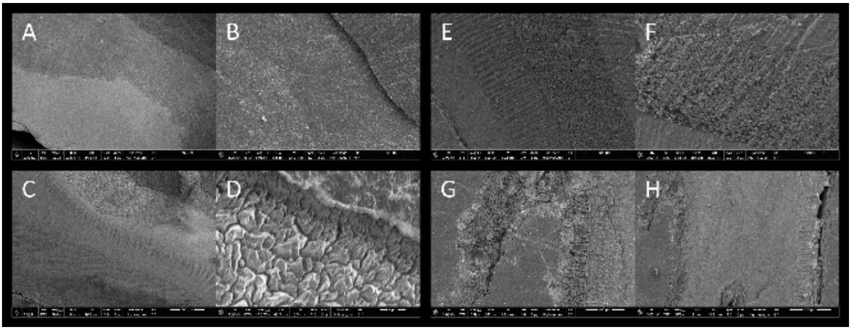

Figure 2. A and B) Rapana bezoar *with a prismatic microstructure; C and D)* Coralliophila megendorffii *with a coarse prismatic structure; E and F)* Dermomurex neglectus *with a spherulitic microstructure; G and H)* Trophonella rugosolamellata *with a foliotic microstructure.*

Conclusion

As a first step into the evolutionary history of calcite within Muricidae, the study was interesting. It raised far more questions than it answered which I hope to continue to look at.

Acknowledgements

Thank you to my supervisor, Dr Liz Harper, for her support. Thank you also to the Palaeontological Association for providing funding through Undergraduate Research Bursary number PA-UB202304.

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Extinctions in the age of mammals: the pruning of the tree of life by a changing planet

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Introduction

It has been widely theorized that presently a sixth mass extinction is occurring, driven by the alarming rate of species decline (Cowie *et al*. 2022). The Cenozoic era, beginning 66 million years ago following the end-Cretaceous mass extinction, marks the geological era whereby modern ecosystems emerged. During this geological period, significant ecological changes have ensued, offering a basis for comparison with the current biodiversity crisis. Amounting to over a quarter of global marine mammal diversity with 34 extant species, pinnipeds (seals and relatives) are central to aquatic ecosystems, reflected in the diverse habitats they populate across Earth. Currently, the IUCN Red List (IUCN 2023) declares 11 extant species 'vulnerable' to 'endangered', revealing instability for the pinniped population. The objective of the project was to examine how pinniped functional and phylogenetic diversity changed, drawing on data from past climatic events, across the Cenozoic. In this way, the magnitude and significance of future pinniped extinction on Earth's ecosystems can be elucidated.

Methods

The analyses integrate time-calibrated phylogenies with trait data. The phylogeny (Park *et al*. 2022) contains 119 pinniped species – extinct and extant – dating from 28.66 Ma to present. To compile information on species traits, a literature review was performed, as well as sourcing data from online databases, including the IUCN Red List (IUCN 2023) and the Paleobiology Database (PBDB 2024). Data were collected at species level for the following traits: global distribution; body length; prey capture strategy; and diet. Functional diversity (FD) was quantified by performing a principal coordinates analysis (PCoA) on the raw trait data, utilizing Gower distance via a multidimensional trait space. Meanwhile, phylogenetic diversity (PD) was calculated as the sum of phylogenetic tree branch lengths and plotted at the midpoint of each time bin. Additionally, data for eustatic sea level (Haq *et al*. 1987), as well as a global temperature proxy (Zachos *et al*. 2001), were used to deduce potential environmental influence.

Results

During both the Late Oligocene Warming (LOW) and the Middle Miocene Climatic Optimum (MMCO), both relative temperature and eustatic sea level rose (Figure 1), as well as an overall increase in PD (Figure 2c). Despite FD increasing during the LOW, it decreased during the MMCO (Figure 2a). Whereas during the Late Miocene Cooling (LMC) and the Pliocene Extinction (PE), relative temperatures declined, along with eustatic sea level (Figure 1). Despite FD and PD increasing overall during the LMC, both diversities subsequently declined during the PE (figure 2).

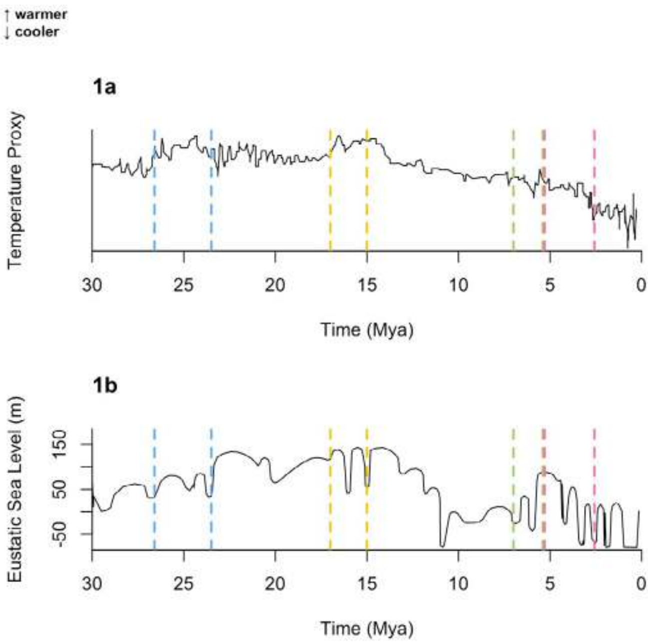

Figure 1. Changes in a) relative global temperature and b) eustatic sea level. Late Oligocene Warming 26.6–23.5 Ma (blue), Middle Miocene Climatic Optimum 17–15 Ma (yellow), Late Miocene Cooling 7–5.3 Ma (green), Pliocene Extinction 5.3–2.58 Ma (pink).

To predict future FD, the IUCN Red List (IUCN 2023) was employed to classify extant species into risk categories. On the removal (imitating possible extinction) of 'vulnerable', 'near threatened' and 'endangered' pinniped species, FD falls to the equivalent of 23 Ma (Figure 2b).

Discussion

The results suggest that climate change drove past fluctuations in pinniped diversity – though inconsistently, regarding the magnitude and direction of change. Until the Pliocene Extinction, PD and FD may have been maintained by a high speciation rate, together with adapting global distribution to mitigate FD and PD decline. The present biodiversity crisis results from global warming, thus the LOW and MMCO may be most relevant in predicting future diversity change in Pinnipedia. Whilst both past warming events led to an overall increase in PD, the effect on FD was inconsistent between events. Despite this contradiction, the IUCN Red List can be employed to deduce future pinniped FD, predicting a decrease if the current trend of species extinction continues. However, the applicability of Cenozoic climatic events to present-day species extinction is limited, owing to the scarcity of fossil data. Although this could be mitigated with further fossil discoveries and research into trait inheritance within phylogenies, employing the Cenozoic as a framework for inference of current biodiversity loss remains restricted. Although the IUCN Red List classifies species into risk categories, the timeframe for this species decline is unknown. It could be inferred that currently the rate of speciation cannot rival that of extinction so it is likely that this decrease will endure with the growing human population and insufficient large-scale conservation efforts. As the only species with conscious choice to determine the future of the planet, humans must act promptly to rectify human-mediated biodiversity loss.

