

The Palaeontology Newsletter

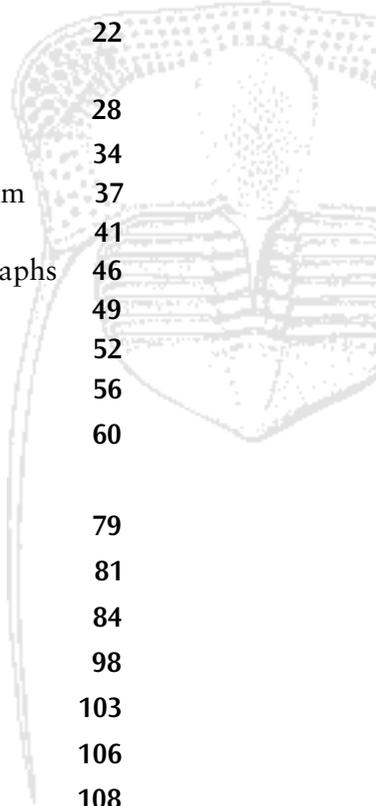
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Reminder: The deadline for copy for Issue no. 112 is 6th February 2023.

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Guest Editorial for World Mental Health Day

October is usually a month that rings in the changes of the season around us, but for some, the ever-present toll of mental health has a poignant metaphor in the darkening nights and fading blooms of nature seen in my surroundings. This month we bring awareness to the fore as World Mental Health Day takes place annually on 10th October.

Within academia, the stigma surrounding openly discussing mental health is slowly being eroded, with social media becoming an important platform to encourage the sharing of experiences and providing support for each other. However, it must also be considered beyond the day-to-day and actively supported at other opportunities, such as conferences or during fieldwork. Though mental health is not the primary focus of work taking place in these instances, it is important to have measures and resources in place that can offer a guiding hand as it could be the moment someone reaches out to grasp it the most.

The Palaeontological Association's *Newsletter* hopes to expand the conversation with the introduction of a new feature, which will shine a light on the personal experiences of peers and colleagues, fostering both empathy and awareness. During the current cost-of-living crisis, with soaring energy and food prices around the globe, mental health concerns may be exacerbated even more, making this not just a discussion for October but something we all must actively approach with consideration and compassion throughout the year. If you wish to contribute to this important topic, named or anonymously, please e-mail <hannah.bird@palass.org>.

Elsewhere in this *Newsletter* we meet three palaeontologists living abroad, in Sweden, Switzerland and Poland, to discover the challenges and celebratory moments of residing and working outside of their home countries. Meanwhile, our Spotlight on Diversity in this issue recognizes the inherent biases in the review process of publications and how this takes a toll on authors experiencing rejection, whilst we also consider the preservation of palaeontology – just how will the legacy of our work be conserved and remembered?

Hannah Bird

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Association Business

Annual General Meeting 2022

Notification is given of the 66th Annual General Meeting.

The Annual General Meeting (AGM) will be held at 16:00 GMT on Wednesday 21st December 2022 as a virtual meeting. Joining details will be sent to all Members by e-mail or post (where applicable).

AGENDA

1. Apologies for absence
2. Minutes of the 65th AGM*
3. Trustees Annual Report for 2021*
4. Accounts and Balance Sheet for 2021 and reappointment of financial examiner*
5. Overview of the Association's activities 2022
6. Results of Council Election 2022 and vote of thanks to retiring members
7. Announcement of Council Awards: Lapworth Medal, President's Medal, Hodson Award

The AGM will close with an address by the PalAss Exceptional Lecturer for 2022/23, Prof. Mark Williams, entitled: "The Anthropocene: planetary scale change to the biosphere, and the future wellbeing of planet Earth".

* Papers pertaining to these agenda items are available at the back of this *Newsletter* and were previously published in *Newsletter* 110, available online at <<https://www.palass.org/publications/newsletter/archive?number=110>>.

Council Election 2022

At the AGM in December 2022 the following vacancies will occur on Council:

- Vice-President (2 years)
- Internet Officer (3 years)
- Deputy Internet Officer (3 years)
- Meetings Coordinator (3 years)
- Outreach Officer (3 years)
- Early Research Career Officer (3 years)
- Ordinary Member (3 years)



Nominations received by the 1st September 2022 deadline are as follows:

- Vice-President: **Uwe Balthasar**.
- Internet Officer: **Russell Garwood** (second term).
- Deputy Internet Officer: **Elizabeth Dowding, Shane Wheatly**.
- Meetings Coordinator: **Harriet Drage, Robert Sansom**.
- Outreach Officer: **Elizabeth Dowding, Euan Furness**.
- Early Research Career Officer: **Nidia Alvarez Armada, Orla Bath Enright, Harriet Drage, Joseph Keating, Roland Sookias, James Witts**.
- Ordinary Member: **Orla Bath Enright, Harriet Drage, Euan Furness, Joseph Keating, Roland Sookias**.

Voting process:

As there are multiple nominations for all except the Vice-President and Internet Officer positions there will be an election conducted prior to the Annual General Meeting. This will take place electronically (or by post for those without electronic access) as per section 11.7 of the Association's Constitution. Voting instructions will be sent via e-mail (or post) to all voting Members in early November, to allow for all votes to be cast by early December and subsequently counted in time for election results to be announced at the AGM. As no candidate may hold more than one position on Council, any candidate declared the winner of a vote will be discounted from all subsequent votes. The order of voting has been determined to give each candidate the best chance of attaining their preferred position as indicated on their nomination. The statements of interest for the positions by the candidates are as follows.

Candidate statements:

- **Nidia Alvarez Armada:** I am running for the role of Early Research Career Officer. I have been a member of the Palaeontological Association for the past ten years, during which time I have been a recipient of several grants and unconditional support from the PalAss. I find myself in a position to reimburse the Association with my time and enthusiasm with this role. I finished my PhD in March 2021 and I am currently applying for European funding to continue the growth of my career. To fulfil this role, I will poll the early career researcher (ECR) community regularly, to gain a direct insight into current issues. I have already come to see that ECRs are incredibly vulnerable in instances where senior researchers may not be working towards their subordinates' best interests and, sadly, there is a real abandonment from academic institutions regarding internal disputes. It is my wish to work with PalAss towards the creation of a "safe space" network for ECRs in need of assistance and more particularly the establishment of an independent working group that will seek a sustainable response from institutions for the creation and application of a code of conduct regarding the fair treatment of ECRs worldwide.
- **Uwe Balthasar:** I have been serving as Meetings Coordinator on the PalAss Council for five years and in this time initiated and coordinated the Association's Exceptional Lecturer scheme, and have been active in a number of sub-committees. From my first Council meeting onwards



I have been enormously impressed by the degree of professionalism and dedication that happens on Council and I would be honoured to be given the opportunity to continue to contribute to this effort as Vice-President. The field of palaeontology and its associated sciences has undergone significant changes over the past 5-10 years and I will do my best to ensure that our Association represents palaeontology as a relevant science for the future.

- **Orla Bath Enright:** My name is Orla, I am a post-doctoral researcher at the University of Lausanne, Switzerland. During my career, I have had to move country for every position that I've held (Ireland, UK, Switzerland and soon, Germany). The Association has provided me with constant support and opportunities, and I understand the important role that the Association plays for early career researchers (ECRs). I believe the Association has the potential to do more for the ECR community and I would enhance the resources available for ECRs by focusing on creating free online workshops. I would organize and run workshops on topics such as funding chats, career series, conflict management, supervision training, *etc.* By utilizing the experience of the Association's membership, I would run workshops that will provide a space for ECRs to develop core skills and network with others. I have experience of creating these resources: I currently serve on the Association of Post-Doctoral Researchers in Natural Sciences (UNIL) committee, where I represent geoscience ECRs and produce free educational events (such as those proposed above). As an approachable member of our community, I will represent ECR perspectives on Council and push for accessible online content and resources for the ECR community.
- **Elizabeth Dowding:** Hello all! My name is Elizabeth and I am an Australian palaeontologist working on biogeography and the Devonian. I have been very active with science outreach in Australia and, now that I am working as a postdoc in Europe, I hope to continue it up here with the PalAss. I am full of ideas and would love the opportunity to work with the PalAss Council to increase science engagement. I would also like to advocate for the creation of accessible resources for scientists, students and teachers who are interested in outreach. I personally believe that outreach is incredibly important and yet I am aware that many academics are already overworked and stretched. My plan for the Outreach Officer position would involve the creation and collation of tools, resources and activities to both facilitate academic outreach and increase science engagement. My interest in the Deputy Internet Officer post is naturally linked to the aims I hold for Outreach Officer, and I would love to develop further skills, assist with ProgPal, and be in touch with the palaeo community.
- **Harriet Drage:** I have recently returned to academia for a postdoctoral position at the University of Lausanne. Previously, I worked as a Commissioning Editor for secondary school-level science education at Oxford University Press. I want to use my experience gained from a career outside academia to improve conditions and help prepare and motivate ECRs, for either a career within or outwith academia. ECRs gain so many crucial transferable skills during their work, and I want to provide resources and support for ECRs to be able to recognize this, aid their personal development, and achieve their career goals. I would like to work on establishing a broader scheme of events to support ECRs in this way, for example career exposure events and key skill workshops. I would be an excellent addition to Council because I am highly skilled in organization, people and project management, and communication. I am keen to contribute to wider Council initiatives, in particular working to broaden inclusivity,



access, and representation in the sciences, which I spent much time working towards during my publishing career. I also plan to produce materials to support those involved in the geosciences to use inclusive language and accessible design.

- **Euan Furness:** I am currently in my third year of PhD research at Imperial College London, UK and believe that I can usefully represent the interests of PhD and Masters students on Council. Students are major contributors to the Association's activities, and the Association has the potential to do a lot to guide them towards their academic and career goals. The excellent attendance of the early-career researchers event at the Annual Meeting in Cork this year demonstrates the appetite that Masters and PhD students have for guidance from PalAss' more senior members, and I would like to see that appetite sated. I am also keen to be involved in public engagement work for PalAss: I have previously volunteered for public engagement projects with schools on behalf of Imperial College London, and am enthusiastic about encouraging greater participation in public engagement, particularly by Masters and PhD students for whom experience in science communication is an invaluable skill for their own career development. Outreach at fossil festivals appeals to me as an excellent opportunity for hands-on engagement, but I also believe that PalAss' YouTube channel is an excellent tool to provide education for enthusiasts who cannot reach Lyme Regis or Yorkshire.
- **Russell Garwood:** It is my pleasure to stand for a second term on the PalAss Council as the Internet Officer. I believe this is an important role because the provision of the PalAss web architecture in-house is key to allowing the Palaeontological Association to support its charitable aims, whilst keeping meetings and memberships affordable (the commercial cost of this provision would, for instance, exceed the Association's expenditure on grants). As such, I find the role a rewarding contribution to the community. Standing for a second term will allow me to collaboratively update the Association's website content management system as well as continuing development of a number of other systems. My hope is that this will allow a future Internet Officer to step into the role without having to make significant overhauls to the web infrastructure.
- **Joseph Keating:** We are living in turbulent times. The global pandemic has triggered the biggest change in working habits since World War II. Hot on its heels, the global economic crisis has stretched wallets thinner than ever before. These global challenges have not affected our palaeontological community equally. Early-career researchers are impacted predominantly. PhD stipends are not meeting the rising cost of living, potentially pushing students into poverty. Furthermore, in the age of Zoom and hybrid working, the expectation of moving location for short-term postdoc positions no longer makes practical or financial sense, not to mention the strain such positions place on personal relationships and mental health. As a community, we need to understand how this paradigm shift in working and living is affecting our profession. If I'm elected, I aim to commission a survey into working/living practices, which will inform actions for the Association to support its early-career members through these trying times. I also want to instigate an annual postdoctoral award, "Postdoc of the Year", which will be nominated by PIs and recognize the outstanding contributions of postdoctoral researchers. Currently, the PalAss presents awards to PhD students and tenured researchers, but postdocs are left unrecognized by our Association.



- **Robert Sansom:** I have deep respect for the Palaeontological Association given its long track record of promoting and supporting our discipline, and I would be honoured to serve on Council as Meetings Coordinator. I currently support the Association's various activities acting as handling editor for *Palaeontology*, as an Association mentor for early-career researchers, and previously as co-host of the Annual Meeting 2021. Academic societies such as ours are facing a variety of intersecting challenges in uncertain times from diversity crises and shifting research environments, to systemic challenges for early-career researchers. I hope to serve as Meetings Coordinator to directly address these challenges by supporting early-career researchers' participation in truly global and diverse meetings, and by creating an environment for agenda-leading and inclusive events and talks to support our discipline and Association at an international level, as well as supporting the Association's activities more broadly. My research interests range across the biological and geological, including early vertebrates, animal origins, and broader questions relating to phylogenetic methods, taphonomic biases and decay experiments. I am currently a senior lecturer at the University of Manchester, UK, having previously worked at the Universities of Bath, Bristol and Leicester, as well as the NHM, London.
- **Roland Sookias:** I am a postdoc in Liège, Belgium, working on the interaction of 3D shape with phylogeny in archosaurs, with a background in Triassic fossil archosaurs. I have been a regular attendee at PalAss meetings since my PhD, and really appreciate the Association's activities. For this reason – especially inspired by the great success of recent meetings despite adversity – I would like to offer my help to the Association and become more deeply involved. As an early-career researcher myself I well understand the challenges faced by this community, so if I am able to serve it I would be keen to do so. I thus stand primarily for Early Research Career Officer, and secondarily for Ordinary Member. I can bring extensive administrative experience, dedication, and a wide network in the ECR (and broader) community. I am based outside the UK with much experience abroad, and thus also bring another perspective to the Association. I strongly value diversity, and would do everything I could to foster inclusion and support for researchers from under-represented groups, especially at an early career stage (including standing aside here for another candidate). I aim to be your representative and bring your needs and wants to the PalAss!
- **Shane Wheatly:** Information Technology (IT) is incredibly important to the running of the Association, and I believe my experience coupled with my enthusiasm will allow me to properly support the Association in maintaining and upgrading this vital resource. I was one of the co-chairs of ProgPal 2022 and handled much of the IT associated with the event, including updating the website and formulating the hybrid approach to the conference as well as the management of the online resources used in the planning of ProgPal. My experience with ProgPal has given me insight into the many ways we can improve the conference interface, making it easier for the organizers of both to implement a more accessible experience and ultimately, creating a better experience for members. My goal is also to help further diversity in palaeontology; I am neurodiverse myself and I think that I can help Council in understanding the difficulties faced by neurodiverse people, continuing the work needed to increase diversity in Palaeontology and putting more in place to support those people. Thus, I believe I can use my position to better develop ways of making palaeontology more accessible, and effective implementation of IT resources is essential in delivering upon that goal.



- **James Witts:** I have been an active member of PalAss for over ten years, contributing to numerous outreach activities, ProgPal and Annual Meetings. I am currently a Lecturer in Palaeontology at the University of Bristol, UK, where my research focuses on the response of marine ecosystems to environmental perturbations such as the K-Pg mass extinction. I have a PhD from the University of Leeds and completed two postdoctoral Fellowships in the USA (American Museum of Natural History and University of New Mexico). Yet like many Early Career Researchers, I am not currently in permanent employment and hold a fixed-term, teaching-heavy lectureship. For most ECRs this is the reality of pursuing a career in palaeontology; chasing a small number of tenured positions and Fellowship/grant opportunities. I believe that PalAss is a vital community and platform for ECR professionals and I want to develop the Association to better serve the large ECR membership by liaising closely with the ECR community and representing their voices on Council. I would advocate for initiatives such as increased mentorship opportunities, more accessible events tailored for ECRs both during and beyond the PhD stage, and ensuring that the perspectives of current ECRs are embedded in the decision-making process.

Future timing of our Annual Meetings

The Palaeontological Association's Annual Meeting has historically taken place in the first half of December. However with the recent years of COVID-19-related travel restrictions, lockdowns and seasonal waves to contend with in the winter months Council took the decision to move the recent 2022 and upcoming 2023 Annual Meetings to northern hemisphere summer slots. This was in order to help organizers best deliver the Meetings and in particular the various in-person elements. Going forward Council would like to hear views from the membership on when in the year the Annual Meeting should be held. Therefore in addition to the election (above) we will be asking all Members to complete a brief anonymous online poll in the coming month to help inform Council early next year when making decisions for the 2024 Meeting and onward. Details on how to participate will be sent via e-mail (or post) to all eligible Members in early November.

Awards and Prizes

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. Members considering making nominations should first read the Palaeontological Association 'Statement of Diversity' below.

Statement of Diversity

The Palaeontological Association has an Unconscious Bias document (available on the Association website), the recommendations of which will be adhered to at all times. All decision-making for Palaeontological Association awards and prizes will be carried out objectively and professionally.



The Association is committed to making award and prize decisions purely on the basis of the merit of the individual(s). No nominee for awards or prizes will receive less favourable treatment on the grounds of: gender, marital status, sexual orientation, gender re-assignment, race, colour, nationality, ethnicity or national origins, religion or similar philosophical belief, spent criminal conviction, age or disability. Equally, all nominations will be assessed on equal terms, regardless of the sex, age and/or ethnicity of the nominee. Nominations will therefore be assessed and graded on their merits, in accordance with the criteria and the aims and objectives set for each award or medal. Due consideration will be given to any period away from science due to parental leave, illness or any other such career break. Nominators are reminded that neutral language (*e.g.* gender neutral) should be used in all nominations.

Palaeontological Association Awards/Medals selection procedures

The Palaeontological Association Council discusses Awards and Medals at the May Council meeting and votes to select awardees. The benefit of using Council to select awardees, rather than a dedicated awards committee, is that it draws on the wider experience of the entire Council. Voting is preceded by an introduction from the President that: (i) includes a diversity statement to remind Council of their responsibility in terms of fairness and diversity issues (including impact of non-standard careers *etc.*); (ii) outlines the remit and selection criteria for each award; (iii) considers the impact of awardees in terms of increasing the diversity of recipients. Each award is considered in turn with every application considered except those that clearly fall outside of the remit. Each Council Member will vote by listing their three preferred candidates in rank order. The candidate with the most votes as preferred candidate will be awarded the award/medal. If there are only two candidates and they are tied the President shall have the casting vote. If there are three or more candidates and there is a tie the vote will be recounted including the second ranked candidate for all of the votes. If the vote remains a draw after second and third ranked candidates are considered the President will cast the deciding vote.

Lapworth Medal

The Lapworth Medal is the most prestigious honour bestowed by the Association 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: Council will look for breadth as well as depth in the contributions in choosing suitable candidates.



The candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of: (i) a two-page career summary (font-size 12); (ii) a list of ten papers that demonstrate significance and breadth of research. The two-page career summary should outline the significant contribution to the science in terms of research and also other activities such as outreach, teaching, mentoring and administration (including that relevant to palaeontology at their home institutions, scientific societies and at higher levels, such as funding bodies and government advisory panels). We are looking for evidence



of both depth and breadth in research with clearly identified achievements and breakthroughs. Relevant honours and awards may be mentioned. If a candidate has taken time out from their professional career for family or other purposes this should be highlighted. Nominations must be compiled into a PDF file of less than 10 MB and uploaded via the webpage before the deadline.

The award will be considered by Council at its May meeting and awardees will be invited to a ceremony at the Annual Meeting in December. Awards will also be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to not make an award in any particular year.

Nominations are invited by **31st March** each year.

President's Medal



The President's Medal is a mid-career award given by Council to a palaeontologist who has had between 15 and 25 years of full-time experience after their PhD (excluding periods of parental or other leave, but not excluding periods spent working in industry) in recognition of outstanding contributions in his/her earlier career, coupled with an expectation that they will continue to contribute significantly to the subject in their further work. Please note that, in recognition of the disruption caused by the COVID-19 pandemic, Council has decided that 2020 should be discounted when calculating the years of full-time experience.

The candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of: (i) a statement of when the PhD was awarded; (ii) a two-page career summary (font-size 12); (iii) a list of ten papers that demonstrate significance and breadth of research. The two-page career summary should outline significant contribution to the science in terms of research and also other activities such as outreach, teaching, mentoring and administration. We are looking for evidence of significance of research with clearly identified achievements and breakthroughs. If a candidate has taken time out from their professional career for family or other purposes this should be highlighted. Nominations must be compiled into a PDF file of less than 10 MB and uploaded via the webpage before the deadline.

The award will be considered by Council at its May meeting and awardees will be invited to a ceremony at the Annual Meeting in December. Awards will also be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to not make an award in any particular year.

Nominations are invited by **31st March** each year.

Hodson Award

The Hodson Award is conferred on a palaeontologist who has had no more than ten 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 science. Please note that, in recognition of the disruption caused by the COVID-19 pandemic, Council has decided that 2020 should be discounted when calculating the years of full-time experience.



The candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of: (i) a statement of when the PhD was awarded; (ii) a two-page career summary (font-size 12); (iii) a list of ten papers that demonstrate significance and breadth of research. The two-page career summary should provide evidence of outstanding contribution in career so far. If a candidate has taken time out from their professional career for family or other purposes this should be highlighted. Nominations must be compiled into a PDF file of less than 10 MB and uploaded via the webpage before the deadline.

Nominations will be considered by Council at its May meeting and awardees will be invited to a ceremony at the Annual Meeting in December. Awards will also be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to not make an award in any particular year.

Nominations are invited by **31st March** each year.

Mary Anning Award

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 candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of: (i) a statement confirming that the nominee is NOT professionally employed in palaeontology; (ii) a one-page career summary (font-size 12). The one-page career summary should outline the nominee's contribution to palaeontology. This should include details of the sorts of activities pertaining to development of fossil collections, curation, care and maintenance of fossil collections, publications relating to these fossil collections, evidence for outreach activities associated with these fossil collections. Nominations must be compiled into a PDF file of less than 10 MB and uploaded via the webpage before the deadline.

Nominations will be considered by Council at its May meeting. Awardees will be invited to a ceremony at the Annual Meeting in December, although the award may be presented at another time and place on request of the awardee. Awards will be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to not make an award in any particular year.

Nominations are invited by **31st March** each year.

Gertrude Elles Award

The Gertrude Elles Award is to promote high-quality public engagement in the field of palaeontology. The award is made by Council for high-quality, amateur or institutional, public engagement projects that promote the discipline. Nominated projects can include museum displays and exhibitions, outreach programmes to schools and/or communities, art/science collaborations, digital initiatives, or any other programme that falls broadly under the heading of public engagement with palaeontology.

Nominations must consist of a one-page supporting case (font-size 12) and a portfolio of up to four images. The supporting case must outline:

- the aims of the project
- the nature of the target audience



- the available budget and funding sources
- visitor/audience numbers
- the results of project evaluation to demonstrate the quality and effectiveness of the project
- links to any digital components
- mechanisms for obtaining feedback

Self-nominations are permitted, and the nominators (names and contact details required) and proposed recipients do not need to be members of the Association. Nominations will be considered relative to the scale of the institution and the available project budget. The supporting case and the portfolio of images must be compiled into a PDF file of less than 10 MB and uploaded via the webpage before the deadline.

The award will be considered by Council at its May meeting and winners will be invited to the award ceremony at the Annual Meeting in December. Awards will also be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right not to make an award in any particular year. Nominations are invited by **31st March** each year.

Honorary Life Membership

Honorary Life Membership recognizes individuals whom Council deems to have been significant benefactors and/or supporters of the Association. Recipients will receive free membership for life. The candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of a one-page statement (font-size 12) outlining the nature of their support for the Palaeontological Association. This should be uploaded via the webpage before the deadline. The award will be considered by Council at its May meeting and announced at the AGM. The award will also be announced in the *Newsletter*, on the Association website and through social media. Nominations are invited by **31st March** each year.

Annual Meeting President's Prize and Council Poster Prize

The President's Prize is awarded for the best talk and the Council Poster Prize is awarded for the best poster at the Annual Meeting. All student members of the Palaeontological 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), excluding periods of parental or other leave, are eligible for consideration for this award. Individuals may nominate themselves for consideration when submitting abstracts for the Meeting. The prize is announced immediately after the oral sessions at the end of the Annual Meeting. Winners will receive an official certificate and free membership to the Association for one year.

Best Paper Awards

The aim of these awards is to recognize papers published in either *Palaeontology* or *Papers in Palaeontology* and reward excellence in our field of science. The selection criteria are as follows: scientific breadth and impact; novelty of approach; and quality of writing and illustration. The awards are open to all authors irrespective of age and nationality; membership of the Association is not required. Frontiers reviews, rapid communications and regular research articles are all eligible.



The selection procedure is that a list of all papers published in the year will be drawn up in October (when papers for the final part are allocated) and circulated around the science editors. The science editors are asked to nominate any paper that stands out, providing 2–3 sentences explaining why it is deserving. The Editor-in-Chief will draw up a shortlist of no more than five papers with supporting statements to circulate to the Editorial Board. The Editorial Board will then select winners by vote. Corresponding authors of winning papers will be offered 'Gold open access' paid for by the Association for one nominated paper submitted to *Palaeontology/Papers in Palaeontology* within the following 18 months (and subsequently accepted). In the case of joint authorship papers, the corresponding author can, by agreement, transfer the prize to one of the co-authors. The Editor-in-Chief will contact the winning authors and write short synopses for the *Newsletter*. An announcement of the awards will also be made at the AGM.

Undergraduate Prize Scheme

The Undergraduate Prize Scheme annually invites all university departments where a palaeontology course or module is taught after the first year as part of a degree programme to recommend one of their undergraduate students to receive this award. The award consists of a certificate and free membership of the Association for the rest of the year in question, plus the following calendar year. It provides electronic access to both of our journals, postal copies of the *Newsletter*, and all the other advantages of membership. Receipt of the award also looks good on a recipient's CV.

Departments may use any criterion for selection, though most prefer to use the scheme as an acknowledgement of best performance in a relevant exam or project. Only one nomination will be accepted from any one institution in each calendar year. The nominee must be an undergraduate student, not a postgraduate, when they are selected. Normally the award is made to a student in their penultimate year of study, but a final-year candidate may be chosen if this is deemed more appropriate for the department in question.

E-mail <executive@palass.org> with the nomination (name and e-mail address) and we will arrange to sign up the student as a member and send them a certificate. There is no deadline for this award.

Innovations in Palaeontology Lecture Series and the PalAss Exceptional Lecturer

The Innovations in Palaeontology Lecture Series, to be given by the PalAss Exceptional Lecturer, aims to promote palaeontology to the wider academic community and to recognize excellence in research among palaeontologists. The PalAss Exceptional Lecturer is selected in a competitive process. This scheme aims to:

- improve the dissemination of cutting-edge palaeontological research to the broader academic community;
- raise the profile of palaeontology within the Earth sciences and related fields;
- recognize outstanding research and science communication in palaeontology among members of the Association.



Format of the scheme:

- One PalAss Exceptional Lecturer will be selected each year in a competitive process.
- The PalAss Exceptional Lecturer will be expected to give five lectures at five different institutions over a nine-month period.
- The successful applicant will receive the Innovations in Palaeontology Lecture Series Grant, which will be administered by the home institution of the PalAss Exceptional Lecturer.
- The Innovations in Palaeontology Lecture Series Grant may only be used to pay the reasonable travel costs incurred by the PalAss Exceptional Lecturer to visit each of the host institutions (up to £2,000 for the total Innovations in Palaeontology Lecture Series with a maximum of £500 for any individual lecture). The host institutions will cover costs for accommodation (where necessary) and hospitality.
- Any academic institution (universities and/or museums) from any country can apply to participate in the Innovations in Palaeontology Lecture Series as a host institution.
- Any unused funds must be returned to PalAss after delivery of the final lecture. Should the PalAss Exceptional Lecturer move institutions within the timeframe of the lecture series, any unspent funds must remain available to the PalAss Exceptional Lecturer.
- Applications to be a PalAss Exceptional Lecturer will be strengthened if the applicant agrees to submit a paper as a review article for possible publication in *Palaeontology*.

Eligibility and selection process of the PalAss Exceptional Lecturer:

- Eligible candidates will have a PhD in palaeontology or a related field.
- Applicants can reside in any country, but must be members of the Association.
- Candidates must self-nominate.
- To self-nominate, a two-page CV, full list of publications, and statement of motivation (max. 300 words) must be submitted via the Association's webpage as a single PDF file (max. 8 MB). In addition, a 60 second video summary (in MP4 format; max. size 30 MB) of a proposed seminar topic must be submitted via the Association's webpage.
- The PalAss Exceptional Lecturer will be chosen based on the career track record, including research impact (relative to their career stage) and oratorical skills.

Selection of host institutions:

- Institutions interested in participating in the Innovations in Palaeontology Lecture Series should apply via the PalAss webpage and suggest a timeframe within which the lecture should be given.
- The PalAss Exceptional Lecturer will receive the list of potential host institutions after the 1st May deadline, and will choose their preferred hosts and liaise directly with them. Applications after 1st May will be considered depending on the remaining availability.

Expectations for host institutions:

- Each lecture must be widely advertised across the host institution. We particularly encourage advertisement of the Innovations in Palaeontology Lecture Series on social media.
- Host institutions are expected to pay for hospitality and offer a meal in a social environment to the PalAss Exceptional Lecturer.



- If the PalAss Exceptional Lecturer has to travel more than three hours to the host institution or cannot return home at a reasonable time, the host institution must offer at least one night of accommodation.

Deadlines each year:

- 1st November: Deadline for nominations for the PalAss Exceptional Lecturer.
- December: The PalAss Exceptional Lecturer will be announced at the Annual Meeting.
- March: The call for host institutions to participate in the Innovations in Palaeontology Lecture Series will be published in the *Newsletter*.
- 1st May: Deadline for applications from host institutions.
- September – May: Delivery of lectures.

GRANTS

Palaeontological Association grants are offered to encourage research, education and outreach through different means. Undergraduates, early-stage researchers, and otherwise unfunded persons are given special encouragement 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 (<<https://www.palass.org/awards-grants>>). Those with deadlines in the next six months or that run throughout the year are detailed below.

Grants-in-aid: meetings, workshops and short courses

The Association is happy to receive applications for grants from the organizers of scientific meetings, workshops and short courses that lie conformably with its charitable purpose, which is to promote research in palaeontology and its allied sciences.

