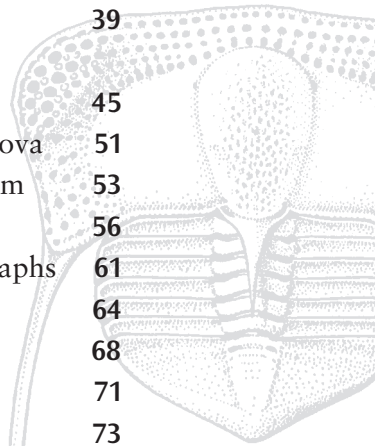


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The Palaeontology Newsletter

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Reminder: The deadline for copy for Issue no. 113 is 5th June 2023.

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Editorial

As I'm writing this editorial on the eve of International Women's Day, there is much in the *Newsletter* to celebrate women's participation in palaeontology. I am consciously writing 'participation', not 'contributions', so as not to reduce our field to a competition about who produces more (or more important) output. There are many other roles needed for palaeontology to thrive: the public, policymakers, educators, artists, accountants, editors, curators, technicians, typesetters, and – increasingly commonly – data scientists, software engineers, as well as scientists from adjacent fields, who have the courage to cross disciplinary boundaries. Many of these roles are represented in this issue: starting with the new PalAss President, **Rachel Wood**, through recipients of the Association's distinctions: **Moya Meredith Smith**, **Zerina Johanson** and **Allison C. Daley**. Associated with each name is a story of more than articles and discoveries. Zerina kindly shared her advice and guidance with me in the PalAss mentoring scheme and now Allison acts as a mentor to my own PhD student. These contributions often go unnoticed publicly, but make all the difference. Any of you willing to act as a mentor or wishing to become a mentee I do encourage following up on **Paul Barrett's** call in this issue. We also hear from **Helke Mocke**, palaeontologist and curator at National Earth Science Museum in Namibia, on animating public interest and research on the country's outstanding fossils. **Liz Dowding**, in *Palaeontology's* greatest ever graphs, offers a critical view of bioregionalization applied to fossil faunas and promises a bioregionalization revolution. We hear from two women whose work is indispensable for diverse palaeontological research: **Joëlle Barido-Sottani**, a computational biologist developing methods for phylogenetics, and **Elisa Guasti**, research support officer and micropalaeontologist by training. There is clearly more than one career path, as we learn from **Natalia Jagielska** writing about the rebellious Russian palaeontologist **Irina Levshakova**. We also have a volunteered contribution by **Victor Monnin**, who asks: who will teach the history of our field to help us understand its biases, the gaps on our maps, in our databases and in our models?

If you missed the 6th International Palaeontological Congress, you can read the impressions by **Muhammad Aqqid Saporin** and **Ros Fatimah Haji Muhammad**, then start preparing for *Progressive Palaeontology* on 1st – 3rd June and the Association's Annual Meeting on 11th – 15th September.

Emilia Jarochowska

Newsletter Editor

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 <<https://www.facebook.com/ThePalAss/>>



Association Business

Annual Meeting and AGM 2023

Notification of the 2023 Annual Meeting

The 2023 Annual Meeting of the Palaeontological Association will be held at the University of Cambridge, UK, on Monday 11th to Friday 15th September, as an in-person meeting, and is organized by Dr Alex Liu and colleagues.

Information on the 2023 AGM

The Annual General Meeting (AGM) will be held in December 2023. Details of this event will be communicated to Members in the coming months.

Nominations for Council

AGM 2023

At the AGM in December 2023, the following vacancies will occur on Council:

- Vice President
- Diversity Officer
- Education Officer
- Newsletter Editor
- Reviews Editor
- Ordinary Member

Nominations are now invited for these posts. Please note that each candidate must be proposed by at least two members of the Association and that any individual may not propose more than two candidates. Each nomination must be accompanied by the candidate's written agreement to stand for election, and a short personal statement (less than 200 words) describing their interests for publication in the *Newsletter*, and a completed Professional Standards and Behaviour Self-Declaration form filled in by the candidate. Full details of the nomination procedure and form to download can be found at <https://www.palass.org/association/how-stand-election-council>.

All potential Council Members are asked to consider the following: since the Palaeontological Association is a Registered Charity, in the eyes of the law most Council Members become a Trustee of that Charity. Under the terms of the Charities Act 2011, Trustees have independent control over, and legal responsibility for, a charity's management and administration. Further information on the responsibilities of Trustees can be obtained from the Charity Commission for England and Wales.

The closing date for nominations is **1st September 2023**. They should be sent in a PDF document to the Secretary by e-mail to secretary@palass.org.



Council vacancies: 'job descriptions'

Vice-President (x1 vacancy; two-year term)

The Vice-President is one of the more loosely defined Council offices. Vice-Presidents are normally long-serving Council members who have previously held one of the other offices. They have no formal portfolio or duties other than to deputize for the President if and when required, but are present on Council to provide independent input on all matters, backed up by experience arising from their long service. They are also expected to lead or at least participate in important subcommittees, particularly those tasked with making recommendations for the awards of grants.

Diversity Officer (three-year term)

The Diversity Officer leads the Diversity Group in developing strategies to support and promote diversity within the Palaeontological Association and broader palaeontology community. The Diversity Officer should aim to identify issues and barriers that arise for under-represented groups and work with the Diversity Group on trying to provide solutions. The officer will also liaise with the Public Engagement Group with the aim of promoting palaeontology as a diverse and welcoming scientific community to a wider audience. The officer should also promote the code of conduct and facilitate efforts to ensure it is being upheld at Association-sponsored events. The Diversity Officer may volunteer to sit on one or more of the Council sub-committees to review grants and awards.

Education Officer (three-year term)

Together the Publicity Officer, Outreach Officer and Education Officer comprise the Public Engagement Group (PEG). These posts have responsibility for all the Palaeontological Association outreach activities. Currently they include organizing the Association's presence at Lyme Regis Fossil Festival and the Yorkshire Fossil Festival, coordinating the Engagement Grants, answering relevant enquiries, and initiating other activities that promote and develop palaeontological outreach and education for the Association. The members of PEG work closely together and their roles often overlap, but responsibilities associated with the Education Officer post include leading the Association's educational activities, *e.g.* delivering dedicated activities at schools' days associated with fossil festivals and communication with ESTA. Members of PEG also work closely with the Diversity Group. The Education Officer may volunteer to sit on one or more of the Association sub-committees to review grants and awards.

Newsletter Editor (three-year term)

Editing the *Palaeontology Newsletter* is an intense role three times a year with relatively little in between apart from collating some content and attending Council meetings. The main responsibilities are approaching people and commissioning content, ensuring that permission for all reproduced images and content has been sourced, editing all content in the *Palaeontology* style, and reminding contributors of deadlines as necessary. The Newsletter Editor may volunteer to sit on one or more of the Council sub-committees to review grants and awards.

Reviews Editor (three-year term)

The main duty of the Reviews Editor is to provide a range of new and recently-published scientific book titles for members to review, as well as soliciting reviews of any other relevant media (*e.g.* film, TV programme, online blog, YouTube series, podcast, computer game, educational resource, software package). The books available to review span all areas of palaeontological and



evolutionary research and, as such, it is necessary to establish and maintain contact with a broad range of publishers, search for new titles and request review copies from publishers. For each *Palaeontology Newsletter*, a list of recently-acquired titles is prepared and, as requests come in from members to review the books, each copy must be sent to the prospective reviewer. Reviews recently received from members must be edited in time for each *Newsletter* deadline. It is often necessary to remind reviewers when their text is required so records must be kept to monitor movement of books and receipt of reviews. The Reviews Editor may volunteer to sit on one or more of the Council sub-committees to review grants and awards.

Ordinary Members (x1 vacancy; three-year term)

Ordinary members do not have a formal portfolio. They attend Council meetings and contribute to discussion, decision making and future planning. They often participate in important sub-committees, such as those tasked with reviewing and making decisions upon grant applications.

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 and 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 members 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, but 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 contacts 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; (iii) [from 1st April 2023 onwards] profession standards and behaviour declarations by the nominators in relation to the nominee (see website for form). 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 on the Association's website before the deadline. The completed Professional Standards and Behaviour forms should either be combined with the aforementioned PDF or e-mailed separately to the Secretary and/or Executive Officer.

The award will be considered by Council at its May meeting and awardees will be invited to a ceremony at the Annual Meeting. Awards will be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to choose not to 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; (iv) [from April 1st 2023 onwards] Professional Standards and Behaviour declarations by the nominators in relation to the nominee (see PalAss website for form). 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. 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 on the Association's website before the deadline. The completed Professional Standards and Behaviour forms should either be combined with the aforementioned PDF or e-mailed separately to the Secretary and/or Executive Officer.

The award will be considered by Council at its May meeting and awardees will be invited to a ceremony at the Annual Meeting. Awards will be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to choose not to 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; (iv) [from April 1st 2023 onwards] Professional Standards and Behaviour declarations by the nominators in relation to the nominee (see PalAss website for form). 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 on the Association's website before the deadline. The completed Professional Standards and Behaviour forms should either be combined with the aforementioned PDF or e-mailed separately to the Secretary and/or Executive Officer.

Nominations will be considered by Council at its May meeting and awardees will be invited to a ceremony at the Annual Meeting. Awards will also be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to choose not to 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); (iii) [from April 1st 2023 onwards] Professional Standards and Behaviour declarations by the nominators in relation to the nominee (see PalAss website for form). 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 on the Association's website before the deadline. The completed Professional Standards and Behaviour forms should either be combined with the aforementioned PDF or e-mailed separately to the Secretary and/or Executive Officer.

Nominations will be considered by Council at its May meeting. Awardees will be invited to a ceremony at the Annual Meeting, 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 choose not to 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 on the Association's website before the deadline.

In addition [from April 1st 2023 onwards], we ask that nominations are accompanied by Professional Standards and Behaviour declarations (see PalAss website for forms). The completed Professional Standards and Behaviour forms should either be combined with the aforementioned PDF or e-mailed separately to the Secretary and/or Executive Officer.

The award will be considered by Council at its May meeting and winners will be invited to the award ceremony at the Annual Meeting. Awards will also be announced in the *Newsletter*, on the Association website and through social media. Council reserves the right to choose 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 contacts details required). The nomination must consist of a one-page statement (font-size 12) outlining the nature of their support for the Palaeontological Association. In addition [from April 1st 2023 onwards], Professional Standards and Behaviour declarations by the nominators in relation to the nominee (see PalAss website for form) are required to be completed. The outline should be uploaded via the webpage on the Association's website before the deadline. The completed Professional Standards and Behaviour form should either be combined with the aforementioned PDF or e-mailed separately to the Secretary and/or Executive Officer.

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 of the Association for one year.

Best Paper Awards

Due to the relatively recent changes in the publication model for our journals the timing of these awards is currently under review. The text below may therefore change in the near future. Please check the Association's website for the latest information.

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 papers that stand out, providing two or three sentences explaining why they are deserving. The Editor-in-Chief will draw up a short-list 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.

Contact <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 23:59 GMT: 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 June 23:59 GMT: Deadline for applications from host institutions.
- September – May: Delivery of lectures.

Application:

Applications are via online forms. See <<https://www.palass.org/awards-grants/awards/innovations-palaeontology-lecture-series-and-palass-exceptional-lecturer>>.



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 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.

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.

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 current COVID pandemic, illness of keynote speakers, *etc.*) advice should be sought from the Association's Executive Officer and/or the Secretary.

Please see also the Palaeontological Association Grant Ethics and Conditions:

<<https://www.palass.org/awards-grants/grants/grant-ethics-and-conditions>>.

Pre-submission 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 each meeting. The workshops are arranged in consultation with the local meeting organizer; the local organizer has the final decision as to how many and which events to select for inclusion in any workshop programme. It may (subject to the local organizer being able to facilitate it) be possible 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 GBP) for contributors. An honorarium may be appropriate to support ECRs/ 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 may 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 online submission, 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).



Engagement Grants

Awards are made to encourage educational outreach, public engagement, and related initiatives with palaeontological themes. Normally, the budget for an individual grant would be less than £5,000 GBP (or equivalent currency in the applicant's country at the time the funds are disbursed). However, under exceptional circumstances, a budget of up to £8,000 GBP for an individual application will be considered. Grants can support either stand-alone complete projects, or 'proof of concept' case studies that have their own outcomes but that form the groundwork for a larger bid elsewhere. Applications are welcomed from any country and from applicants of any nationality.

Applications for salary costs are permitted, providing a full justification is given, but if awarded all legal and financial liability will lie with the applicant (see: Categories of expenditure for which the Palaeontological Association does not provide support, below).

Other conditions:

- Proposals must fit with the charitable aims of the Association.
- Preference is given to applications for a single purpose (rather than top-ups of grants for existing projects). We particularly encourage applications with an innovative aspect, such as engaging with new media, and especially cases that will disseminate good practice. We also encourage applications aimed at supporting under-represented groups in palaeontology (see the Diversity Study for more details).
- If the principal applicant is a member of the Association they should be signed into the website when submitting the form. Applicants can contact the Executive Officer Dr Jo Hellawell (e-mail <executive@palass.org>) for further information regarding membership.
- Preference will normally be given to candidates who have not previously won an award. The application deadline is **1st September** and funds will normally be available from 1st November each year. The awards will be announced at the Annual General Meeting.

Proposals will be ranked on the following criteria:

- Fit to the charitable aims of the Association
- Imaginative quality, innovation, and likely spread and impact of the proposal
- Feasibility, value for money and cost effectiveness
- Track record of the investigator in engagement and education initiatives

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. Appropriate parts of the final report will be published in the Association *Newsletter*. Any publicity associated with the activity must mention the support of the Association.

Applications must be submitted electronically via the webpage. Feedback on unsuccessful applications will be provided upon request to the Secretary.

Categories of expenditure for which the Palaeontological Association does not provide support:

Applicants are advised that the Association does not offer funding for the following costs, and hence none of these items may be included in any budget proposal submitted to the Association.