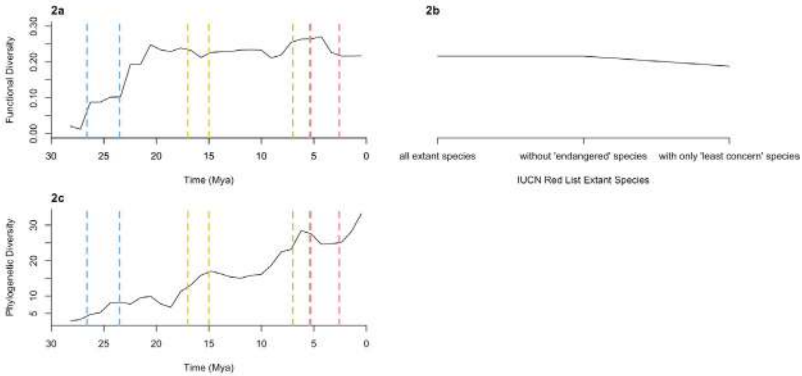

Figure 2. Changes in a) functional and c) phylogenetic diversity in pinnipeds. Late Oligocene Warming 26.6–23.5 Ma (blue), Middle Miocene Climatic Optimum 17–15 Ma (yellow), Late Miocene Cooling 7–5.3 Ma (green), Pliocene Extinction 5.3–2.58 Ma (pink). b) Future FD from IUCN Red List assessment of extant pinniped species.

Acknowledgements

I wish to express my gratitude to the Palaeontological Association for the Undergraduate Research Bursary (PA-UB202401) which enabled me to undertake this project. I would also like to thank my supervisors Dr Katie Davis and Dr Jack Hatfield, as well as the University of York's Department of Biology and Leverhulme Centre for Anthropocene Biodiversity.

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Investigating Oligocene–Miocene small bird assemblages of Germany using micro-CT fossil data

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Perching birds, known as passerines, are the most diverse bird order with over 6,000 extant species known today. Crown passerines are thought to have originated in Australia ~47 million years ago, with two major clades, oscines and suboscines, diverging ~3 million years later (Oliveros *et al.* 2019). Crown passeriforms arrived in Europe by 30 Ma (Mayr and Manegold 2004; Steell *et al.* 2023; Lowi-Merri *et al.* 2024). The first crown oscine fossil is 5–9 million years younger than the first suboscine fossil, suggesting that oscines arrived in Europe at 24 Ma, and the two clades coexisted in Europe by the late Oligocene (Manegold 2008). Notably, suboscines are no longer present in Europe.

Despite the vast diversity of passerines, we have limited knowledge regarding passerine evolution during the Oligocene and Miocene, particularly in the Northern Hemisphere. This is exacerbated by the difficulty in correctly placing fossil taxa into clades due to poorly understood morphological traits and small, fragmented bones. This study provides information on 46 undescribed passerine bones recovered from the late Oligocene to middle Miocene of southern Germany, enhancing the known fossil record for passerine birds. All bones within this study are tarsometatarsi, which is in the lower hindlimb. Since these birds are very small, their bones may have been overlooked, but CT scanning allows us to look at them in more detail. Some species have tarsometatarsi reaching lengths of just 20mm (Figure 1).

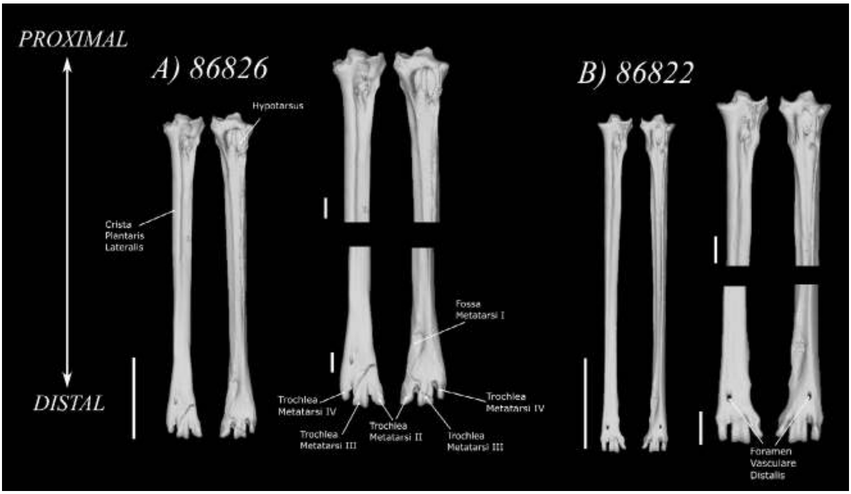

Figure 1: Right tarsometatarsi of middle Miocene specimens. Complete bone scale bar: 5mm. Distal and proximal fragment scale bar: 1mm. Left: dorsal view. Right: plantar view.

The specimens were provided by Staatliches Museum für Naturkunde Stuttgart (SMNS) in Germany. The tarsometatarsus is a useful bone to study because it is abundant in the Cenozoic fossil record and exhibits a number of diagnostic features. Passeriforms are characterized by their long and thin tarsometatarsi and trochlea II, III and IV reaching approximately equally far distally, forming one plane dorso-ventrally (Manegold *et al.* 2004). I used Avizo to segment the CT scans to generate 3D volumes of each fossil. I segmented 46 isolated, mostly fragmentary tarsometatarsi specimens: two complete bones, five proximal fragments and 39 distal fragments. The specimens were grouped by age: late Oligocene, early Miocene, or middle Miocene. Morphological comparisons were drawn between the specimens within and across the time periods.

Figure 2: Right tarsometatarsi of late Oligocene specimens. Scale bar: 1mm. Left: dorsal view. Right: plantar view. A-W: distal. X: proximal

Results and discussion

Some specimens were fragmented to the point where certain morphological features could not be confidently compared. We inferred the projection of trochlea II medially and compared other features, such as medial extensions on the shaft, to identify whether the specimens were passerines. Medial extensions and asymmetrical trochlea III are characters of oscines; thus we find SMNS 59466_22 (Figure 2 A to D) more likely to be suboscines due to their smooth shaft and more symmetrical trochlea III. This inference is supported by 59466_22_4 which shows the medial margin of trochlea II projecting at a larger angle medially than other specimens, a morphology present in extant suboscines, for example, *Tyrannus tyrannus* (Eastern Kingbird). The presence of suboscine tarsometatarsi in this sample is expected given that Manegold (2008) identified late Oligocene suboscine carpometacarpi (a bone in the wing) from the same collection. The similarities in the medial extensions and asymmetry of trochlea III indicate that 59466_20 specimens are closely related, or possibly even the same species. Notably, 59466_20_5 is larger than the other bones in this group but shares a consistent shape. We also see general similarities in shape between early Miocene and late Oligocene specimens. This could represent the continuity of the same oscine taxa across the Oligocene–Miocene boundary, although it is not clear that any suboscine species persevered across this boundary. The next step for this work is to carry out a phylogenetic analysis with extant passerines to further identify which passerine subclades were present in Germany across the Oligocene–Miocene transition.