NEW: The Association will, via the Grants-in-Aid programme, consider applications to financially support workshops to be held as part of the Annual Meeting and Progressive Palaeontology. Further details on this are below.

General Regulations for all applications.

- The Association will consider applications up to £2,000 GBP.
- Applications must be received by the deadline of either **1st March** or **1st September** each year.
- Application must be made in good time. The proposed event must commence no earlier than six months after the application round deadline applied to.
- All applications are to be made by the scientific organizer(s) of the meeting using the online application form at <<https://palass.org/awards-grants/grants/grant-aid-application-form>>.
- Applications will be considered by Council at either the May or the October Council Meeting each year.
- Applicants will normally be informed of the application outcome by the end of May or October (*i.e.* 2-3 weeks after the May or October Council meeting).



- If the application is successful, we require that the support of the Association is acknowledged, preferably including reproduction of the Association's logo, in the meeting/workshop/short course literature and other media.
- Any monies granted must only be used for the specified purposes stated in the original grant application. Should circumstances change and the monies cannot be used then it is expected that all unspent amount is returned to the Association.
- Retrospective changes to grant applications, *i.e.* after the proposed event, are not allowed.
- In the event of unforeseen changes in circumstances prior to the start of the proposed event (*e.g.* due to the COVID pandemic, illness of keynote speakers, *etc.*) advice should be sought from the Association's Executive Officer and/or the Secretary.

Presubmission enquiries may be made to the Secretary (e-mail <secretary@palass.org>).

Financial support via the Grants-in-Aid programme for workshops at the Annual Meeting and Progressive Palaeontology

Workshops have been an important part of both the Annual Meeting and Progressive Palaeontology in recent years. These have typically been held the day before the meeting.

The workshops are arranged in consultation with the local meeting organizer; the local organizer having the final decision as to how many and which events to select for inclusion in any workshop programme. It may be possible (subject to the local organizer being able to facilitate it) to arrange a hybrid event. Our preference, however, is to run the workshop as either an in-person or a virtual event. We especially welcome suggestions for workshops that help the Association advance its commitments to EDI-related issues.

We invite those organizing workshops at either the Annual Meeting or Progressive Palaeontology to apply for competitive funding via the Grants-in-Aid programme to help offset costs (*e.g.* travel, accommodation) incurred by those delivering the workshop, and/or to provide an honorarium (to a maximum of £250.00 GBP) for contributors. An honorarium may be appropriate to support ECR/precariously-employed workers, others not in full-time, permanent employment, or where the contributions are by subject specialists on topics that do not necessarily form part of their core research activities. These examples are not exhaustive.

Before applying for funding, please liaise with the local meeting organizer and secure their support for the proposed activities. You should confirm in your application that this support is in place. This is to avoid potential issues such as there not being the infrastructure available locally (rooms, *etc.*), or time in the schedule, to accommodate the workshop.

The Association would support a maximum of two workshops at each of the Annual Meeting and Progressive Palaeontology.

Making an application for meeting or workshop/short course support

Applications must be made through the online submission form, for which you will need the following information:

- Title of meeting / workshop / short course
- Date and Place of proposed event



- Name, position and affiliation of the organizer(s)
- Brief description (not more than ten lines) of the rationale behind the meeting / workshop / short course
- Anticipated number of attendees
- Amount requested
- Other sources of funding applied for
- Specific use to which requested funds will be put

Note 1: If funds are requested to support one or more keynote speakers, then full details of their names, affiliations and titles of presentations must be included.

Note 2: The application will be strengthened if the keynote speaker(s) agrees to submit their paper as a review article for possible publication in *Palaeontology* or *Papers in Palaeontology*.

Deadlines are **1st March** (for events commencing on or after 1st September in the same year) and **1st September** (for events commencing on or after 1st March the following year).

Research Grants

Awards are made to assist palaeontological research up to a maximum value of £10,000 GBP per award. Normally, grants must support a single research project, or a 'proof of concept' proposal with an aim of supporting future applications to national research funding bodies. Field-based projects are also eligible, but the scientific objectives and outcomes of the research must be made clear.

Applications for investigator's salary costs will only be considered in exceptional circumstances and if awarded all legal and financial liability will lie with the applicant.

Other conditions

Preference is given to applications for a single purpose (rather than top-ups of other grant applications). Applicants must be members of the Association and will normally have a PhD and a successful track record as an independent scientific investigator. Current PhD students (*i.e.* those who have not yet been awarded a PhD by the application deadline) are not eligible for this scheme and instead should consider the Small Grants Scheme.

Preference will normally be given to candidates who have not previously won an award. Proposals must fit with the charitable aims of the Association.

Proposals will be ranked on the following criteria:

- Scientific quality of research, novelty and timeliness, likely outputs
- Feasibility
- Value for money and cost effectiveness
- The scientific track record of the investigator

At the end of the award period a final report (including receipted accounts) will be submitted for review by the Trustees or, where appropriate, external referees. This final report will also be printed in the *Newsletter*. Awardees are asked to prioritize the Association's meetings and publications as media for conveying the research results.



Applications must be submitted electronically through the PalAss website, with a deadline of **1st March**. Enquiries may be made to the Secretary (e-mail <secretary@palass.org>).

Successful applications will be reported at the May Council meeting, and funds will normally be available from 1st June. The awards will be announced at the AGM. Feedback on unsuccessful applications will be provided by the Secretary upon request.

Undergraduate Research Bursaries

The Palaeontological Association Undergraduate Research Bursaries are aimed at giving undergraduate students the opportunity to acquire research skills and experience that will significantly transform their academic career. The bursaries will support projects co-designed by students and their supervisor(s) that give students registered for an undergraduate degree their first experience of undertaking a palaeontological research project; students and supervisors from all countries are encouraged to apply. The bursaries provide a stipend for the student for up to eight weeks. The scheme is not intended to fund students to undertake routine work for the supervisor(s) and the Association expects the supervisor(s) to provide significant personal mentoring of successful student applicants. Proposals will be assessed as to whether they meet expected standards, and then awarded via an anonymised lottery system, with students from under-represented groups given priority.

- Applications from any country and applicants of any nationality are encouraged to apply.
- The principal supervisor must be an academic member of staff in the same institution as the student, or in a closely related institution such as a museum, as they can give significant career advice and take ultimate responsibility for the student researcher. It is permissible for the student to opt to work in an institution more convenient for their home town in order to remove any cost barriers, but in this case the academic member of staff must be clear in the application that the insurance implications have been considered and agreed by the host institution where the student will actually do the work. The supervisor is also responsible for verifying that the student is registered at the institution stated on the application form.
- The principal supervisor must be a member of the Association at the time the application is received. Supervisors and students applying for the first time who are not members of the Association (and have not been members in the past) can receive free membership for one year and must apply for membership before the application has been submitted. Supervisors and students are requested to contact the Executive Officer for information regarding this.
- If the principal supervisor is on a fixed-term contract, then this contract must extend beyond the proposed end date of the project.
- PhD students and postdoctoral researchers in the same, or a closely related, research institution may be named as additional supervisors and share in the training and supervision of the student, thus enhancing the quality of the research experience for the student.

Further information, including eligibility criteria for supervisors and students, details of the prioritization scheme and lottery system, and a full list of terms and conditions for the Undergraduate Research Bursaries scheme can be found on the appropriate page of the Association's website. Enquiries may be made to the Secretary (e-mail <secretary@palass.org>).



The deadline is **1st February** each year. Successful applicants will be notified by the end of March and funds will normally be available from 1st June. A full list of awards will be announced at the AGM.

Postgraduate Travel Fund

Financial assistance is offered to postgraduate students who are members of the Association to attend international meetings that are not directly supported by the Association through the Grants-in-Aid scheme. A list of directly-sponsored meetings is given below. The funding is only intended for conferences that are explicitly scientific in nature.

Terms and Conditions

Please read the following notes before applying:

1. The award is specifically for travel.
2. Applicants must be delivering a presentation (poster or oral) that falls within the scope of the Association's charitable aims.
3. The maximum amount awarded will be £200 GBP.
4. Successful awards will be paid retrospectively on the submission of receipts for reasonable travel costs.
5. Applications must be made online no later than two months prior to the beginning of the conference.
6. The total fund and number of awards will be at the discretion of Council.
7. Only one travel grant will be awarded per applicant per year, but subsequent applications can be made.
8. Applications are to be made through the Association website, and should include the personal details of the applicant and their career stage, the title of the accepted abstract, and details of other funding obtained towards the cost of the meeting. Two letters must also be attached, in PDF format: a letter of confirmation from the meeting convenor which states the acceptance of the applicant's abstract, and a short status-confirming letter from the applicant's supervisor.
9. Funding from the Association must be acknowledged on your poster or in your presentation.

Directly-sponsored meetings (NOT eligible for the Postgraduate Travel Fund):

- The Palaeontological Association's Annual Meetings.
- Progressive Palaeontology.
- Lyell Meetings.
- Any other meetings that have been awarded funds to support student attendance from the Association's Grants-in-Aid scheme.

There is **no deadline** for this fund. Enquiries should be made to the Meetings Coordinator (e-mail <meetings@palass.org>).



ASSOCIATION MEETINGS



67th Annual Meeting of the Palaeontological Association
University of Cambridge, UK 11 – 15 September 2023

The 67th Annual Meeting of the Palaeontological Association will be held at the University of Cambridge, one of the oldest universities in the world. The organizing committee is chaired by Dr Alex Liu, with help from other members of the University of Cambridge Departments of Earth Sciences, Zoology and Archaeology; the Sedgwick Museum of Earth Sciences; the Zoology Museum; the British Antarctic Survey; and CASP. The e-mail address for all matters relating to the Meeting is <annualmeeting2023@palass.org>.



Outline conference programme

We will be inviting abstract submissions for oral and poster presentations for the Meeting. Scientific sessions will take place in the West Road Concert Hall and the adjacent Faculty of Law lecture theatres. The Meeting will begin with an Early Career Researcher event on the afternoon of Monday 11th September. Workshops and museum collection visits, allowing delegates to view fossil material housed at the partner institutions listed above, will be available on the morning of Tuesday 12th September, while the Symposium topic that afternoon will be “Ecosystem Engineering through Deep Time” (see box on next page). An icebreaker reception will be held in the Sedgwick Museum of Earth Sciences on Tuesday 12th September. The Annual Address on Wednesday 13th September will be followed by the Annual Dinner, which will be held in the beautiful setting of Girton College, the UK’s oldest residential institution to offer higher education to women. A post-conference field-trip on Friday 15th September will visit the Pliocene Red Crag and Eocene London Clay of Bawdsey in Suffolk. We look forward to providing more information in future announcements.

Registration, booking and abstract submission will commence in April 2023. Abstract submission will close in June (date to be confirmed) and abstracts submitted after the closing date will not be considered. Registration after that date will incur an additional administration charge, with the final deadline for registration in late August 2023. We will circulate information to members as more details are known, both via e-mail and in the next *Newsletter*. Information will also be made available on the Association website at <www.palass.org>.



Please make note of the new Symposium format, and opportunities to contribute. Rather than limiting presentations solely to invited speakers, the 'Ecosystem Engineering through Deep Time' Symposium will include two different categories of contribution: on the one hand four keynote lectures outlining the concepts, applications and current state-of-the-art research; and on the other, up to eight 15-minute presentations reporting on active developments in the field. Importantly, this latter category will be open to anyone interested in taking their research in the 'ecosystem engineering' direction. Applications will be through self-nomination during the usual call for abstracts. The reason for this early notification is to allow time for the development of ideas and possibilities. Each abstract selected for the symposium will receive a monetary contribution towards the costs of travel and accommodation, as well as covering the registration costs for the full meeting. The proceedings of the symposium will be published in a thematic issue in Volume 67 of *Palaeontology*.



Progressive Palaeontology

University of Liverpool, UK 1 – 3 June 2023

In 2023, the 40th edition of Progressive Palaeontology (ProgPal) will be held at the University of Liverpool; the meeting will be organized and run by research students Matthew Dempsey, Samuel Cross and Amber Wood-Bailey.

ProgPal is an annual conference for postgraduate research students who wish to present their results at any stage of their research (undergraduate students in their final year who are intending to start a postgraduate course later that calendar year are also welcome to attend). All aspects and areas of palaeontology are welcomed, and abstracts can be submitted for either oral or poster presentations.

ProgPal provides a framework for developing palaeontologists in which to present ideas and discuss their work amongst peers, and in 2023 will be augmented by workshops and social events. The organizers will also be leading a field-trip to the spectacular Carboniferous limestone pavements and quarries of Llandudno's Great Orme.

The e-mail address for all matters relating to ProgPal is <progpal2023@palass.org>. More information regarding registration and other details will be available soon via the Association's website (<www.palass.org>) and on Twitter @ProgPal2023.





How much for a dinosaur?

A series of dinosaur fossil auctions took place in 2022, drawing attention towards the issue of fossil trade. A 77-million-year-old *Gorgosaurus* skeleton was sold for more than 6 million dollars. A *Deinonychus* was sold for 12.4 million dollars, while *Stan*, a very well-preserved specimen of *Tyrannosaurus rex*, was sold for 31.8 million dollars.

Dinosaurs and more in general fossil trading is nothing new. Dinosaurs came to the attention of scientists and the general public in the nineteenth century, and since the beginning they were treated like all the other valuables that can be found digging in the ground. Like gems or minerals. All museums acquired fossils by buying them from fossil traders, often using the money donated by wealthy patrons. This trend declined towards the end of the nineteenth century for three main reasons.

The first reason was the scientists advocating for so-called ‘pure science’. A vision in which knowledge should have been pursued for the sake of knowledge itself, leaving money for more mundane and less noble business. Like trading. Dinosaurs and other fossils shouldn’t be considered like mere objects that could have been sold and bought like coal or silver.

On the other end, the wealthy people donating fossils to the museums didn’t want to be associated with trading any more. They wanted to detach themselves from the portrait of the average capitalist who thinks that everything has a price.

The third reason is the risk of forgery. It happened more than once that some ‘new species’ of dinosaur was only a collage of different pieces that fossil traders put together to sell them at a higher price. It is the case of the *Archaeoraptor*, a “missing link” between dinosaurs and birds that never existed. It was just a combination of different pieces of several dinosaur species.

Since the nineteenth century, very little has changed. Most palaeontologists still oppose the practice of fossil trading. Their reasons are the same as their colleagues favoured in the nineteenth century. Specimens should be available for public examination to be proven true. On the other hand, commercial fossil hunters point out that there are too many fossils and not enough palaeontologists to dig them up before they are destroyed by the elements.

Dinosaurs have always been popular among both palaeontologists and the general public, and their charm does not seem to be diminishing. That is why fossil trading intensified recently, re-opening a debate that never really closed, enduring since Richard Owen described the biological category of Dinosauria.

A more in-depth analysis of the topic can be found in the article “Do multimillion-dollar dinosaur auctions erode trust in science?” by Lukas Rieppel and in his book *Assembling the Dinosaur: Fossil Hunters, Tycoons, and the Making of a Spectacle*. If you want to share thoughts or information on this issue, we will be happy to hear from you! You can drop us a message via our social media or send an e-mail to <publicity@palass.com>.

Nicola Vuolo

Publicity Officer



BIBLIOGRAPHY

- BATYCKA, D. 2022. Dino-mania shows no sign of extinction as Sotheby's offers a rare *Gorgosaurus* skeleton estimated up to \$8 million. *Artnet*, <<https://news.artnet.com/market/sothebys-gorgosaurus-skeleton-8-million-2142470>>.
- GOLDSTEIN, C. 2022. Christie's auctioned off a *Velociraptor* skeleton for \$12.4 million, eviscerating its \$6 million estimate. *Artnet*, <<https://news.artnet.com/art-world/dinosaur-skeleton-christies-2114482>>.
- GRESHKO, M. 2022. Stan the *T. rex* found! World's most expensive fossil finds home in a new museum. *National Geographic*, <<https://www.nationalgeographic.com/science/article/stan-the-t-rex-found-worlds-most-expensive-fossil-finds-home-in-a-new-museum>>.
- RIEPEL, L. 2019. *Assembling the Dinosaur: Fossil Hunters, Tycoons, and the Making of a Spectacle*, Harvard University Press, 336pp.
- RIEPEL, L. 2022. Do multimillion-dollar dinosaur auctions erode trust in science? *The conversation*, <<https://theconversation.com/do-multimillion-dollar-dinosaur-auctions-erode-trust-in-science-189855>>.



About Ubirajara, colonialism and social media

Ubirajara jubatus is a little feathered dinosaur from the Cretaceous of Brazil. It may be small, but the *querelle* that was generated around this tiny fossil was huge.

The case exploded in 2020, when the fossil was described in a scientific paper. *Ubirajara jubatus* is a unique species, characterized by a series of spear-like feathers that were probably used in displays like modern birds do – to show their social status or to mate. This is the reason why it was named *Ubirajara*, which means “lord of the spear” in Bazil’s Tupi language.



When the paper was published, the fossil resided in Germany's State Museum of Natural History Karlsruhe. Concerns were immediately raised on the fossil's export from Brazil being unethical and possibly illegal.

Despite the wave of protests that asked the fossil be returned to Brazil, the Museum of Natural History in Karlsruhe firstly refused to give it back. In fact, the Museum claimed that the specimen had been legally acquired – before the international convention establishing the return of artefacts entered into force. In fact, a 2016 German law recommends that all material brought into the country before 26th April 2007 is considered legalized in the country. On the other hand, according to Brazilian law, fossils cannot remain permanently outside the country.

The Brazilian palaeontological community fought back the decision of the Museum, starting a campaign to raise awareness of the situation of *Ubirajara jubatus*. A main role in this campaign was played by social media, in particular Twitter. The hashtag #UbirajaraBelongstoBR went viral, reverberating outside the Brazilian palaeontological community and gaining international attention.

Under the hashtag #UbirajaraBelongstoBR there are contributions from palaeontologists, palaeoartists and fossil lovers – from an artistic reconstruction of the dinosaur with a Brazilian flag in the background to infographics explaining the *Ubirajara* issue. The hashtag was also used in the comments under the Museum's social media channels and the movement that wanted to bring back *Ubirajara* to Brazil became bigger and bigger. The global protest movement lasted for a year and a half, until the German Museum finally replied.



Image © valent801.

Ubirajara jubatus will be sent back home, to Brazil. The decision was made by the Council of Ministers of the Baden-Württemberg region where the Museum is based, following the request made by the Minister of Science, Theresia Bauer.

The *Ubirajara jubatus* story had a happy ending. However it isn't the only controversial fossil held in museums that do not seem happy to return them to where they belong. Colonialism is an issue that is deep-rooted in science and palaeontology is no exception. For example, a study from 2021



by Raja *et al.* pointed out that 97 % of the data in a key palaeontology database were entered by scientists from middle to upper income countries. Another study from 2021 highlighted several examples of palaeontological colonialism from publications on Jurassic–Cretaceous fossils from northeast Mexico and northeast Brazil. These publications have no fieldwork or export permit declarations and there are no local experts among authorships.

It is clear that something has to change in our approach to science. What are your thoughts on *Ubirajara jubatus* and other colonialism issues? Do you think that the movement asking for *Ubirajara* to be returned to Brazil would have achieved its goal without the social media sounding board?

If you'd like to share your thoughts please send an e-mail to <publicity@palass.org> or message via our social media, on Twitter and Facebook.

Nicola Vuolo

Publicity Officer

BIBLIOGRAPHY

CISNEROS, J. C. *et al.* 2022. Digging deeper into colonial palaeontological practices in modern day Mexico and Brazil. *Royal Society Open Science*, **9**, 210898.

GRESHKO, M. 2022. Unique 'spear lord' dinosaur to be returned to Brazil. *National Geographic*. <<https://www.nationalgeographic.com/science/article/unique-spear-lord-dinosaur-to-be-returned-to-brazil/>>.

MARCELO, J. 2022. German museum refuses to return dinosaur fossil irregularly taken from Brazil. *DIRE* <<https://www.dire.it/15-09-2021/667786-german-museum-refuses-to-return-dinosaur-fossil-irregularly-taken-from-brazil/>>.

MIRANDA, G. (translated by FREELON, K.) 2022. German museum will have to return dinosaur fossil to Brazil. *Folha de S. Paulo*. <<https://www1.folha.uol.com.br/internacional/en/scienceandhealth/2022/07/german-museum-will-have-to-return-dinosaur-fossil-to-brazil.shtml>>.

RAJA, N.B. *et al.* 2022. Colonial history and global economics distort our understanding of deep-time biodiversity. *Nature Ecology & Evolution* **6**, 145–154.

Neanderthals, Denisovans and Nobel prizes

You've probably been asked the question "What is palaeontology useful for?"

The list of answers is very long, and since this October it is even longer thanks to **Prof. Svante Pääbo**. He is one of the fathers of palaeogenetics, the discipline that applies genetics to prehistoric human remains to answer archaeological and paleontological questions. And he won the 2022 Nobel Prize for Physiology or Medicine.

He earned his Nobel Prize for his discoveries concerning the genomes of extinct hominins and human evolution – in particular, the sequencing of the Neanderthal genome, a task that was considered impossible. Prof. Pääbo also discovered a new species of hominin from Denisova and



found that gene transfer had occurred from Neanderthals and Denisovans to *Homo sapiens* following the migration out of Africa around 70,000 years ago.

Even though this gene flow event happened long ago, it still has implications for modern human physiology, affecting our immune system reaction to infections.

Before Prof. Pääbo's work, the genetic differences between *Homo sapiens* and our closest extinct relatives were unknown. As the Nobel Prize press release stated, the ongoing research focusing on analysing these differences and their functional implications have “the ultimate goal of explaining what makes us uniquely human”.



Professor Svante Pääbo. Image © Nobel Prize Outreach. Illustration: Niklas Elmehed.

Nicola Vuolo

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BIBLIOGRAPHY

2022. *Nobel prize press release*. <<https://www.nobelprize.org/prizes/medicine/2022/press-release/>>.

‘Plesiosaurus’ macrocephalus: *the image on the Newsletter’s spine*

With the previous issue of the *Palaeontology Newsletter*, no. 110, the final flipper of ‘*Plesiosaurus*’ *macrocephalus* completed the image used on the Newsletter’s spines that began with issue 95 in 2017. This iconic plesiosaur skeleton was discovered by Mary Anning in Lyme Regis in December 1830. Regarded as her last major discovery, it was first figured under the name “*Plesiosaurus macrocephalus*” by William Buckland in 1836, and later described by Richard Owen in 1840. The fossil was originally purchased by Lord Cole in 1831. It was subsequently acquired from him by the Natural History Museum, London, where it has remained on display in the Museum’s ‘Fossil Marine Reptiles’ hall under the number NHMUK PV R 1336.

The skeleton has a proportionally large head and small flippers, poorly ossified limb bones and vertebrae, and a small overall body size. These characters suggest the individual was immature. ‘*Plesiosaurus*’ *macrocephalus* certainly does not belong to the long-necked, small-skulled genus *Plesiosaurus*. It is probably a juvenile rhomaleosaurid but has not yet been assigned to a new or existing genus.

Adam S. Smith

Nottingham Natural History Museum, Wollaton Hall, UK



Spine image 'Plesiosaurus' macrocephalus Buckland, (NHMUK PV R 1336) collected from the Lower Lias at Lyme Regis, UK, by Mary Anning. Figured by Ellis Jones.

Is there some news that you think belongs to **Palaeontology in the News**, that you would like to see included in the **Newsletter**? Let us know by e-mailing Nick at [<publicity@palass.org>](mailto:publicity@palass.org), sending a link to the news and explaining why it should be included in the 'News' section.

news



A Palaeontologist Abroad

Highlighting early-career researchers who have taken posts outside their home country and the opportunities they used. This issue's palaeontologists are Melanie During, Jorge Domingo Carrillo Briceño and Kenneth De Baets.

Melanie During is a Dutch PhD student in Sweden, at the Department of Evolutionary Biology at Uppsala University.



Melanie During pointing to high bone cell density. Photo courtesy of M. During.

Q1: How did you end up in Sweden?

When I was on the hunt for a PhD position, my partner Dennis Voeten was on the hunt for a postdoc. Not that there were many institutions looking for both a postdoc and a PhD. When Dennis received the opportunity to start a postdoc in Uppsala, I reached out to the head of the programme. Professor Per Ahlberg was not only very understanding, but he also apparently saw potential and hired me as a segmentation assistant. Per and I subsequently joined forces and applied for a grant with the Swedish Research Council – and we were lucky!

Q2: How is your position funded?

My PhD is funded by the Swedish Research Council.

**Q3: What is your project about?**

My PhD is focused on the application of synchrotron tomography and deep learning as tools for investigating events in the life histories and evolution of lower vertebrates.

These events include the fish–tetrapod transition on the basis of morphology and events in ordinary time, such as growth, seasonality and mass-death occurrences. These two kinds of events occur together as well since, for instance, the Hangenberg crisis punctuated the origin of tetrapods.

Q4: What has been the biggest challenge for you living in Sweden?

I would say the biggest challenge is raising our child. This is, however, also the best thing. The challenge is having a little one who grows up incredibly far away from the rest of my family. They see him a couple of times a year whenever we fly back to the Netherlands, but babysitting is not an option. Furthermore, visits home feel like a road trip from family members to family members, leaving me exhausted at the end of a “vacation”.

Q5: What is the best thing for you about living in Sweden?

Childcare! Dennis and I could take over a year off to take care of our little one. Not only is this a standard here in Sweden, but also absolutely every colleague here expects you to take this time. There was no one demanding a quick return to work. After that, he could go to preschool full time. I now work full time and my little one is playing with paint and plants and learning to share and speak shockingly good Swedish. To my knowledge, there are very few countries where everything is organized so well.

Q6: Apart from friends and family, what do you miss most about The Netherlands?

Soil? Yes, I miss soil. The thing is: we live on top of granite boulders here and I like to garden a little bit. Every plant I want to put in the ground first needs to be supplied with soil, making it quite an expensive endeavour. That and affordable beer of course.

Q7: What role does the Swedish language play in your academic and private life? Has the language been a challenge and how did you go about it?

Generally speaking, everyone speaks English at the office and most Swedes speak English quite well. I did take a Swedish language course that was offered at the University, which I mostly use at my son’s preschool and with some of my more elderly neighbours.

Q8: What was the biggest benefit of your move abroad? And what was the biggest sacrifice?

The biggest benefit I would say is being able to study these amazing fossils with these absolutely amazing techniques in a very supportive and collegial department.

The biggest sacrifice is not being able to go on a quick fossil hunt, like I used to frequently do. I can’t just drive an hour or two to the Dutch coast and look for bones of Pleistocene megafauna, or to my favourite place in the Netherlands to excavate the bones of sauropterygians in the Muschelkalk quarry of Winterswijk.

Q9: What was your experience with DEI (Diversity, Equity, Inclusion) aspects in Sweden? We are curious about your personal experience as well as observations on policies and attitudes.

I find this quite hard to answer. As a woman I am certainly not a minority at our department and, as I mentioned earlier, Swedish childcare is so good that it is common for mothers to work full time. One of the running jokes in our department is that instead of looking for future staff members, we are making them ourselves. Although this may sound like they do not look outside



for new candidates, this is merely a joke about how welcoming they are to employees having children. Honestly, the majority of the colleagues in our department are not Swedish. And no, none of the babies have been hired so far.

We are frequently offered surveys that anonymously record cases of harassment, but also how welcoming, comfortable and happy staff members are. Subsequently, we receive invitations to participate in courses that help us recognize DEI improvement points. However, since the majority of my PhD has taken place during COVID-19, I find it hard to judge whether these policies are good and whether they accommodate everyone equally.

Melanie During tweets at @MelanieDuring and releases videos at <<https://www.youtube.com/genuinerockstars>>, where she interviews other scientists.

Jorge Domingo Carrillo Briceño is Venezuelan and a tenured research associate in the ‘Evolutionary Morphology and Paleobiology’ Group led by Marcelo Sánchez-Villagra at the Paleontological Institute and Museum of the University of Zurich, Switzerland. He was born in 1978 in a small city called Trujillo in the Andes. He graduated as a geographer from the Universidad de los Andes, Mérida, Venezuela, in 2008 and continued with a Magister degree in Oceanography in the Universidad de Valparaíso, Chile, in 2011. In 2016 he received his doctorate at the Paleontological Institute and Museum of the University of Zurich.



Photo: Marcelo Sánchez-Villagra.

Q1: How did you end up in Switzerland?

I had worked for some years with the person who became my advisor and his team in the field in Venezuela and helped with student excursions there. My engagement and our good collaboration resulted first in support in improving my English skills and eventually in me starting the PhD programme in Zurich in 2013. My research is exploratory; it involves fieldwork and concerns taxonomy and fundamental basic data – skills that are being gradually lost. This kind of research being fundamental in my host lab made me useful and desirable as a long-term hire.

Q2: How is your position funded?

My position is mostly funded by the budget of my research group provided by the University of Zurich (50%) and the rest by fluctuating monies generated by research grants obtained in our research group.

Q3: What is your project about?

My main project is focused on the evolution of aquatic ecosystems of the Neotropics in ‘Deep Time’, especially freshwater fishes. I am very interested in how geological and hydrographic events influenced the origin of today’s fish fauna and what the fossil record can tell us about it. I am also interested in human–megafauna interactions during the Late Pleistocene and early Holocene in the Americas. I am currently supporting several projects related to excavations and dating of some archaeological sites and in curatorial and faunal diversity work on megafaunas. Our institute is also a museum in part and I enjoy the curatorial aspect of my work and the diversity of challenges we confront dealing with a collection.

**Q4: What has been the biggest challenge for you living in Switzerland?**

Possibly the cultural contrast and the local languages. However, from my personal experience, the key to prosper and be happy is to seek direct integration with the new society and culture in which you are living.

Q5: What is the best thing for you about living in Switzerland?

From an academic point of view, coming to study in Switzerland was a radical impulse that changed the course of my professional career. It was a great opportunity to direct my professional profile by training in an institution of high academic level, and especially under the supervision and collaboration of colleagues with an excellent ethical and professional level, who have served as an inspiration.

Personally, the opportunity to come to Switzerland changed my life in a positive way. For any human being, the challenge of changing lifestyles and integrating into a new culture can only be defined as personal growth.

Q6: Apart from friends and family, what do you miss most about Venezuela?