- Core funding or overheads for institutions. The Association will fund the directly-incurred costs of the engagement/educational initiative but, as a charity, we expect the general running costs (e.g. indirect costs, estate costs, support services, directly allocated staff costs) to be otherwise covered. We will therefore not fund on a proportion of full economic costs (FEC) basis. Attention is drawn to paragraphs 3.31 to 3.37 of the Science and Innovation Investment Framework 2004–2014, HM Treasury (July 2004), which explains arrangements for the provision of overheads linked to charity funding to academic institutions.
- Individual items of equipment over £1,000 GBP, sites, buildings or other capital expenditure. Artwork and similar specially-commissioned outreach tools are not considered to be equipment, and will be considered for funding.
- A shortfall resulting from a withdrawal of or deficiency in public finance.
- Student tuition fees and summer research bursaries. If you would like to support a summer research project see the Undergraduate Research Bursaries for more detail.

The application deadline is **1st September** and funds will normally be available from 1st November each year. The awards will be announced at the Annual General Meeting. For more information please contact the Association's Outreach Officer (e-mail <outreach@palass.org>).

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 a PDF document: 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>).

Palaeontological Association Carer's Bursary

Bursaries are made to support attendance at Association meetings by researchers with caring responsibilities. Normally the budget for an individual bursary will be a maximum of £250 GBP. Applications must include a supporting statement and a breakdown of anticipated expenses, supported by quotes where possible. Appropriate costs include attendance of a carer or use of local childcare facilities (for care of accompanying young children), or other caring costs at home.

Bursaries will be awarded to applications received prior to the application deadline. Applications will be assessed by the Council Diversity Group; if there are several eligible applicants, awards will be made on a first-come first-served basis. No subsequent report on expenditure is required.

Successful applicants will be invited to submit a brief statement (<60 words) describing the impact of the bursary on their career. This statement may be used in publicity for the bursary scheme and thus should not contain any confidential or sensitive information.

The principal applicant must be a member of the Association. Applications must be submitted electronically via the Association website. Any associated publicity must mention the support of the Association.

Successful awards will be paid retrospectively on the submission of receipts for reasonable costs (e.g. economy air fares or train tickets, accommodation, subsistence, care costs).

Required supporting information:

- A cover letter detailing the case for support (no more than one A4 page)
- Receipts or quotations for expenses
- Details of any pending or previous applications for funds

These documents must be submitted in a single PDF file.

The deadlines for 2023 are **1st May** (for Progressive Palaeontology) and **1st August** (for the Annual Meeting 2023).



Awards and Prizes AGM 2022

The following awards and prizes were announced and summarized at the AGM held virtually in December 2022.

Lapworth Medal: Prof. Moya Meredith Smith

Philip Donoghue and Paul Smith write: Moya is foremost among researchers who have forged links between classical comparative anatomy, palaeontology and molecular developmental genetics, to create the discipline of evolutionary developmental biology. Her research has long been focused on the origin and early evolution of the vertebrate skeleton; the formative role played by neural crest in the evolution of vertebrate novelties; the origin and evolution of skeletal tissue types; and the origin and evolution of teeth, and of dental replacement patterns. Her work has been based in studying the histology of fossil vertebrates, interpreting them using insights from the molecular developmental genetics of their living relatives. Moya has inspired generations of scientists to follow her interdisciplinary lead, integrating disparate disciplines and disparate datasets to obtain fundamental evolutionary insights. Her research falls into four principal themes:



Photo: © King's College London.

Phylogenetic and developmental origins of teeth

Moya devised an entirely novel theory that teeth, as rotational succession sets, first appeared in the fossil record as sets of pharyngeal denticle whorls in the extinct jawless thelodonts, which have a micromeric skeleton, and that these rather than skin denticles (as the canonical theory advocates) were co-opted with the first pharyngeal arch at the origin of jawed vertebrates. The theory has been hotly debated, reflecting Moya's talent to enthuse researchers from disparate fields to direct their expertise and data to the scientific problems that she promotes.

Moya later showed that placoderms also had teeth – despite dogma to the contrary – proposing an organized, serial pattern of tooth addition, projecting developmental characters onto growth stages of 3D-preserved Gogo fossils. Moya argued that teeth evolved twice, by convergent evolution in placoderms and chondrichthyans, challenging the canonical theory of teeth as a shared character of all jawed vertebrates. Much of this work, unravelling the evolutionary origins of teeth, has been conducted in collaboration with Zerina Johanson (Natural History Museum, London).

Testing the theory that teeth evolved twice, Moya proposed that the alternating pattern of teeth with rotational succession constituting tooth families in chondrichthyans represents a key stage in the evolution of their dentitions, separate from the dentitions of placoderms and of osteichthyans. She also showed that an embryonic alternate pattern of timed tooth initiation was inherited, but could be modulated through developmental plasticity into distinct adaptive adult patterns of



replacement. Moya showed that holocephalans (sister group to sharks and rays) have lost tooth whorls early in their evolutionary history, inventing a novel hypermineralized dentine using a unique mineral for vertebrates, whitlockite, a calcium magnesium phosphate more commonly found in granites and meteorites. Thus, holocephalans have adapted to total tooth loss with a novel hypermineralized dentine as a substitute and Moya has shown that this forms continuously in life from specialized odontoblasts, using stem cells in the aboral dental pulp for renewal in this statodont type dentition.

Conserved gene deployment in evolution of dentitions

To elucidate the regulatory mechanisms of the proposed pattern order inspired by studying fossil jawed vertebrates, Moya and her collaborators Gareth Fraser (University of Florida, USA) and Anthony Graham (King's College London, UK) studied gene expression in the dental development of living sharks and bony fishes. They demonstrated that the same signalling genes have choreographed tooth induction, arrangement and replacement for 420 million years.

Working with Tim Mitsiadis (University of Zurich, Switzerland), Moya generated a new genetic model for tooth replacement. Combining the classical Clone and Field theories, they proposed the 'co-operative genetic interaction' model which implicates combinatorial homeobox gene expression patterns, and a role for the dental lamina as a stem-cell niche for tooth replacement.

Moya used this model to explain iconic dental adaptations in lineages including pufferfish, paddlefish and lungfish, all corroborated using gene expression data.

Role of neural crest in development of skeletal tissues

In collaboration with Brian Hall (Dalhousie University, Canada), Moya integrated data from palaeontology and developmental biology to demonstrate a canonical role for neural crest (a vertebrate embryonic innovation) in the evolution and development of the dermal, visceral and endodermal skeletons of vertebrates. Their key papers made the combined study of fossils and developmental biology *de rigueur* in attempts to understand the origin and early evolution of the vertebrate skeleton.

Moya and Brian went on to test many of their hypotheses experimentally, finding that neural crest cells from the trunk, rather than cranial region, could migrate to tissue of the caudal fin, hence could make bone of the dermal skeleton. Testing cranial neural crest (CNC) potential in amphibian tissue explant cultures, Moya found that teeth could develop in these combinations of cells, but neural crest cells were required. An *in vivo* study tracing labelled CNC cells in the lungfish *Neoceratodus* showed they ended up as odontoblasts and made the dentine, as a shared developmental character with tetrapods.

Earliest vertebrate tissues

Moya proposed that microvertebrate scales with dentine were evidence that neural crest occurred in the Ordovician dermal skeleton, as dentine is always derived from this tissue, and cellular bone was the first of its kind. In collaboration with Ivan Sansom (University of Birmingham, UK) and Paul Smith (Oxford University Museum of Natural History, UK), Moya demonstrated the presence of perichondral bone in primitive sharks, revealing boneless cartilaginous nature of modern shark skeletons to be a consequence of evolutionary convergence. They also demonstrated the presence of enamel and dentine in conodonts, resolving a 150-year debate over their biological affinity in demonstrating the vertebrate affinity of conodonts.



Developmental biologists consider Moya Smith to be a palaeontologist while many palaeontologists think of her as a developmental biologist; these communities could provide no higher accolade for her thoroughly interdisciplinary, boundary-busting approach to science.

Moya has inspired palaeobiologists to consider the relevance of their work through the lens of evolutionary developmental biology, while also convincing developmental geneticists to integrate palaeontological data in their attempts to understand developmental evolution. In so doing, Moya effectively helped, through example, to forge the discipline of evolutionary developmental biology, placing palaeontology at its core.

President's Medal: Dr Zerina Johanson

Philip Donoghue and Robert Sansom write: Zerina is an international leader in the comparative morphology and evolution of jawed vertebrates who has made fundamental insights into the evolutionary assembly of the bodyplan that almost all living vertebrates share, including ourselves. Zerina has achieved this primarily through analyses of fossils, including classical comparative anatomy, computed tomography, physical and virtual histology, as well as phylogenetics. However, Zerina's research has not been limited by the fossil record and she has followed research questions where they lead, including into the comparative anatomy, histology and developmental biology of living species. Her research can be considered in terms of three principal themes:



Photo courtesy of Zerina Johanson.

Evolutionary assembly of the tetrapod bodyplan

Following on from her early work on marsupials in her native Canada, Zerina shifted focus to study osteolepiform and rhizodont fish based on exceptionally-preserved material from Canowindra in southern Australia. Based on exquisite morphological and taxonomic descriptions, combined with some of the first comprehensive phylogenetic analyses, Zerina and colleagues demonstrated that rhizodonts were remote relatives of tetrapods and, therefore, similarities in their limb structure are a consequence of convergence. Zerina and Per Ahlberg (Uppsala University, Sweden) went on to demonstrate that osteolepiforms are paraphyletic, including diverse successive sister-lineages to tetrapodomorph stem-tetrapods. In so doing, they established the modern understanding of the tetrapod stem-group and revealed the sequence of character changes that underpinned the early assembly of the tetrapod bodyplan among fishes. This work was framed within the context of hypotheses on the developmental evolution of tetrapod limbs, emerging from the nascent discipline of evolutionary developmental biology. It was the first manifestation of Zerina's long-standing approach to integrative science, blending comparative morphology, phylogenetics and data from comparative developmental genetics to obtain an holistic understanding of the origin of vertebrate bodyplans.

Evolutionary assembly of the gnathostome bodyplan

While conducting her work on Canowindra stem-tetrapod fishes, Zerina also produced a prodigious number of exquisite descriptions of placoderms, especially antiarchs. Building on this work, she



proposed new homologies between the pectoral fin skeletons of the jawed antiarchs and jawless osteostracans. On this basis, Zerina was the first person to seriously question the shibboleth of placoderm monophyly – the hypothesis that placoderms comprise a natural group, sister to all other jawed vertebrates. This is now conventional wisdom: placoderms are a paraphyletic assemblage of early jawed vertebrates, so many lineages that are related by degree to living jawed vertebrates and, perhaps, among the fundamental lineages of living jawed vertebrates. Zerina has gone on to make many other significant contributions to understanding the evolution of paired fins, including the developmental evolution of the cells that contribute to the tissues from which paired fins develop in living and fossil stem- and crown-gnathostomes. With colleagues, she was also responsible for the discovery of placoderm embryos *in utero*, demonstrating internal fertilization and live birth among these early jawed vertebrates. Based on living and fossil vertebrates, Zerina has also revealed fundamental insights into the evolution of that most iconic of vertebrate evolutionary innovations – the vertebral skeleton.

Origin and evolution of vertebrate dentitions

More recently, Zerina has built a strong and enormously successful collaboration with Moya Smith (King's College London, UK), trying to elucidate the evolutionary origin of teeth. Not only is the evolution of teeth a key innovation thought to belie the success of jawed vertebrates, but it is also a model system in developmental biology for studying organogenesis. As such, the evolution and development of teeth is a very important topic for which integrative studies are essential. Zerina and Moya challenged the century-old hypothesis that teeth evolved through co-option of external dermal scales that extended into the internal oral cavity. This stemmed from a series of studies revealing a much greater diversity of conditions observed in the fossil record than previously appreciated or observed in living jawed vertebrates; this includes jawless vertebrates with 'teeth' (internal pharyngeal and oral scales in thelodonts) and jawed vertebrates without teeth (certain placoderms, and osteichthyans). Thus, they concluded that teeth are exaptations that evolved before jaws, but the teeth of the fundamental lineages of jawed vertebrates evolved convergently from pharyngeal or oral scales. This disruptive hypothesis was not initially well-substantiated, but Zerina and Moya have gone on to corroborate their hypothesis with an enormous amount of careful primary research. Their hypothesis has proven to be very influential, spawning new research seeking to test hypotheses of convergence or homology: between teeth in disparate clades of jawed vertebrates; and between teeth and scales. This has been done through analyses of fossils and comparative developmental genetics, both by Zerina and colleagues, as well as by independent and competing research groups.

Outside these highlight themes, Zerina is also a leading authority on lungfish taxonomy, systematics and evolution, early chondrichthyan evolution and actinopterygian evolution; her portfolio of cross-cutting interdisciplinary research is complemented by her meticulous approach to solid taxonomic work. She is also an excellent mentor, having fostered the careers of a number of master's, PhD and postdoctoral researchers, and a consistent contributor to undergraduate teaching at the University of Cambridge, UK. She has been influential in establishing open data practices in digital morphology. Otherwise, Zerina has been a tireless servant for science, serving as co-Head of the Department of Earth Sciences at the Natural History Museum, London, as well as serving on editorial boards and grant review panels.

Zerina's accomplishments make her a truly worthy recipient of the 2022 Palaeontological Association's President's Medal.