Acknowledgements

I want to thank Dr Lizzy Steell (University College London/University of Cambridge) for supervising this project, Paul Burke (University College London) for help with Avizo, Phil Mannion (University College London) for access to computing resources, and Stephan Spiekman (Stuttgart Museum of Natural History) for scanning the fossils and providing access. This study was kindly supported by an Undergraduate Research Bursary from the Palaeontological Association (grant number PA-UB202405).

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High-resolution sampling of Antarctic marine ecological and environmental change across the K–Pg boundary

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The Cretaceous–Paleogene boundary (K–Pg, ~66 Ma) is the most recent mass extinction of ~75 % of marine and ~50 % of terrestrial species linked to a large bolide impact (Shulte *et al.* 2010). The mechanisms leading to mass extinction and the environmental context are widely debated (Tobin *et al.* 2012). Most of our understanding is derived from highly condensed deep-sea sections and from low- and mid-latitude sites in the northern hemisphere, thus does not provide a full assessment of the impacts.

Seymour Island, Antarctica (65°S), contains one of the most complete sedimentary records of the K–Pg event at high latitudes, with abundant and exceptionally preserved marine fauna (Witts *et al.* 2016; see Figure 1). Prior sampling of this section (Zinsmeister 1998) has failed to capture representative, quantitative data, leaving high-latitude ecological change across the extinction poorly understood. Drawing on systematic highest-resolution sampling across the K–Pg on Seymour Island by the British Antarctic Survey in early 2024, together with biomarker analysis, was the basis of my project exploring the drivers of palaeocommunity restructuring during this period of massive environmental and ecological change.

Figure 1. Exceptionally-preserved marine fossils from across the K–Pg boundary of Seymour Island, Antarctica: a. Rotularia *(serpulid worm), b.* Maorites densicostatus*, c.* Diplomoceras cylindraceum *(ammonites), d. Lamniform shark vertebra, e.* Lahillia larseni *(bivalve), f.* Struthiochenopus hurleyi *(gastropod), g. Fish vertebra, h. Unidenitfied Palaeogene gastropods.*

Fossil samples were collected from five sedimentary sections through the K–Pg of the Lopéz de Bertodano Formation. Bulk faunal collections were done in a one-hour interval within a stratigraphic interval of 3–5 m to collect a representative community sample and sediment for biomarker analyses collected across the boundary. I have had the privilege to be the first person to work on this material since collection. I separated bulk fossil samples by taxonomic class (Mollusca, Bivalvia, Cephalopoda, *etc.*) and identified individuals to the lowest taxonomic level. Poorly preserved samples were excluded, and the remaining taxa were assigned a 'Mode of Life' according to Bambach's Ecospace method (Bambach *et al.* 2007). Abundance and palaeoecological data were compiled into several binned intervals – 0 to 3 m above the K–Pg (~50 kyr after the K–Pg), 0 to -3 m below (0 – 40 kyr before), and then -50 m (300 kyr before), and -200 m (1.3 Ma before). I extracted biomarkers from sediment samples to provide environmental context. The samples were analysed on gas chromatography–flame ionization detection (GC-FID), gas chromatography–mass spectrometry (GC-MS) and liquid chromatography–mass spectrometry (LC-MS) to identify and quantify changes in different organic matter sources.

So, what have I found? Preliminary palaeoecological analysis suggests a large shift in community mode of life across the K–Pg boundary. Throughout the sections, 16 modes of life were ascribed to 51 different species. Cretaceous sections were diverse in both abundance of taxa and modes of life, while Palaeogene communities consisted of shorter range less diverse species (Figure 2).

The Cretaceous sections were dominated in biomass by cidaroid echinoid spines and Rotularia, both of which dwindle in numbers in the Palaeogene – these have been removed from Figure 2 for clarity of the remaining communities. The Cretaceous sections exhibit many changes in ecogroup composition. Pelagic ammonites, shallow infaunal bivalves, and surficial gastropods vary in dominance of the community, occupying different tiering and feeding niches throughout the Cretaceous, but overall maintain diverse and even palaeocommunities. The evenness of communities was altered suddenly and drastically across the K-Pg boundary. The Palaeogene is dominated by primarily shallow infaunal bivalves such as Lahillia larseni – a 'disaster taxon' taking advantage of the lack of competition (Whittle et al. 2019).

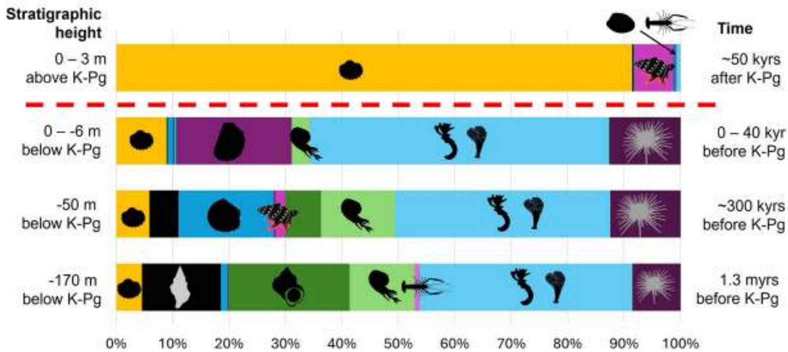

*Figure 2. Stacked bar chart of proportional abundances of the Banbach 'Modes of Life' comprising each of the four palaeocommunities across the K–Pg. Silhouettes from PhyloPic (<**https://www.phylopic.org/**>; Keesey 2023).*

Biomarker analysis is an ongoing investigation. So far, they suggest that there may have been seasonal anoxia/euxinia and input from biomass burning. Biomarkers for reconstructing temperature are yet to be run but should provide insights into shifts in palaeoecology across the boundary.

As it stands, our findings do not support a two-phased extinction at high latitude across the K–Pg, but rather a restructuring of palaeocommunities during the Cretaceous and a sudden and cataclysmic event at the boundary. Changes in community structure may have been driven by shifts in climate change related to the Deccan Traps volcanism during this period (Tobin *et al.* 2012). While statistical analysis of fauna and biomarker analysis are still ongoing, my work aims to shed light on the specifics of high latitude K–Pg environmental and ecological change and will do so in time.

Acknowledgements

I am grateful to my fantastic supervisors Prof. Daniela Schmidt, Dr Caitlyn Witkowski and Dr James Witts. I thank the Association for Undergraduate Research Bursary number PA-UB202404 that supported this project, and further thank the Bristol OGU lab group for their kindness and help throughout.