Something as simple as enjoying every day the natural wonders that a tropical region offers you.

Q7: What forms of support for an expat in your position have been the most helpful for you? What type of support did you miss most?

The most important thing about working at the University of Zurich is the great flexibility and support to adapt and grow that I have received for my research from the group led by Marcelo Sánchez-Villagra, including the trust to develop my own side projects and collaborations using my taxonomic expertise, as well as participation in international conferences for example.

Q8: What role does the language of Switzerland play in your academic and private life? Has the language been a challenge and how did you go about it?

In Switzerland there are four official languages (German, French, Italian and Romansh). I live in the region where German is spoken, Swiss German mostly. For more than ten years I have been developing and improving my English; luckily Zurich is very cosmopolitan and with this language alone it is possible to live and work without problems. However, to achieve further integration it is important to learn the local language, so since I became permanent I have made efforts to gradually learn German too.

Q9: What was the biggest benefit of your move abroad? And what was the biggest sacrifice?

As I mentioned before, the opportunity to experience integration with other cultures and languages, the growth of personal intellect, and especially the development of academic opportunities and a career, are some of the many advantages that can be obtained. My home country has experienced major difficulties in recent years and I could not have developed academically there as I did in Zurich.

Apart from Facebook which I use to promote our research, at the moment I do not use any other media.

Kenneth De Baets is a Belgian in Poland employed as assistant professor at the Institute of Evolutionary Biology, Faculty of Biology, University of Warsaw on IDUB funding. He did his PhD at the University of Zurich where he also met his wife. After that he was an SNF-Fellow with his own project at the University of Bristol and before arriving in Warsaw held an assistant professor/senior lecturer position at the Friedrich-Alexander-University Erlangen-Nürnberg in Erlangen, where their son was born.



Q1: How did you end up in Poland?

My previous position had no tenure options or perspectives. I saw the attractive opportunity to obtain funding to set up a large team to pursue a research agenda close to my heart. Although I applied in a very broad call, I was offered the position – a little bit to my surprise.

Q2: How is your position funded?

My position is funded through my project PARADIVE for three years pending successful mid-term evaluation by the IDUB I.3.4 Action of the Excellence Initiative – Research University Programme at the University of Warsaw, funded by the Ministry of Education and Science, Poland. It also covers the salaries of two postdoctoral researchers and one research/technical specialist as well as funding for equipment, analyses, conference travel and consumables. The programme is attractive, as such funding is only rarely offered to someone at my career stage and position in Germany.



Photo: Studioline Fotostudio Erlangen.

Q3: What is your project about?

My project is about better understanding the impact of extinction and environmental perturbations on parasitism in the fossil record. Also about using what we learn to better inform predictions of possible future change scenarios in relationship with biodiversity and climate change. For this purpose, we focus on sampling parasitic-induced pathologies in marine environments to eggs in terrestrial vertebrate coprolites and modelling those in relationship with host diversity around major extinction events or environmental changes.

Q4: What has been the biggest challenge for you living in Poland?

The biggest challenge has been the language. Although colleagues speak good English, I would argue that in everyday life, as well as in science outreach and administration, Polish is indispensable. Simple things like organizing appointments, insurance and paperwork suddenly become a big hurdle. Luckily, we have support from my amazing colleagues and the University Welcome Point and its volunteers, but it remains humbling not being fully independent. We also cannot imagine moving to a country and not learning the language. The University offers free courses, but they were difficult to unite with our busy schedule. Currently, my wife and I take two private classes a week to learn Polish and we try to use the things we have learned as much as possible in daily life (market, shopping, *etc.*). Our son has Polish lessons in school.

Q5: What is the best thing for you about living in Poland?

We live in a big city, but people take the time to help or talk. We live in a large apartment block and commonly take public transport, but it's less loud and people respect one another more than in Germany and other cities where we lived previously. Warsaw also feels like 20 cities in one. We live close to a forest and a market where we can buy fresh vegetables and practise our Polish, but we are also 30-45 minutes away from the University and museums by metro and bicycle and even



closer to the school. Generally, we feel less stressed than in other countries that we have lived in so far. We also better fit in with the general mentality and down-to-earthness – where there is a will, there is always a solution.

Q6: Apart from friends and family, what do you miss most about Belgium?

Not sure, as I haven't lived in my home country for over 15 years due to the rarity of job opportunities and perspectives for my kind of research. I would say Belgian fries and "frituur" food more generally, as well as the particular kind of sarcastic humour. However, I must say I also miss particular foods as cultural aspects from other countries I have lived in including Switzerland, the UK and Germany. After these experiences, I see my home as where my family is rather than tied to a specific place, although we have reached a point where we would love to settle somewhere permanently.

Q7: What forms of support for an expat in your position have been the most helpful for you? What type of support did you miss most?

The support from my colleagues from our Institute, the Faculty of Biology, as well as the Welcome Point and their volunteers at the University of Warsaw has been indispensable for getting registered and legalized, getting insurances, filling out paperwork more generally, and finding an affordable place to live. To give a few examples, without my colleague Karolina we would not have found and obtained affordable housing with easy access to the University and the school for our son. Without the help of the Welcome Point and its volunteers, it could have been very challenging to legalize our stay and import our car. More generally, I feel moving countries in the academy is challenging and even more so with family – but I cannot imagine moving without my family. An important aspect is that the salaries offered to a scientist alone can seem attractive, but do not consider the costs of moving and providing for your entire family. For us, it only became possible because I managed to negotiate the highest possible salary and we had some savings. Generally, I feel such constraints and support need to be institutionalized more. For example, most expats we know who work for international companies did not have to worry about finding a place to live and school as it is all organized and funded for them.

Q8: What was the biggest benefit of your move abroad? And what was the biggest sacrifice?

The biggest benefit has been to focus fully on my research and my team as well as the increased personal wellbeing of my family and myself. There were two big sacrifices. A big sacrifice was the financial security – currently, my salary is comparatively high compared to that of my colleagues, but this will change when my project ends and the project is successful enough for me to obtain a faculty position. After that, if we want and can afford to stay here for the long run, it depends on me bringing in additional projects, on the possibilities to buy rather than rent a place to live, as well as on my wife finding a well-paid job. It really would be a shame not to be able to stay for that reason and lose the life and team we are currently building up. This brings us to the second type of sacrifice, the loss of our social network and support when moving away from Germany where we lived for more than eight years. We really feel comfortable here and hope to be able to stay. We are, however, a bit worried about some of the recent political developments, including those pertaining to reproductive rights.

Q9: What was your experience with DEI (Diversity, Equity, Inclusion) aspects in Poland? We are curious about your personal experience as well as observations on policies and attitudes.

I have just started so I am not fully aware of all policies and attitudes, but I know there are various initiatives to improve DEI aspects at faculty and university level. I actively encouraged



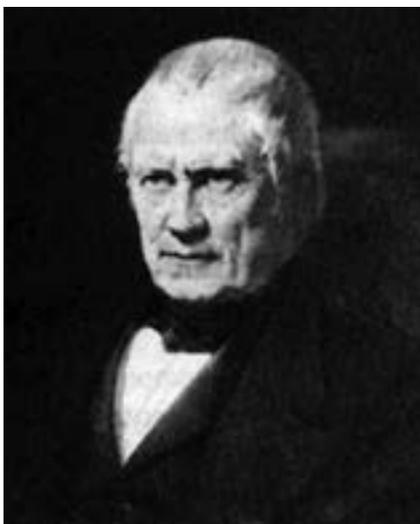
members of under-represented groups to apply for positions in my project. A major goal of my type of funding is to attract international researchers and, currently, we have at least three international researchers in our institute, which includes me and a member of my team. It is my perception that, at least in our Institute and the University, the gender balance is better than at my previous institution in Germany, although an exception was the palaeobiology group. I did have the honour to offer three positions. For all these positions women ranked best, with one exception. In the end, the researchers who accepted our offers for the competitive positions were all women, including one from abroad.

Kenneth De Baets tweets at @djbirdanerd.

Legends of Rock

Henri Marie Ducrotay de Blainville and the bicentennial of the word “palaeontology”

The researchers who pioneered the scientific study of fossils during the last decade of the eighteenth century and the early 1800s, including Georges Cuvier and William Smith, did not think of themselves as palaeontologists, for the simple reason that it was only in 1822 that the word “palaeontology” was coined (as “palaeontologie”) by the French zoologist Henri Marie Ducrotay de Blainville. Although he is somewhat forgotten today, in his lifetime Blainville was considered to be a respected authority on various fields of zoology. He was born on 12th September 1777 in the small town of Arques in Normandy to a family of the local gentry. He was supposed to become an army officer and was duly sent to the royal military academy at Beaumont-en-Auge, in another part of Normandy. When the French Revolution broke out, however, he left the academy and for several years led a rather erratic life (by his own account, he even joined the crew of a foreign – presumably British – vessel and took part in naval engagements in the English Channel, although the story has been doubted). He eventually returned to France in 1796, spending some time in Rouen and then settling in Paris where he studied acting and painting, to the great displeasure of family members who had remained in Normandy.



*Henri Marie Ducrotay de Blainville (1777–1850),
French naturalist. Image in the public domain.*



His interest in natural history began when, aged 27, he attended a lecture by Georges Cuvier. After medical studies, he became Cuvier's assistant. However, both men had strong personalities and the proud Blainville could not bear the prospect of remaining Cuvier's subordinate. A break soon ensued and Blainville became one of Cuvier's fiercest opponents. In 1812 he became professor of zoology, anatomy and physiology at the University of Paris, and a member of the Academy of Sciences in 1825. In 1830, he succeeded Lamarck as professor of mollusc, worm and zoophyte zoology at the Muséum national d'Histoire naturelle in Paris. When Cuvier died in 1832, Blainville replaced his old enemy as professor of comparative anatomy at the Muséum, a position he held until his death. He died of a stroke on 1st May 1850 at a Paris railway station

when boarding a train bound for his native Normandy.



Reconstruction of the head of the dodo (Raphus cucullatus), from Blainville's Mémoire sur le Dodo, autrement Dronte (1835, plate 1). Image in the public domain.

Blainville was known for his misanthropic personality and haughtiness (linked by some to his aristocratic origins). Cuvier joked that whatever question you asked him, and even when saying "good day" to him, he would always answer "no". He had few friends and never married. Nevertheless, he was respected as a brilliant scientist. He had a wide range of interests, from "zoophytes" (cnidarians) and molluscs to vertebrates. Among the latter, he was especially interested in mammals, but also published on reptiles and birds (including the dodo, which he

mistook for a kind of terrestrial vulture). He proposed a classification of mammals based on their reproductive organs which is basically the one still used today (although the taxon names have changed). One of Blainville's main scientific projects was a huge compendium of the skeletal anatomy of all living and fossil vertebrates, lavishly illustrated with lithographic plates, entitled *Ostéographie*. Publication, by fascicles, was to be spread over several years and started in 1839, but subscriptions were not sufficient to ensure publication of the whole work, only 24 issues appearing in Blainville's lifetime.

His interests thus extended to fossil forms as well as extant animals and it is in this context that he coined the word "palaeontology". He first used it in a review of recent papers on various kinds of fossils in the January 1822 issue of the *Journal de Physique, de Chimie, d'Histoire naturelle et des Arts*, a scientific periodical he edited. He did not give any explanation about the meaning of the new word or its etymology (perhaps there was no need for that at a time when all scientists had a sound Classical education). It was only in 1825, in a treatise on molluscs, that he explained that palaeontology was the science dealing with the study of fossil organized bodies. "Palaeontology" of course is based on the Greek words *palaios* (ancient), *ontos* (genitive of *on*, being) and *logos* (discourse). It is worth noting that another word, oryctology (from the Greek *oryctos*, dug up from the ground, which is also the original Latin meaning of "fossil"), had previously been used to designate the study of fossils. Blainville's word had a somewhat different connotation, implying that fossils were clearly the remains of ancient living beings. The word



“palaeontology” was not an immediate success. Cuvier, for instance, never used it (unsurprisingly perhaps, since it had been coined by Blainville). However, by the 1840s it had gained currency in France and, suitably adapted, in other western countries.



An example of the lithographic plates for Blainville's *Ostéographie* by Jean-Charles Werner: fossil remains of the Palaeocene mammal *Arctocyon* (here called *Palaeocyon*). Image in the public domain.

Blainville's interpretation of the fossil record was strongly influenced by his religious convictions. He was a very conservative Roman Catholic who believed that the aim of science was to discover God through His works. He rejected both the catastrophism of Cuvier and his followers and the early evolutionary conceptions of Lamarck and Geoffroy Saint-Hilaire as not being in accordance with Scripture. He thought that all living beings were the result of a single act of divine creation and downplayed the role of extinction in the history of life, considering that some fossils actually belonged to living species (for instance that the mammoth possibly belonged to the same species as the Indian elephant). For him, species formed a continuous series, in which fossils could sometimes fill gaps, in a conception reminiscent of the eighteenth-century Great Chain of Being.

Blainville's ideas about the history of life never gained many supporters. Less than a decade after his death, Darwin's *Origin of Species* provided a radically different interpretation that was quickly accepted by a large part of the scientific community. It is rather ironic that palaeontology, a science that has provided so much evidence in favour of evolution, should owe its name to a scientist who, although a brilliant anatomist, was also an undeterred creationist.

Eric Buffetaut

Centre National de la Recherche Scientifique, Paris, France

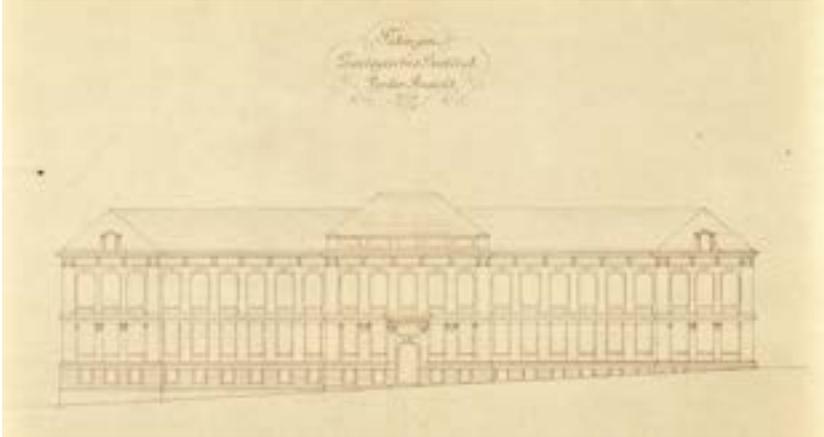
FURTHER READING

BUFFETAUT, E. 2022. Two hundred years of palaeontology: Henri Marie Ducrotay de Blainville and the science of ancient beings. *Historia Natural*, **12**, 5–17.



Behind the Scenes at the Museum

The Palaeontological Collection, Eberhard Karls University, Tübingen, Germany



Architectural plans for what is now the Senckenberg Center for Human Evolution and Palaeoenvironment housing the Palaeontological Collection in Tübingen, Germany in 1898 [UAT (archive of the University of Tübingen) Signatur 397/1-397/5].

The Palaeontological Collection in Tübingen, with its purpose of enabling research and teaching palaeontology and evolution, has a long history, which is tightly intertwined with the history of palaeontology in Germany and the field of palaeontology in general (Werneburg 2021a,b). Many palaeontologists influenced the collection as it is today by their personal research interests and their related excavations and acquisitions. In the following, a handful of people will be highlighted. Nevertheless, there are many more who contributed and worked dedicatedly for the collection and its scientific exploration; to name a few: Wilhelm Branca (1863–1898), Richard Dehm (1907–1996), Alfred Eisenack (1891–1982), Hans Gocht (1930–2014), Helmut Hölder (1915–2014), Volker Josef Mosbrugger (*1953), Hans-Ulrich Pfretschner (1959–2020), Josef Felix Pompeckj (1867–1930), Jobst Wendt (*1933), and Jost Wiedmann (1931–1993) (see Werneburg and Böhme 2018). A comprehensive document archive relating to these people is available (Hinz and Werneburg 2019).

The first record of a natural history collection in Tübingen dates back to 1802. This is when Ferdinand Gottlieb Gmelin (1782–1848) founded the former “Naturalienkabinett” of the University of Tübingen, which was originally housed in the castle Hohentübingen (Seidl *et al.* 2021).

In 1837, Friedrich August Quenstedt (1809–1889), former conservator at the Museum of Natural History in Berlin, became the first professor for geology (“Geognosie”) in Tübingen. Quenstedt expanded the collection immensely, moved it to the “Alte Aula” of the University in 1849, and formed what can be considered the core of the collection today. His research focused mainly



on fossil invertebrates from the local area (*i.e.* the Swabian Alps, Germany) leading to enormous publications with 14,185 described and figured fossil gastropods, ammonoids, brachiopods, gastropods, poriferans, cnidarians and echinoids (Quenstedt 1867). He also acquired the “Schwäbisches Medusenhaupt” (German for: Swabian medusa head), a large floating crinoid colony (Werneburg 2021a).

Quenstedt initiated the plans for the construction of a new building to house the Palaeontological Collection. In 1902, under the supervision of Ernst Koken (1860–1912), the collection found its home at Sigwartstraße 10, where it is still today. Koken organized the exhibition stratigraphically showcasing fossils of special interest. The Schwäbisches Medusenhaupt became literally the centrepiece of the exhibition by defining the ceiling height of the hall at 4.60 m as it was supposed to fit vertically onto the wall. So, this may be one of the oldest cases where the sheer size of a fossil influenced the architecture of the museum housing it. Koken acquired, amongst others, large marine reptile skeletons for the collection. These were to a large extent bought from the Alfred Leeds (1847–1917) collection via Bernhard Stütz (1845–1928), a fossil dealer from Bonn, Germany (Krahl *et al.* 2022). Koken also collected and described fossils from the Baltics and from North Africa (Algeria, Tunisia). He initiated excavations in the karst caves of the Swabian Alps that provided the foundation for the Institute of Prehistory, Early History and Medieval Archaeology of the University of Tübingen, which now houses some of the earliest art of humankind. The caves and their ivory sculptures became a UNESCO world heritage site in 2017 (Heger 2021, Werneburg 2021a).



Overview of the old marine reptile exhibition, before 1928 (picture by Heinz Dürr in Zoepf and Knapp 1928).

Edwin Hennig (1882–1977) restructured the Palaeontological Collection and adapted it to new geological and palaeontological knowledge but remained with a biostratigraphic and taxonomic framework (Hennig 1923). This led to the new “Stratigraphic hall” (representative fossils for different stratigraphic time frames), the “Württemberg hall” (local stratigraphy, fossils and localities), the “Dinosaur hall” (the “Swabian Lindwurm” *Plateosaurus* and *Kentrosaurus*), and the “Marine reptile hall” (ichthyosaurs, sauropterygians, metriorhynchids and mosasaurs), which have remained in their essence unchanged until today.



In 1927, Friedrich Richard Freiherr von Hueningen (1875–1969), aka Friedrich von Huene, became the first custodian of the collection. He led digging campaigns in Trossingen, Germany (1921–1923), Argentina and South Africa (1923/1924), as well as in Brazil (1928/1929) bringing to light Late Triassic sauropodomorph dinosaurs and synapsids. Von Huene's non-destructive method of mounting fossil skeletons, especially therapsid skeletons (Preuschoft *et al.* 2022), with elaborate welded steel corsets, greatly influenced fossil mounts around the world. He published more than 400 scientific articles and books (Turner 2009), mainly on fossil land and secondary aquatic vertebrates, and provided one of the first phylogenetic trees of those animals (Werneburg and Betz 2018).



Von Huene and a technician mounting *Stahleckeria potens*, (*Therapsida*, Middle Triassic of Brazil), before 1933, (UAT).

Otto Heinrich Schindewolf (1896–1971) became the new director of the collection in 1948. He amended many ammonites to the collection, but he is most famous for developing the typostrophic evolutionary theory (Schindewolf 1950). He also shaped the palaeontological exhibition in a more taxonomical way (Werneburg 2021a,b).

Adolf Seilacher (1925–2014), Schindewolf's successor, founded the field of palaeoichnology (Seilacher 2007) and enriched the collection with numerous fossil tracks and traces. Seilacher and the custodian Frank Westphal (1930–2022) modernized the exhibition and added immured marine reptiles into the staircase and marine reptile hall walls (Werneburg 2021a).

Volker Josef Mosbrugger was the next director of the Museum. He integrated several palaeobotanical fossils into the collection. He initialized the renovation of the Museum, which was finished only after Madelaine Böhme became director of the collection in 2009 and had established the chair of Terrestrial Paleoclimatology in Tübingen. Böhme's research focuses on Miocene vertebrates, and thanks to her, the findings of the first digging campaigns in the Hammerschmiede, Bavaria, Germany, including *Danuvius guggenmosi*, an early hominid (Böhme *et al.* 2019), have been added to the collection. Under her supervision the collection reopened in 2011 displaying a new Therapsid hall including the historical mountings by von Huene (Preuschoft *et al.* 2022). A collection journal was founded in 2021 and is named *CHELYOPS – Berichte aus der Paläontologischen Sammlung in Tübingen* (see <<https://www.researchgate.net/profile/Chelyops-Palaeontologischen-Sammlung-Tuebingen>>).

**Anna Krahl and Ingmar Werneburg***University of Tübingen, Germany***REFERENCES**

- BÖHME, M., SPASSOV, N., FUSS, N., TRÖSCHER, A., DEANE, A. S., PRIETO, J., *et al.* 2019. A new Miocene ape and locomotion in the ancestor of great apes and humans. *Nature*, **575**, 489–493.
- HEGER, A. 2021. 1933. Das Mammut von Horb – Eiszeit und Mensch. *In*: SEIDL, E., BIERENDE, E. and WERNEBURG, I. (eds). *Aus der Tiefenzeit – Die Paläontologische Sammlung der Universität Tübingen*. Schriften des Museums der Universität Tübingen MUT, 20, Tübingen, Germany. 526pp.
- HENNIG, E. 1923. *Führer durch die Sammlung des Geologisch-Paläontologischen Instituts der Eberhard-Karls-Universität Tübingen (eine Anleitung für das Wissensgebiet)*. Schweizerbart, Stuttgart, 149 pp.
- HINZ, J. K. and WERNEBURG, I. 2019. The historical archive of the Palaeontological Collection of Tübingen, Germany. *Palaeontologica Electronica*, 22.2.26A,1-94.
- KRAHL, A., SMITH, A. S. and WERNEBURG, I. 2022. Historically transposed flipper pairs in a mounted plesiosaurian skeleton. *PalZ*, published online on 15 April 2022..
- PREUSCHOFT, H., KRAHL, A. and WERNEBURG, I. 2022. From sprawling to parasagittal locomotion in Therapsida: A preliminary study of historically collected museum specimens. *Vertebrate Zoology*, **Festschrift Wolfgang Maier 72**, 907–936.
- QUENSTEDT, F. A. 1867. *Handbuch der Petrefaktenkunde*. Laupp, Tübingen, 982 pp.
- SCHINDEWOLF, O. H. 1950. *Grundfragen der Paläontologie. Geologische Zeitmessung, Organische Stammesentwicklung, Biologische Systematik*. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.
- SEIDL, E., BIERENDE, E. and WERNEBURG, I. 2021. (eds.) *Aus der Tiefenzeit – Die Paläontologische Sammlung der Universität Tübingen*. *Schriften des Museums der Universität Tübingen MUT*, **20**, Tübingen, Germany.
- SEILACHER, A. 2007. *Trace Fossil Analysis*. Springer-Verlag, Berlin-Heidelberg, 226 pp.
- TURNER, S. 2009. Reverent and exemplary: 'dinosaur man' Friedrich von Huene (1875–1969). *Geological Society, London, Special Publications*, **310**, 223–243.
- WERNEBURG, I. 2021a. Ein Stück Kulturgeschichte – Zur Entwicklung der Paläontologischen Sammlung. *In*: SEIDL, E., BIERENDE, E. and WERNEBURG, I. (eds). *Aus der Tiefenzeit – Die Paläontologische Sammlung der Universität Tübingen*. Schriften des Museums der Universität Tübingen MUT, **20**, Tübingen, Germany, 33–65.
- WERNEBURG, I. 2021b. Ganzheitliche Naturschau – Die Tübinger Paläontologie und die Evolution. *In*: SEIDL, E., BIERENDE, E. and WERNEBURG, I. (eds). *Aus der Tiefenzeit – Die Paläontologische Sammlung der Universität Tübingen*. Schriften des Museums der Universität Tübingen MUT, **20**, Tübingen, Germany, 68–97.
- WERNEBURG, I. and BETZ, O. *Phylogenie, Funktionsmorphologie und Bionik – Schriften zum 60. Phylogenetischen Symposium in Tübingen*. Scidinge Hall Verlag, Tübingen.



WERNEBURG, I. and BÖHME, M. 2018. Tübingen: The Palaeontological Collection of Tübingen. In: BECK, L. A. and JOGER, U. (eds.). *Paleontological Collections of Germany, Austria and Switzerland – The History of Life of Fossil Organisms at Museums and Universities*. Springer Nature Switzerland AG, Cham.

ZOEPEF, L. and KNAPP, T. 1928. *Die Universität Tübingen, ihre Institute und Einrichtungen*. Düsseldorf, Lindner.

Museum website: <<https://uni-tuebingen.de/en/97958>>

The preservation of palaeontology

How does one fossilize a palaeontologist? This thought, of course, might give rise to all manner of fanciful speculation to enliven, say, one of the spookier Halloween parties. But, of course, whatever ingenious subterranean odyssey we might devise for the mortal remains, it's the immortal legacy that is usually uppermost in mind, especially for the icons of the profession. Part of this legacy lies in the fame – or notoriety – that may reverberate across generations; part, though, is all too solid – measurable in kilograms, indeed – whether that palaeontologist is a celebrated academic or jobbing stratigrapher. Both came to mind as I was reading a little of the life of Alcide Dessalines d'Orbigny lately, and caused me to wonder quite how such legacies might endure as life and times change. Reputation, of course, has always been a fickle thing, though I had always rather taken the solid stuff for granted. But perhaps it now needs a bit of thought, as a planet's taphonomic balance begins to shift.

First things first. D'Orbigny is one of those names that is omnipresent in the fossil trade, and one becomes subconsciously aware of it long before any curiosity about the man himself might emerge. Palaeontologists who specialize in foraminifera are especially haunted by the man (Lipps 2002), with 66 genera of his still in use, including the iconic *Globigerina* of the eponymous oozes. Indeed, he has the whole phylum to himself. In 1826, d'Orbigny, at the age of 24, recognized and named the Foraminifera as a separate group, a step which has been taken as the founding of the whole discipline of micropalaeontology. He had been helping his keen amateur naturalist father, whose eyesight was fading, study these minute skeletons, which were abundant in the beach sands of La Rochelle, France, and he was soon infected – incurably – by the same enthusiasm. That, and the energy and industry that was to mark his whole life, meant that things went on from there, to most serious purpose. D'Orbigny, incidentally, like other naturalists of the day, initially thought his foraminiferans were a kind of cephalopod, being minute relatives of the pearly *Nautilus*, a not unreasonable assumption given the sophisticated spiral form of the skeletons with their elaborate chambers. A few years later, the foraminiferans' true affinities



as protozoans were recognized, with the ‘tentacles’ that d’Orbigny thought he saw being the pseudopodia of these amoeba-like organisms and the ‘reduced head’ being, in fact, no head at all. Nevertheless, solid taxonomy survives wishful interpretation, and indeed the upshot was to make d’Orbigny’s discovery yet more sharply distinctive.

One can make a big thing out of small fossils, and d’Orbigny did this quite literally. As well as many detailed drawings and descriptions, he sculpted three-dimensional models out of limestone of the main genera he recognized, magnified up to a couple of hundred times, and used these sculptures to make plaster replicas for sale¹. This foraminiferan enterprise impressed no less a figure than Georges Cuvier, then building up Paris’s Muséum national d’Histoire naturelle, and the young D’Orbigny was chosen to be the Muséum’s naturalist explorer on a scientific expedition to South America. It was an adventure in the spirit of the famous journey of Alexander von Humboldt and Aimé Bonpland, with some of the inspiration very close to home: Bonpland was a family friend of the d’Orbignys and Humboldt was to give the young Alcide advice², equipment and letters of introduction.

It really was an adventure, geographically roughly a mirror-image of Humboldt’s and Bonpland’s widely celebrated epic some three decades previously, heading mostly south rather than north as those earlier explorers had done, to take in Brazil, Argentina, Chile, Uruguay, Bolivia and Peru over nearly eight years. This adventure included being thrown into jail (briefly, as luck had it, before he managed to buy his way out) and reluctantly – he was a peaceable man – being made to serve as a soldier in a local war. Parallels with Humboldt and Bonpland went further, as d’Orbigny studied not just biology and fossils, but geography, climate and what would later be known as ecology, as well as anthropology, collecting information on the local people, present and past, and protesting at the social injustices done to them. He was one of the great nineteenth century polymaths, then, something that may well have been more widely recognized if he was not working in Humboldt’s giant shadow.

But, in his travels he was to cast a little shade of his own, enough to cause another great man to grumble. Charles Darwin, on board the *Beagle* as it sailed around South America, wrote to his mentor, John Henslow: “I must have one more growl, by ill luck the French government has sent one of its Collectors to the Rio Negro. – where he has been working for the last six month, & is now gone round the Horn. – So that I am very selfishly afraid he will get the cream of all the good things, before me. – As I have nobody to talk to about my luck & ill luck in collecting; I am determined to vent it all upon you”³. D’Orbigny’s reputation as an indefatigable collector had preceded him, just as his physical presence on the continent preceded Darwin. As it turned out, there was more than enough material for both of them, even though d’Orbigny’s collecting efforts were prodigious. He brought back to France specimens of some 9,000 species of animals (both vertebrate and invertebrate) and plants, many new to science (and including 81 foraminifer species, to keep his hand in); also rock and mineral specimens, and archaeological and ethnographic relics, shipped across the ocean to fill out the collections at the Muséum national d’Histoire naturelle. When he returned to Paris, he did not stop there. Other organisms

¹ The spirit of this endeavour lives on in the world’s first foraminiferal sculpture park, in Zhongshan City, China: <<https://www.nhm.ac.uk/natureplus/blogs/micropalaeo/tags/heron-allen.html>>.