Hodson Award: Prof. Allison C. Daley

Xiaoya Ma and Bertrand Lefebvre write: After her PhD in 2010 at the University of Uppsala, Sweden, Allison spent time at numerous UK institutions including: the University of Bristol as an Honorary Research Associate; the Natural History Museum, London as a Postdoctoral Research Fellow; St. Edmund Hall at the University of Oxford as a Junior Research Fellow; the Oxford University Museum of Natural History as a Museum Research Fellow; and the department of Zoology at the University of Oxford as a lecturer in Animal Diversity. These culminated in 2016 when Allison became Associate Professor of Paleontology at the Institute of Earth Sciences at the University of Lausanne, Switzerland. During all these positions, Allison's research was internationally recognized and can be summarized under three principal themes:

Diversity, taxonomy and palaeoecology of Radiodonta (stem lineage arthropods)

Allison is a world expert on radiodonts such as *Anomalocaris* (basal stem lineage arthropods), showing how their morphology, phylogenetic significance and ecology provide key insights into the Cambrian Explosion and the Great Ordovician Biodiversification Event. Allison's palaeontological research characterizes the diversity of Cambrian radiodonts on a global scale, with a focus on the Cambrian Burgess Shale and Chengjiang Biota, and the Ordovician Fezouata Biota. Prior to her publication in *Science* on the radiodont *Hurdia* in 2009, fewer than five papers had been published on radiodonts during the previous 20 years. After her work revealed the anatomical diversity of this fossil group, more than 40 papers have since been published (by her research group and others) on radiodont morphology, taxonomy, ecology and preservation.

The early evolution of Arthropoda

Allison's research puts fossils front and centre in evolutionary analyses of the timing and drivers of early arthropod evolution. She uses detailed morphological information obtained by extensive specimen examination to feed into phylogenetic databases, either to establish the inter-relationships of early animal taxa or as fossil calibrations for molecular clock analyses. These analyses have revealed, for example, the origins of biramous limbs, arthropod head shields and digestive systems. Together, this research is bringing the context, timing and drivers of the Cambrian Explosion and Great Ordovician Biodiversification Event into focus. Most recently, this topic has been explored in her lab courtesy of funding from the Swiss National Science Foundation to study arthropod evolution in the Fezouata Biota, from 2018 to 2022.

Variability and preservation biases in the arthropod fossil record of ecdysis

Allison has established a research programme examining the fossil record of exoskeletal moulting, combining her anatomical expertise and knowledge of fossil preservation processes to reveal a highly variable evolutionary history of ecdysis in the earliest arthropods. This work combined traditional palaeontological techniques with statistics and functional morphology approaches to establish a list of criteria needed to identify fossil moults, and quantify temporal and taxonomic trends in



Photo courtesy of Allison Daley.



the diversity of trilobite moulting. Highly detailed descriptions of moult assemblages allow us to reconstruct moulting behaviour and fossil preservation pathways. This work is being expanded using experimental taphonomy approaches (decay experimentation, population studies) to reveal life-history strategies in extinct arthropods. Her research in this field has culminated in a substantial Swiss National Science Foundation Sinergia grant, between four labs, including her own, for a four-year interdisciplinary study of arthropod moulting, linking genotype, phenotype and life history evolution.

Allison is currently an Associate Editor for the *Swiss Journal of Palaeontology*, and *Royal Society Open Science*. In addition to research activities, Allison has extensive experience in teaching undergraduate and postgraduate students at Western University, Canada; Uppsala University, Sweden; University of Oxford, UK; the École Normale Supérieure de Lyon, France; and the University of Lausanne, Switzerland. Allison has hosted and is hosting five postdocs in her labs, and has successfully supervised and is supervising five PhD students, seven undergraduate interns and seven master's students. At time of writing she has been an examiner in four PhD vivas.

Although research and teaching are very important, these are not the only areas in which Allison excels. She also has outstanding organizational and communication outreach skills, and she has been putting together all the means she has to communicate palaeontology to a broad audience. Allison wrote popular science articles in *Current Biology* and *Australasian Science*. She organized a public science fair at the Oxford University Museum of Natural History on the Cambrian Explosion. She even gave a Ted(dy) Talk on 'Earth's Earliest Predators' for the St. Edmund Hall YouTube channel.

Allison is very eager to increase diversity and inclusion in palaeontology. In 2018, Allison joined the Commission for Equality at the University of Lausanne. She has been defending women scientists on all social media platforms. She is also very supportive of members of the LGBTQ+ community in palaeontology. This was clearly shown during Palaeovision 2020, after the Annual Meeting of the Palaeontological Association. Allison's lab entry won the competition and was an *Anomalocaris* dressed up in rainbow colours, reflecting a clear image of the supportive environment she provides in her lab. Finally, Allison has won numerous awards during her career, including the Gold Medal in Geological Sciences from Queen's University, Canada, the Outreach Award from the Department of Earth Sciences at Western University, and Jan Bergström Young Geoscientist Award from the Geological Society of Sweden.

Allison's impressive career, in which she has excelled in research, teaching, supervising, outreach and defending marginalized communities in science, makes her a deserving recipient of the 2022 Hodson Award.

Research Grant Awards

Research Grants represent the largest grants awarded by the Association and are made to assist palaeontological research. 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. In 2022 Council agreed the following applicants should receive awards: Susannah Maidment for a project entitled 'The flora, fauna and depositional setting of the Upper Jurassic Sundance Formation, Wyoming, USA' (£9,810); Evan Saitta for a project entitled 'Characterizing the diagenesis of sex hormones' (£5,000); and Robert Sansom for a project entitled 'Life after death: the evolution of microbial communities responsible for animal decomposition' (£4,280).



Small Grant Awards

The small grants awarded by the Association for funding in 2022 include the Sylvester-Bradley, Callomon, Whittington and Stan Wood awards. Council agreed that the following applicants should receive the awards: Thibault Durieux, Sylvester-Bradley Award (£1,500); Diana Osipova, Callomon Award (£1,500); Tina Sklavounou, Whittington Award (£1,490); and Jorgo Ristevski, Stan Wood Award (£1,483). Details of the proposed research projects are given below.

Architecture and development of a Carboniferous fern relative

Thibault Durieux

The Cladoxylopsids are an extinct group of fern relatives known from the Middle Devonian to the early Carboniferous. They were an important component of Devonian vegetation, especially during the Middle Devonian where, along with the archaeopteridalean progymnosperms, cladoxylopsid species formed the earliest forests. Cladoxylopsid species encompassed a wide range of growth patterns, with or without secondary growth, from trees to small bushes, and based on preliminary studies, even a lianescent species. The genus that potentially possesses lianescent representatives is *Cladoxylon*, from the early Carboniferous (Tournaisian–early Viséan) of Europe. *Cladoxylon* was described for the first time by Unger in 1856, but there is only one preliminary study that tried to reconstruct its habit, and there is no study focusing on the organization of its lateral organs or its ontogeny. Its taxonomy also needs to be revised in the context of recent advances in the phylogeny of cladoxylopsids. This project aims to use the extensive collection of *Cladoxylon* held at the Université de Montpellier, France to reconstruct the architecture of the plant, its development and its relationships with other, older, cladoxylopsids.

Hinge inversion study in Cenozoic Bivalvia of West Pacific

Diana Osipova

The proposed evolutionary tree of Bivalvia groups based on hinge morphology and topography has been widely accepted. These features are ontogenetically established and taxonomically valuable. The phenomenon of hinge inversion has been recognized in bivalve molluscs in different basal and derived families. However, a detailed description and classification of inversion are almost lacking in both recent and fossil materials. Studying changes in the standard topography of hinge teeth can be useful for reconstructing the phylogeny of specific Bivalvia clades. Nevertheless, the range of variation of the inversion from various geological ages is poorly presented. In addition, no records of inversion from fossil species were described from the West Pacific, where the marine biodiversity is considered high globally. Here I propose a fauna revision and a description of inversions of hinge structures among different fossil Bivalvia families in Taiwan. Examination of the museum collections along with new bulk sampling from the Toukoshan Formation (northwest Taiwan) and the Szekou Formation (southern Taiwan) are planned. The results will provide the most up-to-date review of past molluscan fauna of Taiwan, which would further contribute to our understanding of the hinge inversion character in the Bivalvia phylogeny from this poorly described region.



Bovid taxonomy and palaeoecology of the Upper Miocene locality of Pikermi (Greece) through osteometric and mesowear analysis

Tina Sklavounou

Past terrestrial ecosystems can be reconstructed using several methods. Mesowear analysis of cheek teeth of bovid species provides an almost direct look into the diet of these animals. Species of the family Bovidae, which includes animals such as antelopes or cattle, have evolved high-crowned teeth that are adapted to the consumption of abrasive plants, namely grasses. The radiation of Bovidae in the Neogene at a nearly global scale is correlated to the spreading of grasslands. In Europe, the fossil locality of Pikermi (near Athens, Greece) is one of the richest in the Balkan Peninsula, still yielding new taxa and new occurrences in recent excavations (2010–2022). This project will include a taxonomic update and perform mesowear analysis of bovids from the historic Albert Gaudry collection of Pikermi fauna housed in the Muséum national d'Histoire naturelle (MNHN), Paris, France. The taxonomic composition will be compared with data provided by new occurrences of bovids from recent excavations. Comparison with the historic collections allows for a complete dataset to be compiled. In addition, mesowear analysis gives a unique opportunity to examine the diversity and diets in greater detail, to provide results on the palaeoecology of this exceptional site, but also to valorize the natural history collections of the MNHN.

Cranial anatomy and phylogenetic relationships of the mekosuchine crocodylian *Quinkana timara*

Jorgo Ristevski

This project aims to expand the knowledge on the craniomandibular morphology, palaeoneurology and phylogeny of the ziphodont mekosuchine crocodylian *Quinkana timara*. As with all other species of *Quinkana*, *Q. timara* is a poorly understood taxon due to the scarcity of fossils attributable to it. Newly discovered material from the Middle Miocene of Bullock Creek in the Northern Territory of Australia is referable to *Q. timara*, which promises to significantly improve the understanding of this morphologically distinctive crocodylian. The new material of *Q. timara* will be studied from data obtained via micro-CT scans. This is expected to provide an unprecedented look into the anatomy of any *Quinkana* species and to be one of the most detailed morphological studies for any mekosuchine. Overall, the proposed study is expected to provide the most complete understanding of *Quinkana* to date through novel insights into the anatomy, taxonomy and palaeobiology of one of the most important carnivores in Australia since the end of the Mesozoic. The newly obtained information from this study will have substantial impact on our understanding of crocodylian anatomy, palaeobiology and evolution, not only in Australia but globally.



Undergraduate Research Bursaries 2022

The following Undergraduate Research Bursaries were awarded by Council in 2022 and reported at the Annual General Meeting:

- **Charlie R. Scherer** (University College London, UK) for ‘The dinosaurs of Tendaguru (Late Jurassic, Tanzania): bringing dark data into the light’. Supervised by Paul M. Barrett;
- **Aamir Mehmood** (University of Bristol) for ‘Macroecology of the recovery of temnospondyls from the end-Permian mass extinction’. Supervised by Michael J. Benton;
- **Charles Bates** (The University of Manchester, UK) for ‘Quantifying drift and selection as macroevolutionary processes’. Supervised by Russell J. Garwood;
- **Kieran M. Walsh** (University of Nottingham, UK) for ‘Metals, malformations and mass extinction: testing the theory in the living’. Supervised by Barry H. Lomax;
- **Inés Z. Rivero Delgado** (University College London, UK) for ‘Ontogenetic changes in an extinct species of crocodile’. Supervised by Phillip D. Mannion;
- **Helen Edmondson** (The University of Manchester, UK) for ‘Early Vertebrates of Shropshire’. Supervised by Robert S. Sansom;
- **Samuel Newton** (University College London, UK) for ‘The Palaeobiogeography of Late Cretaceous-Palaeocene mammals’. Supervised by Paul Upchurch.

Engagement Grants

A total of three Engagement Grants were awarded by Council. These awards are made to encourage educational outreach, public engagement, and related initiatives in palaeontological themes. The awards reported to the Membership at the 2022 AGM were:

- **Jed W. Atkinson** for Fossils in t’Hills and where to find them (£1,260) – resources for educational activities and materials required for a stall for use at the Yorkshire Fossil Festival, UK.
- **Roland B. Sookias** for Palaeo for all (£2,650) – project to introduce concepts including ‘deep time’, climate change and evolutionary thinking to as wide an audience as possible, via creation of a state-of-the-art online virtual reality.
- **M. Eugenia L. Gold** for Science on the street (£1,000) – an online engagement resource: creating and hosting videos on the YouTube channel @scienceonthestreet to appeal to a broad audience.

Career Development Grants

The Association’s Career Development Grants are designed to assist talented early-career researchers who have recently completed their PhD. It aims to strengthen their CVs to help them achieve a career in palaeontology (research or curation). The grantee is also automatically enrolled in the Association’s mentoring scheme and assigned a mentor by agreement.

The following grants have been made by Council and were reported at the 2022 AGM: **Nora Carolin**; **Paige dePolo**; and **Jane Reeves**.



Association announcements

The new PalAss President



Photo courtesy of Andrew Curtis

Our new President, Rachel Wood FRS, is Professor of Carbonate Geoscience at the University of Edinburgh, UK. Rachel studied in the UK with a BSc in Geology/Zoology at the University of Bristol and a PhD jointly at the Open University and the Natural History Museum, London. After a postdoctoral year at the Freie Universität Berlin, Germany, she then spent many years on various research fellowships at the University of Cambridge, UK. After five years in industrial research, she returned to academia as a lecturer at the University of Edinburgh in 2006 and has been there ever since.

Rachel's research interests are in the evolution of ancient reefs, not only to illuminate changing ecological dynamics, but also changes in biogenic carbonate sediment production. This is a major sink of the long-term carbon cycle, which also links interactions between global change and evolutionary response. She is particularly interested in the role of changing seawater chemistry on carbonate sediment production and

early diagenesis, controls on early metazoan biomineralization, the cause and ecological effects of mass extinction events, and understanding the Ediacaran–Cambrian rise of skeletal animals.

Rachel was awarded the Johannes Walther Medal of the International Association of Sedimentologists in 2018, the Lyell Medal of the Geological Society of London in 2020, became a Corresponding Member of the Göttingen Academy of Sciences and Humanities in 2022 and is Honorary Consul to Namibia in Scotland. In 2022 she was elected as a Fellow of the Royal Society.

Rachel has been a member of the Palaeontological Association since she was an undergraduate. She has served on Council, both as an Editor and as 'Publications Secretary' (Chair of the Publications Board). We warmly welcome Rachel to her new position as President of the Palaeontological Association.