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Mammalian body size evolution during the Pleistocene environmental changes

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Palaeontologists are increasingly asking how biodiversity responded to past tectonic and climate changes (Fortelius *et al.* 2014). Here I investigate biodiversity dynamics during times of major tectonic and climate evolution, using a case study of land mammals in Anatolia, Turkey, a region of dynamic environments during the Neogene (~23.03–2.6 Ma). I analysed genus richness and turnover using the New and Old Worlds Database of Fossil Mammals (The NOW Community 2024) and relate their temporal patterns to the landscape history of Neogene Anatolia synthesized from the literature.

Biodiversity Dynamics

Among the six taxonomic orders included in NOW, Rodentia tended to be the most diverse order (measured in genus richness) in Neogene Anatolia (Figure 1a) and exhibited a distinct richness pattern potentially related to their smaller bodies and other associated properties (see below). Rodent richness first peaked at ~13–14 Ma in the middle Miocene and again at ~5–6 Ma in the late Miocene. Notably, there is a substantial decrease in Rodentia richness at ~8–10 Ma when Artiodactyla and Carnivora richness was increasing towards peaks at ~7–8 Ma when they exceeded rodent diversity.

To investigate the potential influence of habitat changes, I categorized large-bodied mammals by their main diet and show that large-bodied herbivores and carnivores exhibit similar richness patterns, both differing from rodents (Figure 1b). However, the three groups align in their patterns of genus turnover quantified with Simpson's dissimilarity index (Simpson 1943; Figure 1c), which captures the replacement of taxa not related to richness changes.

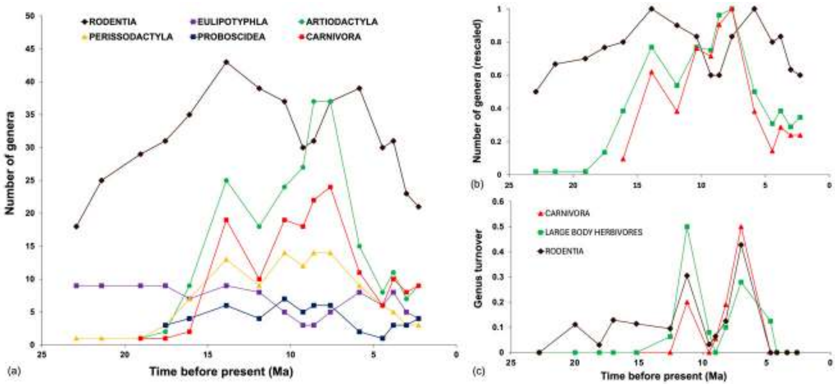

Figure 1. Genus richness (a, b) and turnover (c) of the Anatolian mammalian faunas across the Mammal Neogene (MN) time scale (following Hilgen 2012; richness at mid-points and turnover at boundaries of adjacent bins). Richness in b) was rescaled to the respective maximum to facilitate comparison.

Potential drivers of biodiversity dynamics

The dynamics of mammalian diversity suggested influences of both landscape evolution and changes in the larger-scale regional environment. Anatolia is estimated to have risen over 1km since the Miocene, and the peaks of genus richness and turnover overlapped with the onset of uplift in the central region at around 7–8 Ma, and in the east at 13.8–11.6 Ma (Bartol and Govers 2014). These uplifts can modify the local environment through changing water and soil teleconnections, the regional climate through altering atmospheric circulation, and ultimately local and regional flora and fauna (Ott 2020). The formation of a plateau and surrounding mountain ranges also creates heterogeneity in environmental conditions (*e.g.* climatic zones) and topographic barriers which affect the richness and composition of biodiversity (Huang *et al.* 2019). However, the rodents evidently maintained more stable richness, despite similar turnover peaks, potentially owing to their shorter generation times and thus faster colonization of new habitats (Kaya and Kaymakçı 2013).

At the larger scale, Europe in the early-middle Miocene had a humid, subtropical climate with more closed forests (Kazanci *et al.* 1999). The mid-Miocene peak in mammalian richness and turnover may be attributed to the Mid-Miocene Climate Optimum accommodating new taxa (Bouchal *et al.* 2018). From the late Miocene, global cooling led to drier open grasslands dominating central Europe to central Asia (Meijers *et al.* 2020), followed by extensive continental ice sheets at ~2.7 Ma (Fortelius *et al.* 2014). The late Miocene high turnover of large herbivores and rodents might reflect diversification of grazers (*e.g.* the *Hipparion*) and terrestrial rodents replacing arboreal ones promoted by the spread of open grassland and C4 grasses (Maridet and Costeur 2010; Kaya and Kaymakçı 2013). Intuitively, carnivores mirrored the patterns of their herbivorous prey.

In conclusion, my research demonstrated the complex links between biodiversity dynamics and changing environments. These findings highlight the value of palaeontological data in providing a direct window to past dynamics, which can be further used as analogues for understanding our current climate and biodiversity crisis and predicting future scenarios.

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Reviews

Life Sculpted: Tales of the Animals, Plants, and Fungi That Drill, Break, and Scrape to Shape the Earth

Anthony J. Martin, 2023, 360 pp, University of Chicago Press,
ISBN 9780226810478.

Maybe you have heard that some palaeontologists can decipher the behaviour and ecology of ancient animals, like dinosaurs or giant mammals, by studying their preserved footprints. But did you know that daily life traces of sea snails, bivalves, sponges, crabs, fish, and even bacteria can be preserved as well? Moreover, have you ever wondered how these small creatures shaped and continue shaping modern Earth ecosystems? This is the premise of *Life Sculpted* by Anthony J. Martin, a book that guides you into the realm of tiny bioeroders, decomposers, and their fascinating role as undercover players in the environmental evolution and global climate game. Martin is a prominent palaeontologist and ichnologist, author of other books such as *The Evolution Underground*, *Dinosaurs without Bones*, and *Life Traces of the Georgia Coast*, and his passion for trace fossils becomes evident with each personal story and palaeo-field-trip he shares in the book. Every chapter is distinctive, but without losing the conduit thread of bioeroders galore. Martin does an excellent job of maintaining the balance between science, humour and anecdotes, all of that wrapped in an easy-to-follow and entertaining narrative that motivates the reader to finish each chapter. He is also wonderful at summarizing important studies and mentioning dates and researchers. Even though some personal stories overshadowed the content a bit, or were not the most engaging, Martin flips the attention from those and introduces scientific concepts in a unique, fun way that keeps the reader hooked.