² Probably a great deal of advice – Humboldt had a well-deserved reputation for great and insistent loquaciousness.

³ <<https://beagleproject.wordpress.com/2012/12/15/darwins-nemesis-and-the-naming-of-species/>>.



caught his attention, with (for instance) some one-third of bryozoan genera in current use being d'Orbigny's. Then came the 'universal prodromus of stratigraphical palaeontology', the result of examining material of 40,000 named fossil species (though by the time he finished synonymizing, just 18,000 remained), and the 'Paléontologie française' which describes 2,800 species.

D'Orbigny's subsequent use of this prodigious taxonomic accumulation was to make his own legacy double-edged. The use was in, logically enough, ordering Earth history through the successive dynasties of fossil organisms that he had so painstakingly examined and classified. And so in the mid nineteenth century he produced a list of 27 stages of Earth history (Monty 1968). Those he set up in the Jurassic and Cretaceous 'terrains', as he called them, pretty well all survive as modern chronostratigraphic stages: from the Sinemurian right up to the Danian, taking in such familiar names as the Toarcian, Oxfordian and Aptian. In older rocks his classification takes on a surreal tinge, though, as he crosses modern hierarchical levels, his Palaeozoic 'terrain' comprising the Silurian, Devonian, 'Carboniferan' and Permian 'stages'. His younger stages in the 'Tertiary terrain' fared even worse, as they, such as the 'Suessian', have disappeared without trace – perhaps a pity, as the mighty endeavours of Eduard Suess would have deserved such lasting recognition. No matter: the practical core of d'Orbigny's stage stratigraphy in the Mesozoic has survived magnificently.

But his wider interpretation of that history was soon to be criticized – lampooned, even – and the mud continues to be slung to this day. For d'Orbigny was brought up in the school of Cuvier, and he waved that influential baron's catastrophist flag most vigorously, separating each of his 27 stages by catastrophes that annihilated the life of its time, with new life-forms being created at the beginning of each subsequent stage. This 'doctrine of successive creations' soon managed to come under fire from geologists – and from theologians, too, for taking creationist ideas to levels regarded as ridiculous even in those circles. As a near-inevitable corollary, d'Orbigny also followed Cuvier in having no truck with Lamarck's idea that one species could transmute into another over time, and so has been labelled as an anti-evolutionist. But is the mud-slinging quite fair? Marie-Thérèse Venéc-Peyré (2004; see also Fischer and Venéc-Peyré 2002) argues that D'Orbigny died two years before Darwin's *Origin of Species* was published – so he never had a chance to disagree with the idea of evolution as we now understand it. And in any case, she notes, his main concern was in establishing a factual framework of the physical characterization of very many thousand species, and logging their distribution through geological time – a gigantic task in itself. His interest in the biological relationships of those species was of necessity scant: there are only so many hours in the day, even for one as industrious as d'Orbigny.

And, because d'Orbigny singlehandedly ranged across so many fossil groups, across pretty well the entire span of the Phanerozoic, his history could only be painted in the broadest of brushstrokes, which were inevitably too coarsely applied to pick out the final detail of gradational morphological shifts along individual fossil lineages – or of just how abruptly or gradually old species disappear and new ones appear (or old ones reappear) across major extinction event boundaries. Even Darwin despaired of the fossil record ever being able to produce the kind of evidence that would support his theory of 'descent with modification', and it was only when the next generation of palaeontologists emerged to build on this broad framework and to specialize that this final detail convincingly emerged, whether from shifting patterns of sea-urchins traced up Chalk cliffs – or, for that matter, from the minute study of very many thousand specimens of



d'Orbigny's happy invention of the foraminifera. D'Orbigny's intellectual legacy, therefore, can be said to be secure, despite its imperfections. But there is a physical legacy, too. Overall, he left some 100,000 specimens in Paris's Muséum national d'Histoire naturelle – not counting the myriad individual foraminiferans in their sample bottles, of course – which have been curated there ever since. This is an impressive collection, assembled by one of the fabled names in the science. But, it is just one tiny part of a national collection which has been assembled by very many equally assiduous if not always quite so illustrious scientists in the bit-more-than-a-century-and-a-half since: somewhere between five and six million fossils, numerically just a modest part of the ~68 million specimens in all, but I would guess making up a less than modest part of the total *avoidupois*. And that is just the Paris collections. London's Natural History Museum has some seven million fossil specimens, and of course there are also the British Geological Survey collections (some four million) and regional collections (a million at Cambridge, nearly half a million at Oxford, and so on). Go across the water to Washington DC's Smithsonian National Museum of Natural History, and you can, with sufficient patience, make acquaintance with some 40 million fossils. Even in my few years as a jobbing biostratigrapher at the BGS, I added well in excess of 10,000 fossil-bearing slabs, individually numbered and stored in many wooden trays, many of which seriously risk a pulled muscle when lifting them out of their place among the four storeys of metal racks. And pretty well everywhere, in every museum and survey collection, these endless collections are growing still, as palaeontologists today continue to ride the wave of knowledge's frontier.

When I worked within this world, one always had a feeling of both permanence and tradition. The permanence because those specimens, that you stored in the four-by-four cardboard boxes – even those specimens so scruffy that they only merited the notorious 'indet.' in the register – were there for good, to be jealously guarded by tenacious curators for evermore. And the tradition, because you could walk along the corridor to compare your newly excavated specimens with those hammered out by d'Orbigny and his contemporaries (for me at the BGS, it was a direct line to Sedgwick, Murchison, Lapworth & co.). And no matter how the practicalities evolved, as electronic databases and virtual fossils sprouted from among these ever-growing masses of labelled rock, the reassuring solidity of *le tout ensemble* would continue, as the most solid of time machines, for future generations. But now the world is changing, physically and quickly, in quite a new way. Almost the simplest part of that change is that between land and sea, and the striking difference between the near-absolute stability of sea level of almost all of the last 3,000 years (to within 10 centimetres, as ingeniously worked out from stalagmite 'dipsticks', see Onac *et al.* 2022) and the growing measures of how soon, and how quickly, and irreversibly, the world's polar ice is melting and pouring into the sea (*e.g.* Stokes *et al.* 2022). Over the lifetimes of palaeontologists starting their careers today, coastal urban fabrics worldwide will perforce begin a long process of remodelling, and migration inland, as the sea rolls in, and ripples of all kinds will spread far inland. The integrity of the world's palaeontological collections, now – infinitely complex, fragile, precious, *heavy* – (starting, perhaps, with those of Venice's natural history museum, the Museo di Storia Naturale di Venezia, with collections dating back to the sixteenth century) probably comes very well down the list of major societal concerns as a tiny and mostly hidden and mostly unthought-about part of our urban constructions. But I sometimes do wonder about it, perhaps precisely because it does come so low on that list. The global community of fossilists, I suspect, will need to argue the case for their science extra-vigorously as the century wears on, to preserve



the physical fruits of their labours in a warmer and wetter world. A little of d'Orbigny's energy and tenacity of purpose may help in the horse-trading to come.

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REFERENCES

- FISCHER, J. C. and VENÉC-PEYRÉ, M.-T. 2002. Le "créationnisme" d'Alcide d'Orbigny et les fondements de la théorie biostratigraphique. *Comptes Rendus Palevol*, **1**, 359–364.
- LIPPS, J. H. 2002. Alcide d'Orbigny and American micropalaeontology. *Comptes Rendus Palevol*, **1**, 1–9.
- MONTY, C. L. V. 1968. D'Orbigny's concepts of stage and zone. *Journal of Palaeontology*, **42**, 689–701.
- ONAC, B.P., MITROVICA, J. X., GINÉS, J. *et al.* 2022. Exceptionally stable preindustrial sea level inferred from the western Mediterranean Sea. *Science Advances*, **8**, eabm6185.
- STOKES, C. R., ABRAM, N. J., BENTLEY, M. J. *et al.* 2022. Response of the East Antarctic ice sheet to past and future change. *Nature*, **608**, 275–286.
- VENÉC-PEYRÉ, M.-T. 2004. Beyond frontiers and time: the scientific and cultural heritage of Alcide d'Orbigny (1802–1857). *Marine Micropalaeontology*, **50**, 149–159.



Palaeontology's greatest ever graphs

Stratigraphic Palaeobiology and its promise to palaeontology

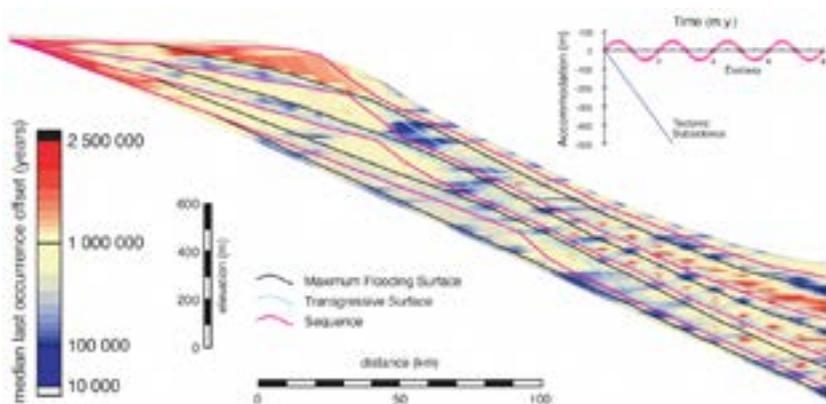


Figure 1. Contour plot of median range offset of last appearance in four modelled depositional sequences across basin. From Holland and Patzkowsky (1999). Reproduced with permission.

Despite much work since the 19th century, palaeontological research continues to be influenced by early arguments about how to best read and interpret the fossil record. Whether a literal (Cuvier 1812) or a more nuanced interpretation (Lyell 1833), how palaeontologists read the fossil record has major implications that affect how we interpret evolutionary history. The implications include the application of biostratigraphic zonation, the role of environmental change in evolutionary dynamics, and how we interpret extinction and origination, including mass extinctions. The more recent advent of sequence stratigraphy, or the interplay between variation in sediment supply, eustatic sea-level change and tectonic subsidence (Catuneanu 2006), has changed how geologists interpret the stratigraphic record. Utilizing facies models following Walther's Law (Walther 1894) and basin analyses based on outcrop, core and seismic data (Van Wagoner *et al.* 1990), geologists have gained a greater understanding of the temporal and spatial constraints of the stratigraphic record. Combining quantitative palaeobiology with sequence stratigraphy has substantially improved our ability to interpret the fossil record. As Figure 1 demonstrates, such an approach highlights how stratigraphy affects the distribution of fossils in time and space (Holland and Patzkowsky 1999, Figure 3). This union of quantitative palaeobiology and sequence stratigraphy has created the subdiscipline of stratigraphic palaeobiology (Patzkowsky and Holland 2012).

This leads us to the featured figure, which is undoubtedly one of palaeontology's greatest ever graphs. The aim of the study by Holland and Patzkowsky (1999) is to test whether the offset between when a species last occurs within a single stratigraphic column along a cross section and



when the species last occurs in that basin can be simulated stratigraphically. This figure depicts a two-dimensional cross-section of a basin produced using the stratigraphic modelling program STRATA (Flemings and Grotzinger 1996). This cross section (also known as a slug diagram) depicts the modelled sedimentation history of a basin, demarcated by major stratigraphic surfaces. These surfaces were created by changes in sediment accommodation based on four two-million-year cycles of sea-level change with a fluctuation of 50 metres. Using this cross-section model, Holland and Patzkowsky also modelled the occurrences of species using a random-branching model with three randomly assigned characteristics associated with habitat preference and increased preservation potential, specifically preferred depth, depth tolerance and peak abundance, using the program BIOSTRAT (Holland 2003). The result of the model demonstrates that the greatest amount of offset of last occurrences lies below major stratigraphic surfaces that abruptly mark changes in facies, particularly sequence boundaries and where they combine with major flooding surfaces to produce a single surface. More importantly, and what makes this one of palaeontology's greatest ever graphs, is that the figure demonstrates stratigraphic architecture not only controls where you stratigraphically find clusters of last occurrences, but also controls the amount of offset of when a species last occurs and when it goes extinct.

This figure represents a leap forward that would help cement the importance of stratigraphic palaeobiology. Before this study, earlier models (such as Figure 2) depicting the stratigraphic distribution of fossils were conducted on a single dimension representing a single stratigraphic column (e.g. Holland 1995).

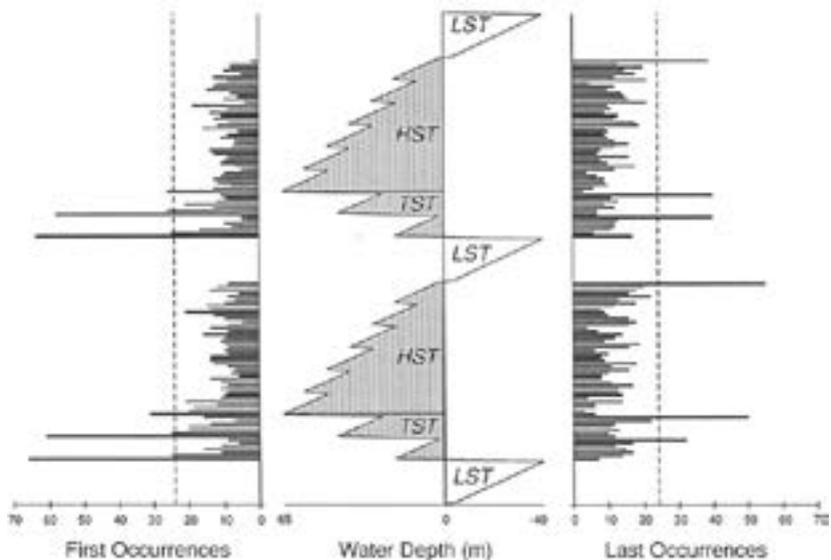


Figure 2. Single stratigraphic column model from Holland (1995). Reproduced with permission.

While these models are equally important in demonstrating how facies changes and sequence stratigraphic architecture can control where you find clusters of species first and last occurrences, they are missing the spatial component. Advances in modelling have allowed additional hypotheses to be tested, such as the response of marine habitat area to sedimentation (Holland



and Christie 2013), the relationship between species richness and habitat area (Holland 2018), delineating last occurrences from true extinction pulses during mass extinctions (Holland and Patzkowsky 2015; Zimmit *et al.* 2021), and more recently, the ability to test hypotheses in terrestrial systems (Holland 2022).

Stratigraphic palaeobiology offers palaeontology the promise of addressing the long-held debate over how to read the fossil record (Holland 1999). Instead of lamenting over the incompleteness of the fossil record, stratigraphic palaeobiology offers a way to work with the structure of the stratigraphic record (Holland 2017). The implications of reading the fossil record using sequence stratigraphic principles are far reaching, including how we extrapolate patterns and events in the fossil record to the modern and future biosphere. Despite its promise, stratigraphic palaeobiology has not been adopted as widely as it could be. Some palaeontologists do not agree with this approach. Others understand and agree with the basic premises of stratigraphic palaeobiology, but do not apply it. Perhaps a lack of formal training in sequence stratigraphy or, at a more basic level, an understanding of facies models among palaeontologists has slowed its application. Sequence stratigraphy has an inherently steep learning curve, but not as steep as other methodologies that palaeontologists have overcome to make advances in our discipline. Nevertheless, stratigraphic palaeobiology has room to grow.

Palaeontologists need not require a comprehensive knowledge of sequence stratigraphy to apply its principles to the fossil record. An understanding of facies models, Walther's Law and a sampling scheme that discriminates depositional environments is sufficient to apply the principles of stratigraphic palaeobiology. Controlling for changes in facies reduces misinterpretation of biotic signals. Ecologists interested in the temporal change of a single benthic community would not assess the composition of a community at a water depth of 20 metres by returning later and assessing a community at 120 metres depth. So why are palaeontologists taking this approach in the fossil record?

We need more palaeontologists applying the principles of stratigraphic palaeobiology to expand on the work in Figure 1 featured here. Models like that of Holland and Patzkowsky (1999) are great at simulating the stratigraphic record, but we need to test these models with empirical data. For now, the promise of deciphering the fossil record through stratigraphic palaeobiology remains, and it is this promise and implications made by this figure that make it one of palaeontology's greatest ever graphs.

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REFERENCES

- CATUNEANU, O. 2006. *Principles of Sequence Stratigraphy*. Elsevier, Amsterdam.
- CUVIER, G. 1812. *Essay on the theory of the earth (Jameson 1818 translation)*. Kirk & Mercein, New York.
- DARWIN, C. R. 1859. *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life*. John Murray, London, UK.
- FLEMINGS, P. and GROTZINGER, J. P. 1996. STRATA: Freeware for analyzing classic stratigraphic problems. *GSA Today*, **6**, 1–7.



- HOLLAND, S. M. 1995. The stratigraphic distribution of fossils. *Paleobiology*, **21**, 92–109.
- HOLLAND, S. M. 1999. The New Stratigraphy and its promise for paleobiology. *Paleobiology*, **25**, 409–416.
- HOLLAND, S. M. 2003. BIOSTRAT: a program for simulating the stratigraphic occurrence of fossils. *Computers & Geosciences*, **29**, 1119–1125.
- HOLLAND, S. M. 2017. Presidential Address: structure, not bias. *Journal of Paleontology*, **91**, 1315–1317.
- HOLLAND, S. M. 2018. Diversity and tectonics: predictions from neutral theory. *Paleobiology*, **44**, 219–236.
- HOLLAND, S. M. 2022. The structure of the nonmarine fossil record: predictions from a coupled stratigraphic–paleoecological model of a coastal basin. *Paleobiology*, **48**, 1–25.
- HOLLAND, S. M. and CHRISTIE, M. 2013. Changes in area of shallow siliciclastic marine habitat in response to sediment deposition: implications for onshore-offshore paleobiologic patterns. *Paleobiology*, **39**, 511–524.
- HOLLAND, S. M. and PATZKOWSKY, M. E. 1999. Models for simulating the fossil record. *Geology*, **27**, 491–494.
- HOLLAND, S. M. and PATZKOWSKY, M. E. 2015. The stratigraphy of mass extinction. *Palaeontology*, **58**, 903–924.
- LYELL, C. 1833. *Principles of geology*. John Murray, London.
- PATZKOWSKY, M. E. and HOLLAND, S. M. 2012. *Stratigraphic paleobiology: understanding the distribution of fossil taxa in time and space*. University of Chicago Press, Chicago.
- VAN WAGONER, J. C., R. M. MITCHUM, K. M. CAMPION and RAHMANIAN, V. D. 1990. Siliciclastic sequence stratigraphy in well logs, cores, and outcrops. *American Association of Petroleum Geologists Methods in Exploration Series 7*. Tulsa, Oklahoma.
- WALTHER, J. 1894. Beobachtungen Über die Bildung der Gesteine an der heutigen Erdoberfläche. Dritter Theil einer Einleitung in die Geologie als historische Wissenschaft. In: FISCHER, G. (ed.) *Lithogenesis der Gegenwart*. Jena, pp. viii + 535–1055.
- ZIMMT, J. B., HOLLAND, S. M., FINNEGAN, S. and MARSHALL, C. R. 2021. Recognizing pulses of extinction from clusters of last occurrences. *Palaeontology*, **64**, 1–20.

Job secrets a statistician does not want you to know

Richard Mann is an Associate Professor of Statistics at the University of Leeds, UK. He grew up in the beautiful town of Crawley in West Sussex, dropped biology after his GCSEs, and is the proud owner of precisely one fossil.

What is your professional background?

I did an undergraduate degree in physics before completing a PhD in machine learning, where I studied pigeon navigation by analysing GPS-tracked flight paths. I then did postdocs at Uppsala University, the Institute for Futures Studies in Stockholm and ETH Zurich, each connected



to research on collective behaviour in humans or animals. I moved to Leeds in 2015, and since 2020 I have been leading a UKRI Future Leaders Fellowship on 'Collective behaviour of cognitive agents'.



Richard Mann (left) with his palaeontology collaborator Graham Budd (photo: Thomas Farrell).

What is your link to palaeontology? Can you tell us about your project or collaboration with this field?

My connection to palaeontology is entirely due to my friendship with Graham Budd, who assures me he is a palaeontologist of some repute! Graham accosted me in a pub shortly after I moved to Uppsala in 2010 and demanded that I solve a statistical problem he had concerning the distribution of scars on fossilized snails. Nine years later we did finally publish something on that original problem, but in the meantime we had moved on to discussing arguably more interesting problems around the nature of early diversification in major clades such as the Cambrian arthropods, where we did a lot of work on the statistical biases that arise from studying clades that survive for a long time and are larger than other contemporary clades. In essence, we are concerned with what we should expect the fossil record of these clades to look like, when you factor in their special nature compared to the many clades that were less successful.

What type of palaeontological data do you use for your work?

The work we have published so far hasn't involved much direct data analysis, but instead focuses on the expected patterns of diversification and its likely signals in the fossil record using mathematical models. However, we are of course interested in whether these predictions are correct, so we (and by 'we' I mostly mean Graham!) spend a lot of time with the published literature on fossil distributions through time, assessing whether these are consistent with our models. More recently we have also been directly running molecular phylogenetic analyses using genetic data to investigate apparent conflicts between what our models suggest, what the fossil record looks like, and what molecular clock studies claim about the age of various clades.

What tools or methods do you have that palaeontology can benefit from?

The code we have published alongside our papers could allow palaeontologists to explore scenarios of diversification, though my standards of coding and packaging software are much less



professional than seen in widely-used palaeontological R packages such as TreeSim and Ape. My hope is that others will pick up on the general mathematical approach we have taken, where we try to answer as many questions about diversification as possible without simulating any trees. For me, it is easier to think clearly about these questions without the complexity of considering exactly how different taxa are related, but instead focusing on how many species there would be at any given time, and how many will have modern descendants.

What is your favourite finding from this collaboration so far?

The ‘push of the past’ is an effect where clades that survive for long times tend to diversify quickly early on. This is something we have explored a lot, but the effect itself was already well established in the mathematical palaeontology literature. A related effect that I think is quite interesting is what we have termed the ‘large clade effect’, where clades that are larger than those of similar age tend to generate a large burst of early lineages that survive to the present. I think this is particularly interesting because it is a bias in the data that comes not from a simple fact of nature (*i.e.* whether clades survive) but from a more sociological factor – the tendency of palaeontologists to focus on the largest and most charismatic clades as somehow representative of the period they originated in, when in fact they are often the least representative examples.

What are the challenges of working across the two disciplines? For example data formats, different jargon, and communication barriers.

I don’t think Graham and I have too many communication problems – but then we have spoken to each other nearly every day for about ten years! Eventually you get used to peculiarities of usage; Graham no longer complains when I talk about the ‘soil’ that fossils are found in, and I don’t argue with his claims to have good statistical ‘instincts’. I do have a wallchart in my office with all the geological periods on it, but my attempts to subtly check it without being noticed during Skype calls are usually unsuccessful.

I am fortunate to have been taught maths by physicists rather than by mathematicians. It’s a way of thinking and talking that offers more intuitive, physical descriptions of mathematics, and thus one that lends itself well to interdisciplinary collaboration. The traditional jargon of mathematics can be very intimidating, even to me sometimes!

If a palaeontologist wanted to collaborate with you, what would you like them to consider?

My advice would be the same for any interdisciplinary collaboration. It’s not sufficient for me to simply focus on delivering mathematical analyses and proving theorems without really engaging with the biological process I’m modelling. Likewise, it’s far more rewarding to collaborate with a biologist/palaeontologist who has a genuine curiosity about the maths and statistics, rather than seeing them as tools that an expert simply needs to apply. Of course, we all have our own skills and knowledge, but by collaborating in palaeontology I hope I’m becoming a bit of a palaeontologist, and I would hope that any collaborator of mine would become a bit of a statistician.

Do you have career advice for students who would like to follow in your footsteps? What would you recommend them to do or learn? Are there any study programmes particularly suited for your field?

I’m always wary of offering specific career advice because my own career took such an undirected path. Many things have gone right for me, mostly not due to any special effort or merit on my part. As a student of selection and survival bias, I’m keenly aware that just because the things I did worked for me, it doesn’t mean they are necessarily wise choices to make.



Notwithstanding that caveat, the thing that has undoubtedly benefited me most in my career is finding the right people to work with. I've been very lucky to work with people who became friends first and colleagues second, with whom I regularly just shoot the breeze without an immediate project or paper on the horizon. I think that's valuable in any area of science, but in interdisciplinary work it's almost essential.

In terms of what to learn, a good course in Bayesian inference will serve anyone well, not so much because of the practical methods they will learn, but because it will both demystify a lot of statistics, and also clarify how one ought to think about the accumulation of knowledge, uncertainty and the scientific method. Your friendly neighbourhood maths department almost certainly runs such a course!

Do you have any other thoughts to share about the interface between palaeontology and your field?

While there are many people doing excellent mathematical research in palaeontology today, these seem to be clustered around molecular phylogenetics. I think there's a lot of potential for people to follow the path of people such as David Raup by thinking about palaeontology and its connections to biology more mathematically in general. It's important that maths and statistics aren't just something 'under the hood' of the software people use, but are part of how people think about the problems they are addressing. In general, it's very hard to go wrong by learning more about mathematics and statistics, and very hard to run out of things to learn – I certainly haven't!

Spotlight on Diversity

Crosslinking privileges and biases in the peer-review process

Peer review is the system used to assess the quality of a scientific paper before it is published. Usually, independent researchers in the relevant research area submit manuscripts for an evaluation of their originality, validity and significance, based on which editors determine whether a manuscript should be published in their journal. Researchers are expected to publish in peer-reviewed journals; the more the merrier. They are encouraged to carry out "state of the art" science and reach for "high-impact" journals. Getting a scientific paper published in such journals may boost one's career, and requires a celestial alignment, which – in addition to the science and its findings – includes a considerate and unbiased editor, fair reviewers, and a space in the journal to publish the work. As such, manuscript rejections are an expected outcome following peer review. It is possible for editors to decline the publication of a certain manuscript without review: if (i) they think that there is no space left in their journal for this topic; (ii) the paper is considered not to bring about significant advance; and/or (iii) it is considered outside the scope of the journal. Theoretically, editors, regardless of the quality of the manuscript, should ensure a fair, factual and unbiased assessment of the work, far from personal, unscientific comments.

Rejections based on scientific arguments and written in a constructive manner are certainly very helpful. However, this is not the case all the time. Herein, I take the opportunity to discuss



different biases that often consciously or unconsciously occur in the peer-review process, and how they impact scientists at different career stages and backgrounds.

Institutional prestige bias is one of the biases that can occur during peer review, as some scientists could be treated preferentially within this process. Editors may be consciously or unconsciously biased by personal networks and classical metrics of institutional prestige (*i.e.* the idea that large, old, elite universities are the only ones able to produce avant-garde science). Reviewers, like all human beings, may be biased by this system as well. Most academics at different career stages acknowledge, to some extent, the existing issue of editorial and reviewer institutional biases. However, while this problem is certainly frustrating, academics do not give it much attention because “the manuscript will eventually get published in another journal”.

How many times did academics think that they suffered from an unfair editorial decision? How many times did they appeal? The answers to these questions do not add up. To my knowledge, appeals are not a common practice and are considered by many a loss of precious time, during which the manuscript could be considered in another journal. This shows the degree to which academics are willing to compromise and remain silent following unjust decisions that may differentially impact their careers. For instance, a researcher with a permanent position might not be impacted at all by a manuscript rejection. But a PhD student trying to graduate or a postdoctoral fellow struggling to find a job could be strongly impacted by an unreasonable rejection.

Regardless of how frustrating unjust prestige and network-based rejections could be, an even worse type of rejection is the one including personal comments to the authors, even if the scientific ground for the rejection is sound. Comments such as: “the authors seem to be incapable of doing this”, “the authors are not genuine in their approach” and questions such as “Have you actually looked at the material? Are you aware of the actual literature on the subject?” are not the expected arguments from a peer, especially when made with a substantial amount of irony. No one expects scientists to write manuscripts if they have not collected, or at least seen and examined, the material. Even if the science in the paper is questionable and raises doubts, these comments could be phrased in so many other ways such as: “I recommend rejecting this paper because more data collection and literature review are needed prior to its publication”. As initially phrased, these comments may feel bitter to the authors. During peer review, there should be no room for sarcasm. There is a fine line not to be crossed between criticizing the science and criticizing the scientist. More importantly, the impact of similar comments might be brutal, and it certainly affects early-career researchers and people from marginalized communities in science preferentially. Imagine fighting numerous social and financial odds to do a PhD, only to hear from a peer that you are negligent, ingenuine and incompetent, during a process originally intended to make your submitted work better in a professional way.

Yet, the absolute worst type of rejection is the one based on fundamental attribution error. The fundamental attribution error is the tendency for people to over-emphasize dispositional or personality-based explanations for behaviours observed in others while under-emphasizing situational explanations. For instance, if an additional set of analyses was not made, it does not mean that the authors did not want to do it. It most probably reflects that they could not do it. Academics do not have unlimited resources to run endless experiments or carry out unlimited



fieldwork, for example. Most of them are doing their best with the resources they have. For instance, lack of funding, inability to obtain a visa, parental responsibilities and unstable economic, societal and political situations in one's home or country of residence are all valid reasons to explain why certain work could not be carried out. Only privileged people can carry out fieldwork wherever and whenever they want to, assume that everything is okay for everyone, and do not acknowledge some of the assets in their lives such as having a strong passport, being able to eat, and having access to medical care. Hypothetically, all these are basic human rights. But in reality, they are privileges given only to a small proportion of people around the world. Avoiding fundamental attribution errors requires a deep understanding of the career and personal life of the authors by the editor and reviewers. This is problematic because no one can be aware of all the problems in the world, at all times. As such, a possible alternative to this is for reviewers to acknowledge their own privileges when reviewing a peer's paper. With each privilege that we have, but do not acknowledge, we feed our unconscious bias and fall deeper into fundamental attribution errors. Within this context, we can assume that fundamental attribution errors affect people from marginalized communities and early-career researchers more than senior white male-identifying scientists.