PalAss Council also welcomes new members Evelyn Kustatscher (Editor Trustee), Robert Sansom (Meetings Coordinator), Elizabeth Dowding (Outreach Officer), Orla Bath Enright (Early Research Career Officer), Shane Wheatley (Deputy Internet Officer) and Harriet Drage (Ordinary Member). Uwe Balthasar, previously the Meetings Coordinator, steps into the role of Vice-President.

We are very grateful for the time and efforts of departing Council members Patrick Orr, Richard Butler, Nicholas Butterfield, Zoë Hughes, Elspeth Sinclair, Sam Giles, Tom Harvey and Liz Hide.

Jo Hellawell
Executive Officer



Scheduling of future Annual Meetings

Background

Traditionally, the Annual Meeting was held in mid-December, typically for two or three days around the period 14th–21st December. In response to the COVID-19 pandemic meetings were held online in December 2020 and December 2021, the latter a switch at short notice from the planned in-person meeting. Given the expectation that the impact of the ongoing pandemic would be greatest in the winter months, Council took the decision to schedule the 2022 and 2023 meetings in July and September, respectively, to maximise the likelihood of being able to hold the meetings with largely in-person elements. Towards the end of 2022 it was decided by Council to establish the specific time of year at which an in-person Annual Meeting will be held in 2024 and thereafter; as part of this process a poll of the membership was undertaken to help inform this decision. The intention behind fixing the time slot for the foreseeable future is to allow both potential organizers and attendees clarity as to when the Meeting will be scheduled in future years.

Summary results from the poll

From the total eligible membership of just over 1,200 individuals we received 229 responses (c. 20 % response rate). The survey asked a number of questions, some to establish the background of the respondent and their relationship with the Annual Meeting, while others focused on what time of year best suited the respondent.

A question asking ‘When did you first attend the Palaeontological Association Annual Meeting?’ revealed that c. 71 % of the respondents had first attended our in-person meetings prior to the pandemic in 2020, and c. 9 % had their first experience of an Annual Meeting after the start of the pandemic, while c. 20 % stated they had never attended (Figure1). The purpose of this question was to establish, in a very rough sense, what experience the respondents have had at previous Annual Meetings (*i.e.* in-person, remote or hybrid) and the number that have experience of a non-summer meeting.

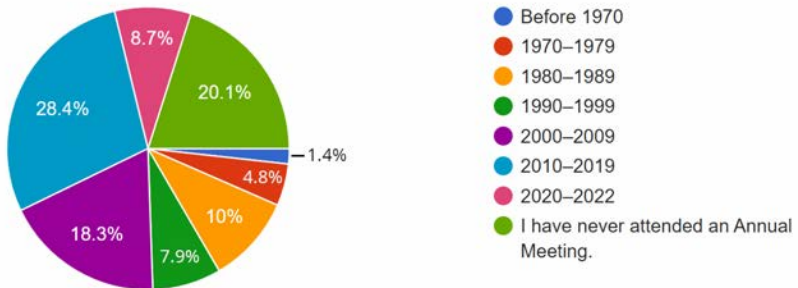


Figure 1. Piechart showing results from the question ‘When did you first attend the Palaeontological Association Annual Meeting?’. A total of 229 individual responses were recorded.

Other questions aimed to establish how many times in the last seven and 15 years individuals had attended the Annual Meetings. The results for the last seven years showed that just under 40 % of respondents have attended 50 % or more of the Annual Meetings held, with 37 % having attended less regularly, and the remaining 23 % not ever having attended. These questions aimed to contextualize the results to help Council understand what percentage of our membership have been able to attend our meetings (or not) .



A key question in the survey asked ‘What time of year would you prefer the Annual Meeting to be held?’. The respondents were able to select multiple time slots and/or indicate another time slot not represented. The results indicate a strong preference (52.4 %) for the December (early-mid) time slots compared to the other predefined time ranges (June through to September). However, if the individual June to September time ranges are considered together, as the alternative to December time slot, there is a near 50:50 split with no clear ‘winner’.

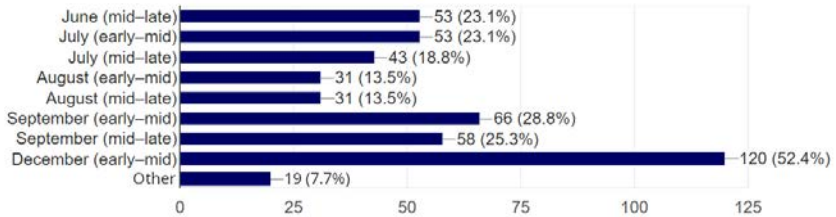


Figure 2. Barchart showing results from the question ‘What time of year would you prefer the Annual Meeting to be held?’. In total 229 individual responses were recorded, with respondents able to select multiple options. The ‘Other’ category shown represents all suggestions that were not within the predefined time ranges suggestions.

In addition, respondents were asked optionally to state why they preferred the time ranges they selected and could, if they wished, provide any other general comments. Council has reviewed these comments to see if any patterns could be established between the time slot preferences and personal circumstances (e.g. career stage, child care and family commitments, travel costs, teaching, fieldwork periods, other work responsibilities, etc.). No such pattern could be ascertained with any degree of certainty, with many of the same issues relating to Annual Meeting attendance being highlighted across all suggested times ranges.

Decision reached

At the recent February Council meeting the question of what time of year to hold the Annual Meetings from 2024 onwards was raised, with the poll results forming the basis of this discussion. During the discussion it became apparent that Council itself was also split along very similar lines to the poll results, holding many of the same viewpoints highlighted by the membership. However, as a higher percentage of responses were in favour of the December meeting compared to other proposed time slots, and given the need for certainty both for the membership and for our potential 2024 organizers, the President made an executive decision and proposed a **December meeting for 2024**. Council felt it was not appropriate to fix the Annual Meeting time slot permanently going forwards until more thought has been given to how we can support the substantial number of the membership who highlighted issues with attendance in December. As our Annual Meeting will be held in September this year more data gathering will be carried out to allow further in-depth discussion about the long-term placement of the Annual Meeting from 2025 onwards.

Alan Spencer
Secretary



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, UK, one of the world's oldest universities, which dates back to 1209 AD. The organizing committee is chaired by Alex Liu, with assistance from members of the Departments of Earth Sciences, Zoology and Archaeology; the Zoology Museum; the Sedgwick Museum; CASP; and the British Antarctic Survey.

The e-mail address for all Meeting matters is <annualmeeting2023@palass.org>.

Programme at a glance

Monday 11th September

Afternoon: Pre-conference Early-Career Researcher event: 'Palaeontologists for the Future', to be held in the Department of Earth Sciences.

Tuesday 12th September

Morning: Pre-conference workshops and museum/collections tours (multiple options and venues).

Afternoon: Symposium: 'Ecosystem Engineering through Deep Time', West Road Concert Hall.

Early evening: Welcome Reception, Sedgwick Museum of Earth Sciences.

Wednesday 13th September

Oral and poster presentation sessions, West Road Concert Hall and Faculty of Law.

Annual Address (title and speaker TBC).

Evening: Annual Dinner, Girton College.

Thursday 14th September

Oral and poster presentation sessions, West Road Concert Hall and Faculty of Law.

Friday 15th September

08:00 – 18:30 Field-trip to the Eocene and Pliocene deposits of Bawdsey, Suffolk.

All scientific sessions and the symposium will take place on the University's Sidgwick Site on West Road, Cambridge, in either the West Road Concert Hall or the adjacent Faculty of Law lecture theatres. The Early-Career Researcher event will take place at the Department of Earth Sciences, on Downing Street, in the city centre. Workshops will take place at a variety of venues around the city.

Note that the Association AGM will not take place during the Annual Meeting but will be scheduled for a date in December. Details will be posted on the PalAss website (<www.palass.org>) and sent to members via e-mail closer to the time.



Meeting format

The Palaeontological Association and the Meeting organizers are committed to hosting a safe in-person meeting. Should developments related to the COVID-19 pandemic or any other unexpected event occur, we will follow local government guidance and will inform delegates of any changes to the Meeting format as soon as possible. Excepting a limited number of presenters from low- and middle-income countries (see below), delegates should plan to attend in person; virtual attendance is limited to very specific circumstances and is not supported by interactive online platforms for communications and discussion.

The September meeting will include selected virtual elements, and delegates delivering oral presentations will be offered the opportunity to have their talks recorded and uploaded for dissemination on the PalAss YouTube channel. Live-streaming will not be offered for regular talk sessions.

A limited number of oral presentation slots have been ring-fenced for delegates from low- to lower-middle income countries (LMIC, as defined by the World Bank) who cannot attend in person but who register as virtual attendees and submit an abstract. Any selected LMIC virtual attendees will be required to submit pre-recorded talks by 4th September, and will be expected to attend via Zoom to answer questions from the audience.

A dedicated poster session for delegates is scheduled for the afternoon of Wednesday 13th September. Posters will remain on display for the duration of the Meeting, including during coffee and lunch breaks. To raise the visibility of research presented as posters, delegates presenting in this format will have the opportunity to submit a 'striking image' from their poster prior to the Meeting. These images will be displayed alongside the presenter's name, poster title and poster location before and after relevant talks sessions, on screens in meeting venues and on social media. There will be opportunities for poster presenters to e-mail their posters ahead of time for printing and collection on arrival in Cambridge. Further details of this service will be e-mailed to poster presenters upon acceptance of their abstracts.

Monday 11th September: Early-Career Researcher event

There will be an ECR event on the afternoon of Monday 11th September, with the theme 'Palaeontologists for the Future'. The event will include workshops on decolonization and elevator pitches, and will conclude with an informal evening networking event.

The event will run from 12:45 to 17:30, and will be followed by a buffet in the Watson Gallery of the Sedgwick Museum. A full schedule for the ECR event will be made available on the Meeting webpage at the time of registration. The event is free and is aimed at early-career stages and at key early-career transition points. The primary goal is to provide an opportunity for ECR participants to get to know peers in their field. Participants must register for the event when registering for the conference. Places are limited and will be allocated on a first-come, first-served basis at time of online registration. At registration, participants will be asked to provide three keywords to describe their research topic and methods.

Tuesday 12th September: Workshops, collections tours and symposium

We are pleased to offer several workshops on the morning of 12th September, held in the Departments of Zoology and Earth Sciences, or in the Sedgwick or Zoology Museums. Several rooms



have been booked for the workshops from 09:00 to 12:30. Concurrent with the workshops, there will be tours of the palaeontology and geology collections in the following locations:

- Colin Forbes Building of the Sedgwick Museum
- CASP
- British Antarctic Survey
- Zoology Museum
- Sedgwick Museum gallery tours
- Department of Archaeology bioanthropology collections

Places on the tours are limited, and will be allocated on a first-come, first-served basis at time of registration. Please see the meeting website for further details about individual collections and tours.

Workshops

We are pleased to offer four workshops as part of the 67th Annual Meeting:

- A 'Photogrammetry techniques' workshop, coordinated and delivered by Emily Mitchell, will guide participants through the principles of photogrammetry, photographing specimens to make photogrammetric models, and the techniques available for processing photographs to produce 3D models. We are grateful to Agisoft Metashape for supporting this workshop.
- The 'Pop-up Palaeo Museum', run by Liz Hide and Rob Theodore of the Sedgwick Museum, will be a practical workshop that will help participants to develop skills in interpreting and communicating palaeontology, working through the process of creating an exhibition to curate a new public display.
- The 'Palaeoart' workshop, delivered by palaeoartists (and Cambridge PhD students) Katrina van Grouw and Oliver Demuth, will be an informal art workshop based in the Sedgwick Museum. The emphasis will be on accurate observation and an appreciation of rendering three-dimensional objects in two dimensions. The workshop will include tips on traditional drawing from museum specimens, and digital 3D techniques.
- 'Best practices for specimen based and taxonomic research in palaeontology' will be delivered by Zoë Hughes (NHM, London) and Luke Parry (University College London), and will demystify the process of working with collections (and curatorial staff), and demonstrate best practices in specimen-based palaeontological research, from discovery to the naming of new species.

Symposium

The Symposium on the afternoon of Tuesday 12th September will be on the topic of 'Ecosystem Engineering through Deep Time', and will have a new format. Rather than limiting presentations solely to invited speakers, the 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 six 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. Each abstract selected for an oral presentation in the Symposium will



receive a monetary contribution towards the costs of travel and accommodation, as well as coverage of registration costs for the full Meeting. The proceedings of the Symposium will be published in a thematic issue in *Palaeontology*.

Our four invited speakers and their topics are:

- Prof. Graham Shields-Zhou (University College London, UK) on biogeochemical interactions between life and the environment;
- Prof. Kevin Lala (University of St Andrews, UK) on niche construction as a cause of natural selection;
- Prof. Gabriela Mángano (University of Saskatchewan, Canada) on bioturbators as ecosystem engineers;
- Prof. Chris Doughty (Northern Arizona University, USA) on body size evolution as a driver of Phanerozoic nutrient availability.

For further details on how to contribute a presentation to the symposium, please see the Symposium page on the Annual Meeting webpage: <<https://www.palass.org/meetings-events/annual-meeting/2023/annual-meeting-2023-cambridge-uk-symposium-ecosystem-engineering-through-deep-time>>.

Wednesday 13th and Thursday 14th September: Scientific Sessions

Wednesday 13th September will feature a full day of talks and a dedicated poster session, followed by the Annual Address (speaker and title TBC).

The Annual Dinner will be held in the beautiful and historic surroundings of Girton College, the UK's oldest residential institution to offer higher education to women. Founded in 1869, Girton is one of the 31 Colleges that make up the 'collegiate' University of Cambridge, and prides itself on widening participation and embracing sustainability. Dinner will be preceded by a drinks reception in the College gardens, subsidized thanks to the generosity of our sponsors. Attendance at the dinner is capped, so places will be allocated at the time of registration on a first-come, first-served basis. In addition to offering dining options for those with dietary requirements, we will offer a reduced rate of dinner registration for those delegates who would prefer non-alcoholic beverages.