Chapter 1 works as an introduction for the unfamiliar reader to key concepts that will recur in the book, emphasizing the job of an ichnologist, how different fossil borings correspond to specific organisms, and how these biosignatures are linked to bioerosion. Chapter 2 presents examples of microbial biodegradation, from tooth decay caused by *Streptococcus* to the bioerosion of limestone, corals and shells due to cyanobacteria, fungi and lichen. Besides endolithic microbes and their rock cycle contribution, the author gives a review of microbial evolution and how microorganisms have influenced the climate and ecosystems of our planet. Chapter 3 focuses on bioeroding invertebrates and their related trace fossils. The marine molluscan chiton is the first protagonist, followed by the Ediacaran fossils *Kimberella* and *Cloudina,* the distinctive borings of sponges, marine worms, barnacles, and sea urchins, and finally a brief perspective on bioerosion and climate. Many trace fossils are also introduced (*e.g.*, *Entobia, Trypanites, Polydora* and *Gastrochaenolites*). Chapter 4 is an immersive tale about the behaviour of parrotfishes and their essential role in the sedimentary rock cycle together with the well-being of coral reefs, and how they, for example, maintain the flux of sand to create beaches in tropical areas. An absorbing and environmentally centred chapter.

Chapter 5 discusses fossil brachiopods before dragging the reader to drillholes in clams and snail shells made by moon snails, muricids and octopi. The chapter ends with discussions about the evolution of predation in molluscs, the related ichnospecies, and the life history of shells. Chapter 6 explains how shell predation marks are preserved as trace fossils. Crustaceans, stingrays and bony fishes are among the responsible predators, producing claws and bite traces and other ichnofossils (*e.g.*, bromalites, *Pisichnus*). Ancient and modern shell-eating animals are also mentioned, such as placodonts, ichthyosaurs, mosasaurus, walrus, otters and shorebirds. Chapter 7 is dedicated to wood bioerosion, explaining the emergence of plants, wood tissue evolution, the advent of xylophagy, and coprolites and wood-boring fossils as indicators. Bark beetles, wood roaches, termites and *Maiasaura* are some featured wood-eaters. A thorough description of woodpeckers and their influence in woodland encompasses the last part of this chapter. In Chapter 8 wooden sailing ships reveal the roles of wood-boring clams and bivalves as driftwood eaters and their influence on human marine navigation. The chapter expands on the evolution of wood-boring clams, the first Devonian forests and their relationship with oceans, and how ichnofossils such as *Teredolites* and *Apectoichnus* reveal the emergence of wood-boring clams. The highlight of this chapter is the story of the early Jurassic fossil log colonized by giant crinoids; my pick for most fascinating anecdote in the book.

Chapter 9 takes on the biodegradation of marine carcasses carried out by shallow- and deep-sea bone-eating organisms, and how these organisms drive the continuous change of matter and energy at the bottom of the ocean. The main protagonist is the bone-boring *Osedax* worm and its predilection for whale bones, although ichnofossils in Cretaceous marine reptile bones suggest that these polychaetes were around since the Mesozoic. Chapter 10 discusses land bone-eaters, from insects boring into, living in and eating bones of the dead (*e.g.*, beetles, termites, ants) to mammals that include bones in their diet to avoid calcium deficiency (*e.g.*, squirrels, rats, deer). A review of bone-eating behaviour development, vertebrate evolution and bite trace fossils is provided, highlighting some iconic extinct taxa such as *Dunkleosteus*, '*Megalodon*', *Tyrannosaurus* and *Basilosaurus.* Finally, Chapter 11 depicts the bioerosion caused by megafauna, such as mammoths, mastodons and ground sloths polishing rocks by rubbing themselves on them, elephants creating caves by ingesting salt-laden rock, and bearded capuchin monkeys wearing down rocks by using them as tools. Human bioerosion, from the first hominins to *Homo sapiens,* is the focal point of the last part of this chapter, with a view of humans as the main bioeroders of terrestrial environments and enlightening comments about future Earth bioerosion.

As a palaeontology student with no previous awareness of the significance of ichnofossils and bioerosion, this book was an unexpected and enjoyable discovery. Moreover, I was surprised to learn that each chapter can easily be read independently as the book functions like a science anthology without being a textbook. Nonetheless, I must say that at least some prior interest in ichnology or palaeoecology is needed for the reading experience to be fully gratifying; despite its excellence this material could be a bit tedious for the average science geek. So, if you have some time to spare and are keen to know about drill-holes made by octopuses[1], wood-eroding clams or the most famous ichnofacies, this book is a good match for you.

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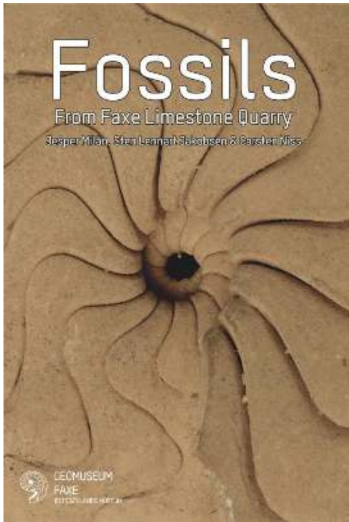
Fossils from Faxe Limestone Quarry

Jesper Milan, Sten Lennart Jakobsen and Carsten Niss, 2022, 106 pp, Geomuseum Faxe/Østjaellands Museum, ISBN 9288799672912.



The giant quarry at Faxe, Denmark (55 km SSW of Copenhagen), is cut in limestones of Danian age dating to approximately 63 Ma, three million years after the K–Pg boundary. In northern Europe and across into central Asia, carbonate deposition continued through the end-Cretaceous into the Paleocene, and many fossils which are characteristically Cretaceous, such as the sea urchins *Echinocorys* and *Tylocidaris*, thrived in the early Cenozoic. It was only the advent of clastic sedimentation, in the Selandian, which saw the final end of Chalk Sea deposition. The presence of 'Cretaceous' macroinvertebrate taxa was a major reason why the Danian was retained in the Cretaceous until the 1970s, when the micropalaeontologists eventually won the argument and the scale of the K–Pg extinction was acknowledged.

The limestones exposed in the Faxe quarry represent a cold-water coral mound ecosystem and have been worked for cement for over 100 years. The locality has yielded an extraordinary diversity of fossils, beautifully illustrated in this book. A new museum, Geomuseum Faxe, is built on the edge of the quarry, houses many important finds, has magnificent displays of fossils from the site, and arranges collecting trips into the quarry for visitors. Its director, Jesper Milan, did a PhD in Copenhagen with the late Richard Bromley on the experimental taphonomy of vertebrate footprints, getting emus in Copenhagen Zoo to run over sand and clay substrates in order to form underprints, aiding the interpretation of ancient reptilian trackways. Jesper is also behind the *Rock Fossils on Tour* exhibition, taxa named after rock, punk and heavy metal stars, which reaches a wide audience.

The book includes over 500 photos of Faxe fossils, mostly in colour, illustrating all the groups represented in the Faxe fauna. These include bryozoans, corals, bivalves, gastropods, nautiloids, crustaceans, brachiopods, sponges, echinoderms, serpulids and a diversity of shark's teeth. More rarely, turtle and crocodile remains have been discovered. The crustacean remains include diverse crabs, lobsters and prawns in which the details of the surface textures are exquisitely preserved.

[1] Reviews Editor: insert tedious joke about pluralisation of word 'octopus'.