These are only three examples of biases, and I am certain that numerous more biases occur on a regular basis within the peer-review process. In order to avoid these issues, a fairer way would be to anonymize the authors' identities and affiliations even to editors while making reviewers' identities public (except for early-career reviewers who might be affected by retaliatory behaviours from senior authors) and disregarding reviews with personal comments to the authors. Journals also need to include a mandatory "limitations" section, in which the authors are free to explain why the conclusions of the paper might need further experiments, fieldwork, and investigations, without influencing the editorial decision. As it stands, the current system encourages scientists to exaggerate and inflate their conclusions rather than being honest about the real importance of their paper. This is unhealthy and misleading. More importantly, journals should also normalize publishing ideas, theoretical and hypothetical science, as well as negative results, in order to give a fairer opportunity to people from marginalized communities, who do not have access to the same resources as senior white scientists. Appeals should also be encouraged by the journals and must be treated efficiently.

In brief, it is impossible to fully understand the life experience of others and the challenges they overcame to arrive at the stage where they are today. Academia is supposed to be a safe place to professionally exchange opposing views, for the greater good. In order to keep a healthy environment within academia, editors and reviewers should limit their reviews to factual assessments, while avoiding personal comments and unnecessary jargon, regardless of the quality of the paper and the outcome of the review process. Journals should also be thinking of more innovative ways to balance the current situation and provide comparable opportunities for people from different backgrounds and with contrasting privileges. This is key if we truly want to increase diversity and inclusion across all scientific disciplines.

Farid Saleh

Diversity Officer

<diversity@palass.org>

Palaeocast

Invited Lecture Series

As part of Palaeocast's new **Patreon** funding model, we are providing our backers with a quarterly lecture series.

We are currently looking for more academics who would be interested in giving talks about their area of expertise.

We are looking for:



20-60 minute long talks



Diverse range of palaeontological subjects



Aimed at a palaeo-aware, non-specialist audience



Narrated PowerPoint (webcam optional)



Recorded & exported as a video file



Repurpose existing PowerPoint slides

Compensation will be offered for your time.

If interested, please email dave@palaeocast.com to discuss details.

We can provide instruction on how to record presentations if required.





>>**Future** Meetings of Other Bodies



6th International Palaeontological Congress (IPC6)
Khon Kaen, Thailand 7 – 11 November 2022

The 6th International Palaeontological Congress in Thailand on 7–11 November 2022 will consist of 28 scientific sessions and will be complemented by five main field-trips. Due to its origins as two terranes in Gondwana in the Palaeozoic, their fusion with Laurasia in the Triassic and the development of the Sundaic biota in the Neogene, Thailand is a land of great geological and palaeontological diversity – hence the theme for the Congress: ‘From Gondwana to Laurasia’. The organizers have assembled an exciting and highly informative programme, including all aspects of our science and its connections to biology and Earth and planetary sciences, from the Archean to the Holocene, and covering work from all continents. Workshops, a palaeoart contest and an exhibition of Thailand’s geology are just some of the one-day mid-conference events. Details of scientific sessions/symposia are available online.

For more information please see <<https://ipc6.msu.ac.th>>.



New and Old Worlds (NOW) database 25th Anniversary Meeting
Sabadell, Barcelona, Spain 16 – 18 November 2022

The NOW database of fossil mammals started as a small joint initiative of a few researchers in 1996, but over three decades it has grown and evolved into a thriving community including mammal palaeontologists from all over the world. After a year’s delay because of the pandemic, the organizers at the Institut Català de Paleontologia Miquel Crusafont welcome you to join NOW’s 25th anniversary meeting. The meeting will be an in-person meeting with two days of talks and workshops plus a one-day field-trip. There will be various thematic sessions devoted to different topics ranging from systematics and biochronology to palaeobiogeography, palaeobiodiversity and eometrics. The field-trip will visit major mammal sites of the Vallès-Penedès basin, one of the best Miocene continental records worldwide. Contributions will be restricted to oral presentations and extended abstracts will be peer-reviewed and published in a special issue of the journal *Paleontologia i Evolució*.

For more information please see <<https://now25.icp.cat>> or e-mail <now25@icp.cat>.



4th Palaeontological Virtual Congress
Virtual environment 8 – 22 May 2023

Following successful online meetings in 2018, 2020 and 2021, the organizers are pleased to announce the fourth edition of the Congress. The purpose is to spread, worldwide, the most recent scientific advances in palaeontology in a fast, easy and economical way. This initiative was pioneering in palaeontology, being the first exclusively virtually developed conference in our field.



The main aim is still the same: to give international projection to the palaeontological research carried out by groups with limited economic resources, as well as to promote the participation of palaeontologists from developing countries around the world. This is reflected in low-cost registration fees; there is also a social fund for participants from low and lower-middle income countries. The deadline for thematic session proposals is 15th February 2023 and the deadline for abstract submission is 8th March 2023.

Please see the meeting website for more information: <<http://palaeovc.org/>>.

**14th Conference on Mesozoic Terrestrial Ecosystems****Salt Lake City, Utah, USA 8 – 10 June 2023**

Postponed from June 2022, this conference will feature all aspects of Mesozoic terrestrial palaeontology, palaeoecology, palaeoclimatology and palaeogeography. Generally held every four years, the pandemic has caused the meeting to be delayed. First time in the USA, Utah has been a major centre for new discoveries in its nearly complete Mesozoic terrestrial section over the past 25 years. MTE14 includes pre-meeting field-trips to local museums, a four-day trip up and down through Mesozoic areas of Utah, and a post meeting trip to the region around Dinosaur National Monument.

Meeting website: <<https://utahpaleo.org/mte14/>>.

**International Symposium on Foraminifera (FORAMS 2023)****Perugia, Italy 26 – 30 June 2023**

FORAMS 2022 was postponed to 2023 due to the ongoing pandemic and has now been labelled as FORAMS 2023. The symposium will be held in June 2023, beginning with an ice-breaker reception on 25th June, and also featuring both pre- and post-conference field-trips. The organizers wish to pursue an in-person meeting. The venue will still be the Hotel Giò in Perugia as previously planned. The website also remains the same to minimize the changes; all deadlines have simply been postponed by one year. The meeting will host communications regarding new achievements coming from any research field involving foraminifera.

For more information see the website: <<https://distav.unige.it/forams2022/iniziale>>.

**2nd Asian Palaeontological Congress (APC2)****University of Tokyo, Japan 3 – 7 August 2023**

Following the success of APC1 in Beijing, China in 2019, the University of Tokyo will host the second edition of this congress with the theme 'Science in deep time in a new epoch'. APC2 will be held in-person but there will be one 'online day' where all participants can give/see online presentations and communicate with other delegates via the internet. The topics of the congress will include all aspects



of palaeontology, including a full range of themes and scientific sessions. There will be pre- and post-conference field-trips. In order to promote networking and scientific growth of younger participants, the organizers are offering discounted registration fees for students, as well as best poster awards. Registration will open in late February 2023 and the abstract deadline is 31st March 2023.

For details see the congress website: <<https://www.apc2.org/index.html>>.



3rd Crossing the Palaeontological-Ecological Gap (CPEG)

Hybrid/Vilnius, Lithuania 28 – 31 August 2023

The purpose of this conference is to connect palaeontologists and ecologists by means of building and co-developing concepts, theory, analytical approaches and sharing raw empirical findings. Some example questions are: What is the role of temporal and spatial scales in the origins, and detection of ecological and evolutionary patterns? How reliably can we detect imprints of long-term processes in modern ecosystems; and conversely, what are the limits of detection and characterization of fast ecological and evolutionary processes in the recent past, and in deep time? How translatable are the patterns found in the fossil record in predicting the present, and how well can present systems predict the future (with or without the fossils) – what is the role of evolution, and historical events more generally, in determining predictive reliability of our models? This conference will bring together ecologists, palaeontologists, Earth system scientists and biogeographers who are interested in fundamental drivers, as well as applications of (palaeo) ecological patterns in understanding past and present, as well as preserving biological diversity and ecosystem functions for the future. The meeting will be hosted by Vilnius University and the Nature Research Centre, Vilnius, with in-person and online options.

More on deadlines and other relevant information will be available online soon.



Bivalves – Where are we going?

University of Cambridge, UK 5 – 8 September 2023

This Conference, focused solely on bivalved molluscs, is intended as a successor to the bivalve meetings that took place in London (1977), Drumheller (1995), Cambridge (1999) and Barcelona (2006). The aim is for a relaxed, open in-person meeting to continue the tradition of convivial review of all aspects of current bivalve research (living and fossil).

For more information, contact Liz Harper by e-mail to <emh21@cam.ac.uk>.



XIth International ProGEO Symposium 2023

Charnwood Forest Geopark and Loughborough, UK 9 – 11 October 2023

The organizing committee and the International Association for the Conservation of Geological Heritage (ProGEO) welcome you to take part in the XIth International ProGEO Symposium. The



meeting is being organized by the Charnwood Forest Geopark and will take place in Loughborough, UK. The symposium is an international event open to scientists, students, educators, professionals, decision-makers and anyone involved in geoheritage and geoconservation. The meeting will promote communication and collaboration among attendees from all over the world, and provide a space to discuss new challenges and threats in geological conservation. The Symposium will include a special session on the conservation of palaeontological heritage.

Further details can be found on the website: <www.progeo2023.com>.



XV International Palynological Congress and XI International Organization of Palaeobotany Congress (XV IPC-XI IOP)
Clarion Congress Hotel Prague, Czech Republic 25 – 31 May 2024

This Congress celebrating 200 years of modern palaeobotany, originally scheduled for September 2020, was postponed until May 2021; however, due to the ongoing pandemic the organizers made the decision to move the event to 2024. This date has also been chosen to reflect the decisions of the parent organizations (IFPS and IOP), and the fact that the online European Palaeobotany and Palynology Conference in Stockholm took place in 2022. These conferences are held biannually and usually alternate between European and world events. More information will be available in due course via the website.

For more information please see <<https://www.prague2020.cz/>>.

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



66th Annual Meeting of the Palaeontological Association

University College Cork, Ireland 18 – 24 July 2022

The 66th Palaeontological Association Annual Meeting was held in person for the first time in a little over two years at University College Cork (UCC), Ireland. This week-long event hosted approximately 200 attendees from across Europe and further afield, attending talks, workshops and social activities covering all aspects of palaeontology from ammonites to zooplankton. The conference also addressed some of the current issues in the field, such as bias, discrimination and decolonizing palaeontology, as well as problems with data citation. This year was special as the event was held in summer (usually the Annual Meeting is held in December), allowing all the attendees to enjoy Ireland with the hopes of good weather, which for the majority of the time were fulfilled.

The Meeting began with a public outreach event with an interactive fossil exhibition. The exhibition featured fossil-themed activities and games delivered by staff and students from the School of Biological, Earth and Environmental Sciences at UCC. The exhibition was followed by a public lecture delivered by Prof. **Larisa deSantis** of Vanderbilt University, called “Decoding the past to conserve our future” as part of the Royal Irish Academy Discourse Lecture series.



Photo: Elizabeth Dowding.

For the first time, the Palaeontological Association Annual Meeting set aside an entire day for early-career researchers (ECRs). The Career Links Workshop was a dedicated ECR event that focused on networking and providing an opportunity for ECR participants to get to know their peers and senior researchers in their field, and to learn more about career progression options and strategies. Workshop attendees were split into 12 groups based on research topics, allowing them to mingle with other researchers at a similar career stage and in a related field. The day started off with a welcome address by **Maria McNamara** who introduced the senior researchers who would be attending for the day and were at the disposal of all attendees for their questions regarding career paths in academia. These researchers were **Michael Buckley, Allison Daley, Larisa DeSantis, Barry Lomax, Phil Mannion, Chris Mays, Maria McNamara, Nic Minter, Rob Sansom, Vivi Vajda** and **Jessica Whiteside**. The first meeting of the day split the ECRs into their respective research



groups to introduce themselves and their work to their peers. After some time, these groups naturally broke up, allowing attendees to explore different groups that were of interest to them, further allowing mixing and networking amongst the ECRs. After a lunch break, the senior researchers gave five-minute lightning talks on their respective labs and research interests before splitting into groups again to address individual questions from the attendees. After these question-and-answer sessions were concluded, ten-minute talks were given, showing both academic and non-academic career paths after a PhD, with tenured professors talking about the pros and cons of life and work in academia and graduates now working in non-academic careers talking about how they followed that path. The event was wrapped up with a panel discussion on career pathways with senior academics and non-academic professionals including **Soledad De Esteban-Trivigno**, **Una Farrell**, **Zoë Hughes**, **Siobhan Power**, **Chris Rogers** and **Harriet Drage** rounding out the event with a discussion involving all participants. The day concluded with pizza and drinks in the Franciscan Well Brewery, where delegates could chat further in an informal setting over stone-baked pizza and local craft beer. When discussing the outcomes of the event with other ECRs, we gathered that it was an overall positive experience; we feel it was helpful and similar events should take place in the future. The opportunity to hear from various scientists who have taken different career paths provided inspiration and insight to young researchers who are uncertain about the road that lies ahead.

On the morning following the ECR event, delegates had the option to participate in one of several workshops. The statistical analysis workshop by **Soledad De Esteban-Trivigno** focused on the fundamentals of statistical analyses of palaeontological data. Getting Funded by **Sonia Monteiro** focused on topics such as funding strategies, what funders want, and the elements of a successful proposal. The Public Engagement workshop by **Jess Franklin** and **Elspeth Sinclair** showed delegates various types of public engagement and how to develop an effective public engagement strategy (see page 63). Finally, the workshop on bias, discrimination and decolonizing palaeontology by **Cassius Morrison** highlighted that the impact of colonization is still being felt across the world and



Photo: Elizabeth Dowding.



within palaeontology, facilitating a discussion on the topic and what can be done to remove the bias and discrimination. Concurrently to these workshops, tours of the palaeontology/taphonomy and microbeam laboratory facilities at the School of Biological, Earth and Environmental Sciences were open to delegates, showing what the labs at UUC have to offer.

In the afternoon, the Annual Symposium took place on the main campus, with the overarching theme of “Chemical fossils”. **Jessica Whiteside** kicked off the Symposium talking about ocean deoxygenation and acidification at the end-Triassic extinction. This was followed by **Paul Ullmann**, who showed their work on taphonomic and diagenetic pathways to protein preservation using a case study of three Cretaceous nonavian dinosaurs. The last speaker before the first coffee break, **Christine Strullu-Derrien**, presented how a combination of synchrotron-based techniques enables 3D digital visualization of cell walls in unprecedented detail and characterization of the chemical composition in early plants. After the first coffee break, **Vivi Vajda** explained how the chemical fingerprints of fossil plants, together with the microstructural morphologies, can answer questions concerning survival traits during extinction events. **Michael Buckley** discussed the great insights that proteomic techniques can give us for improving our understanding of phylogeny and palaeobiodiversity. **Farid Saleh** used multiple examples of how chemical investigations can resolve enigmatic patterns of both exquisite and obscured preservation in the rock record.



Photo: Elizabeth Dowding.

Once the Symposium talks were concluded, the icebreaker reception was held in the historic Aula Maxima, with refreshments and snacks allowing the delegates to mingle and catch up. For many this was the first time to see their colleagues in person in years, if ever.

The first session saw talks from **Benjamin Griffin** exploring different hypotheses of the launch motion of pterosaurs, **Richard Stockey** looking at the increases in atmospheric oxygen through time, and a lightning talk by **Giovanni Pasinetti** on novel interpretations of the Ediacaran rangeomorph *Clumofrons plumosa*. Tea and coffee were available between sessions and gave attendees time for a much-needed catch up and a chance to check out some of the posters. In session two,



Emma Dunne investigated the climactic drivers of pterosaur origins, while **Carla Harper's** lightning talk starred a "Cabinet of curiosity", exploring the coevolution of woody plants and fungi. After lunch, session three included talks by **Rebecca Cooper** on deep learning estimation of palaeobiodiversity, and by **Jansen Smith** discussing how to increase the equitability of data citation in palaeontology. This year's Annual Address was delivered by Prof. **Dani Schmidt**, discussing "What – if anything – can palaeontology contribute to understanding our climate crisis?".

After the Address, delegates took a short bus trip to the Annual Dinner, which was held at Páirc Uí Chaoimh, Cork's primary stadium for the Irish national sports Gaelic football and hurling. There was a drinks reception before dinner, accompanied by live instrumental traditional Irish music and with a hurling training session on the pitch, visible from the venue. The four-course dinner was followed by a céilí, a traditional Irish dance party that was accompanied by live music. Here attendees were encouraged to get up from their tables to hit the floor and learn some dance moves.

The last day of talks began with **Valentina Rossi** discussing her work using SEM and EDX to study preservation of feathers. This session also heard talks from **Pauline Guenser** explaining her work on revising conodont taxonomy, and **Adam Kocsis** discussing the effects of thermal habitat loss during global temperature changes. In session five, **Joseph Flannery Sutherland** talked about his work using ecological niche modelling to study the rise of modern coral reefs and **Elizabeth Dowding** shared her work on the influence of observer bias on biogeographic interrelationships.

In the afternoon, **Rebecca Walley** asked the big question "Does your data collection method matter?" comparing citizen science data to published works, directly after which **Antonio Ballell Mayoral** shared their work on the form and function of dinosaur teeth. The final session of the conference covered various aspects such as "The role of fossil tips in inferring the tree of life" by **Russell Garwood**, the feet of early theropod flyers by **Michael Pittman**, and rounding off the conference **Mike Benton** on Phanerozoic oceans and the rise of biodiversity hotspots.

A two-day post-conference field-trip was offered to those brave enough to face the wet weather of the west coast. The trip visited the world-famous Carboniferous rocks of North Clare on Ireland's Atlantic seaboard. Participants got the chance to visit the remarkable Burren region and Upper Carboniferous (Namurian) sites along the coast, including the Cliffs of Moher.

This year the President's Prize was given to **Giovanni Mussini** for his exciting talk on vetulicolian phylogeny and to **Andre Rowe** for his excellent work on tyrannosauroids skull sizes. This was the second year of flash talks and the awards for the best ones were given to **Miriam Slodownik** for her insightful work on Araucariaceae and to **Kiersten Formoso** for her great talk on the evolutionary routes taken by secondarily aquatic mammals and reptiles. The Council Poster Prizes were awarded to **Iacopo Cavicchini** for their work on CT scanning and decay experiments, **Alison Cribb** for comparing changes in terrestrial and marine ecospace dynamics and **Anna McGairry** for their work reviewing the various possible interpretations for 'mattress' structures from the Lower Ordovician.

A big thanks and congratulations to Maria McNamara and her team of co-organizers and volunteers for organizing such a terrific conference.



And for those of you wondering where Palaeovision was at this meeting – don't worry! The 3rd Annual Palaeovision song contest will return this 17th December, online.

Laura Mulvey (she/her) and Bryan Shirley (he/his)

Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Public Engagement workshop

The Public Engagement Workshop took place on the morning of Wednesday 20th July and was many attendees' first event of the 2022 Annual Meeting. It was hosted by **Jess Franklin**, Science Outreach Officer for Ireland's Fossil Heritage at UCC, and **Elspeth Sinclair**, Education and Outreach Officer at iCRAG. Attendees cut broadly through the cross-section of early-career research, including MSc and PhD students and postdoctoral researchers, as well as a handful of public engagement professionals.

A key theme of the workshop was thinking of engagement as a two-way exchange of ideas between different groups, rather than scientists unilaterally reaching out to a singular "public". In keeping with this, the workshop itself had a collaborative feel, focused on finding and developing the skills attendees already had instead of a purely didactic teaching process.

The workshop was bookended by warm-up and closing activities where we presented "elevator pitches" of our own research interests. The warm-up activity was unfortunately slightly misunderstood by attendees, but the facilitators got us back on track. At the end of the session, our revised elevator pitches incorporated all we had learned about making our research relevant and understandable to our audiences. The hosts encouraged us to take these pitches out onto the conference floor, whether or not we were presenting research. This brought home the necessity of engagement skills in day-to-day research and networking.

We began the workshop proper by considering different kinds of audience that a public engagement programme might try to engage with. These included children of various ages, their parents and teachers, professions such as farmers, and even other scientists. This laid the foundation for discussing how we would make our research interests relevant and accessible to these different sections of the public. From here the facilitators guided us through imagining an engagement activity to involve our target audience in palaeontological knowledge, gradually introducing specific practical considerations such as funding and risk assessments. These were helped along by looking at planning notes used by the facilitators for real engagement activities.

I am very early in my palaeontological career, having recently completed my master's, and am currently working as a research technician in order to develop my skills as a researcher. I was drawn to the workshop as someone who has long recognized the importance of public engagement with science but felt I lacked the skills and platform necessary. I cannot speak to the experiences of the more senior public engagement professionals in attendance, but to early-career researchers, gaining confidence can be as important as gaining hard skills. Fortunately, this workshop supported both. Not only am I able to write on my CV that I know how to plan a public engagement event, I also feel able to communicate my work to my colleagues and friends within and outside palaeontology. Working through all the considerations on a real event planning sheet was a highlight of the session



and a memorable opportunity to expand our public engagement skills. This planning activity was very useful but a little short; as desperate for lunch as attendees were by 12pm, the task would have benefited from some more time to think and discuss.

The facilitators' experience in putting on events shone through in this workshop. It was engaging and affirming, and rooted in a clear case for the necessity of public engagement in science and a pragmatic understanding of the process of developing engagement programmes. In all, it was a great start to the conference and a powerful tool for researchers to use over the following days, and through the rest of their careers.

Sophie A. Fasey (she/her)

University of Birmingham, UK

UCC Lab Tours

For me, one of the highlights of the recent PalAss Annual Meeting was the lab tours offered on the Wednesday morning (20th July) before the symposium. It is always interesting peeking into where other people work and learning about their research. We met outside the Butler Building in groups of 2-4 people, and while we waited for the tour

to start the student volunteers told us some of the local history of the area. The Butler Building is located where distilleries used to sit, and although the area is along the river, it is fortunately not prone to the devastating flooding that has hit other University buildings.

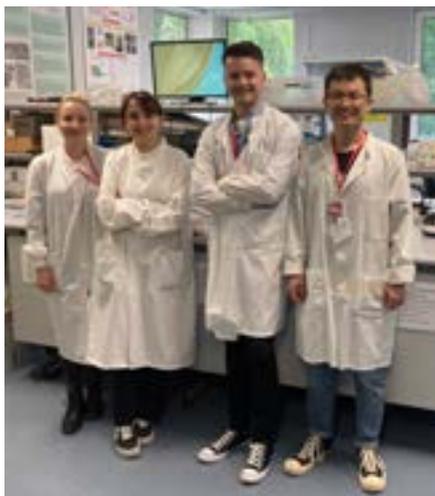
Aaron Quigley then collected us to start the tour in the Palaeobiology Laboratory upstairs, where melanin is extracted and taphonomic experiments are conducted. **Beatriz Carazo del**

Hoyo demonstrated the equipment she uses to extract the melanin, showing us examples of different stages of the extraction process under the microscope. Next, **Zixiao Yang** demonstrated the incubator used for decay experiments which has a nifty hole in the side to allow monitoring of conditions such as pH.

Valentina Rossi then explained the machine they affectionately called 'The Bomb' (formally known as the Strata Technology custom-built

high-pressure maturation rig), a surprisingly compact but exceptionally cool machine that allows experiments on the impact of temperature and pressure on substances such as melanin.

We then ambled over to the Mary Ward Microbeam Laboratory, mulling over the uses of 'The Bomb' as we walked. Although only a single room, the Mary Ward lab holds a surprising number of gadgets. We were met there by **Daniel Cirtina** who showed us the compact scanning electron



*Prof. McNamara's team showing the lab to the Annual Meeting guests: Valentina Rossi, Beatriz Carazo del Hoyo, Aaron Quigley and Zixiao Yang.
Photo: E. Jarochowska.*



microscope (SEM), which can take both gold-coated specimens (prepared on the adjacent table) and un-coated specimens. The SEM I used as an undergraduate was considerably larger and more unwieldy than this one, so it was amazing to see how far technology has come. Just behind the sputter coater we had a demonstration of their light microscope by **Daniel Falk**. With top-tier Leica software, he can take montages and stitch stacks of images together instantly. Watching all of the sand particles in the dish be photographed independently and automatically stitched together was very impressive! Next was the Leica Ultracut UC7 ultramicrotome, which **Maria McNamara** herself demonstrated, producing thin sections of samples within seconds. She also explained how when she first started using the machine it would take her hours to produce a single slice, but with practice she managed to cut the time down to a mere 20 minutes. The thin sections can then be used for further analysis, such as under a light microscope or with Raman spectroscopy, although not the slice Maria created that day as that one sadly ended up on the floor.



Maria McNamara at the microtome. Photo: E. Jarochowska.

Finally, **Tiffany Slater** and **Richard Unitt** demonstrated the micro FT-IR system and the Raman microscope, respectively. Tiffany showed us the large array of specialist attachments that can be used with the FT-IR system to analyse the molecular composition of all manner of objects, from feathers (demonstrated in



Tiffany Slater demonstrating the Raman microscope to impressed Meeting participants. Photo: E. Jarochowska.

front of us) to fossils, and in any position along the object. Richard's demonstration of the Raman spectrometer was similarly impressive as he showed us how quickly they can analyse feathers. This was the end of the tour, and with good timing, as we were able to wander back to the main campus just in time for lunch.

Emily Carlisle (she/her)
University of Bristol, UK



Post-conference field trip to the Burren region

The 66th Annual Meeting of the Palaeontological Association was followed by a two-day field-trip organized by **Maria McNamara** and **Chris Mays** (UCC), with additional input from **Mike Simms** (Ulster Museum). Immersed into the wilderness of the Burren and Cliffs of Moher UNESCO Global Geopark, attendees were given a chance to explore the terraced Carboniferous limestones that typify this region. The first stop consisted of a hike on Mullaghmore hill. These km-scale rock giants are formed by monoclinical folds rising up from an otherwise flat, stark horizon. Undeformed regions to the north and west of the Burren are thought to have been stabilized by an underlying granite batholith that kept sedimentary successions in place during the Variscan orogeny.

Mullaghmore also features one of the most prominent aspects of the Burren: karst landscapes. Successive glaciations over the past two million years have scraped off much of the sedimentary cover, resulting in large areas of limestone exposure that have been subjected to intense dissolution from water circulating into cracks and solution pans (or 'kamenitzas'). This process eventually led to the emblematic scenery of the Burren, dominated by vast areas of fractured, polished rock surfaces.

Our second stop in the Murroghtoohy area gave us additional insights into the process of karstification in the Burren. On top of an expansive limestone plane embracing the shoreline, distinct limestone blocks stick out. These blocks, called erratics, form the relics of various beds that have been scraped off and transported by moving ice sheets. Individual blocks, that can be up to several metres wide, give us an idea of the remarkable strength of glaciations that have shaped the landscape that we see today. On the other hand, the pedestal on which many erratics lie is evidence of a more recent ongoing process of dissolution. Acting as umbrellas, loose blocks protect the portion of limestone directly beneath them, while water drops off and dissolves surrounding areas.

The cliffs of Ailladie were the third and last stop of the day. There, the contact between the Maumcaha and Aillwee Members of the Burren Formation (Asbian; 337.5–333 Ma) is marked by a clay band that forms a distinct notch on the cliff. The preferential dissolution of clays over limestones gives us a direct view of the ongoing removal of 'soft' lithologies beneath the flat limestone beds that characterize much of the surface exposures in the Burren. The first day ended with a delicious dinner in Doolin, followed by a few drinks in a traditional Irish pub with live music.

Protracted rainfall the following morning prevented access to the Clare Shale Formation along the coast of Fisherstreet. The site was still worth a visit, not least for the outstanding beauty of the pyritized goniatites that we found in loose pebbles on the beach. On our way back, we also witnessed another step in the karstification of the Burren: the development of biokarsts. As karstified limestone meets the shore, solution pans and cracks become hosts of unexpectedly rich ecosystems dominated by barnacles, limpets, seaweeds and corals, all of which further participate in the erosion of exposed surfaces.

Culminating in the karstification process is the formation of large underground cavities, which in the Burren were spectacularly exemplified by our next stop: the Doolin Cave. After a short descent into the underworld, we were led into a dark space before all lights went off. This empty, quiet atmosphere set the stage for a wave of amazement as the Great Stalactite was revealed under the spotlights. The 7.3 m-long structure is proudly hanging at the centre of a majestic chamber topped by a series of domes.



The final stop at the Cliffs of Moher offered a range of options to be chosen by attendees: a walk on the cliffs, some fossil hunting on the stairs leading to O'Brien's Tower, a visit to the visitor centre, or a brief excursion onto the surface of the Moore's Bay Sandstone that is packed with Zoophycos trace fossils.

After this two-day journey under nearly persistent rain, the first words that come to my mind as I think of the Burren are 'bare', 'rugged', 'ruthless', 'wild' and 'paradoxically charming'. I think the beauty of this place partly stems from the diversity of the geological features that it hides, each outlining a different chapter in the geological history of a limestone-dominated interval: from deposition to deformation, erosion and irreversible loss.

I deeply thank Maria, Chris and Mike for sharing their passion and knowledge of the Burren. I have left Ireland with a renewed sense of curiosity, and feel inspired by the concept of geoparks as pivotal platforms connecting our field to the wider world.

Elise Wallet

Uppsala University, Sweden



The Mullaghmore hill consists of monoclinial folds of Carboniferous limestone. Photo: N. Vuolo.



Participants having a drink at Doolin. Photo: E. Jarochowska.



Erratics lying on top of a karstified bed by the coast at Murrooghtoohey. Photo: E. Wallet.



Participants gather on biokarsts under heavy rainfall at Fisherstreet. Photo: E. Jarochowska.



The Great Stalactite in the Doolin Cave. Photo: E. Wallet.

**Progressive Palaeontology 2022**

University of Lincoln, UK 14 – 16 June 2022

With COVID safety measures lifted, conferences started to rise again from the ashes and one among them was ProgPal. Brought to you from lovely Lincoln, the conference hosted 11 full talks, ten lightning talks and 24 posters. The numbers were a little lower than last year, possibly due to the shift back from the online to in person format, or perhaps due to details being announced a bit late, especially for presenters. This might also be why I was (as far as I could tell) the only attendee who did not have their home university on the British Isles. Still, what matters most in talks is quality, not quantity, and the quality of the talks and posters was very high. A wide range of topics and methods were discussed, resulting in interesting topics for all who attended.