Thursday 14th September will again be a full day of talks. On both 13th and 14th September, delegates may opt in for a packed lunch, selecting options for dietary requirements at the time of registration.

At lunchtime on Thursday 14th September, delegates will be able to attend a friendly and informal LGBTQ+ gathering of community and allies for cordial conversation and a talk by Cambridge PhD student and Sedgwick Museum Bridging Binaries tour volunteer Klara Widrig. Klara will present a portion of their Bridging Binaries museum tour on the fabulous adventures of nineteenth century Romanian palaeobiologist Franz Nopcsa. A nobleman of the Austro-Hungarian empire, Nopcsa recognized island dwarfism in dinosaurs, was the first person to hijack an aeroplane, and nearly became king of Albania, all while accompanied by his 'secretary', Bajazid Elmaz Doda. All are welcome!



Friday 15th September: field-trip

A one-day post-conference field-trip led by Neil Davies will visit the Cenozoic strata of south Suffolk. Delegates will visit Eocene and Pliocene sites in the London Clay and Red Crag along the coast, reflecting deposition and fauna in the proto-North Sea. Abundant shelly fossils and reworked shark teeth and whale bones are found in the Pliocene Red Crag Formation, while the London Clay yields prolific amounts of pyritized plant and vertebrate material. The field-trip will begin with a visit to the Red Crag in Rendlesham Forest. Subsequently, while waiting for the tide to fall, we will benefit from the region's archaeological heritage, visiting the Sutton Hoo burial site that sits within the field area on top of Pleistocene marine and river deposits. In the afternoon delegates will visit the extensive coastal sections of the London Clay and Red Crag around Bawdsey. The trip will depart Cambridge at 08:00 on Friday 15th September, returning c. 18:30 that day. Field-trip registration fees will include transport, entry to Sutton Hoo and a packed lunch. The number of participants will be limited due to coach capacity, with places allocated on a first-come, first-served basis at the time of registration.

The city of Cambridge

The historic city of Cambridge has plenty to offer visitors. World-class museums include the striking Fitzwilliam Museum (housing art and antiquities from around the globe), Kettle's Yard (twentieth century and contemporary art), and the Whipple Museum of the History of Science. Beautiful University and College buildings adorn the corners of narrow cobbled streets, with numerous independent retailers nestled between them to entice shoppers or those looking to pick up a souvenir. In the summertime, the University Botanic Gardens are in full bloom, and the city is often buzzing with al fresco drama and music performances, including choral services by one of the many College choirs, and performances of Shakespeare in college gardens. Walking or punting along the picturesque River Cam offers an excellent way to see the University buildings, including the iconic King's College Chapel. We are pleased to be able to offer discounted punt tours for meeting delegates, courtesy of local company Scudamore's.

Getting to Cambridge

Cambridge is under an hour from London King's Cross and St Pancras International stations, and less than 40 minutes by train or bus from London Stansted Airport (which has excellent connections with the rest of Europe, and a recently introduced route to Dubai that may be of interest to delegates from further afield: for a full list of destinations see <<https://www.stanstedairport.com/destinations-and-guides/a-z-list-of-destinations>>). Cambridge is also within 1–2 hours on public transport from London Heathrow, Luton and Gatwick airports. Delegates who intend to drive to Cambridge are encouraged to make use of one of several Park-and-Ride sites at the edge of the city.

Since Cambridge is a relatively small city, most destinations can be easily reached on foot. The main train station is around 15-20 minutes' walk from the city centre, while West Road Concert Hall is 5-10 minutes' walk from the city centre. Taxis, Voi electric 'e-bikes' and 'e-scooters', and an extensive local and national bus service are also available.



Accommodation

There are numerous hotels, hostels and guesthouses within a 5–15 minute walk of the conference venues, as well as plenty of eating and drinking establishments. Up to 100 en suite B&B rooms will be available to delegates at discounted rates in St Catharine's College, very close to most of the conference venues and within the city centre. Alternatively, accommodation can be booked using the usual online resources, *e.g.* <www.booking.com>. A list of suggested accommodation options across all price points will be made available on the Meeting website from April 2023.

Registration

Registration, abstract submission, booking and payment (by credit card) will be available online via the Palaeontological Association website (<www.palass.org>).

Registration and abstract submission will open on Monday 3rd April 2023. Full details of registration costs and abstract formatting details will be made available on the Meeting website at the end of March. The deadline for early-bird registration and abstract submission is Friday 9th June at 23:59 BST. It will not be possible to submit an abstract after that date. Registration after 28th July will incur additional charges, and registration will close on 22nd August. Registration and bookings for specific meeting events (ECR event, workshops, collections tours, Annual Dinner and field-trip) will be taken on a strictly first-come, first-served basis.

For international delegates who require visas to enter the UK, there will be an option on the online registration form to tick a box that will guarantee both that you will receive a decision on your abstract, and (if necessary) a formal letter of invitation from the conference organizers, in a timely manner.

Student travel grants

The Palaeontological Association runs a programme of travel grants to assist student members (doctoral and earlier) to attend the Annual Meeting in order to present a talk or poster. Grants of up to £100 will be available to student presenters who are travelling from outside Cambridge. The actual amount available will depend on the number of applicants and the distance travelled. Payment of these awards is given as a disbursement at the Meeting, not as an advance payment. Students interested in applying for a PalAss travel grant should contact the Executive Officer, Dr Jo Hellawell (e-mail <executive@palass.org>) once the organizers have confirmed that their abstract is accepted. Please title the e-mail "Travel Grant Request". No awards can be made to those who have not followed this procedure.

The IAS are also offering financial support to student members of their society who will be presenting oral or poster presentations (as first author) at the Annual Meeting. IAS travel grants are intended to be a contribution to the expenses of the student (travel, housing, registration), but not a full reimbursement of all expenses, with individual grants usually being of the order of £100–£400, depending on distance travelled, and on the number of applications received. IAS student members will be able to apply for an IAS travel grant through their profile on the IAS website in July, after they have been notified of abstract acceptance (please see the Annual Meeting webpage for more details).



Carer's bursary

Bursaries are available to support attendance at the Annual Meeting by researchers with caring responsibilities. The deadline for receipt of applications is 1st July at 23:59 BST. Please see <<https://www.palass.org/awards-grants/grants/palaeontological-association-carer-s-bursary>> for further details.

Nursing facilities

There will be baby-changing facilities at the Sedgwick Museum and the Department of Earth Sciences, as well as a nursing room in West Road Concert Hall. No childcare will be provided, but a list of local childcare options can be provided on request. For further details and to request access to the nursing facilities please contact the conference organizers by e-mail to <annualmeeting2023@palass.org>.

Accessibility

All meeting venues are accessible via ramps and/or lifts. A quiet room will be available for individual use if required.

On behalf of the local organizing committee, we look forward to welcoming you to Cambridge in September!

Thank you to our sponsors:

- Agisoft Metashape
- Dr D. J. Field
- PeerJ
- IAS
- Indiana University Press
- Palaeocast
- Palaeontographical Society – sponsor of the Annual Meeting field trip
- Sedgwick Museum
- The Treatise on Invertebrate Paleontology – sponsor of the Annual Address

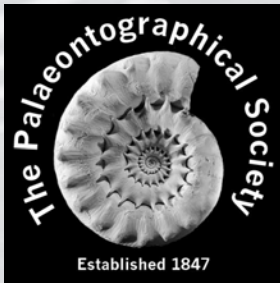
If you or your company would be interested in sponsoring the Meeting, please get in touch: <annualmeeting2023@palass.org>



TREATISE
on Invertebrate Paleontology



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Cambridge 2023



**The Palaeontological Association
Annual Meeting**

PROGRESSIVE PALAEOLOGY 2023

 **Talks, posters and panels**

 **Workshops:**

- “How to weigh your animal: an introduction to volumetric methods in vertebrate palaeontology”
- “Art and Palaeontology: The history and applications of illustration to our research”

 **Away day to Great Orme, Llandudno**

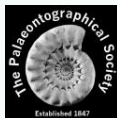
 **Social events, auction and much more!**



1st – 3rd June 2023

with optional public lecture evening
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**news**

Palaeontology in the news

Of skulls, chests and treasures

Imagine finding an old treasure chest, one that fits well in a pirate story. It may contain wonderful treasure; however, you do not have the key to open it. I am sure that none of you would hesitate to break the lock and crack open the chest to find out what is inside. Unfortunately, you are not allowed to damage the chest because the chest itself is part of the treasure. What would you do then?

This seems a very unlikely situation to find yourself in. Unless, of course, you are a palaeontologist. Fossils are like treasure chests, full of information on our planet's history and the evolution of life. Several fossils are like open chests where information can be recovered from them without any damage. But some are locked up and will not unveil their mysteries so easily. This is the case with the skull of a ray-finned fish fossil from approximately 139 million years ago. The skull is a treasure itself, being the only known specimen of its species so far. But it is also a chest holding an even greater treasure: a well-preserved brain, providing a window into neural anatomy deep within ray-finned fish phylogeny. This opens new possibilities in the study of vertebrate brain evolution.

Soft tissues, like the brain, usually do not survive the fossilization process, which is why the fossil record is mainly made of bones, teeth and other mineralized tissues. In the skull studied by Figueroa *et al.* (2023), the brain's 3D structure was preserved in detail inside the cranial cavity. The authors are confident that this is not an isolated case and that it is possible that other vertebrate fossil skulls hold a well-preserved fossilized brain. If this is true, it will give a big push forward in our knowledge of vertebrate brain evolution. But there is still the issue of accessing the treasure without damaging the chest. Or the fossil. Destroying valuable specimens such as the ray-finned fish skull studied by Figueroa *et al.* is not an option.

This is where technology comes to the rescue. Contrary to popular belief, palaeontology has incorporated modern technology in its research for numerous decades. Computed tomography and 3D modelling were turning points in palaeontology, allowing non-destructive reconstruction of fossils or parts of them. In the case of the ray-finned fossil brain, it was possible to generate a 3D reconstruction of it using computed tomography. Without damaging the original fossil.

Now that modern technologies allow palaeontologists to reach the treasure without destroying (or even opening!) the chest, there is the possibility that more vertebrate skulls hold traces of fossilized brain tissue. So, are you ready to remove the dust from the skulls in your collections and take a peek inside?

FIGUEROA, R. T., GOODVIN, D., KOLMANN, M. A., COATES, M. I., CARON, A. M., FRIEDMAN, M. and GILES, S. 2023. Exceptional fossil preservation and evolution of the ray-finned fish brain. *Nature*, **614**, 486–491.



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

The Charmouth crocodile: a glimpse of a far-off world

Dorset's Jurassic Coast is an amazing place for fossil lovers of all ages; located along the south coast of England, it offers a beautiful sea and landscape. Due to its palaeontological and geological heritage, since 2001 it has been on the UNESCO World Heritage Site list. However, it should be considered that some of the features that make Dorset's Jurassic Coast a lovely place today, may have contributed to making it much less lovely in the past. And yes, I am talking about fossils. Among more or less harmless creatures, a variety of deadly predators roamed the waters of the Jurassic Coast in the Mesozoic. The last entry of this list is a fossil of a so-called marine crocodile, a two-metre-long organism representing a new species of a new genus: *Turnersuchus hingleyae*.

T. hingleyae (Wilberg *et al.* 2023) was a predator hunting in the Jurassic coastal waters around 185 million years ago. People from Dorset call it the 'Charmouth crocodile' after the place it was found, and it is often described as a sister species to modern crocodiles' ancestors. Even though you would probably not enjoy being face to face with such a creature during your weekend trip to the sea, seeing the fossil is a completely different story. It is currently on display at Lyme Regis Museum, for people to see and imagine a lost era of giant marine reptiles.

WILBERG, E. W., GODOY, P. L., GRIFFITHS, E. F., TURNER, A. H. and BENSON, R. B. J. 2023. A new early diverging thalattosuchian (Crocodylomorpha) from the Early Jurassic (Pliensbachian) of Dorset, U.K. and implications for the origin and evolution of the group. *Journal of Vertebrate Paleontology*. DOI: <10.1080/02724634.2022.2161909>.

Descending the tree of life

The evolution of life is often represented as a tree, even though a bush with plenty of dead branches would be a more accurate picture. The more we go down, toward the base of the tree, the more enigmatic the creatures and their phylogenetic relationships become. Add a sprinkle of fossil taxa and missing specimens to the mix for extra fun.



Cnidaria is a phylum containing over 11,000 species. All of them live in water, mostly in marine environments. Jellyfish, anemones and corals are the most well-known groups of cnidarians.

If we look at the tree of life, cnidarians are located pretty low down, near the base of the tree itself. This means that they are very important in our understanding of the evolution and phylogenetic relationships of the animals that occupy the higher positions on the tree. But it also means that cnidarians are very enigmatic, particularly if we look at their fossil record.

Luckily, a fossil from the Early Cambrian of Chengjiang, South China, has provided palaeontologists with valuable insights into the evolution of cnidarians. The fossil studied by Qu *et al.* (2023) is a specimen initially assigned to the extinct Palaeozoic hyolith genus *Burithes*. Since they do not resemble any living animals, their phylogenetic position is hard to define.

The specimen studied by Qu *et al.* was first described as *Burithes yunnanensis*. However, it shows a series of characteristics that are closer to cnidarians than hyoliths and, for this reason, the species was reassigned to a new genus: *Palaeoconotuba*. The findings of Qu *et al.* unveil a stem lineage of medusozoans that evolved a lifelong conical theca in the early Cambrian, shedding light on a new, tiny portion of the tree of life.

QU, H., LI, K. and OU, Q. 2023. Thecate stem medusozoans (Cnidaria) from the early Cambrian Chengjiang biota. *Palaeontology*, **66**, e12636.

Nicola Vuolo

Publicity Officer

News bites

With their short legs, big noses and round shape it is hard not to like wombats. But what about a giant one? In this paper, Louys *et al.* describe the most complete skull of the giant wombat *Ramsayia magna*. The specimen is 80,000 years old, the oldest of its species, and its features have never been seen before in wombats. Compared to its modern counterparts, *Ramsayia magna* had a larger skull and nose, plus a set of special features including the development of sinuses in the roof of the skull, retracted nasal bones and a nasal 'spine'.