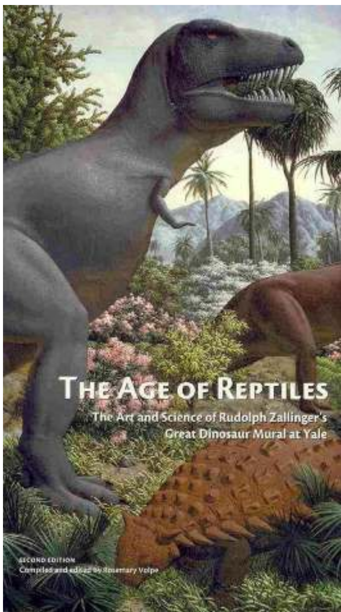
One of the frustrating aspects of studying chalk faunas is the virtual absence of forms with originally aragonitic skeletons, only rarely preserved as external moulds when lithification has preceded dissolution. In an unusual facies present at Faxe the aragonite has been replaced by calcite, preserving shells of gastropods and bivalves in exceptional detail. To date, an extraordinary diversity of 209 species of gastropod have been described from Faxe. The book describes the taphonomy of the fauna, and the preparation and conservation techniques used on the specimens.

The book also includes a description of *Danekrae* ("Danish treasure trove"), a legislative mechanism by which the state has powers of compulsory purchase for important geological finds. Under this law, a *Danekrae* committee decides whether an object qualifies, and the finder is reimbursed for its value. This is an effective means of retaining scientifically important finds and actually encourages collecting. Without collecting, innumerable fossil specimens of scientific value are destroyed by quarrying, marine and fluvial erosion, and weathering.

Andy Gale
Andy is an emeritus Professor at the University of Portsmouth, UK, with a special interest in Cretaceous rocks and fossils. He has published extensively on Cretaceous stratigraphy, asteroids, crinoids and cirripedes.

The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale (second edition)

Compiled and edited by Rosemary Volpe, 2010, 84 pp, The Yale Peabody Museum, ISBN: 0912532769.



After construction had finished in the 1930s, the curators of the Peabody Museum realized that the grey coloured walls and floor seemed to cause the fossil material of the Great Hall to blend together to form a drab colourless exhibit. In 1942, the museum director hired a recently graduated art student, Rudolph Zallinger, to 'spruce things up a bit' and paint some colourful reconstructions on one of the walls. Zallinger's plan was much more ambitious. He would use a nearly forgotten medieval painting technique to create an unbroken 33 metres long and 5 metres tall mural (163 square metres) representing North American landscapes of the Devonian through to the end of the Cretaceous. Eighteen months of planning and anatomical training was needed to develop the detailed state-of-the-art dinosaur reconstructions and stunning ancient vistas complete with beautiful foliage and imposing volcanos. Following the sketching stage came four years of painstaking brushstrokes (1943–47), resulting in the masterpiece, and arguably one of the most famous examples of palaeoart ever created, 'The Age of Reptiles', for which Zallinger won the critical acclaim of a Pulitzer prize.

The Age of Reptiles holds a special place in my heart. I have vivid memories of travelling through snow drifts with my family to rural Kent to visit my grandparents over the Christmas period of 1993. Amongst the roast dinners and the snowball fights, I have a clear memory of receiving a hefty plastic Natural History Museum *Brachiosaurus* and a copy of John Man's *Day of the Dinosaur*. I cannot state how formative that book was to me. The beautiful colour illustrations of weird and wonderful creatures utterly captivated me and introduced me to the notion that the fossils I found at Lyme Regis each summer were actual animals and not just rocks. One aspect of the book that hooked me was the dust cover. It was a stunning vista – an imposing *T. rex* standing amongst the green and brown palms and ginkgos, its piercing orange eyes staring at the viewer, as it stood, huge teeth bared, surrounded by *Triceratops, Ankylosaurus* and a lone *Edmontosaurus*. I didn't know it at the time, but this was Zallinger's art 'The Age of Reptiles'. The book travelled with me everywhere, until eventually the binding broke and was relegated to the bookshelf to prevent full disarticulation. Fast forward to 2018, when I had the privilege to visit the Peabody Museum, Yale, USA. After arriving and spending several days combing through the fossil insect collection, I took an opportunity to visit the Great Hall. I hadn't realized that the 'The Age of Reptiles' was at the Peabody so, it is with little exaggeration to say that as I entered the hall and my eyes fell upon the mural I was quite overcome. The sheer scale of the mural is breathtaking and I was transported back to hiding under my duvet with a torch reading about dinosaurs long after my bedtime.

When I saw that a book had been published explaining the history of the mural, I jumped at the chance to review it. *The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale* is a fascinating and charming book that covers much of the story of the mural's design and creation. It begins with a short chapter outlining the construction of the Peabody Museum and how the mural came to be commissioned, the scope and scale of the mural, and the steps the Museum has taken to preserve it over the last 70 years. For me, the next chapter is the most exciting aspect of the book. The short autobiography of Rudolph Zallinger followed by a wonderful section written by the artist himself titled 'Creating the mural' tells the story of the humanity behind the iconic art piece. These sections cover in detail aspects of his anatomical training, design process, and the physical process of painting the mural. I greatly enjoyed learning that Zallinger chose to use a time-consuming and challenging fifteenth century painting technique known as *Fresco secco*, for which pigments are mixed with a binder and/or lime then directly applied to a dry plaster wall. This technique allows for a long working time but requires specialist preparation and application skills that had almost become extinct by the twentieth century, an interesting allegory for the subject matter of the mural. I was also interested to note that the museum directly employed Zallinger rather than commissioning him – an employment artefact of a bygone era – but also that he had to teach for two days at the Yale School of Fine Arts, restricting painting time to three days a week. This undoubtedly contributed to the three-and-a-half years it took him to complete the mural but also raises another quirk of the process: the museum was still open to visitors who could watch as he meticulously drew each dinosaur scale, insect wing and ginkgo leaf. It would have been fantastic to visit the Peabody Museum over those years to witness Zallinger's incremental progress. This chapter was the highlight of the book for me, although I wish that the logistics of the painting had been discussed a little more. How did Zallinger move around the wall? How much secco paint did he use? Did he make all the paint by hand? How did he keep the colours consistent across the wall? How much did the mural cost financially? How did Zallinger's arm not fall off? *etc*. I was desperate to read more about how Zallinger felt after completing the three-and-a-half-year epic (the same length of time as a UK PhD thesis!) and see more pictures of him working on the rickety wooden scaffolding.

The next chapters are dedicated to outlining the flora and fauna seen across the entire mural. This part of the book is an example of excellent science communication – well written and beautifully illustrated with photos of specimens directly from the Peabody Museum collections, which is a fantastic touch. These chapters are accompanied by a beautiful high-resolution pull-out poster (printed on robust card) of the mural in its entirety, which would have melted six-year-old Thomas' brain. These chapters are excellent light reading and would make a great companion guide if you ever have the opportunity to stand in front of 'The Age of Reptiles'. Lastly, the book contains a chapter written by the American art historian Vincent Scully, who painstakingly dissects the mural in beautiful prose. Scully gives an interesting review of the lost art of *Fresco secco* and marvels at the technical excellence of Zallinger's work, as well as talking at length about how 'The Age of Reptiles' fits within the world of scientific art. One aspect of Scully's essay that I had not considered is the cultural significance of the mural in the zeitgeist of post-World War II America, which saw the pro-scientific revolution of the late 1940s.