The first day started in the afternoon and after a short welcome talk there was the choice between two workshops, each lasting two hours. The first was a workshop named 'Phylogenetic comparative methods using R' given by **Manabu Sakamoto**. The second was the 'Science Communication workshop' by **Elspeth Sinclair**. I joined the former workshop, in which we were shown how to write R code to perform a simple phylogenetic comparison using the University's computers. After these workshops, there was a chance to look at the posters and talk to their authors. During this time there was also an LGBTQ+ meetup and a neurodiversity panel. The programme continued in the evening with the icebreaker event and a palaeo pub quiz, which most definitely broke the ice (I still defend the idea that Sudan is a squarer country than Egypt). After this, everybody, in true conference style, went to the pubs.

However, it seems that it has been widely forgotten during the pandemic that the choices during the evening bring consequences for the next morning, and with the talks starting early, many people had exchanged their normal tea for some very strong coffee. Luckily the talks were definitely not sleep-inducing and the day flew by with all kinds of topics being presented, from the sounds of Jurassic crickets to the preservation of brains and from echinoids to dicynodonts. In the middle of all these talks there was another poster session just after lunch, offering the chance to talk to the presenters if one had missed them the day before. After all the talks had finished, the winners were announced – please see the list at the end of this report. The first part of the conference came to an end with a dinner at Pho, a lovely Vietnamese restaurant, where I was surprised to get the best coffee I've ever had.

The next morning was the last day of the conference in the form of a field-trip to the cliffs of Whitby. After getting up early and taking a two and a half hour coach ride, we arrived. A short walk to the beach and a safety briefing later we were all scouring the beach for any fossil or fossil fragments we could find. This was not very difficult as the ammonite and belemnite fragments were plentiful and many beautiful specimens were collected, including a possible ichthyosaur vertebra. Unfortunately, we had to hurry slightly not to get caught by the tides, but we still had a very bountiful harvest. After the walk we were free to stroll through Whitby itself and some of us went to see the fossils at Whitby Museum. At 6pm the bus went back towards Lincoln and its arrival meant the official end of ProgPal 2022.

I must admit that this was the first conference I have ever been able to attend, so I do not have any other experiences to compare it to. Having said that, I had a great time at ProgPal and it was



wonderful getting to know so many other people also trying to build a career in this field. I can definitely say it was worth travelling 12 hours on a train twice just for those three days. I'm sure I'll be there again for ProgPal 2023!

Joël Koelewijn (he/him)

Utrecht University, The Netherlands

ProgPal Awardees

- Best poster: **James Rawson** – ‘Homoplastic jaw joint evolution in derived South American cynodonts’.
- Best lightning talk: **Alexandra L. Morton-Hayward** – ‘Nerves of steel: the role of iron in the preservation of the central nervous system’.
- Best full talk: **Robert Xavier MacDonald** – ‘Understanding the macroevolutionary relationship between colouration and colour vision in primates’.
- Palaeoart winner: **Luke Meade** – “Mesozoic Mass”.
- Commended Poster: **Nicole Barnes** – ‘The affinity of embryo-like fossils: new evidence from Mongolia’.
- Commended Lightning talk: **Philip Vixseboxse** – ‘Soft sediment stabilization via solvent replacement: a novel approach for preserving taphonomic experiments’.
- Commended Full talk: **Andrew Brinkworth** – ‘A trend of decreasing complexity in the avian appendicular skeleton’.



Photo courtesy of the ProgPal 2022 Committee.



The Geological Society of America CONNECTS 2021; Session T87: New perspectives on Phanerozoic mass extinctions and environmental perturbations
Oregon Convention Center, Portland, USA 10 – 11 October 2021

After two years of online meetings, the resumption of an in-person 2021 Geological Society of America meeting represented a refreshing transition with a hybrid conference format. The Palaeontological Association sponsored the topical session “New perspectives on Phanerozoic mass extinctions and environmental perturbations” that highlighted research utilizing an interdisciplinary approach to improve our understanding of the patterns, drivers and biological response behind mass extinction events, as well as other major environmental perturbations across the Phanerozoic. Session chairs **Ekaterina Larina**, **Bethany Allen**, **James Witts** and **Rowan Whittle** put together a fantastic session that spanned two days of poster and oral presentations, encompassing 29 talks and 11 posters. Presentations were well-attended and covered a wide range of topics, from studying morphospace occupancy to combining isotope proxy records to interpret changes to ocean chemistry during extinction events.

On Sunday, the first part of the session began with talks covering Phanerozoic-wide patterns on the causes, selectivity and biological response to mass extinction events. These talks made use of a wide range of techniques, combining regression analyses and model selection (Figure 1), metabolic models, and multi-layer networks to study long-term patterns in the history of life. Of particular interest was a talk by **Daniel Brecker** on generating a community-sourced quantitative reconstruction of CO₂ concentrations throughout the Phanerozoic by integrating vetted and modernized CO₂ proxy records with new CO₂ proxy models. This kind of initiative would create a publicly available database that would be a fantastic resource for studying mass extinctions in the fossil record, and likely facilitate new breakthroughs in the study of mass extinction events.

After a short break, talks resumed with a focus on early Phanerozoic mass extinction events and biodiversity crises. A common thread throughout these talks was the integration of isotope proxy records to develop a richer understanding of mass extinction events. Proxy records featured in this part of the session included using I/Ca ratios to assess the relationship of shallow marine anoxia with the Late Ordovician and Devonian mass extinctions, high-resolution clumped isotope analysis to understand climate change during the Late Ordovician icehouse, sulfur isotopes to understand the relationship between reducing environments and Silurian biogeochemical events, and the application of carbon and nitrogen isotopes, trace element analysis, and sedimentological analysis to study changes to seawater chemistry. An interesting commonality among these talks was the emphasis on the importance of local controls on patterns in geochemical records, as opposed to invoking global drivers to explain isotopic excursions. Such findings highlight the need for well-resolved regional records of extinction events to extrapolate generalized global patterns of the drivers of an extinction. These talks concluded the first part of the session.

On Monday, the second part of the session commenced with analyses of the Devonian and Permian mass extinctions. One major take-away from these talks was the lack of evidence for synchronous (*sensu stricto*) extinction events, both between and within the marine and terrestrial realms: talks highlighted new evidence for a stepwise extinction across the Devonian–Carboniferous boundary, proposed the absence of an isochronous extinction horizon across Gondwana during the Permian mass extinction, and documented diachronous plant evolution across the Permian–Triassic

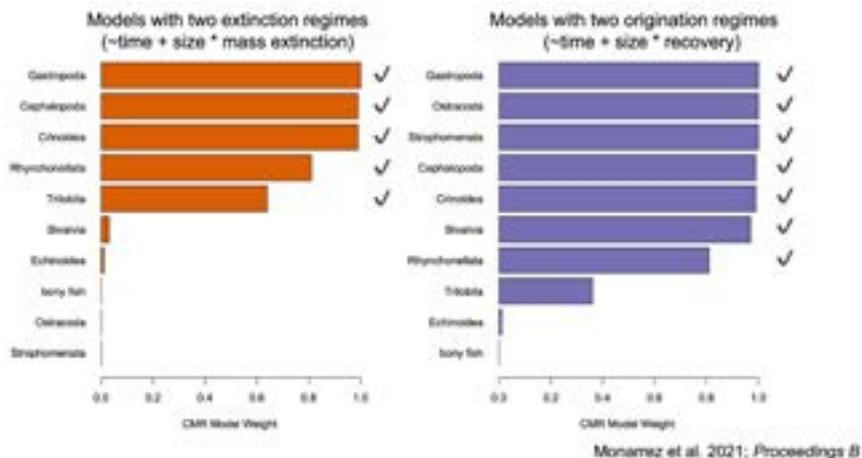


Figure 1. Slide from the invited talk by **Pedro Monarrez** demonstrating capture-mark-recapture (CMR) model weights for body size extinction and origination selectivity between models with a single extinction regime (background only) versus models with both background and mass extinction/recovery regimes. Plots indicate that models with two distinct selectivity regimes are favoured for most taxonomic classes in this study, suggesting that body selectivity for extinction and origination alternates between background intervals and mass extinctions and their respective recoveries.

boundary. These talks underscored the complexity of mass extinction events, a theme that was carried over into presentations on the end-Triassic mass extinction. Session convener **Ekaterina Larina** presented on ecological shifts during the end-Triassic mass extinction, noting the difference in tempo of ecological changes between different basins during the extinction event. **Emma Dunne** demonstrated an interdisciplinary approach to studying dinosaur evolution, combining a general circulation model with phylogenetic and fossil occurrence data to study dinosaur niche expansion during the Early Jurassic. Ending the end-Triassic mass extinction talks, **Nicholas Hebdon** showcased the application of hydrodynamic modelling to understand the advantages of various conch shapes in ammonites, concluding that the morphological shift in ammonites following the end-Triassic mass extinction was a consequence of the extinction, but not a direct response to the event.

Subsequent talks on the Monday morning covered a range of Mesozoic extinction events. These talks reflected the diversity of questions that can be investigated through the study of mass extinctions, including the response of reef ecosystems to extinction crises, the relationship between large igneous provinces and ocean anoxic events, and how morphospace changes can be decoupled from taxonomic turnover. The final talk of the session, by **Christopher Spalding**, discussed a new approach to assessing the magnitude of the current extinction crisis through a quantitative appraisal of humanity's modification of ecosystems as recorded in sediments. The concept is based on the observation that extinction magnitude in the marine fossil record is correlated to the magnitude of sedimentary turnover. He and co-author **Pincelli Hull** demonstrated that the prevalence of habitat disruption around the world today suggests that the most impactful phase of the current extinction crisis has yet to occur, but also has the potential to be avoided. The talk was a fitting end to the session, serving as a reminder of the importance of utilizing the past to understand both the present and the future, particularly as humans continue to modify the Earth's systems in unprecedented ways.



We would like to thank the session organizers for an amazing and rich topical session, covering such a wide range of both disciplines and intervals in the history of life. Throughout the talks, we were reminded that no one interpretation of a mass extinction is 'set in stone': the session underscored how innovative approaches to studying the geological, geochemical and fossil records are key to fully appreciating and understanding the complexity of extinction events. Meeting sessions that bring together scientists from such a wide array of backgrounds remind us of the importance of interdisciplinary work, and open the door to new collaborations that will advance our knowledge of the history of life on Earth.

Acknowledgements

The session was supported by Grant-in-aid from the Palaeontological Association (PA-GA202101) awarded to session organizers Ekaterina Larina, Bethany J. Allen and James D. Witts to aid keynote speaker attendance.

Joshua B. Zimmt

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Pedro M. Monarrez

Stanford University, USA



80th Anniversary of Efremov's Taphonomy (9th International Meeting on Taphonomy and Fossilization (TAPHOS) and 6th International Council for Archaeozoology Taphonomy Working Group (ICAZ-TWG) joint meeting)
Alcalá de Henares, Madrid, Spain 5 – 11 June 2022

This joint meeting was held in recognition of the 80th anniversary of Efremov's 1940 paper defining taphonomy as a scientific discipline and was held at the Aula Magna of the Universidad de Alcalá, Spain in June 2022, postponed from September 2020 due to the COVID-19 pandemic. This special celebration was organized by the 9th TAPHOS Congress and the 6th ICAZ-TWG Meeting. We also commemorated the 30th anniversary of the first meeting on Taphonomy and Fossilization (now known as TAPHOS) and the special contribution to the theory of taphonomy by Sixto Fernández-López, as well as the 30th anniversary of the publication of the masterpiece *Owls, Caves and Fossils* by Peter Andrews (the basis of small mammal taphonomy methodology). We were especially honoured to have the participation of **Kay Behrensmeyer** as the keynote speaker of the opening session and **Christiane Denys** who gave the farewell keynote speech at this special celebration.



Some of the congress participants. Photo: William F. Keyser.



Despite the two-year postponement of the Congress due to COVID-19, we were still able to appreciate the special relevance of 2020 to our discipline and celebrate the aforementioned anniversaries. The pandemic resulted in the absence of around one tenth of delegates; however, although they were unable to attend in person, they were able to send in pre-recorded video presentations to be played during their congress sessions. Unfortunately, Peter Andrews was also unable to attend in person due to illness but luckily was able to follow the conference online. The pandemic did not reduce overall delegate participation significantly, with 123 participants in total of which 25 % were students. The meeting brought together vertebrate and invertebrate researchers from palaeontology, archaeology, geology, biology, histology and zooarchaeology, focusing on all aspects of taphonomy, *i.e.* forensic scholars, palaeoecologists, palaeoclimatologists. The participants travelled from around the world, with many scientists attending from across Europe as well as South, Central and North America.

The Congress began with a field-trip to the World Heritage sites of Atapuerca (Burgos) on 5th June, led by **Isabel Cáceres, Paula Mateo-Lomba** and **Héctor del Valle** from the Institute of Human Paleocology and Social Evolution (IPHES). The next day, another field-trip took us to the Valle de los Neandertales site in Pinilla (Madrid), hosted by **Enrique Baquedano, Belén Márquez, Bárbara Rodríguez** and **Cesar Laplana** from the Regional Museum of Archaeology and Palaeontology. On 9th June a half-day mid-conference trip was made to the open-air site of Batallones (in Torrejón de Velasco, Madrid), led by **Soledad Domingo**.



*Field-trip to Cerro de los Batallones led by Soledad Domingo.
Photo: William F. Keyser.*

The opening of the Congress sessions took place on 7th June and participants were welcomed by the Vice-Rector and Dean of the Universidad de Alcalá (Margarita Vallejo Girvés and Luis Rivera Galicia, respectively) and the director of the Regional Museum of Archaeology and Palaeontology (Enrique Baquedano) as co-hosts of the Congress. Thanks to these institutions, as well as to the Vice-Dean Purificacion Granero and Jose Raul Fernández del Castillo of the Foundation, we had a magnificent setting to celebrate our Congress, the Aula Magna. This conference hall was especially appropriate with sufficient space and ventilation to be COVID-19 secure, and all the facilities made the meeting as brilliant an event as it deserved to be.

The opening keynote by **Kay Behrensmeyer** entitled “What is Taphonomy in 2022?” updated us on the state of the art of taphonomic research methodologies and research subjects. This summary also displayed the new conception and perception of taphonomy amongst different research subjects, topics and professionals, as she noted, “some researchers even today ignore that what they are doing is actually taphonomy”. The sessions that followed were organized by ‘taphosystems’, a term proposed by **Sixto Fernández López** that refers to fossil associations and the external environment in which they were preserved. These sessions aimed to facilitate connecting experts from different backgrounds working on similar environments and were: open air, marine and karstic



taphosystems, then experimental taphonomy and other environments. Each session alternated between podium and poster presentations and received a lot of comments and questions from the audience, leading to interesting discussions.

The Congress was supported by several palaeontological and archaeological institutions, foundations and societies: the Palaeontological Association (Grant-in-aid number PA-GA202003); TaphEN, a French working group supported by the European Union and the French Centre National de Recherche Scientifique (TaphEN-CNRS, Actions 2022); the International Council for Archaeozoology (ICAZ Congress Support); and the ArchaeologyHub of the CSIC (AII'2022 4_001). Other institutions such as the Foundation of and the Universidad de Alcalá, the Faculty of Economics, the Regional Museum of Archaeology and Palaeontology, the City Hall of Alcalá, the Society of Friends of the Museo Nacional de Ciencias Naturales (SAM-MNCN, and especially Josefina Cabarga, who helped us massively with the Congress accounting work) all greatly facilitated the organization and celebration of the 80th Anniversary of Efremov's Taphonomy congress. Student grants were given thanks to the Palaeontological Association, ICAZ and TaphEN. Transmitting Science (<www.transmittingscience.com>) also offered a free course to be awarded to a student presenter who provided excellent responses to questions from the audience; this was given to **Zohar Turgeman-Yaffe** from the University of Haifa, Israel.

The Congress closed with a final session on Saturday 11th June at the Regional Museum of Archaeology and Palaeontology. **Oscar Cambra Moo** paid homage to the contributions of Sixto Fernández-López with a dynamic talk entitled "The preservation and conservation dilemma: a contribution to Sixto Fernández López's theoretical framework of taphonomy". At the end of the talk he proposed a blind test with these two terms, which opened a debate on the difficulty of maintaining the nomenclature and the 'false friends' that also exist in our research fields. This is especially noticeable as we collaborate with specialists from very different fields and carry out cross-cutting research with very different researchers and disciplines. The debate also extended to the difficulty of publishing databases and experimental works and reinforced the need to promote the *Journal of Taphonomy* or create a new one. The Congress made clear the need to



A moment's respite from the Cerro de los Batallones sunshine. Photo: William F. Keyser.



validate taphonomic modifications and processes through experimental work and long-term field monitoring, collecting not only specimens but also data (videos, photographs, maps) to upload and share online.

The tribute was given to Sixto Fernández-López in person and Peter Andrews received the tribute from Yolanda Fernández-Jalvo who flew to the UK to present the award. This tribute was also extended to Kay Behrensmeyer and Christiane Denys. The four received the homage from the Congress organizing committee and delegates for their outstanding contribution to our knowledge of taphonomy. A final keynote entitled “Microfaunal taphonomy comes of age: a tribute to Peter Andrews” was given by Christiane Denys. All contributions, both podium and poster presentations, as well as keynote speeches have been published in a special issue of the *Journal of Taphonomy* (volume **16** (1-4), 2022), featuring a full-colour front cover of Sixto Fernández-López and Peter Andrews. The journal generously granted open access to the Congress participants until the end of 2022. The Congress closed with a farewell party in the main hall of the Regional Museum of Archaeology and Palaeontology, and the participants were invited to reconvene for the future meetings, with the 10th TAPHOS to be held in Ferrara, Italy and the 7th TWG-ICAZ in either France or Israel, as yet to be decided. We hope to see many PalAss members there!



*Images from the farewell party at the Regional Museum of Archaeology and Palaeontology. The left-hand image shows part of the organizing committee and the honourees, L-R: **Aida Gutiérrez, Ana Marín-Arroyo, Marta Moreno, Sixto Fernández-López, Kay Behrensmeyer, Christiane Denys, Paloma Sevilla, Angel Domínguez and Sara García-Morato** (absent: Lucía Agudo, Peter Andrews and Yolanda Fernández-Jalvo). Photos courtesy of Yolanda Fernández-Jalvo.*

Yolanda Fernández-Jalvo

Museo Nacional de Ciencias Naturales, Madrid, Spain

FURTHER READING

- ANDREWS, P. 1990. *Owls, Caves, and Fossils: predation, preservation, and accumulation of small mammal bones in caves with an analysis of the Pleistocene cave faunas from Westbury-sub-Mendip, Somerset, UK*. University of Chicago Press, Illinois. 239 pp.
- EFREMOV, I. 1940. Taphonomy: new branch of paleontology. *Pan American Geologist*, **74**, 81–93.



The Karl-Armin Tröger Memorial Inoceramid Workshop
University of Warsaw, Poland 23 August 2022

The 11th International Cretaceous Symposium was held in Warsaw, Poland from 22nd to 26th August 2022. This conference was intended to bring together researchers working on a wide diversity of topics pertaining to the Cretaceous – ranging from palaeontology to stratigraphy, geochemistry, and tectonics – and marked an ideal occasion for specialist workshops in addition to sessions in the symposium proper (<www.cretaceous2022.com>). This opportunity was especially apt with regards to inoceramid bivalves, an extinct group which ranged from the Early Jurassic to the Late Cretaceous, being particularly abundant in Upper Cretaceous strata. They are a powerful (and increasingly used) tool in Cretaceous biostratigraphy and palaeobiogeography, but have remained enigmatic to the wider palaeontological community, especially with regards to their underlying systematic hierarchy, basic taxonomic relations and their evolutionary context. The last general Inoceramid Workshop was held some 26 years ago, during the 5th International Cretaceous Symposium in Freiberg, Germany (1996), and the field has advanced considerably since then. A common meeting of inoceramid workers was long overdue, and fortunately the opportunity arose to host a workshop during this year's symposium.

As meticulously outlined during the keynote address by **Irenusz Walaszczyk**, Karl-Armin Tröger (1931–2019) was one of the great luminaries of Cretaceous geology, especially with regards to the Inoceramidae. He mentored numerous inoceramid workers, and his work set the foundation for much of our present understanding of inoceramid taxonomy, morphometrics, diversity, biostratigraphy and palaeobiogeography. As such, we found it only fitting that this inoceramid meeting be devoted to his memory. The workshop was generously supported by the Palaeontological Association (Grant-in-aid number PA-GA202202), the Systematics Association and the Paleontological Society. Collectively, this support strongly subsidized the participation of early-career researchers, and more broadly that of all workshop participants. Indeed, in combination with the logistical support provided by the overarching International Cretaceous Symposium, it enabled us to eliminate any associated registration fees, hopefully broadening the diversity and accessibility of the workshop and leading to richer, more insightful discussions.

The Karl-Armin Tröger Memorial Inoceramid Workshop – and indeed, the 11th International Cretaceous Symposium as a whole – was almost entirely hybrid, such that delegates could attend despite pandemic-related (or, more broadly, any and all) restrictions. During the workshop, attendees participated from countries spanning from Canada to New Zealand. The workshop began with a series of talks related to the taxonomy, palaeobiogeography, biostratigraphy, macroevolution and history of inoceramid bivalves. As alluded to above, the keynote address by Prof. Irenusz Walaszczyk delivered a scrupulous overview of Karl Armin Tröger's contributions to the inoceramid literature. **Markus Wilmsen** provided insight into the taphonomic, biologic and palaeobiogeographic implications of the early Cenomanian *Gnesioceramus crippsi* event in Germany. Subsequently, **Bodil Wesenberg Lauridsen** described a rich, previously-unrecognized inoceramid assemblage from northeast Greenland, **Docho Dobrev** an overview of Turonian–Coniacian boundary interval biostratigraphy in central Bulgaria, and **Christina Ifrim** provided insight into the nature and utility of inoceramid biostratigraphy in northeastern Mexico. A second talk by **Irenusz Walaszczyk** outlined macroevolutionary and environmental drivers on the evolution, distribution and palaeobiogeography of Coniacian inoceramids, and **Jordan Todes** discussed preliminary results on the Campanian inoceramid fauna of Alabama, with palaeobiogeographic implications. A final talk,



The Old Library of the University of Warsaw, where the workshop took place. Photo by A. Grycuk, under the Creative Commons licence.

by **Christopher Collom**, described the professional career of Rudolf Heinz, an eminent member of the German inoceramid school with an extremely disturbing legacy.

In turn, these talks served as the basis for a wide-ranging roundtable discussion on the state of inoceramid studies, broadly addressed at answering: why inoceramids were prolific, diverse and cosmopolitan during the Late Cretaceous, and yet disappeared during the Maastrichtian before the end-Cretaceous mass extinction; and how inoceramid bivalves were able to thrive across a variety of environments, including anoxic settings. Several recurring themes emerged, including the need for a better understanding of inoceramid ontogeny, phylogeny and systematic affinity – at the species, genus, and higher taxonomic levels. Furthermore, a refined understanding of the palaeobiogeographic distribution of various inoceramid groups, and the necessity of making inoceramid palaeontology and taxonomy more accessible to the general palaeontological community, also emerged as critical points. Ultimately, any satisfactory answer to these issues will require a more thorough understanding of the spatial and temporal distribution of inoceramid bivalves, coupled to further advances in inoceramid palaeobiology.

It was decided that there is a concrete need for an online, openly accessible database of inoceramid taxonomy and literature. Avenues are currently being explored to implement this: for instance, through MolluscaBase. There was also a consensus that general inoceramid meetings ought to occur more regularly, and suggestions were made that an inoceramid society – under the name of the Tröger Group – should be established. In addition, there was a desire to collectively prepare a comprehensive overview of inoceramid palaeontology for the wider palaeontological community, which is currently in progress.

Jordan Todes

University of Chicago, USA



— OBITUARIES —

John Tempest Temple 1927 – 2022

Professor John Temple, a founding member of the Palaeontological Association, was a polymath: a geologist, palaeontologist and mathematician, who also had an extraordinary range of other intellectual interests – for example etymology, music, the history of maths, science and religion, and in particular a deep knowledge of classical Greek. He liked to discourse on any such subject and enjoyed explaining his discoveries to his companions, and had a sure instinct when to keep his discussion simple. However, when it came to writing up his work for publication, he saw the need to be exact and consistent so that his observations and results would be repeatable; his writings merit careful reading.

John was born and brought up in modest working-class surroundings, mainly in Middlesex (northwest London, UK). From

there he obtained a scholarship to St Catharine's College, University of Cambridge in 1944, where he studied Natural Sciences, majoring in geology, and obtained a BA degree with first-class honours. He then stayed on at Cambridge to conduct research towards a doctoral degree, and in 1951 he submitted a thesis on *The stratigraphy and trilobite faunas of the upper Ashgillian rocks of Britain and Scandinavia*; the rocks from around the Ordovician–Silurian boundary and their contained fossils continued to engage him throughout his career. Having obtained his PhD, John held a post briefly at University College London, but soon moved to become a junior lecturer in geology at Bedford College, London (c. 1954–1956, at that time in Regent's Park), and thence moved to Birkbeck College, London, where he remained until his retirement in 1992. In his early years John was among those palaeontologists who set up the Palaeontological Association, as recounted in *Palaeontology Newsletter* 64 (2007); although he was not reported to be one of those riding in the legendary taxi, the cartoon by Dr Jones in the 2017 "PalAss at 60" booklet does appear to show his bespectacled face on the taxi's roof (<<https://www.palass.org/association/palass-60>>). In 1983 John was awarded a DSc by the University of Cambridge and a year later he was given a personal professorship at Birkbeck College. There is a tradition at Birkbeck for supporting mature part-time students in further education, and John characteristically gave his students, and also other associates, much advice and

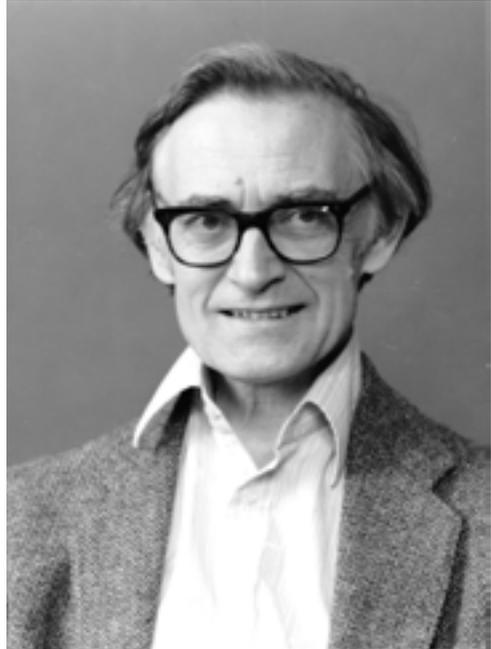


Photo courtesy of Richard Temple.



support; two of my colleagues at the British Geological Survey, Dennis White and David Butler, were both ably supervised by John when studying successfully for their PhD degrees.

John's earlier research papers include a definitive study of the widely distributed late Ordovician brachiopod fauna, now termed the '*Hirnantia* Fauna', that characterizes the Hirnantian rocks in Wales and northern England, and are recognized also in Scandinavia, Poland and Bohemia; this paper has provided a valuable baseline for consideration of the biostratigraphy at the Ashgill–Llandovery boundary. John also redescribed the Hirnantian trilobite *Dalmanitina mucronata* and its congeners (now assigned to *Mucronaspis*). He discussed the ontogeny of *Dalmanitina olini* and observed features that he thought likely to be common to all Phacopid trilobites; he considered it was not altogether improbable that the Phacopids had been derived neotenuously from a Ptychoparioid ancestor. This work prompted a challenge from H. B. Whittington, and later a cautious comment of support from C. J. Stubblefield, who wrote "I share Dr Temple's optimism".

John subsequently wrote several monographic papers on the brachiopod and trilobite faunas from strata at and above the Ordovician–Silurian boundary (1968–1987). The introductions to his monographs give a good idea of his taxonomic principles. He emphasized the need to make accurate and repeatable measurements of many fossil specimens, and to this end collected large fossiliferous blocks that he could break up (a job he seemed to find satisfying to do at home, on his back doorstep) and logged every specimen he could, to arrive at the proportions of each taxon in the total fauna. In his monograph of brachiopods from Keisley (1968), John explained his view that measurement should form the objective way of characterizing the fossil species he was studying; he measured the specimens and subjected the results to multivariate statistical analysis to show (where possible) the variation in each taxon in the population. John also brought his mathematical methods to the study of some trilobites, namely calymenids, trinucleids and encrinurids, the last in collaboration with the prolific R. P. Tripp (see *Palaeontology Newsletter* 49, 2002). Again, John sought to bring objectivity to the way in which measurements were to be made on trilobites, although at the Trilobite Meeting in Oslo in 1973 he found only limited support for his approach; some younger students evidently found his approach too slow for their liking.

For thirteen years (1952–1964) John took over from C. J. Stubblefield the task of listing newly published literature on trilobites, as recorded by the *Zoological Record: Trilobita*. Between 1974 and 1985 John was a voting member of the Ordovician–Silurian Boundary Working Group, to whom he offered a summary of how the boundary might be recognized in parts of Wales. However, when, after much work and discussion led by Prof. C. H. Holland, a formal subdivision of the Llandovery Series was proposed, John would not sign it; he objected to the weakness of some of the evidence and the approximations used in parts of the proposal. This led to a brief but sharp correspondence on "idealism and negativism" (*Journal of the Geological Society*, 148, 875–882). Although John Temple's writings may seem sharp and particular about detail, this was all part of his need to be clear and exact, even ruthlessly honest, while avoiding questionable compromises. However, in conversation he was naturally earnest and reasonable, and if, after a good discussion, it came to the point of agreeing to disagree, he used to sign off with a gentle laugh.

In 1964 John married Dorothy Thompson (1933–2018); they were a devoted couple. Their children Richard and Jane were born in September 1965. When John retired from Birkbeck College, London in 1992, he and Dorothy moved to Oxford, not far from the noble libraries and museums of that city. In his retirement John was for several years secretary to the local residents' association. He ceased



to work on geology and spent years of study, compiling a new and apparently definitive dictionary of idioms used in ancient Greek literature. It is hoped that in due course this will be made available online and that it will stand as a further monument to a man of remarkable intellect and humanity.