LOUYS, J., DUVAL, M., BECK, R. M. D., PEASE, E., SOBBE, I., SANDS, N. and PRICE, G. J. 2022. Cranial remains of *Ramsayia magna* from the Late Pleistocene of Australia and the evolution of gigantism in wombats (Marsupialia, Vombatidae). *Papers in Palaeontology*, **8**, e1475.



This is a tale of life and death, written in bones. Or on teeth, to be more precise. For their paper, Winkler *et al.* used a dental microwear texture analysis technique to reconstruct theropod diets. They tested *Allosaurus* and *Tyrannosaurus* for their food preferences, finding that these dinosaurs had different tastes. *Tyrannosaurus* teeth have fewer marks, suggesting that they did not consume as many bones as *Allosaurus*. However, juveniles had different eating habits compared to their parents, showing signs of bone feeding, which hints at them having frequently scavenged.

WINKLER, D. E., KUBO, T., KUBO, M. O., KAISER, T. M. and TÜTKEN T. 2022. First application of dental microwear texture analysis to infer theropod feeding ecology. *Palaeontology*, **65**, e12632.





There are events that can change somebody forever. Being buried in a coal seam, in contact with subterranean hydrothermal fluids produced by the Variscan orogeny, is one of them. Ó Gogáin *et al.* investigated different specimens of amphibians and fish from the Jarrow assemblage, in south-eastern Ireland. These fossils possess a unique feature in the way their bones have been partially replaced by coal. Imaging the interior of the fossils using micro-computed tomography shows that alteration varies between fossils and even within fossils. Geochemical analysis of bone apatite shows that it has been influenced by the hydrothermal fluids flowing through Ireland during the Variscan mountain-building event, changing these fossils forever.

Ó GOGÁIN, A., O'SULLIVAN, G., CLEMENTS, T., HOARE, B. C., MURRAY, J. and JACKSON, P. N. W. 2022. Metamorphism as the cause of bone alteration in the Jarrow assemblage (Langsettian, Pennsylvanian) of Ireland. *Palaeontology*, **65**, e12628.



Fossilization is a traumatic process. Not only do you need to die, but you also must be buried as soon as possible, possibly in an anoxic environment. However, some fossilization events can be more traumatic than others. Serafini *et al.* report the description of a small bone cluster containing vertebrae, scutes and pelvic elements from northeastern Italy. They interpreted the fossilized mass as a teleosaurid, a marine reptile closely related to crocodiles, that was egested by a marine predator or a scavenger. This very unlucky teleosaurid is the first of its kind found in this peculiar state of preservation.

SERAFINI, G., GORDON, C. M., FOFFA, D., COBIANCHI, M. and GIUSBERTI, L. 2022. Tough to digest: first record of Teleosauroida (Thalattosuchia) in a regurgitalite from the Upper Jurassic of north-eastern Italy. *Papers in Palaeontology*, **8**, e1474.



Palaeontology is not always about bones, rocks and dead organisms. For their research, Hart *et al.* used a combination of living animals to estimate the body mass of two iconic temnospondyls: *Eryops* and *Paracyclotosaurus*. Since temnospondyls are an extinct group of small to very large amphibians with no living close analogues, it is hard for palaeontologists to understand how they lived. Understanding temnospondyls body mass is a big step in the right direction.

HART, L. J., CAMPIONE, N. E. and MCCURRY, M. R. 2022. On the estimation of body mass in temnospondyls: a case study using the large-bodied *Eryops* and *Paracyclotosaurus*. *Palaeontology*, **65**, e12629.



UV light-induced fluorescence is the new palaeontological trend. Instead of a disco dance floor, UV light is used inside palaeontological labs to reveal otherwise invisible fossil details. For example, Wolkenstein shows the outstanding fluorescence of 240 million-year-old bivalves. Like magic, UV light-induced fluorescence reveals previously unseen abundance and diversity of colour patterns in the first scallop, allowing the reconstruction of a general model for the origin and fate of colour pattern fluorescence in molluscs.

WOLKENSTEIN, K. 2022. Fluorescent colour patterns in the basal pectinid *Pleuronectites* from the Middle Triassic of Central Europe: origin, fate and taxonomic implications of fluorescence. *Palaeontology*, **65**, e12625.





PalAss Exceptional Lecturer

We are pleased to announce that Donald R. Prothero has been appointed as the PalAss Exceptional Lecturer for 2023/2024. Donald will present the Innovations in Palaeontology Lecture Series (proposed title: 'How did late Pleistocene birds and mammals from La Brea tar pits respond to climate change?') and we now invite interested institutions to apply to host, via the Association's website. Please provide a timeframe (between September 2023 and May 2024) during which you would like Donald to give a lecture at your institution. The list of interested institutions will be forwarded to Donald on 1st June 2023, although any applications from institutions submitted after this date will still be considered depending on the remaining time and budget. The Association will pay for any reasonable travel costs incurred by the Exceptional Lecturer in visiting each of the host institutions (up to a maximum of £500 per lecture). The host institutions are expected to cover costs for accommodation (where necessary) and hospitality. Please see pages 11-12 in this *Newsletter* or the website for further details.

Rob Sansom

Meetings Coordinator

Richard Fortey OBE

Prof. Richard Fortey, a past president of the Palaeontological Association, has been awarded an OBE in the UK New Year Honours List 2023 for "services to palaeontology and geology". Richard has had an extraordinary scientific career at the Natural History Museum, London, UK, becoming a world expert in trilobites. Richard's interest in palaeontology started as a 14-year-old boy when he discovered his first trilobite, sparking a life-long love of ancient invertebrates and beginning a career that has spanned almost six decades, continuing well into 'retirement'.

Richard studied Natural Sciences at the University of Cambridge, UK, before continuing with a PhD on trilobites from the Arctic archipelago of Svalbard. Since then he has named hundreds of new species of trilobite from all around the world and published over 250 scientific papers and monographs, mainly on the evolution and origins of major trilobite groups. As well as his scientific career, Richard has also inspired many through his nine popular books, plus numerous radio and television appearances discussing and presenting natural history.

Richard has previously served as the president of the Geological Society of London, the Palaeontographical Society, and was our president from 1994 to 1996, overseeing the beginnings



Photo courtesy of Richard Fortey.



of the Association becoming much more international. Richard has not only been elected a Fellow of the Royal Society for his scientific endeavours but has also been elected a Fellow of the Royal Society of Literature, a dual honour earned by very few. Among many other accolades, Richard was awarded the Lapworth Medal in 2014. Council would like to congratulate Richard on this latest recognition of OBE.

Jo Hellowell

Executive Officer

Mentoring Scheme

The Palaeontological Association mentoring scheme aims to assist palaeontologists at the start of their academic careers. The scheme initially focused on those transitioning from late-stage PhD to postdoctoral positions and from postdoctoral positions to permanent jobs but is now open to Association members at any stage of PhD study and those conducting post-doctoral research who do not have a permanent position. Mentoring is a valuable tool, helping individuals make informed choices via the exchange of knowledge and experience. The scheme uses a direct mentoring approach, with mentors in permanent positions offering direct contact via e-mail, Zoom or other forms of communication. Guidelines on expectations, lines of communication and length of mentorship are provided. It is expected that mentors should provide open and honest advice whilst maintaining confidentiality at all times. If you are a PhD student or postdoctoral palaeontologist and are interested in having a mentor please fill out our mentor request form available on the Careers section of the Association's website and we will endeavour to partner you with a suitable mentor as soon as possible. Alternatively, if you are a palaeontologist in a permanent position who would be willing to act as mentor, please e-mail me (<vicepresident1@palass.org>) for more information.

Paul Barrett

Vice-President

*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>, sending a link to the news and explaining why it should be included in the 'News' section.*



From our Correspondents

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 Miriam Slodownik, Riavo Voarintsoa and Stephan Spiekman.

Miriam is a German PhD student in Australia, in the Department of Ecology and Evolution at The University of Adelaide.

Q1: How did you end up in Australia?

During an ERASMUS exchange to Stockholm, Sweden I started to work in the field of palaeobotany at the Swedish Museum of Natural History for a small research project using fossil plants as a CO₂ proxy. Soon, I knew that I would like to stay in the field and also that I wanted to use a PhD as an opportunity to get to know another country. I investigated a few options and eventually drafted a project that I was interested in. Then I reached out to Prof. Robert Hill in Adelaide and asked him whether he would be interested in supervising such a project. He greatly supported that idea, so I applied for a scholarship.



Photo courtesy of Miriam Slodownik.

Q2: How is your position funded?

I am funded through a GÖstralia! Research Center / University of Adelaide scholarship. International students can apply at Australian universities if they have the support of a supervisor and, although the competition for international students may be higher than for domestic ones, I would say that it is achievable with a good CV and one or two publications.

Q3: What is your project about?

My project is focused on understanding the environments and adaptations of the south polar forests of eastern Gondwana during the Early Eocene Climatic Optimum (~52 Ma). I am investigating the fossil flora of a site in Tasmania and using different techniques such as taxonomy and phylogeny, as well as morphological and geochemical proxies, to identify their physiological adaptations to the ecosystems and environments they were living in.

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

The geographical isolation of Australia is privately and professionally challenging. It is very expensive and time-intensive to travel internationally so see my partner, family and friends and to participate in conferences, visit museum collections or to collaborate with an international team. The option of video conferences has improved the situation immensely, but many conferences and meetings in the Americas and Europe occur in the middle of the night in Australia, making participation difficult.



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

First, the opportunity to work on Australia's fossil material and to do fieldwork in remote and beautiful places. By planning my fieldwork in Tasmania, I realized that many areas are understudied and lack enough curious palaeontologists (or funding) to do them justice – thus there is still a lot to discover, which makes it both exciting and challenging.

Second, the nature and the outdoor culture. Australia hosts many national parks and it is easy to go out geologizing, camping or snorkelling. But even the city is full of little hidden nature reserves and wildlife: every day on my way to uni, I pass a fruit bat colony and regularly see koalas, parrots, possums and even the occasional turtle.

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

Bike paths and good public transport! Adelaide is a car city and is rather hard to get around without one. I am mainly cycling, but this can be dangerous since bike lanes double as car parks and people are not used to cyclists. Also, I never would have thought I would miss the Deutsche Bahn (German train system).

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?

I started my PhD just before the COVID-19 pandemic that caused a several-month-long university lockdown. I was lucky that my supervisor and department made a great effort to move university life online. Once most things were back to normal, it did not take long to become a part of the PhD community. However, starting in a new country is not always as easy, especially if there is a language barrier, so it is always good to reach out to new expats and to be inclusive.

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

Luckily, I spent some time abroad before I came to Australia, so English was no longer much of a challenge. However, it took a while to pick up on the Aussie slang!

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

Going abroad has been beneficial in many ways. It elevated my language and networking skills that led to several career opportunities and international collaborations. It also exposed me to a different set of academic fields. For example, without having worked with Dr Margret Steinhorsdottir (Stockholm, Sweden), I might never have found my passion for palaeobotany. It has also been inspiring to immerse myself in different cultures and to really get to know another country. I likely would not have had that many positive experiences by staying in Germany. The biggest sacrifice is probably the limited time with your family and friends in your home country.

Q10. What was your experience with DEI aspects in Australia? We are curious about your personal experience as well as observations on policies and attitudes.

I feel that there is not that much of a barrier in Australia because it is such a multicultural environment. The vast majority of people are immigrants or descendants of immigrants. As such, there is generally a welcoming attitude towards outsiders, especially in academia. There is also progress regarding reconciliation between Aboriginal and Torres Strait Islander peoples and non-indigenous people, although there is still a lot of work to do before reaching equity.

Miriam Slodownik tweets at @dancingfossils



Dr Ny Riavo Voarintsoa, aka Voary, is a Malagasy (native of Madagascar) in Texas, USA, employed as an Assistant Professor at the Department of Earth and Atmospheric Sciences of the University of Houston.

Q1: How did you end up in the USA?

It's a long story, but my experience began as a visiting scholar in Williams College, Massachusetts in 2010 on a project investigating erosion in the Central Highlands of Madagascar by combining geology and ArcGIS. My mentor and supervisor, Prof. Rónadh Cox, from the Department of Geosciences,



Photo courtesy of Ny Riavo Voarintsoa.

identified my capability and knew that I wanted to continue further in my academic studies. Hence, she encouraged and supported my application to graduate school. I was accepted to continue my graduate study at the University of Georgia, where I obtained my PhD degree in 2017. After that, I went to the Institute of Earth Sciences of the Hebrew University of Jerusalem, Israel as a postdoctoral researcher. Then, after three months of being in Israel, I learned that I had successfully secured Horizon Europe funding to work at the Katholieke Universiteit Leuven, Belgium. I was one of the many Marie Curie Fellows, funded for two years to conduct a challenging project to reconstruct the palaeoenvironment of Madagascar. Throughout these listed academic milestones, I have been very productive at publishing papers and securing funds to support my research and also in mentoring students. I was additionally exposed to excellent teaching experience while I was at the University of Georgia. Hence, I am now an Assistant Professor at the University of Houston, and I have been in this position since 2021.

Q2: How is your position funded?

Faculty positions here in the USA are full time but on a nine-month salary, which means that we need to find support for the summer months outside of the university. Typically, we work hard to secure grants (e.g. from the National Science Foundation to pay for these summer months and to support our students). Currently my summer salary is covered by my start-up fund, but I am actively developing research proposals to obtain external funds to keep my lab and research running. It is not an easy job.

Q3: What is your project about?

My research is mainly focused around developing proxies from various geological archives to reconstruct palaeoclimate and palaeoenvironment in tropical regions.

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

There are always cultural differences and, even though I've been in the USA before, Texas does things differently. While I moved here two years ago, it has been hard to make friends, partly because I moved here during the pandemic, but also because people are busy. Additionally, transportation is not the most convenient here. For example, when I did not have a car, taking buses to get to doctor appointments or regular stores used almost half of my day and traffic made it worse for missing bus connections.