While it is obvious that I have a personal attachment to the mural, *The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale* gives an opportunity for newcomers to experience the artistic merit of the mural but also the human story behind it. A copy of the book has sat on my coffee table for some time (sorry Reviews Editor[2]). Visitors (even non-palaeontologists!) often see the brooding *T. rex* on the front cover and recognize it, even if they can't place where they have seen it. They will thumb through pages, picking through the prose and beautiful pictures that adorn each chapter, a testament to the accessibility and excellent writing of the book, but are always excited to unfurl the pullout and marvel at the fine details of the iconic mural. In the end, Zallinger's job was to make a museum hall more exciting and less grey, but he actually ended up creating a palaeoart masterpiece that seems to steal the attention away from the exhibits. Scully's essay on the 'The Age of Reptiles' describes well-known palaeontologists who were inspired to study ancient life as a direct result of seeing the mural – a wonderful legacy for Zallinger. While not famous, I count myself amongst this group, and it brings me happiness that *The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale* might be able to inspire a few more. If you have an interest in ancient life, palaeoart, or want to read about a phenomenal human accomplishment that combines the two, then I cannot recommend this book enough.

Thomas Clements
Thomas Clements is a 'doctor of decay' currently based at Friedrich-Alexander-Universität, Germany. His current obsession is macrophotography and he can be found taking pictures of bugs at every opportunity.

(Sadly we cannot offer a pullout of 'The Age of Reptiles' Mural with the *Newsletter*, but the Internet can as usual provide consolation. Here Armand Morgan, instructor and artist at the Yale Peabody Museum, talks about Rudolph Zallinger and the creation of the Mural:

<**https://www.youtube.com/watch?v=bI49Kn4EeOY**>

And refubishment of the Peabody Museum allows a close-up view:

<**https://news.yale.edu/2021/02/22/peabody-renovation-offers-unique-view-iconic-dinosaur-mural**>)

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[2] Reviews Editor: in my book review experience this is the rule rather than the exception, so all is forgiven.

Books available to review

We are commonly approached by publishers with books to review, and we are always looking for new reviewers. Any member of the Association is welcome to contribute a review, and our reviewers come from all career stages from students to emeritus professors. If you are interested in reviewing a specific book from the list below, have an idea for another book you would like to review, or would be interested in reviewing something but you don't know what, please drop Reviews Editor Richard Dearden an e-mail at <**bookreview@palass.org**>.

Here are some suggestions for books we'd like to commission reviews for. This is just a sample, please e-mail Richard if you'd like more suggestions.

- **Palaeontology in Public: Popular science, lost creatures and deep time. Edited by Chris Manias.**
  A book chronicling the links between palaeontology and broader culture through a series of essays covering Sir Arthur Conan Doyle to Stephen Spielberg.
- **Weathering, by Ruth Allen**
  An exploration of how geology offers insight into ourselves by a geologist/outdoor psychotherapist.
- **Ocean Life in the Time of Dinosaurs, by Nathalie Bardet, Alexandra Houssaye, Stéphane Jouve, and Peggy Vincent.**
  Pliosaurs and plesiosaurs abound in this illustrated book about the marine reptiles of the Mesozoic.
- **Yorkshire's Amazing Dinosaur Coast, by James McKay and Roger Osborne**
  A children's book full of painted pictures illustrating the geological history of the Yorkshire Coast. Co-reviews with young palaeontologists welcome.

We don't just publish book reviews! If there is something else that you think would be of interest to PalAss members and that you would like to review we would love to include it in the *Newsletter*. This could be a film, a podcast, a video game, an exhibition, or something else that Richard is insufficiently imaginative to think of. As above, please just get in touch at <**bookreview@palass.org**> where he is very happy to discuss ideas.

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OBITUARY

Stefan Bengtson
1947 – 2024

Professor Stefan Bengtson died unexpectedly in Rome, Italy on 5th October 2024, where he was doing what he most enjoyed – discussing palaeobiology with like-minded colleagues. He was born in Gällivare in northern Sweden in 1947, published his first research article while still an undergraduate, learned Russian as an interpreter during required military service, and obtained a doctoral degree at Uppsala University in 1977. His advisor, Prof. Anders Martinsson, transformed geoscience in the Nordic countries with the founding of three new international periodicals, *Lethaia*, *Lithos* and *Boreas*, as well as the monograph series *Fossils and Strata*. Stefan soon became managing editor of *Lethaia* and inherited both the journal and *Fossils and Strata* when Martinsson passed away in 1983. Thus began a long and productive parallel career in scientific design, editing and production: *Lethaia* (1973–1999), *Fossils and Strata* (1992–1999) and *Palaeontologia Electronica* (2000–2007) all bear the imprint of his extraordinary leadership.

Stefan Bengtson, standing on a gravel bar in the Aldan River, Siberia in 1990. The red limestones in the distance are the Tommotian Stage of early Cambrian age. Photo by Bruce Runnegar.

Stefan's editorial, managerial and production skills were on full display when he organized and ran the 1992 Nobel Symposium at Björkborn, Karlskoga, Sweden and then used an early desktop publishing program to design and produce the 630-page symposium volume, *Early Life on Earth*, for Columbia University Press. This was before most major publishers were comfortable with anything except paper submissions. Those of us who were fortunate enough to participate in the Nobel Symposium treasure the memory of it.

Stefan's first scientific article was on *Mobergella*, minute phosphatic lids of unmineralized worm tubes from Swedish shoreline boulders of early Cambrian sandstones. It was a *tour de force* that showed exactly how small shelly fossils should be studied and interpreted, a methodology that Stefan developed and refined throughout his career as new techniques became available. The culmination of this approach is synchrotron radiation X-ray tomography, which Stefan and his numerous collaborators have used to investigate the microscopic anatomy of a whole range of Precambrian and younger organisms, including phosphatized embryos, phosphatic problematica such as *Tommotia* and *Lapworthella*, proto- and paraconodonts, microbial endoliths and Palaeoproterozoic filamentous algae and stromatolites.

Stefan's early work on problematical microfossils was carried out just as Soviet scientists were monographing the Tommotian biotas of the Siberian Platform. With his fluent Russian, Stefan was a natural addition to the influential Precambrian–Cambrian boundary working group led by John Cowie, and he went to Siberia in 1973 and to China in 1978 with that group. By 1986, when he organized and ran an innovative international workshop on small shelly fossils in Uppsala, form taxonomy and excessive splitting had become a major obstacle to practical biostratigraphy and evolutionary understanding. Stefan's solution was to assemble all practitioners – with their collections – in rooms equipped with microscopes, so that comparisons could be made and superfluous names eliminated. That approach, together with the discovery of new Konservat Lagerstätten, moved the small shelly fossils from curiosities to centrepieces. Unfortunately, two of Stefan's early collaborators, Crosbie Matthews and Vladimir Missarzhevsky, who jointly coined the expression "small shelly fossils" in 1975, died prematurely and missed the maturation of their pioneering contributions.