Adrian Rushton

Natural History Museum, London, UK

With thanks to Richard Temple and Jane Temple for information on John's career and family background; Mrs Mair Cave and Ms Helen White supplied some details of his professional work.

J. Keith Ingham **1937 – 2022**



Photo kindly supplied by Keith's daughter Clare Stafford.

Keith Ingham recently passed away at the age of 85 and will be missed by friends and colleagues. To many Association members he will be known as the artist who created our trinucleid trilobite logo. For almost 40 years he held the position of Curator and Senior Curator of Palaeontology at the Hunterian Museum, University of Glasgow in Scotland, where he was famous for being able to take on almost any task to an extraordinary degree of perfection. This ubiquity ranged from re-assembling a Mesozoic 'ganoid' fish from what started as a bagful of disarticulated plates, through having an exhaustive (and occasionally exhausting) knowledge of Roman coinage, to re-mastering NASA images from the early robotic explorations of the Martian landscape and identifying potentially one of the best locations to explore for life on Mars as a result (Russell *et al.* 1999). Nothing seemed beyond his capacity.

However, trilobites were his palaeontological speciality, and the Ordovician was his stamping ground. He was a superb field mapper, and relished the kind of structural complexities that would deter lesser mortals. His thesis work was centred on the Cautley and Dent district in northwest England, where the upper Ordovician Ashgill strata provided the global standard in the mid-twentieth century, and Keith published on the stratigraphy of these rocks and their trilobite faunas in a series of regularly cited papers (Ingham 1966; Ingham and Wright 1970). At that time a substantial monograph was a measure of progress for a young scientist, and Keith obliged with three parts of a Palaeontographical Society monograph (Ingham 1970–1977). By this time he had become particularly enthused by the Family Trinucleidae, and with colleagues provided a review of the group that remains one of the most magisterial of trilobite works (Hughes, Ingham and Addison 1975). The drawings in this paper were



all Keith's, and reveal him as the best artist the trilobites ever had. His oblique ventral views of trinucleids are utterly convincing and have never been surpassed (at this period the Association's logo also graced the front cover of the journal).

Following establishment at the Hunterian Museum, Keith progressed on to Scottish Ordovician strata (taking in the Lake District on the way: Ingham and McNamara 1978), at a time when the topography and terranes of the margins of the Iapetus Ocean were being vigorously debated. He started to map and measure the famous coastal sections near Girvan that had yielded some of the later Ordovician trilobites described by Nicholson and Etheridge and F.R.C. Reed. It is doubtful whether any other Ordovician section has been mapped in comparable detail (Ingham 1992) and he continued to refine the particulars well beyond his 'retirement'. Remarkable sedimentary rocks laid down in and around what he interpreted as submarine canyons yielded superb deep water blind and specialized pelagic trilobites that Keith could describe in every detail, his eyes popping with excitement, enriched occasionally with a peal of manic laughter about some unusual feature that he had discovered. He joined forces with the 'professional amateur' R.P. Tripp, who had spent years collecting from small quarries dotted over the Ayrshire countryside. Ron Tripp was an efficient 'finisher' of papers, whereas Keith was by nature a perfectionist who was reluctant to let anything go. However, they joined forces in a fine paper on an important fauna from the Doularg Formation that carries both their names (Ingham and Tripp 1991). Ron Tripp told me that he had to move in with Keith to ensure that the work was actually completed and submitted.

A few years earlier Keith had contributed to a small, but important palaeontological paper that finally settled the question of the early Ordovician age and palaeogeographic position of a sliver of limestone caught up in the Highland Border Complex (Ingham, Curry and Williams 1988) – proving its "Laurentian" credentials. Such detailed studies in these classical areas were contributing to big questions. Meanwhile, the international standard subdivision of the Ordovician was also under scrutiny, and I was charged with leading the revision of the correlation of strata within the British Isles. It was a long process persuading Keith to come up with his latest definitive version of the Midland Valley, but when he did it was so detailed that we had to convince the publishers that a 'pull out' correlation chart was needed, and so it eventually proved (Ingham 2000, Fig. 24). Although Keith continued to work on his Girvan collections until shortly before he became ill many trilobite species remain to be published, and it is to be hoped that his work will be completed by a successor.

Richard Fortey

Natural History Museum, London, UK

PalAss President 1994–1996



Keith at his favourite locality, originally worked by Elizabeth Gray in the 19th century, at the Whitehouse Shore, Girvan. Photo by Neil Clark.



REFERENCES

- HUGHES, C. P., INGHAM, J. K. and ADDISON, R. 1975. The morphology, classification and evolution of the trilobite Family Trinucleidae. *Philosophical Transactions of the Royal Society of London, Series B*, **272**, 537–607.
- INGHAM, J. K. 1966. The Ordovician rocks of the Cautley and Dent districts of Westmoreland and Yorkshire. *Proceedings of the Yorkshire Geological Society*, **35**, 455–505.
- INGHAM J. K. 1970–1977. A monograph of the upper Ordovician trilobites from the Cautley and Dent district of Westmoreland and Yorkshire. *Monographs of the Palaeontographical Society*, **1–3**, 1–123.
- INGHAM, J. K. 1992. Girvan Foreshore. In: LAWSON, J. D. and WEEDON, D. S. (eds) *Geological Excursions around Glasgow and Girvan*. Geological Society of Glasgow, 432 pp.
- INGHAM, J. K. and MCNAMARA, K. J. 1978. The Coniston Limestone Group. In: MOSELEY, F. (ed.) *The geology of the Lake District*. Yorkshire Geological Society, Occasional Publications, **3**, 284 pp.
- INGHAM, J. K. and TRIPP, R. P. 1991. The trilobite fauna of the Doularg Formation of the Girvan District, Scotland, and its palaeoenvironmental significance. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, **82**, 27–54.
- INGHAM, J. K. and WRIGHT, A. D. 1970. A revised classification of the Ashgill Series. *Lethaia*, **3**, 233–242.
- INGHAM, J. K., CURRY, G. B. and WILLIAMS, A. 1986. Early Ordovician Dounans Limestone fauna, Highland Border Complex, Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, **76**, 124–133.
- INGHAM, J. K. 2000. Scotland: the Midland Valley Terrane. In: Fortey, R. A. *et al.* *A revised correlation of Ordovician rocks in the British Isles*. Geological Society of London, Special Reports, **24**, pp.48–50.
- RUSSELL, M., INGHAM, J. K., ZEDEF, V., MAKTAV, D., SUNAR, F., HALL, A. and FALLICK, A. E. 1999. Search for signs of ancient life on Mars: Expectations from hydromagnesite microbialites, Salda Lake, Turkey. *Journal of the Geological Society*, **156**, 869–888.



Small Grant REPORT

*Morphological divergence of the island ruminant *Myotragus balearicus**

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Naturalis Biodiversity Center, The Netherlands

Introduction

Throughout the Quaternary, the Balearic Islands (Mallorca and Menorca) have been completely isolated from the mainland. This extensive period of isolation drastically impacted the morphology of various mammals on the islands, resulting in giant dormice and lagomorphs, as well as miniature bovids (Bover *et al.* 2008). These animals colonized the islands during the Messinian Salinity Crisis (5.3 Ma), a time during which the islands were connected with the mainland. Size adaptations in mammals are frequently seen on islands, whereas their driving forces are not fully understood (see Hennekam *et al.* 2020). This project aimed to investigate morphological variation present within the dwarfed bovid genus *Myotragus* using geometric morphometric analyses. The insular genus includes six morphologically distinct species (*M. palomboi*, *M. peptonellae*, *M. antiquus*, *M. kopperi*, *M. batei*, *M. balearicus*), occupying the Balearic Islands at different stages throughout time. By analysing the variation in size and shape within this genus, I investigated whether these morphological features are the result of specific niche occupation. Considering the large amount of osteological material available, *Myotragus* presents a unique opportunity to analyse morphological variation associated with changing body size, providing new insight on the evolutionary responses of mammals in a changing insular environment.

Material and methods

Over the last few decades, a large amount of osteological material of this bovid was excavated from fossil cave deposits across the Balearic Islands, stored at the Institut Mediterrani d'Estudis Avançats (IMEDEA) in Esporles, and the Museu Balear de Ciències Naturals in Sóller on Mallorca, Spain. For this project, over a thousand *Myotragus* postcranial elements were scanned using both surface scanning with an Artec Space Spider, and computed tomography (CT) at the Son Espases Hospital on Mallorca. I am currently reconstructing the scans using Artec Studio 15 Professional. The dataset will be used to investigate the size and shape variation within the postcranial skeleton of *Myotragus* species throughout time, analysing which morphological adaptations can be associated with changes in body size. Shape variation is evaluated using a geometric morphometric approach, using three-dimensional anatomical landmark configurations on the postcranial elements.

For the preliminary study presented here, I analysed the morphological variation within the tibia of *Myotragus*. A total of 28 tibiae were analysed (*M. peptonellae*=2; *M. kopperi*=2; *M. balearicus*=24), using a landmark configuration of 20 anatomical landmarks. Landmarks were placed on the right



tibia, with left tibiae mirrored assuming bilateral symmetry. By performing generalized Procrustes analyses, the landmarks are scaled, translated and rotated to a shared alignment using a least squares principle. Principal component analyses are used to evaluate the largest shape variations within the dataset in a lower dimensional space. In addition, the effect of size on shape is analysed by a common allometric component analysis (Mitteroecker et al. 2004).

Preliminary results and discussion

The preliminary results show clear morphological variation on the first principal component among the Pliocene *M. peponellae* and the more recent *M. kopperi* (Pleistocene) and *M. balearicus* (Pleistocene–Holocene). The two *M. peponellae* specimens and the two *M. kopperi* specimens continue to cluster respectively, whereas distinct variation between *M. kopperi* and *M. balearicus* is not seen within the first three principal components (Figure 1A and 1B).

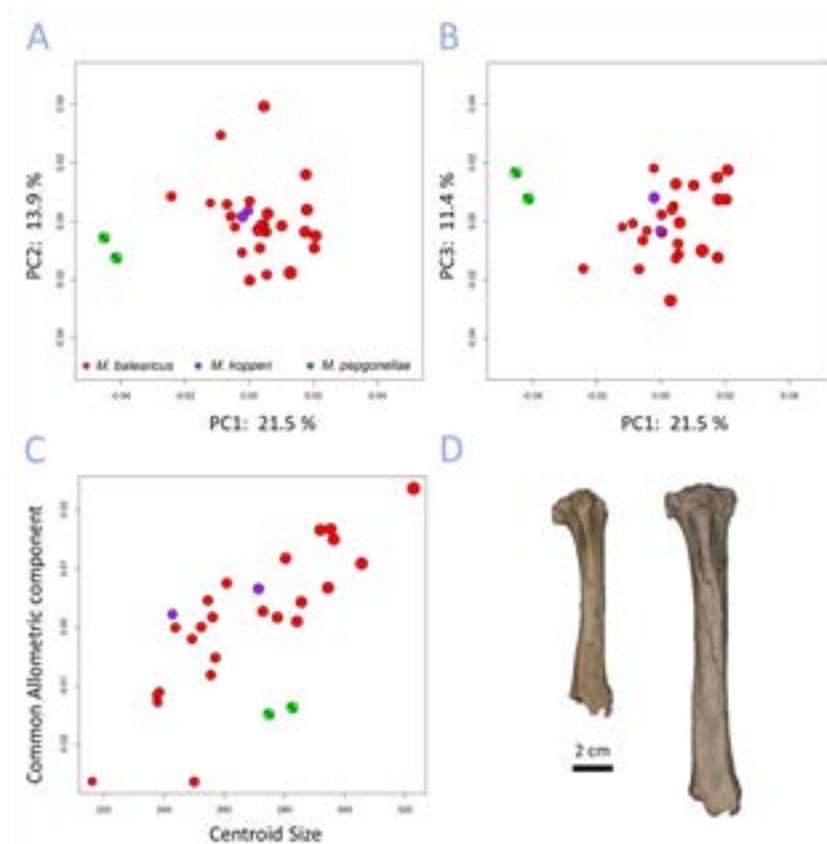


Figure 1. Geometric morphometric analyses showing the first three principal components and the effects of size on shape for the tibia dataset of the species *M. balearicus*, *M. kopperi* and *M. peponellae*. A) PC1 versus PC2; B) PC1 versus PC3; C) common allometric component versus centroid size; D) Smallest and largest *Myotragus* tibia in the dataset (left IMEDEA 59278 from *Tapereres*, Menorca; right IMEDEA 104882 from Cova del Ossos, Mallorca).



M. balearicus is variable in both shape and size, with both the smallest and largest tibia specimens belonging to this species. The majority of shape variation seen in the second and third principal component is also attributed to *M. balearicus*. The linear relationship between size and shape was tested using a Pearson product-moment correlation coefficient ($r=0.735$, 95% CI), indicating allometry influences the morphology of the tibia. *M. peponellae* deviates from the allometric trajectory, with its morphology being more similar to that of smaller-sized *Myotragus* specimens. This could indicate that smaller *M. balearicus* specimens portray more primitive characteristics than larger members of this species. However, as the Pliocene *M. peponellae* tibiae are more weathered than more recent specimens, this might influence the reliability of the landmarking. The two smallest specimens originate from Menorca, suggesting that the population of *M. balearicus* on Menorca was relatively small compared to the populations on Mallorca. Additional Menorcan specimens from various sites are needed as to test this hypothesis.

Upcoming analyses

There are still hundreds of scanned postcranial elements to be reconstructed and landmarked. Preliminary results indicate significant morphological variation is present in the most recent species (*M. balearicus*). By comparing specimens from different cave sites, we will evaluate to what extent spatial distribution might affect this morphological divergence. Furthermore, it appears that *M. peponellae* is morphologically dissimilar to more recent species, and it would be of interest to see how other *Myotragus* species, as well as other skeletal elements, will relate to this preliminary result.

Acknowledgements and funding

I would like to thank J. A. Alcover (IMEDEA) for access to the material in Esporles and for aiding with the CT scanning, and C. Constantino and R. Matamales Andreu (MBCN) for access to the material in Sòller. This project was made possible by the Palaeontological Association's Small Grants scheme (Whittington Award PA-WA202001).

REFERENCES

- BOVER, P., QUINTANA, J. and ALCOVER, J. 2008. Three islands, three worlds: paleogeography and evolution of the vertebrate fauna from the Balearic Islands. *Quaternary International*, **182**, 135–144.
- HENNEKAM, J., BENSON, R., HERRIDGE, V., JEFFERY, N., TORRES-ROIG E., ALCOVER, J. and COX, P. 2020. Morphological divergence in giant fossil dormice. *Proceedings of the Royal Society B: Biological Sciences*, **287**, 20202085.
- MITTEROECKER P., GUNZ, P., BERNHARD, M., SCHAEFER, K. and BOOKSTEIN, F. 2004. Comparison of cranial ontogenetic trajectories among great apes and humans. *Journal of Human Evolution*, **46**, 679–698.



Undergraduate Bursary REPORTS

Treeshrews as dietary analogues for Paleocene mammals: testing hypotheses of diet using microwear texture analysis

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Introduction

Dietary reconstructions are fundamental to understanding organisms' ecological interactions, responses to environmental change and their roles in ecosystems. Modern treeshrews provide a powerful model for understanding basal primate and therian mammal dietary ecology due to their highly conserved 'primitive' molar morphology and anatomical similarity to early mammals (*e.g.* Selig *et al.* 2019). Unfortunately, dietary data, in the form of stomach and scat analyses, is available for only a handful of treeshrew species, and is insufficient to realize their potential as palaeodietary analogues. To address this issue we have conducted the first dental microwear texture analysis (DMTA) investigation into treeshrew diets. The limited published dietary data, combined with recent dental topographic analyses, suggests that treeshrew species differ in the proportions of insects and fruit that make up their diet. DMTA has been shown to track subtle dietary differences in insectivorous mammals (Purnell *et al.* 2013; Gill *et al.* 2014). Microwear texture tracks these differences and allows us to make robust dietary inferences in species for which we lack dietary data. In this study we used DMTA to analyse the microwear and diets of six extant treeshrew species for the first time and compared our results to dental topographic analyses.

Methods

Dental microwear was sampled from species of extant treeshrews from the collections of the National Museum of Natural History (USNM), Smithsonian Institution, Washington DC, USA and the Natural History Museum, London, UK. DMTA followed established protocols (*e.g.* Purnell *et al.* 2013; Gill *et al.* 2014; Adams *et al.* 2020; Bestwick *et al.* 2020). The lower left second molar (LM2) of each sample was cleaned using cotton wool swabs, water and Hydrogen Peroxide (H₂O₂) to remove dirt and remaining tissues. The LM2 protoconid surface was then moulded with President Jet Regular Body polyvinylsiloxane, cast using EpoTek 320 LV Black epoxy resin and allowed to cure in a pressure vessel for 24 hours. Tooth casts were gold sputter coated to allow surface data capture on the Alicona Infinitefocus microscope. Surface texture of the LM2 protoconid was then quantified using ISO-25178 roughness parameters. Principal component analysis (PCA) was used to create a texture-dietary space from the ISO texture parameters.

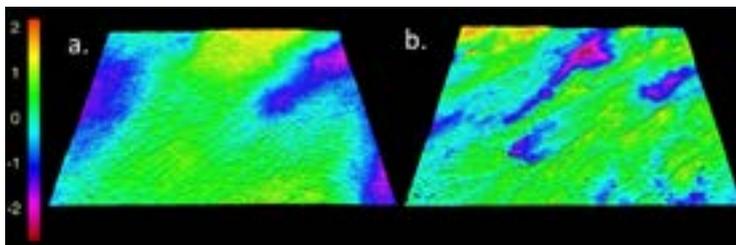


Figure 1. Digital Elevation Models for treeshrew taxa with microwear representative of *T. belangeri* (a) and *T. palawanensis* (b). Sample areas are 146 μm wide; vertical scale in μm .

Preliminary results and interpretation

Principal component analysis of dental microwear texture data reveals three clusters. *Tupaia gracilis*, *T. belangeri*, *T. picta* and *Dendrogale melanura* plot towards negative values of PC1 whilst *T. palawanensis* and *Ptilocercus lowii* exhibit significantly higher PC1 values with minimal overlap with the other species. ISO roughness parameter definitions are complex but alignment with PC1 broadly indicates that higher PC1 values generally correspond to rougher tooth surface textures.

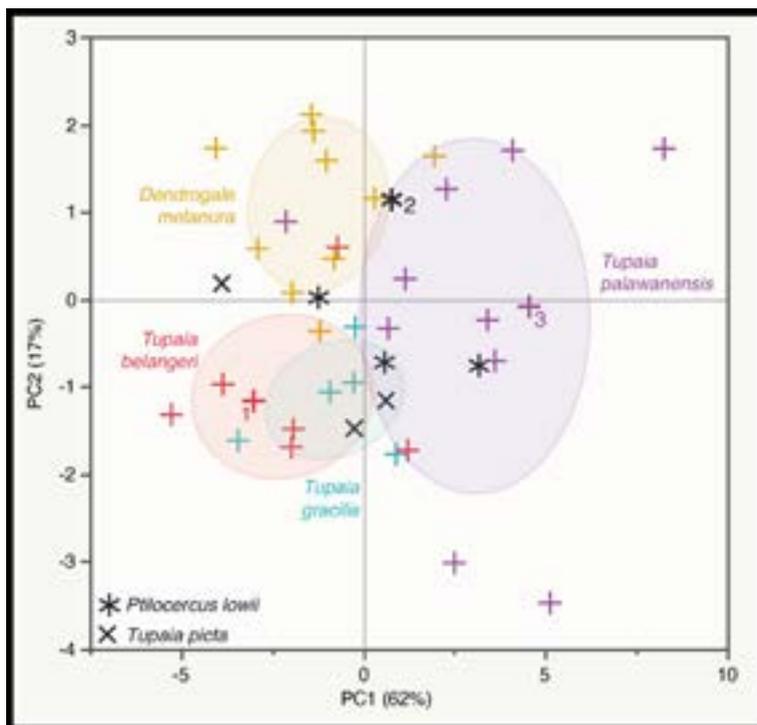


Figure 2. Principal Component Analysis of dental microwear texture from the six species of extant treeshrew investigated in this study. Higher PC1 values generally indicate rougher textures, suggesting a diet of more intractable foodstuffs. Species specific shaded areas represent 50% confidence ellipses. Ellipses are not plotted for *P. lowii* and *T. picta* due to small sample sizes.



The strong relationship between microwear texture and diet demonstrated in previous work on extant mammals (e.g. Scott *et al.* 2005; Purnell *et al.* 2013) allows us to interpret the PCA results in terms of dietary preferences for these species, with rougher textures corresponding to more intractable food. The overlap between *T. gracilis* and *T. belangeri* indicates similar diets, and their negative PC1 values suggest they, along with *D. melanura*, consumed foodstuffs that were less intractable and generally softer than the food consumed by *T. palawanensis* and *P. lowii*. The limited available data from stomach contents and scat support this interpretation. In some respects our results align with recent analyses using dental topographic metrics (Selig *et al.* 2019), which suggests that the teeth of *P. lowii* are adapted for consuming greater proportions of insects while those of *T. gracilis* are adapted for frugivory. However, in contrast to the microwear texture analysis Selig *et al.* (2019) interpret *D. melanura* and *T. belangeri* as highly insectivorous and *T. palawanensis* as frugivorous.

While this initial study is highly promising, analysis of larger samples and more taxa is required before we can be confident in the results. But our findings suggest DMTA can reveal more complex and subtle evidence of dietary differences than dental topographic analyses alone. The strength of the technique lies in the evidence of diet being independent of the form-function relationship that underpins most analyses of fossil teeth. This work on treeshrews suggests DMTA will continue to develop as a powerful tool for analysis of dietary preferences where direct observation, scat and stomach contents data are not available, whether the animals under investigation are living or extinct.

Acknowledgements

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REFERENCES

- ADAMS, N. F., GRAY, T. and PURNELL, M. A. 2020. Dietary signals in dental microwear of predatory small mammals appear unaffected by extremes in environmental abrasive load. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **558**, 109929.
- BESTWICK, J., UNWIN, D. M., BUTLER, R. J. and PURNELL, M. A. 2020. Dietary diversity and evolution of the earliest flying vertebrates revealed by dental microwear texture analysis. *Nature Communications*, **11**, 1–9.
- GILL, P. G., PURNELL, M. A., CRUMPTON, N., BROWN, K. R., GOSTLING, N. J., STAMPANONI, M. and RAYFIELD, E. J. 2014. Dietary specializations and diversity in feeding ecology of the earliest stem mammals. *Nature*, **512**, 303–305.
- PURNELL, M. A., CRUMPTON, N., GILL, P. G., JONES, G. and RAYFIELD, E. J. 2013. Within-guild dietary discrimination from 3-D textural analysis of tooth microwear in insectivorous mammals. *Journal of Zoology*, **291**, 249–257.
- SCOTT, R. S., UNGAR, P. S., BERGSTROM, T. S., BROWN, C. A., GRINE, F. E., TEAFORD, M. F. and WALKER, A. 2005. Dental microwear texture analysis shows within-species diet variability in fossil hominins. *Nature*, **436**, 693–695.
- SELIG, K. R., SARGIS, E. J. and SILCOX, M. T. 2019. The frugivorous insectivores? Functional morphological analysis of molar topography for inferring diet in extant treeshrews (Scandentia). *Journal of Mammalogy*, **100**, 1901–1917.



Macroecology of the recovery of temnospondyls from the end-Permian mass extinction

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Introduction

Temnospondyls are a diverse group of tetrapods which rose to prominence during the Carboniferous period, diversifying in the Permian and surviving the Permo–Triassic mass extinction (PTME). They rebounded rapidly in the Early Triassic before experiencing a significant decline through the Mid to Late Triassic (Schoh 2013). They thrived in a range of environments and survived many climatic changes throughout the late Palaeozoic and early Mesozoic. The aim of my project was to investigate the diverse array of forms that arose after the PTME and how their morphological diversity changed both spatially and temporally through the Triassic, and to determine whether their decline in the Late Triassic was associated with climate change.

Methods

I used discrete and continuous characters to describe the morphology of Late Permian – Early Jurassic (259.1–174.1 Ma) temnospondyls. Data were collected from specimen photos, reconstructions and descriptions in the primary literature. Measurements were taken in the Fiji bio-imaging program (Schindelin *et al.* 2012), to incorporate the relative scales of each image and allow accurate absolute measurements. These discrete and continuous characters were compiled into a master dataset of 120 species and 33 characters, including features tied to the skull and post-cranial material. This was trimmed down to 99 species and 19 functional characters, mostly limited to skull features. Palaeolatitude data were retrieved from The Paleobiology Database using occurrence information for each taxon.

I ran a principal component analysis (PCO) to map the primary axes of morphological diversity (disparity) and used skull length to plot PCO with Log_{10} body size. This PCO plot was then subdivided into a stackplot showing substage morphospace evolution through time, with the data point denoting taxon location (Gondwana and Laurasia) and colour denoting clade or palaeolatitude. Phylogenetic disparity was calculated for temnospondyls overall, as well as several chosen clades: Metoposauridae, Capitosauria, Trematosauria and Basal Stereospondyls, using the sum of variance (SOV) (Foote 1992). All analyses were performed in R.

Results

The morphospace shows that skull shape is the primary control on principal component (PC) 1, whilst PC2 shows more complex variation of skull elements, which is shown through the greater concentration of smaller taxa for greater values of PC2 but cannot be solely attributed to body size (Figure 1). Trematosauria shows the greatest variation across both axes and Capitosauria, being the most speciose clade, shows equal variation across both PC1 and PC2. The basal temnospondyls are split into two groups: one exhibiting similarities to large Capitosauria and Trematosauria, and the other displaying similarities with basal Stereospondyli and mid-sized members of Trematosauria. The greatest clustering occurs around Capitosauria (Orange), where multiple clades have converged (Metoposauridae, Trematosauria and basal temnospondyls), for similar skull parameters. The skulls



of these organisms are large, roughly parabolic, with a rounded premaxilla, located around the middle left of the morphospace. The long-snouted taxa are loosely clustered on the right side of the morphospace with *Aphenaramma gavialimimus* being the most extreme example (Figure 1).

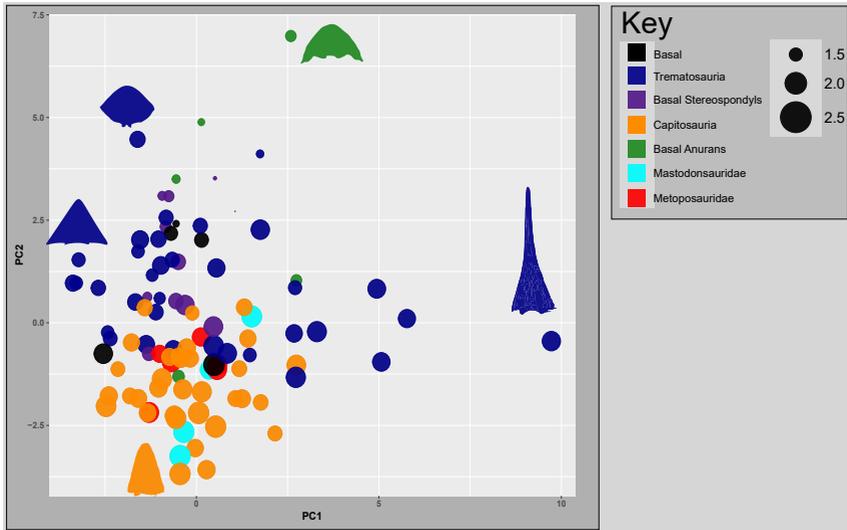


Figure 1. Trematosauria (dark blue) show the greatest range in the morphospace, which is reinforced by their wildly different-shaped skulls, adapted for different feeding modes. Capitosauria (orange) rarely diverge from the moderately long parabolic skull shape, with other clades converging upon their form. Most notably, Metoposauridae (red), being derived trematosours, occupy the same large semi-aquatic ambush predator niche, akin to today's crocodilians.

Temnospondyls show their greatest range in morphological disparity between the Induan and Middle Olenekian, largely due to the radiation of Trematosauria, specifically the long snouted taxa, appearing immediately after the PTME. Before the Anisian, these early-diverging trematosours become extinct and the morphospace shrinks considerably and does not recover. Capitosauria begin to diversify during the Middle Triassic before largely disappearing, with more derived metoposaurids later occupying the vacant capitosaur morphospace (Figure 2a).

Temnospondyl disparity varies considerably between the Wuchiapingian and the Pliensbachian. Across the Wuchiapingian and Changhsingian, disparity increases sharply, and this trend continues through the Induan to the mid-Olenekian, where a significant loss in morphological disparity occurs, continuing to the middle Anisian. This was the greatest loss in overall temnospondyl disparity. Throughout the Middle Triassic it continues to fluctuate and begins decreasing further, even during the Carnian Pluvial Episode. Disparity post-Norian is unreliable due to insufficient data. Metoposauridae, contrary to the overall data, exhibit a sharp increase and roughly steady disparity from the late Ladinian to the middle Norian; other clade disparity curves were omitted as no coherent lines formed (Figure 2b).

Incorporating temnospondyl palaeogeography into the morphospace through time plot (Figure 2c) shows that during the Late Permian, there is a roughly equal split of palaeolatitudes occupation, and then in the early Triassic they become limited to temperate and polar latitudes. Following the



overall decline in disparity, temnospondyls became localized to the Equator with a few remaining polar and temperate species and this trend continues to the Pliensbachian (Figure 2c).