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

I listed cultural differences as a challenge, but it is also something I like about being abroad.

I like the food, although I still need to visit more restaurants to discover more local foods. I was also surprised that Texas has many hiking and biking trails, so this has contributed to my work-life balance on weekends besides cooking and singing. I like being independent and discipline myself in the things I want to do.

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

I miss the food, the landscape (Texas is pretty flat in topography, while Madagascar has lots of valleys, mountains and greenery when you travel outside Antananarivo, the capital city), speaking my native language and just seeing people of the same nationality as me.

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?

I think the support I got is a combination of many things that have been built up since I started school until now. There is no single word to answer it, but I most value the independent mindset that my parents taught me, the willingness to learn regardless of circumstances, the training and mentorship at several levels in my academic milestones, the friendships (inside and outside my education) and financial support, many of which I worked very hard to secure so that I could continue my study/research.

As I have travelled pretty much all around the world, I miss all the friends that I met – adventure in travelling means more acquaintances than friends, although I agree some will become your best friends if there is chemistry in tastes, likes and importantly in personality.

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

I learned English as a second language in high school, but it was really the a-b-c. I could greet, do short and small talks, and that's all. While I was working on my graduate degree at the University of Antananarivo, equivalent to a master's degree, I decided to take a one-year intensive British English course. I did not know then that I would be going to the USA, but I did it because I liked the language and also I knew I could be more competitive in the market when I applied for jobs or internships.

My very first time in the USA, despite knowing how to speak the language and getting excellent grades in classes, was a challenge because my daily language in Madagascar was Malagasy, and the next day when I arrived in the USA no-one spoke that language anymore. I understood what people said, but it took me a while to respond, especially for everyday languages. So socializing was slightly compromised. Lectures in class were easier to grasp because, while I was in Madagascar, I took some time to read textbooks in English. But, with time and with friends, things improved. Now I even dream in English!

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

I could work on my dream job and do research that I am passionate about. I also sacrificed quality time being with my family, especially during holidays and big events.

Q10. What was your experience with DEI aspects in the USA? We are curious about your personal experience as well as observations on policies and attitudes.

Compared to other foreign countries that I have resided in, I think the USA is doing well with respect to DEI, though I should acknowledge that more efforts still need to be made. I, myself,



joined our college-wide DEI committee, and there are activities that we do to bring about awareness of minorities, people of colour and DEI in general. Our department also has a DEI committee, so it is being considered. I want to admit that it is not easy to answer this question because DEI means a lot of things. There are levels where DEI may simply reflect a fancy word for some people (their mouth says DEI but their hearts and activities say the opposite). For others it is work to do and a group effort to ensure all genders and all races are not discriminated against. They may be the ones who invest a lot of time but receive the least rewards.

Voarintsoa tweets at @nyr_voarintsoa and has a lab website: <www.voary.com>.

Stephan Spiekman is a Dutchman in Germany, employed as a postdoctoral researcher in the Department of Palaeontology at the State Museum of Natural History Stuttgart on a grant from the Deutsche Forschungsgemeinschaft (DFG).

Q1: How did you end up in Germany?

I've moved around quite a bit at this point. Although my first research project on palaeontology was in the Netherlands, I've subsequently lived and worked in Berlin (eight months, MSc. project at Museum für Naturkunde), Zurich (four years, PhD at the University of Zurich, Switzerland), and London (18 months, research fellowship at the Natural History Museum, London, UK). I was offered my current position (which is for three years) when I had about six months left on my previous project. I wasn't initially eager to move to a new place again; however, the project's potential, its duration and the great working environment in Stuttgart (I already knew the amazing collection and several friends were already employed here) were simply too good to pass up. Currently, my partner and I are quite happy here!



Photo: Emma Finley-Jacob.

Q2: How is your position funded?

Rainer Schoch (head of the Department of Palaeontology) acquired funding for a new project. I was considered the best candidate for the job based on my previous experience from my PhD and first postdoc, since it deals with some particularly difficult Triassic reptile remains that require CT segmentation for study – fortunately that is right up my alley. I acquired my own funding for my first postdoc, and also applied together with colleagues for other grants in the UK and the Netherlands before this project came up, but these were not awarded to us. I am happy that, with the duration of the current project, I have some time to focus on work rather than trying to acquire funding and potentially having to move again.

Q3: What is your project about?

I cannot say too much about it just yet, but it revolves around undescribed fossils from the Buntsandstein (early Middle Triassic) of Alsace, France. It concerns a completely new reptile taxon, including quite unique soft tissue preservation.

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

Because I spent four years in Zurich I can speak reasonable German. Being Dutch also helps, since the languages are quite similar (although perhaps not as similar as some people might think). Nevertheless, there is still a language barrier, which makes it difficult to become close to



people outside of your working environment. Also, anything regarding bureaucracy is always an enormous drag in a new country.

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

It's perhaps not necessarily directly related to the country, but I really do like the working atmosphere in our museum. We have a great group of young, international researchers and good facilities. I also quite like German beer.

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

I miss feeling at home in the country in which I live. It is quite hard to define; it relates to the language barrier, but also to differences in culture. In the end I do think it boils down to friends, family and community. I value that quite a lot. I also miss the type of humour that only really works in your native language and culture.

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?

By far the most help has come from my colleagues. Because most of us come from abroad, we all have gone through the basic steps that need to be taken in the new country and can give advice to each other. There is not any particular support that I can think of that I'm missing.

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

As I mentioned, my German is good enough for everyday life. However, bureaucratic German is something else ... and that remains a struggle. In the Museum we really only speak English within the research group but speak German with colleagues who are not research staff, which is not a problem for me (and vice versa as far as I can tell).

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

At this point, I think I'm a pretty internationally-oriented person. I'm not of the opinion that you have to move abroad in order to become a good researcher (in fact, I think that is quite an unhealthy attitude). However, although palaeontology is now luckily on the rise in the Netherlands, when I was a student there was not much in terms of research opportunities, so going abroad has definitely helped my career a lot. I also think I have a very well-established international network of colleagues and friends. The biggest sacrifice has definitely been my social life. I am now further away from family and old friends, of course, and where before I had several different social groups (sports, housemates, school friends), it is now much more limited. I am quite close with several colleagues, so the quality of the friendships is great, but it is (numerically) less diverse.

Q10. What was your experience with DEI aspects in Germany? We are curious about your personal experience as well as observations on policies and attitudes.

I think and hope that we all feel at ease in our department. The permanent staff in vertebrate palaeontology consist of two men and one woman, each of different nationalities. I think our international outlook makes us very diverse, and that through this, we are very welcoming to everyone. We also discuss DEI aspects amongst each other. I am not aware of any specific policies of the Museum or state regarding DEI, but I also haven't looked into them.

Stephan Spiekman tweets at @StephanSpiekman and has a personal website:
<www.stephanspiekman.com>.



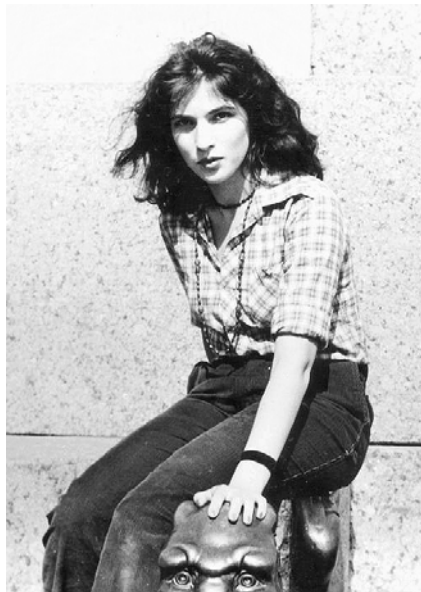
Legends of Rock

We are driving through narrow passageways, shaded by towering orange trunks of pines and white birches, and occasionally passing small plots of land marked by wooden fences enclosing small timber dachas (wooden huts, common seasonal housing in the post-Soviet world) or more ornate pre-revolutionary villas. We are driving down the glacial-lake-flanked settlement of Комарово (Komarovo, Russia), a stone's throw away from St. Petersburg and the border with Finland. A tiny place with a thousand inhabitants, which, despite its tiny population, has left disproportionately large footprints. Komarovo is known as the creative heartland of Russia, giving birth to an eclectic mix of 'intelligentsia', including poets, actors, Nobel-winning scientists, musicians and eccentric palaeontologists; be it pre-revolutionary or Soviet.

We stop at an unassuming single-storey wooden hut. Locals might warn you that the house is surrounded by wolves, that it is cursed and inhabited by an immortal witch, who not too long ago axed the power supply line to the village, and was a known felon, imprisoned for cultivating one of the largest cannabis plants in Russia. However, peering over the fence nothing about the small seasonal hut points to some dark mystic energy. Little also indicates that it was the capital of the St. Petersburg rock underground movement, a concert hub and recording studio, a beating heart of Soviet underground rock. You might be wondering how this ties in to palaeontology. This is a dwelling of a controversial artist-palaeontologist, Irina (Lyala) Levshakova neé Kuznetsova (Ирина Левшакова). A person who deserves the label of 'a character'.

Levshakova was born in 1959 in what is now St. Petersburg, to a multi-generational family of established and respected academics, mathematicians and artists. She was a rambunctious child, but the locals suggest her academic detour was a sign of her settling down. In 1977, Irina entered the Department of Palaeontology at the (currently) Saint Petersburg State University, where she remained up until graduate school, specializing in palaeontology and publishing papers with a focus on the collections acquired by Ivan Efremov. Ivan Efremov was a character unto himself, from the same Komarovo settlement as Irina. Ivan, in addition to being a pioneer of taphonomic studies and to running fossil expeditions to Mongolia and Central Asia, was a prolific communist science fiction writer. Irina's contributions to palaeontology are somewhat sparse. Much like

Irina Levshakova



Irina Levshakova. Wikipedia, Creative Commons, author Val-etc.



numerous Soviet scientists she travelled and worked on material from Soviet Central Asia. She described crania of the 'Central Asian monitor' (*Varanus darevskii*) from the Pliocene of Tajikistan (Levshakova 1986; Pianka 2004) and described a few species of *Trionyx*, soft-skinned tortoises (Levshakova 1982; Danilov 2013). However, little of it was widely published.

Being a palaeontologist is already exciting enough, albeit many might point out that the field is too esoteric and that academics need to branch out. Levshakova is a stellar example of branching out into industries outside of academia. And likely has a biography unlike any other palaeontological academic dealing with reptiles. To list her musical endeavours and family drama would be a tad out of scope for the *Palaeontology Newsletter*. Especially the complicated, wild and unhinged history of the Russian rock scene. Levshakova was described as "a beauty with a medieval appearance" and unashamedly donned a hippie persona. From 1980 she became an active member of the Leningrad rock musicians, harbouring a commune of like-minded people in the remote dacha, transforming her hut into a recording studio. She also illustrated numerous rock album covers with psychedelic watercolours. Following the disintegration of the Soviet Union, she moved briefly to the UK, running environmental campaigns. In 1992, back in Russia, she was almost murdered on account of being "a witch" by a Russian cult rock icon, Fyodor Chistyakov, who tried to decapitate her using a ritual Uzbek dagger. And that is just scratching the surface of her turbulent life.

The last big chapter in the life of Levshakova, like the rest of her life, was a bang. In the late 2010s, she was butting heads with the State Drug Control Service, who found her responsible for the cultivation of one of the largest cannabis plantations in Russia. Despite the offence, she returned to the dacha on a five-year probation. Levshakova died not too long after, in 2016 at the age of 56, from a sudden heart attack. According to Дзён (2022), upon request, her cremated remains were fired from a cannon over a lake in Komarovo.

Rarely can a palaeontologist leave behind such a colourful history, from cannabis to underground rock movements and failed murder attempts. Irina Levshakova is a fascinating figure, not known to all within the world of palaeontology, but too fascinating to ignore or move into the obscurity of time.

Natalia Jagielska

University of Edinburgh, UK

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Behind the Scenes at the Museum

The National Earth Science Museum, Windhoek, Namibia



Model of the dinosaur Massospondylus that roamed central Namibia during the Triassic, as well as replicas of dinosaur footprints from Namibia. Photo: Helke Mocke.

The National Earth Science Museum is a young museum that was established in 1995, only four years after Namibia's independence, and forms part of the Geological Survey of Namibia. It was selected as the custodian of the country's fossil, mineral, rock and meteorite collections after the replacement of the National Monuments Council with the National Heritage Council.

The Museum is financially supported by the Ministry of Mines and Energy and exhibits information and specimens on most of the major mines that have operated or are still in operation in Namibia, showcasing ore and mineral samples and giving short explanations about the history and mining processes. Many beautiful, rare mineral specimens (such as leelite, arsesumebite, diopside, smithsonite, mimetite and wulfenite) from famous places, such as the Tsumeb Mine, are on display and there are exhibits showing the usefulness of mining products in everyday life, such as in the kitchen, bathroom and in the automobile industry. Several large iron meteorites of the Gibeon meteorite shower attest to an ever-changing world beyond the Earth and attract a lot of attention from visitors. The National Earth Science Museum also exhibits many unique fossils, such as the Ediacaran fauna, including *Pteridinium simplex* and *Protechiurus edmondsi*, the Permian aquatic reptile *Mesosaurus* and a Triassic apex predator named *Etjosuchus*.

The collections comprise more than 12,298 fossil specimens, 1,682 rock samples, 133 polished sections, 8,944 mineral samples from Namibia catalogued as 'Namibia Mineral Occurrences', 1,286 mineral reference samples, 74 mineral samples from mineral deposits outside Namibia,



and 216 meteorites. Cataloguing of mineral specimens from the historical Tsumeb and Kombat mines is still ongoing, as well as cataloguing of fossil specimens that are returned from palaeontological research trips in the country.