In 1984, Stefan joined the Precambrian Paleobiology Research Group (PPRG) at the University of California, Los Angeles (USA) and thus extended his outlook beyond the Cambrian into the Proterozoic. There, as we all know, evidence for complex life is both rare and recalcitrant. One promising avenue, which Stefan had already explored in the Cambrian, is phosphatized embryos that preserve histories of cell divisions and early organismal development. He and his collaborators had already used SEM and X-ray tomography to document the embryonic growth of Cambrian cnidarians and scalidophoran worms, but the putative animal embryos from the Ediacaran Doushantuo Formation of South China were a more formidable challenge. Using the beam lines of the advanced Swiss Light Source and his exceptional image processing skills, Stefan and his colleagues were able to reveal cellular features that questioned the metazoan embryo interpretation.

In deeper time, Stefan's work is even more controversial. With Birger Rasmussen and others, Stefan explored some of the earliest evidence for complex, multicellular life in the Stirling Ranges of Western Australia, the Vindhyan Supergroup of peninsula India and the Francevillian of Gabon. Each occurrence is preserved in a vastly different way – ichnofossils in quartzite (Australia), phosphatized organic matter (India) and pyritized nodules (Gabon) – and each required a suite of specialized tools for analysis. The juries remain out on these and other innovative proposals, but Stefan's 1.6 Ga crown group red algae from the Indian Vindhyan should certainly qualify for one of *Science*'s 2024 *Breakthroughs of the Year*: multicellularity came early for ancient eukaryotes.

Stefan's honours include the Lapworth Medal of the Palaeontological Association in 2017. He was a member of the Royal Swedish Academy of Sciences, a Centennial Fellow of the Paleontological Society, and he received the Walcott Medal from the US National Academy of Sciences. He was married for 47 years to Christina Franzén-Bengtson, also a palaeontologist, who died in 2023, and retired as Professor and chairman of the Department of Palaeozoology at the Swedish Museum of Natural History in 2014. He is survived by his two children, Jesper and Jenny, and four grandchildren, Carl, Freja, Hugo and Xaver, whom he adored.

Late in life, Stefan learned to fly and did so in various parts of the world until Parkinson's symptoms prevented him from doing so. Stefan and Christina loved fine food, music and the opera, and Stefan was especially fond of Wagner and Gilbert & Sullivan. When the palaeontologists at Uppsala University held a symposium for Stefan in 2024, colleagues were invited to send recorded greetings. Stefan's reaction was as follows: "[The] personal greetings began to put me in somewhat of a mushy mood, but Nick Butterfield restored the balance with a splendid take on the Major-General's song from Gilbert & Sullivan's 'The Pyrites of Gabon [Penzance]'. Thanks, Nick!" I told Stefan that anyone who could come up with 'The Pyrites of Gabon' must have a mind the size of a planet. He admitted that the self-deprecating joke was his. Thanks, Stefan!

Bruce Runnegar
University of California, Los Angeles, USA

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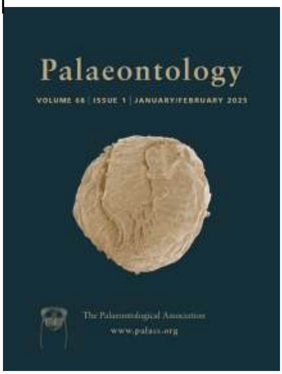

An embryo of Markuelia lauriei *Haug* et al., *2009, a scalidophoran from the Monastery Formation (late Templetonian, Middle Cambrian) at North Rogers Ridge, Georgina Basin, northern Australia (CPC 39946; Commonwealth Palaeontological Collection of Geoscience Australia, Canberra).*

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Papers in Palaeontology

VOLUME 11 • ISSUE 1 (OPEN)

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Essexella asherae *(ROM IP53728), a sea anemone (Actiniaria) from the Pennsylvanian Mazon Creek Lägerstatte of Illinois, USA. For more information see* <**https://doi.org/10.1002/spp2.1479**>.

Regional Correspondents

Hiu Wai Lee

Region: **Hong Kong**; Affiliation: University of Hong Kong
Position: PhD student
Research/job focus: Interested in how the skull evolves and develops in archosaurs, particularly in pseudosuchians.

Miguel Díaz de León

Region: **Mexico**; Affiliation: The National Technological Institute of Mexico
Position: Substitute teacher. Pronoun: he/him
Research/job focus: Vertebrate paleontology, virtual paleontology

Christina Ozeki

Region: **Japan**; Affiliation: Kyoto University
Position: PhD candidate
Research/job focus: The stages of decomposition of large, marine vertebrates through geological time.

Lukáš Laibl

Region: **Czech Republic;** Affiliation: Czech Academy of Sciences, Inst. of Geology
Position: Researcher. Pronouns: he/him
Research/job focus: The morphology, evolution and development of various Palaeozoic arthropods.

Devapriya Chattopadhyay

Region: **India**; Affiliation: Indian Institute of Science Education & Research Pune
Position: Associate Professor. Pronouns: she/her
Research/job focus: Understanding how marine molluscs respond to their physical and biological environment in ecological and evolutionary timescales.
(Photo courtesy: Science Media Centre, IISER Pune)

Miky Lova Tantely Ravelson

Region: **Indian Ocean**; Affiliation: ASJA University Antsirabe
Position: Researcher. Pronouns: he/him
Research/job focus: sauropod dinosaurs.

Jean Vannier

Region: **France**; Affiliation: Université Claude Bernard Lyon 1
Position: Senior Researcher
Research/job focus: Early life, late Precambrian and lower Palaeozoic faunas and marine ecosystems (based of Fossil-Lagerstätten).

Rudy Lerosey Aubril

Region: **USA**; Affiliation: Harvard University
Position: Research Associate
Research/job focus: Cambrian exceptionally preserved biotas

TAXONOMY/NOMENCLATURE UPDATE

This publication is now registered on ZooBank and is thus deemed to be valid for taxonomic/nomenclatural purposes. However we request contributors (especially those contributing grant reports) not to include names of new taxa in their reports.

Newsletter copy

Information – whether copy as such or Newsletter messages, review material, news, emergencies and advertising suggestions – can be sent to Newsletter Editor Harriet Drage via e-mail to <**newsletter@palass.org**>).
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Deadline for copy for Issue No. 119 is 2nd June 2025.

Palaeontological Association on the Internet

The Palaeontological Association website can be found at <**http://www.palass.org/**> and includes information about the Association, and PDF copies of the *Newsletter*. Internet Officer Russell Garwood can be reached by e-mail at <**webmaster@palass.org**>.

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