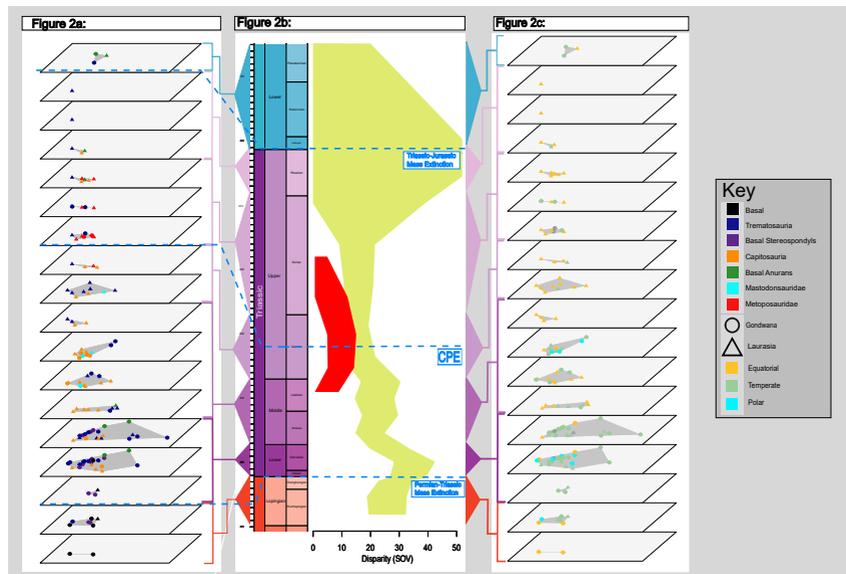


Figure 2. Prior to the PTME the morphospace is small and self-contained, which is later occupied by the large Mastodontosauridae and Metoposauridae. The greatest change in morphospace occurs during the Induan and Olenekian, which suggests that temnospondyls were disaster taxa and capitalized on the mass extinction at the end of the Permian. During this time, the Equator became hostile to life, which is highlighted by the shift towards higher latitudes, as equatorial habitats were recovering. Temnospondyls shift back towards the Equator following the Anisian, and become almost exclusively Equatorial. There is a notable gap in missing taxa between the Olenekian and Ladinian.

Discussion

Trematosauria and Capitosauria trended towards large body sizes through the Triassic, with earlier forms following the PTME typically being smaller (Tarailo, 2018). Basal anurans are the exception, as they remain relatively small even in the Jurassic. Long-snouted temnospondyls disappear from the morphospace after the Olenekian, which may be reinforced by the appearance of long-snouted archosaurs, which began diversifying around this time (Brusatte *et al.* 2010). It could be that the longirostrine temnospondyls were outcompeted by convergently evolving archosaurs or that physical environmental change triggered the replacement.

There was a significant difference (obs: -8.7, exp: 0.00657, $p < 0.05$) between the taxa found in Laurasia and Gondwana, with Gondwanan forms occupying more of the morphospace (Figure 2c). This could suggest a greater range of suitable environments in Gondwanan mid-to high-latitudes during the Early and Middle Triassic (Figure 2c), perhaps related to warmer oceans with weak circulation and higher average global temperatures, although this has not been proven to be localized to the southern hemisphere and would require further study. (Kidder and Worsley 2004).

Fluctuations in climate apparently affected Triassic temnospondyl disparity (Liu *et al.* 2022) as they became rarer in Gondwana after the Ladinian, although this could reflect sampling biases. The



number of genera per stage decreased significantly from their peak in the Induan and Olenekian (Ruta and Benton 2008). Their palaeolatitudinal distribution seems to support the presence of an equatorial hothouse environment (Preto *et al.* 2010) during the Induan and Olenekian. Far more species are found in both temperate and polar latitudes, which may suggest the Equator, immediately after the PTME was far too hot for large amphibians, following large-scale volcanism and global warming (Sun *et al.* 2012).

The Carnian Pluvial Episode may have been responsible for major turnovers in tetrapod lineages during the Upper Triassic. It was hypothesized to provide higher concentrations of suitable habitat and thus a resurgence in temnospondyls, yet only appeared to stabilize their already falling disparity. During and after the Carnian Pluvial Episode temnospondyls were restricted to Equatorial latitudes (30°N to 30°S). Polar species disappear from the fossil record and temperate species become exceedingly rare (Figure 2c). The initial burst of substantial rainfall and humidification (Arche and Lopez-Gomez 2014) benefited the remaining members of Temnospondyli: metoposaurids experienced their greatest species richness at this time, whilst other clades faced extinction (Figure 2b). The diversification of archosauromorphs, such as the phytosaurs, and the ensuing aridification of Laurasia and Gondwana (Benton *et al.* 2018) may have caused the extinction of the giant temnospondyls. This could be reflected in the disparity decline of Metoposauridae around 230 Ma and significant fall during the middle Norian (Figure 2b).

There are sampling biases, preservation biases and the presence of large temnospondyls (*Siderops kehl*) in Jurassic strata, indicating some resilience to climatic changes and large-scale competition with archosaurs.

Acknowledgements

I am extremely grateful to Mike Benton, Suresh Singh and Armin Elsler for all their help during this project. I thank the Palaeontological Association for providing funding and opportunity via Undergraduate Bursary PA-UB202202.

REFERENCES

- ARCHE, A. and LOPEZ-GOMEZ, J. 2014. The Carnian pluvial event in Western Europe: new data from Iberia and correlation with the Western Neotethys and eastern North America–NW Africa regions. *Earth-Science Reviews*, **128**, 196–231.
- BENTON, M. J., BERNARDI, M. and KINSELLA, C. 2018. The Carnian Pluvial Episode and the origin of dinosaurs. *Journal of the Geological Society*, **175**, 1019–1026.
- BRUSATTE, S. L., BENTON, M. J., LLOYD, G. T., RUTA, M. and WANG, S. C. 2010. Macroevolutionary patterns in the evolutionary radiation of archosaurs (Tetrapoda: Diapsida). *Earth and Environmental Science Transactions of the Royal Society of Edinburgh*, **101**, 367–382.
- FOOTE, M. 1992. Rarefaction analysis of morphological and taxonomic diversity. *Paleobiology*, **18**, 1–16.
- KIDDER, D. L. and WORSLEY, T. R. 2004. Causes and consequences of extreme Permo-Triassic warming to globally equable climate and relation to the Permo-Triassic extinction and recovery. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **203**, 207–237.
- LIU, J., ABDALA, F., ANGIELCZYK, K. D. and SIDOR, C. A. 2022. Tetrapod turnover during the Permo-Triassic transition explained by temperature change. *Earth-Science Reviews*, **224**, 103886.



- PRETO, N., KUSTATSCHER, E. and WIGNALL, P. B. 2010. Triassic climates – state of the art and perspectives. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **290**, 1–10.
- RUTA, M. and BENTON, M. J. 2008. Calibrated diversity, tree topology and the mother of mass extinctions: the lesson of temnospondyls. *Palaeontology*, **51**, 1261–1288.
- SCHINDELIN, J., ARGANDA-CARRERAS, I., FRISE, E., KAYNIG, V., LONGAIR, M., PIETZSCH, T. *et al.* 2012. Fiji: an open-source platform for biological-image analysis. *Nature methods*, **9**, 676–682.
- SCHOCH, R. R. 2013. The evolution of major temnospondyl clades: an inclusive phylogenetic analysis. *Journal of Systematic Palaeontology*, **11**, 673–705.
- SUN, Y., JOACHIMSKI, M. M., WIGNALL, P. B., YAN, C., CHEN, Y., JIANG, H. *et al.* 2012. Lethally hot temperatures during the Early Triassic greenhouse. *Science*, **338**, 366–370.
- TARAILO, D. A. 2018. Taxonomic and ecomorphological diversity of temnospondyl amphibians across the Permian–Triassic boundary in the Karoo Basin (South Africa). *Journal of Morphology*, **279**, 1840–1848.



Engagement Grant REPORT

The hospital's fossils: an educational resource for paediatric patients

Carlos Martínez-Pérez and Castor Armañanzas Alpuente

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Play and recreation are part of the natural growth process of children, allowing them to learn, master experiences, express themselves, cope with anxiety and to put their abilities into practice. However, the normal life of children is sometimes disturbed by the diagnosis of diseases that make it necessary for them to be admitted to hospital. Many hospitals have developed their own pedagogical units to provide hospitalized children with not just continuity in their educational process, but programming educational, therapeutic and recreational activities to help them to spend a more comfortable time during their stay in the hospital.

In this sense, the work developed by these units is essential for helping children to adapt to their new environment and to understand more about the hospital and their own condition. As a child starts to feel more comfortable at the hospital, they become more cooperative and less anxious. It is in this context that medical play is a commonly used therapeutic activity that helps to distract children from pain and worries. Thanks to the PalAss Engagement Grant (PA-OE202003), and using fossils as an educational tool for children, we were able to develop a complete interactive activity, in the form of a mobile app to be applied in the biggest hospital in the city of Valencia, Spain.

The treasures hidden in the hospital's walls

The Hospital Universitari i Politècnic La Fe de Valencia was built with the so-called 'Galala Cream Marble' extracted from the Galala quarry in the Suez region, Egypt. This ornamental rock belongs to the Thebes Formation, characterized by an Eocene nummulitic limestone with abundant fossil remains. The palaeontological heritage hidden within these rocks is represented by numerous 2D sections of invertebrate and vertebrate remains, which represent the palaeofauna of a highly productive tropical carbonate platform developed during the early Eocene in the Mediterranean Basin. Due to the abundance of fossils, we were able to select up to 15 different fossil types, including examples of macroforaminifera, echinoids, corals, molluscs, and several marine vertebrates such as bony fishes, sharks and marine mammals. All these treasures hidden on the walls were the main driver to build our fossil hunt activity in the corridors of the hospital.

Fossil Hunt: The Hospital Adventure

Based on the palaeontological heritage of the hospital's walls, we developed a complete activity focused on the design of a mobile app using the software Unity, a game-development environment that is used to create 2D and 3D games and deploy them on multiple platforms. The selected



15 examples of the hospital's fossil taxa were reconstructed as 3D models, including their reconstruction as fossils, as well as the living organisms to help kids to visualize how they might have been in the past. For the species included, data sheets were developed with basic information, including aspects of their taxonomy, general characteristics, size, distribution and curiosities. The app was designed as a Pokemon-Go game, where the children can find the different fossil types via the fossil targets distributed on the walls of the hospital (sited next to the 2D sections of the real fossils), 'excavate' them using augmented reality (AR) tools, and add any new findings to their own virtual fossil collection. To enhance the recreational use of the activity, together with the AR, virtual reality (VR) techniques were also integrated into the app allowing them, for instance, to swim with sharks, whales or sirenians in an Eocene sea with the help of 3D goggles. The children then become Fossil Hunters after they 'capture' all 15 different fossil types.



A paediatric patient 'excavating' fossil remains hidden on the walls of the hospital (left). Once excavated, the new finding gives access to the different 3D models plus extra information that can be used to explain different palaeontological aspects to the children. Photos: C. Martínez-Pérez.

Due to the COVID-19 restrictions in the hospital environment, we could only develop the activity for a couple of days during the summer of 2022. During this development we chatted with the children, explaining the importance of fossils and palaeontology to unravel the Earth's history, and how the rocks of the hospital held plenty of fossils. After our chat, we started our Fossil Hunting experience to complete our own digital fossil collection. In this context, and in order to facilitate the experience, we describe a Fossil Route in the corridors of the paediatric floor, where the children were able to find all the different fossil types. In parallel, with the aim of expanding the game for the reduced-mobility patients to within their own rooms, we created a portable palaeontological collection composed of the same ornamental rocks that adorn the walls of the hospital.



Two paediatric patients with reduced mobility playing with the fossil collection using the augmented reality (left) and virtual reality (right) options developed by the Fossil Hunt: The Hospital Adventure app. Photos: C. Martínez-Pérez.

Future directions

Unfortunately, the pandemic situation hasn't yet allowed us to launch the app to the general public, but our goal is to give access to them via the main online platforms (Apple Store and Google Play), specifically for the IOS and Android systems. The app has been designed in three languages (English, Spanish and Catalan), and it will allow the download of all the educational material (instructions, targets, games, etc.) to make play outside the hospital environment possible, as another educational game.

Acknowledgements

We would like to thank the Palaeontological Association for funding our Engagement Grant (PA-OE202003) and to the Paleontological Society PS Outreach and Education Grant 2018. Thanks to those who have made this project possible, especially the 3D designers and multimedia engineers, and the staff of the Hospital Universitari i Politècnic La Fe for allowing us to implement it at the hospital, despite the current pandemic situation.



Reviews

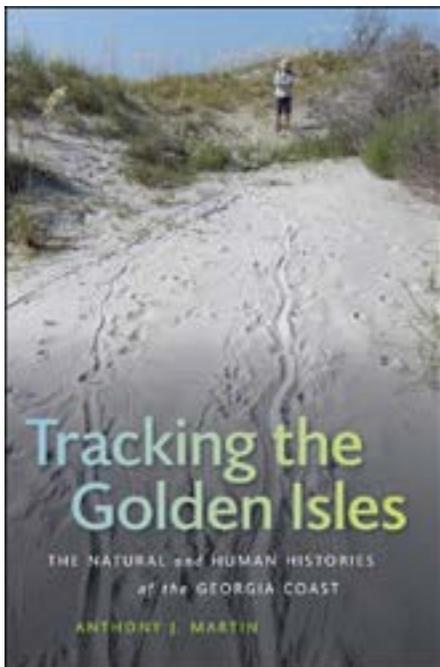


Tracking the Golden Isles

Anthony J. Martin, 2020, The University of Georgia Press, £30.95, ISBN: 9780820356969.

Tracking the Golden Isles by Anthony Martin is a meandering, personal account of the author's time spent on the barrier islands of the Georgia coast. Ultimately, I'd describe the book as the musings of a naturalist, rather than a more traditional popular science book. Reading *Tracking the Golden Isles* is like sitting down with Martin in the pub, and listening to him recount his experiences teaching, researching and holidaying on the Georgia Coast.

Martin divides the book into four parts, each comprised of multiple chapters. Part one, 'Impressions of Past Histories', consists of four chapters, in which the author gives detailed accounts of finding vertebrate and invertebrate traces on the islands, and 'discovering' their track-makers and backstories. These chapters include fairly lengthy discussions about topics with which readers of this Newsletter will be intimately familiar: plate tectonics, fossilization, igneous versus sedimentary rocks, *etc.* These chapters also set the scene by describing the islands and their habitats, though as someone otherwise unfamiliar with the Georgia Coast, I was disappointed that something as simple as their location relative to mainland USA wasn't clearly figured.



The second section, 'Shells and Carapaces' consists of seven chapters jumping between various invertebrates and their traces, while Part three, 'Beaks and Bones', follows the same structure as Part two, but for vertebrates. One of these chapters, 'Why do birds' tracks suddenly appear?', contains the most palaeontological content, in reference to one of Martin's prior publications on fossil bird tracks, in which he describes how he made connections between modern and fossil bird footprints.

The final Part, 'The Human Touch', contains nine chapters mostly about invasive species, including hogs and horses. I found this section to contain some of the more interesting parts of the book, particularly discussion of archaeological structures made up from oyster shells and dating back, apparently, thousands of years. After the penultimate chapter spends time discussing floods and the links with rising tides and climate change, the final chapter finishes by trying to make the case



that the study of traces can contribute to our understanding of climate change and its effects. To me, this felt a little shoe-horned in, but it did lend a distinct end point to the book.

The figures and images are perhaps the biggest, and only major, negative to be aimed at the book. I have no reason to think that my copy was particularly badly reproduced, but images, mostly photographs, were all black and white and had a murky, low-contrast quality. I frequently found it difficult to discern subtle invertebrate traces in the sand, or stratigraphic layers of a salt marsh where presumably subtle changes in browns, reds and greys have been lost. This is a shame because some of the traces Martin describes can be quite complex and clearer images would have helped immensely.

While there are absolutely some interesting anecdotes and observations, the style may prove frustratingly round-about or indirect for some. Martin has a habit of posing a question, then getting side-tracked with asides (and asides of asides) before eventually returning to the point at hand and offering an answer. I'd quote an example, but these reviews are limited in words, and I'm not sure any of these cases would fit! Conversely though, the conversational tone may prove to be quite comfortable to others and make for easy reading.

I went into *Tracking the Golden Isles* expecting a detailed, and probably dry, account of the ichnology of the Georgia coast, but the technical aspects are toned down considerably and in their place are emotive, personable and friendly words about personal experiences that happen to often involve looking at burrows, tracks and droppings. Sometimes hard conclusions are lacking, and instead we get 'recons' and 'probablys'. At first, this can be unsatisfying, but perhaps it is a truer representation of science, and even moreso ichnology, than we are usually subjected to.

Peter Falkingham

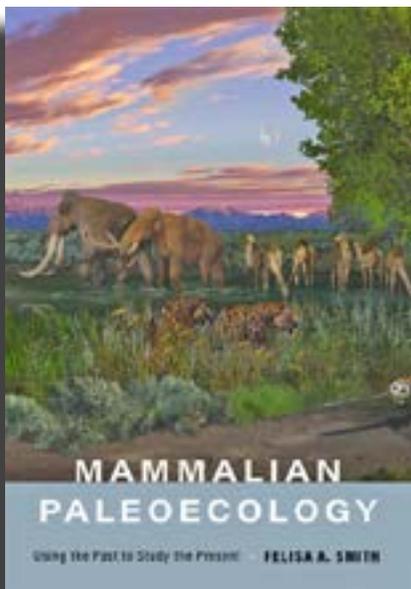
Peter is Reader in Vertebrate Biology at Liverpool John Moores University, UK. He mainly spends his time simulating footprint formation on a computer. He also has strong interests in digitization and 3D, and frequently makes guides and tutorials available through his website: <<https://peterfalkingham.com>>. You can find him on twitter: @peterfalkingham.

Mammalian Paleoecology

Felisa A. Smith, 2021, Johns Hopkins University Press, £60.50,
ISBN: 9781421441405.

It's refreshing to hear an authoritative female voice in the palaeontological literature because, let's be honest, proportionally there's a dearth. Prof. Felisa A. Smith is not only the author of *Mammalian Paleoecology: Using the Past to Study the Present*, but also one of the leading specialists in the discipline. Her lab (the University of New Mexico Smith Lab) is a dynamic group whose research examines changes in climate and biodiversity in the palaeontological record, and uses this to inform our understanding of the responses of ecological communities to the current extinction crisis. She is a top mammalogist, and looking at her publication record is sure to turn even the most accomplished researcher a little green. There is no doubt that she is the perfect person to write a text on this subject.

The book is divided into three parts: introducing the main principles behind palaeoecology, examining methods to assess the ecology of extinct organisms, and finishing with applications of



the discipline and its findings to the present day. Understandably the content is overwhelmingly Cenozoic, so Mesozoic mammal workers may be disappointed, but this is nit-picky; clearly for a subject like mammal palaeoecology, information is more easily gleaned and discussed from the last 66 million years of mammal history than the first 134+ million years. There are diagrams, tables and figures throughout, and these have been carefully chosen to fluidly illustrate the concepts and case studies presented in the text. The case studies are chosen masterfully to make core and sometimes complicated concepts digestible. Some readers might feel a few sections are over-explained – indeed, the author is apologetic in the opening chapter about this – but in my opinion she needn't be. Too many researchers who know their subjects inside out make assumptions about the knowledge of those they speak to, leaving them floundering or incessantly

reaching for other textbooks to clarify terms. Reading this text, anyone with an undergraduate level of knowledge will not be left behind. All in all, the treatment of the subject speaks of someone well practised in teaching their discipline to others with clarity.

I thoroughly enjoyed this book, learning new facts and ways to explain concepts that I'll undoubtedly apply in my own teaching. I wish I'd had this text to refer to during my undergraduate and masters! At times I felt uncertain who *Mammalian Paleocology* was aimed at, as several chapters have popular science style openers, and there are literary quotations peppered through what are otherwise technical sections. There are one or two jarringly informal moments which stuck out among the concise scientific text. This is in no way to imply the rest of the writing is dry – every chapter is extremely readable, not only conveying information but communicating with flow and eloquence. This mixture of tones feels odd for a textbook – which is the category in which I would place this book – but it certainly gives us a taste of Prof. Smith's personality. Some readers will love this style, and I admit that afterwards, I felt I had a clear idea of what attending Prof. Smith's lectures must be like; I would definitely enjoy them!

There are many parts I could pick out as favourites. Among them is the chapter 'On Being the Right Size', which comprehensively takes the reader through the physiological, ecological and evolutionary implications of body mass (Smith's previous book with the University of Chicago Press focused entirely on the topic of body mass, and is also worth a read). The use of what appears to be Totoro (the main character from Japanese animation company Studio Ghibli's film *Tonari no Totoro*) as the template animal to demonstrate Bergmann's and Allen's rules, really tickled me.

I would encourage all mammalogists to own a copy of *Mammalian Paleocology*, whether they are working in the palaeontological record or on extant animals. It will also be useful to palaeontologists examining the palaeoecology of other animal groups, and to zoologists and



conservation biologists. For students, this text will be invaluable for understanding foundational concepts, and as a pointer to further references. I can see this book becoming the classic go-to text for palaeoecology, and recommend it for anyone studying extinct mammals.

Elsa Panciroli

Elsa is a Scottish palaeontologist and writer. She is currently an EC Leverhulme Research Fellow at the Oxford University Museum of Natural History, UK, and has published two popular science books. You can find her on Twitter @gscienceLady, or on Instagram (where she posts far too many pictures of rocks).

Books available to review

The following books are available to review, and others are in the pipeline. Please contact the Reviews Editor Thomas Clements (e-mail <bookreview@palass.org>) if you are interested in reviewing any of these or any other book, video or game of palaeontological interest that you would like to see reviewed.

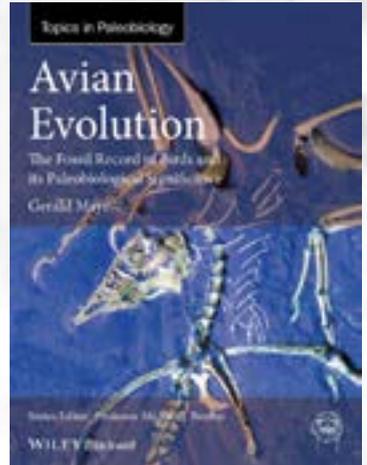
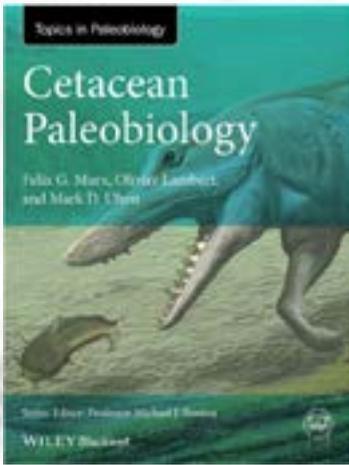
- *Functional Inference in Paleoanthropology: Theory and Practice*, by David J. Daegling.
- *The Cosmic Oasis: The Remarkable Story of Earth's Biosphere*, by Mark Williams and Jan Zalasiewicz.

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We have a selection of pop science palaeo books available for review but due to Thomas moving between countries they are trapped in a lorry in customs somewhere near the English Channel due to Brexit. If you are interested in reviewing a book, or you have some media you would like to review, please contact Thomas directly: <bookreview@palass.org>.

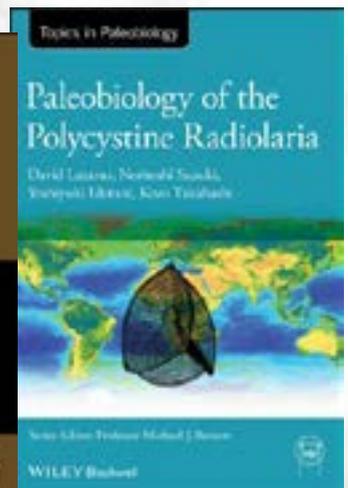
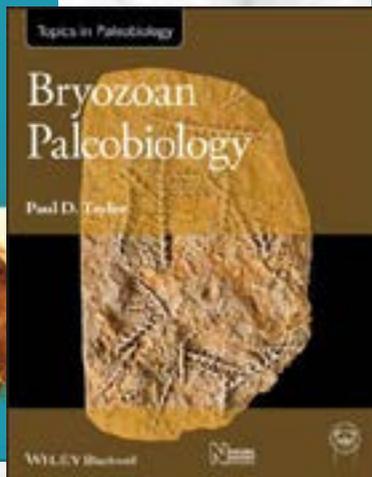
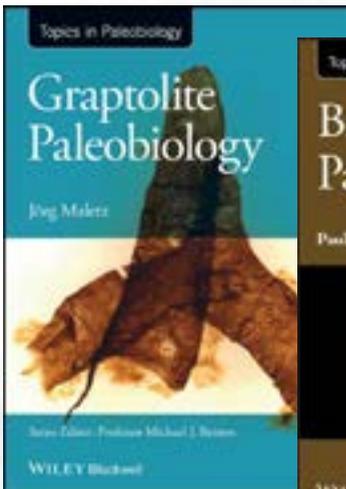




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Careers Q & A

Professional palaeontologists in the wider world

Carys Bennett completed her PhD (2005–2009) on Carboniferous ostracods, sedimentology and geochemistry at the University of Leicester, UK, researching the marine-freshwater radiation of ostracods. Her postdoctoral research focused on Ordovician trilobite geochemistry at the University of Lille 1, France (2011–2012) and Carboniferous tetrapod evolution, specializing in sedimentology, micropalaeontology and palaeoclimates, at the University of Leicester (2012–2017). Since 2018, Carys has worked for the UK entity People for the Ethical Treatment of Animals (PETA), which is the world's largest animal rights organization with over 9 million members and supporters globally.



Photo courtesy of Carys Bennett.

1. When you were a child, what did you want to become when you grew up?

As a child I loved the outdoors, history, watching the archaeological TV show *Time Team*, science, and animals. I'd never heard of geology until I was 12 when I visited my local museum and saw an exhibit by the under 18s geology group *Rockwatch*. I was fascinated and soon joined *Rockwatch*, with my early passion being for volcanology.

2. How did you first get interested in palaeontology?

My enthusiasm for volcanology changed course in the final year of my MSci at the University of Liverpool because of an inspiring lecturer. Professor Jim Marshall taught a palaeoclimates course with real verve, and he was so infectious I was soon hooked. I chose a PhD in micropalaeontology because I wanted to study ancient climates and environments.

3. Having previously completed a PhD and postdoctoral research in palaeontology, what led to your transition to working for PETA?

I wanted to have a career which I was passionate about, and to help animals. Like many people, I grew up eating meat, dairy and eggs, thinking there was nothing odd about this. As a teenager, I came across a leaflet which exposed disturbing practices in egg farms and I couldn't believe these wonderful, sensitive birds were exploited in this way. After researching the industrial farming of animals further, I soon went vegan. I've been a vegan advocate since 2000 and I always say it was the best decision I've ever made.

As time went on, my vegan advocacy started taking up much of my free time. In the year before joining PETA I was leading a project – Leicester Vegan Challenge – which had 20 volunteers, 450 participants, and I worked with



30 companies to obtain free food samples. I thought: “Hang on, what if I can do this as my job?”. I loved palaeontology and geology, but I had struggled to make the leap from postdoc to lecturership, and I was open to other opportunities. I saw a vacancy at PETA which was working with food companies to promote vegan options and it seemed like the perfect fit. I’m lucky that I work in a role where it doesn’t feel like work, just like when I was an academic, because it’s my passion.

4. What skills/elements of your scientific background do you now use in your advocacy role?

Research and analysis, writing, and public speaking have been the core transferable skills from academia that have aided my charity work. I have a good understanding of climate science from my research on palaeoclimates, so I talk with companies about anthropogenic climate change and how diet change can reduce greenhouse gas emissions. Having experience of conducting my own projects, where I was responsible for my output and direction of work, gave me the confidence to be an independent team member at PETA and I was promoted quickly.

Academic presentations at conferences and more informal research meetings have been invaluable. I’ve presented to the directors and CEOs of companies, as well as speaking at public events and on televised debates. I’ve been able to answer difficult questions – a key skill when presenting at palaeontology conferences!

5. What are the main responsibilities of your current position?

I am Corporate Projects Manager at PETA and my work is in two sectors. I help food companies like school caterers, restaurants and train companies to add more vegan options to their menus. I also advise travel companies on using animals in tourism, sharing information from PETA’s field investigations into cruel practices. I appreciate using evidence-based advocacy to encourage businesses to adopt

animal-friendly policies, so society can move towards a compassionate future for humans and animals.

6. What is the biggest highlight of your work as a palaeontologist/advocate so far?

In 2018 I published a paper titled ‘The broiler chicken as a signal of a human reconfigured biosphere’. It explored how humans have radically changed the composition of the biosphere beyond all recognition, and how chickens – their biology now supersized for maximum meat production – are a symbol of the Anthropocene. It linked archaeology, biology and palaeontology, and has been my most cited paper. The work received worldwide media attention, and while it didn’t take an ethical position, the stark facts alone got people thinking about the scale of human impact on our planet.

An important moment at PETA was giving evidence to the Welsh Parliament on how animals suffer in circuses. It was a formal submission that was video recorded, and I needed to communicate the findings of many years of PETA’s work in this field in a concise and compelling way. I was able to respond to some challenging questions, and my expert opinion was listened to, which was very rewarding. Thanks to compassionate people speaking out, circuses with wild animals are banned in Wales (and in Scotland and England).

7. Do you have tips for anyone wishing to use their scientific background in an advocacy position, and how to effectively lend their voice to important causes?

While I was a PhD student I did several science education projects where I explained my work to the public and engaged them to share in the joy of palaeontology. I ran classes in schools about the evolution of life and spoke at the Natural History Museum’s “meet the scientist” events. Being able to explain your science to the public is a fantastic skill that is transferable to many roles.



Having experience in the field you are applying for is vital. Before working at PETA I built up a record of running vegan cookery demos, food fairs, challenges and educational events. I also volunteered as a researcher for the US charity Faunalytics so I could gain NGO experience and a broader understanding of animal rights issues and animal welfare science.

8. What are your future ambitions?

My goal is to continue working at PETA to build our corporate team so we can help more

animals. I still love palaeontology and I am an Honorary Fellow at the University of Leicester. You may often find me in the University on Sundays picking through microfossil residue or photographing ostracods! It suits me well, and it's a privilege to be able to continue my research interests. I hope to continue my research for many years to come, and to support the Palaeontological Association's important work to advance palaeontology.

Follow Carys on social media: @Carys_vegan

You can find out about People for the Ethical Treatment of Animals at

<<https://www.peta.org/>>

or at one of its international sites at

<<https://www.peta.org/international/>>



Photo courtesy of Carys Bennett.



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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.

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