Outreach activities have always formed an integral part of the Museum and once a year the Museum participates in Heritage and Science Weeks, during which special activities are held either in the Museum itself, or at selected venues. These activities have included the identification of rocks, minerals and fossils, experiments, demonstrations, quizzes, treasure hunts, art competitions and debates. Sometimes staff reach out directly to schools and communities, promoting a better understanding of the geosciences.



Display of fossils of the first multicellular animals, the Ediacara from southern Namibia's Nama Group. Photo: Helke Mocke.

Research collaborations, especially in palaeontology, with other institutions and scientists all over the world is another integral component of the Museum and has resulted in many publications on fossils and fossil localities. Institutions the Museum collaborates with include: the Muséum national d'Histoire naturelle, Paris, France, on vertebrate fauna in travertine and karst systems, as well as the diamond mining area; Iziko South African Museum, South Africa, on Permian and Triassic fauna; Monash University and Swinburne University of Technology, Australia; Vanderbilt University, USA; University of Toronto, Mississauga, Canada; and the University of Cambridge, UK, on Ediacara fauna.

Some historically significant dates include the following: the oldest record of fossils from Namibia, the *Eurydesma* bivalves reported in 1908 by H. Schroeder; H. Lotz's fossil wood collections from the early 1900s;



Close-up of several uniquely Namibian Ediacara fossils, with Pteridinium featured in the centre. Photo: Helke Mocke.



and W. Gotham's 1908 publication on Lotz's fossil wood; E. Stromer's 1914 publication on the aquatic reptile *Mesosaurus* and vertebrates from the Sperrgebiet; E. Kaiser's 1926 publication on the *Diamantenvüste*, which is a two-volume series about the geology and fossils of the Sperrgebiet diamond area; a series of publications were written on the Ediacara fauna of Namibia in the 1920s by G. Gürich and P. Range; on the



Iron meteorites from the Gibeon meteorite shower of southern Namibia. Photo: Helke Mocke.

same subject in the 1960s by H. Pflug and in the 1970s by G. Germs; and on invertebrates from Sperrgebiet by W. Beetz during the 1920-30s. In 1937 A. du Toit used *Mesosaurus* as evidence for continental drift; in 1937 R. Kräusel published on the fossil wood collections he made; in 1973 A. Keyser discovered and published Karoo fossils from Namibia; in 1976 G. Corvinus discovered Miocene vertebrate fossils at Arrisdrift in the diamond area along the Orange River, and in the 1990s F. Grine reported on a *Homo* specimen from the Berg Aukas Mine.

In recent years many new fossils and fossil localities have been discovered. Reef-dwelling Ediacaran organisms *Namacalathus hermanastes* and *Namapoikia* lived during the terminal Ediacaran. *Etjoia*, a traversodontid cynodont, and *Etjosuchus ecurvidens*, a rauisuchian from the Triassic, have been collected for a long time and either re-studied or finally named. The oldest parrot (Psittaciformes) species from the Middle Eocene locality of Eocliiff and 4-5 Ma representatives of recent savanna animals (such as bovids, rhinos, lions and one of the most complete skeletons of a *Mammuthus subplanifrons*, the oldest mammoth species) were excavated in the Etosha National Park. The exceptional mammoth specimen is still in plaster jackets and not yet on display.

Helke Mocke

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For more information on the Museum see the website
<https://www.museums.com.na/museums/windhoek/earth-sciences>.

Follow the Museums Association of Namibia on social media @MuseumsANamibia.



A question of identity

Sometimes there is a beautiful clarity about what a name tells you. Take *Walliserops*, for instance. It is most definitely a fossil, of pleasing antiquity, at some 400 million years old, from the prolific strata of Morocco. It is most definitely a trilobite, though one so bizarre that it recalls more science-fiction than mere palaeontology, with a stout and sinister-looking trident that, extending from the front of the head, can be nearly as long as the rest of the animal. It's the subject of a study that involves Richard Fortey. Indeed, he says it's the paper that brings down the curtain on his illustrious half-century-plus career¹, much of it spent tangling with, and illuminating, those most splendidly carapacious of the arthropods.

The story that Richard and his co-detective Alan Gishlick conjure up from the mortal remains of *Walliserops* is certainly worthy of science fiction, of the sword-and-sorcery kind. They suggest that this monstrous three-pronged appendage was not a spear for impaling prey, nor was it to scare off predators, and nor yet was it a sensor, to give the animal advance warning of what lay ahead on the seafloor. Rather, the evidence they assemble, including of a yet-more-bizarre four-pronged specimen, and then finely grind through the mathematical mill of principal components analysis, points to its use in the trilobite mating games, in gladiatorial combat between the *Walliserops* males, which thus behaved (badly, of course) much as stag beetles – and indeed stags – still do today.

It's a lovely piece of palaeo-deduction, even more pleasingly so as some of the fog of mystery still swirls around it. All of the considerable number of *Walliserops* specimens found bear these fearsome tridents, so that begs the question of where, then, were the objects of their desire, the female of the species? Two ideas are suggested. One is that the gladiatorial males were congregating for combat in the equivalent of an arena, with the females keeping sensibly well out of the way, this arrangement then being preserved by the vagaries of preservation and rock outcrop. The other possibility is that females of the species were not simply *Walliserops* minus tridents (not least as no such have been found), but that they were substantially different in size and shape, and currently masquerade under quite a different trilobite genus name. Sexual dimorphism, hence, and of substantial kind – by its nature something that's difficult to spot and, if more widely developed among trilobites, that can insinuate a little mayhem into studies of diversity and evolution: new ideas, new pitfalls.

This question of identity came to mind when reading a more general discussion (Bertling *et al.* 2022) on fossils and the naming of them, largely dealing with trace fossils, though including a modest proposal that takes aim at the very notion of what a fossil is – and is not. More on that anon, but even the greater part of this exploration has a fascination in the care and indeed perversity directed at what can be allowed within the trace fossil category, and what should be left at the door.

The textbook examples are, of course, by and large, unproblematic: dinosaur footprints, worm burrows and so on. But some other examples don't allow such straightforward categorization. Take that fascinating area of palaeontology which is often delicately avoided in dinner table conversation, that reflects the pathways taken by food through an organism: here are recognized such components as regurgitates and coprolites, representing waste material voided through

¹ Prolonged and repeated curtain calls would be welcome, of course.



the front and back ends of an animal, respectively. It's the lesser-known category in between, though, upon which the pernickety is most brought to bear. These are cololites, which are the gut contents of an animal which, to be considered and named as such – and here is the tricky bit – need to be separately preserved when the rest of the body of the animal has fallen apart. If the animal is there, then they are merely fossilized gut contents, and cannot be named separately as 'no part of an animal should be named separately'.

There are grey areas aplenty here, forensically examined by Bertling and colleagues. Firstly, in that cololites and coprolites have the closest of relationships, and there may be little obvious change seen as the waste passes from one category into the other, especially in the absence of the animal to show whether the object in question was in or out of the body. Secondly, the disintegration of the animal is also a sliding scale, and the authors quote a nice study (Knaust 2019) of the trace fossil *Rhizocorallites*, strings of sediment blobs inferred to be the gut contents of a holothurian, which can be found by themselves, with perfect legal entitlement to their trace fossil name, and rather more exceptionally inside the animal itself – when, taxonomically, the trace fossil leaves the stage and the body fossil (now a part of holothurian rather than trace fossil taxonomy) enters it.

It's a minefield, if a somewhat stickier one than usual, and this kind of logic was extended to gastroliths where, as well as the question of whether the stomach stone in question is inside or outside of the animal, there is a more general interpretive subtlety in that it is the surface polishing and alteration of the rock by the stomach contents that is regarded as the trace, and not the rock as a whole. Plants are not immune from such categorization headaches, either. Root traces can be *bona fide* trace fossils, where they create distinctive structures in the soil. But this kind of structure grades on the one hand into generalized soil disturbance too diffuse to be called anything other than a bioturbation texture, and on the other into a cast of the root itself, like *Stigmaria*, which is emphatically a body fossil.

In this precise analysis of functional but imprecise nature, the authors venture, too, into a part of the trace fossil minefield that has recently exploded, and into which some colleagues and I incautiously ventured a few years ago. These are the trace fossils left by humans – not so much things such as footprints, like the celebrated 3.7 million-year-old examples from Laetoli in Tanzania, which show how and when our ancestors learnt to walk on two feet. Rather, it is the modern equivalents, going beyond footprints that now mostly represent the shape of shoes and boots, to regard the footwear itself as traces – as well as the machines that helped build them, and the buildings in which they were manufactured: and, indeed, extending out to encompass the enormous urban constructions that weigh down² large areas of the Earth's continental crust. As biologically modified parts of the substrate, they seem to fit within the general idea of trace fossils, and we called them technofossils (Zalasiewicz *et al.* 2014), to emphasize that many of these objects are hard-wearing and very fossilizable – an allusion of geological longevity that 'artefact' does not quite convey – and to denote the central role of technology in enabling (and now, hyper-rapidly accelerating) the growth of this new phenomenon.

Bertling and colleagues carefully and judiciously stepped out onto the tightrope that this new kind of trace has created. Yes, they said – these are traces, and so within this kind of palaeontological category. But, they said, 'they should not be named following the principles of

² Literally weigh down and indeed measurably depress, according to a geophysicist friend of mine.



zoological taxonomy and rules of zoological nomenclature'. At the grandly philosophical scale, I am not sure how solid the foundations for this statement are, but pragmatically it's a shoo-in, not least to prevent a collective breakdown of ichnotaxonomists faced with the need to find orders of magnitude more names for a trace fossil diversity suddenly gone berserk: probably many orders of magnitude.

For how many kinds of things – individual technospecies in this perspective – have we made? By and large, nobody knows, and nobody is counting, but it is probably in the range of hundreds of millions at least. Technodiversity of this kind thus far outnumbers biological species diversity (a mere ten million or so, it seems), to a yet greater degree than the amount of currently functional 'technomass' (*i.e.* not counting discards and waste) has recently come to outweigh all of the living mass on Earth (Elhacham *et al.* 2020). And new technospecies are being conjured every day, as innovation meets ever-greater technical capabilities and the consumer society to ignite a new and lightning-fast kind of evolution on Earth. Now, this is something that might be brought into the realms of palaeontological analysis and where patterns of relationship, and migration, and diversity and disparity might be usefully mulled over, and perhaps even analysed, if one could find the wit to do it sensibly. But saddling a bottle-top, or a ballpoint pen, or the latest smartphone with a Latin binomial – *Biro abundans*, anyone? – would for sure be an endless and hopeless task (and selecting a holotype a surreal one). It's a new world, and not one amenable to Linné's classical nomenclature.

As regards the old world, though, Bertling and colleagues suggested that it remain definitively antique, in their one foray into considering all of palaeontology, rather than just the trace fossil side of it. Fossils, they say, to be considered as such should be old fossils, and they also go so far as to state quite how old. They must be pre-Holocene: or, to use their exactitude of phrase, they should be 'not demonstrably postdating the beginning of the Holocene'. Now, this modest proposal does give pause for thought, and perhaps in some quarters it might be regarded as fighting talk. The logic behind this suggestion isn't spelled out in great detail, but is expressed as representing 'a practicable boundary to distinguish ongoing, taphonomically active processes affecting the preservation of biogenic matter from its incorporation in the rock record'. Thus, for *bona fide* fossilization to take place, the time boundary posited is 11,700 years before 2000 CE – the calculated age of the Holocene 'golden spike' level. And, to maintain the spirit of perversity, this demarcation point, at which palaeontology begins (or ends, depending on point of view) is therefore currently 11,723 years ago.

Well, it's the best kind of provocation, that makes one try to think through not only to the meaning of words, but to the heart of the phenomena that they are meant to represent. So, how does transforming a cadaver into an honest petrification square with an allotted time limit of a little under twelve millennia? Perhaps very loosely, for exceptions almost instantly leap to the mind: those exceptional fossils, for instance, where soft tissues are preserved, that normally decay away in a matter of weeks or months. The animals buried in the Burgess Shale mud slurries, for instance, or the Silurian ash bed that entombed and flash-petrified those delicate Herefordshire invertebrates: here the making of cadavers and fossils seems to have been more or less simultaneous. Or the fossil fish of the Santana Formation in that Brazilian archetype for Conan Doyle's *Lost World*, where not only were the muscle tissues of the fish almost instantly phosphatized, but so were bacteria that were trying (and failing) to rot them down (Martill 1988).



These all were fossils well before their own twelve millennia had played out, and of course similar things are happening today: grubbing about in the sands of Hunstanton beach, Norfolk in the UK, for instance, it's not hard to find some beautifully pyrite-lined shells, likely only a few years old.

Or, one can go to the other end of the time spectrum. I can walk across the road from my home to a ploughed field, where only a little patience yields one or two specimens of that most classical of fossils, *Gryphaea*. And with these one might play the Devil's advocate and ask: where, pray, is the fossilization here? After 150 million years or more, the curved shell that you hold in your hand still has its calcite microstructure, and if one wishes to reach into it at atomic scale, then a little hard labour with a mass spectrometer will likely extract its original carbon and oxygen isotope patterns, that tell how benign were the summers, and chill the winters. This is simply a dead shell that one holds in one's hand, not that much changed from its Jurassic days.

The restriction of fossils to the pre-Holocene does therefore seem a little uncomfortable, like a shoe that is simultaneously too tight and too loose. The mortal remains of dead plants and animals abound in such young strata, of course, as do their assiduous descriptions, like the foraminifera found in the Holocene strata of Borth beach in Wales, published in *Palaeontology*, no less (Adams and Haynes 1965), and which for good measure underlie a fossil forest. Yet more spectacular, the lustrous, concretion-encased specimens of the mud lobster *Thalassinia* that, excavated from Gunn Point in Australia, can sell for several hundred dollars each; according to Murray and Hanley (1986), the tough calcareous cement precipitated around them just a few years after death, a fraction of their ~7,000-year age.

Of course, there are times when one has to draw a cut-off point in what is effectively a continuum. In segmenting the continuum that is mass, we precisely specify that of the gram and kilogram, and in that of time, seconds, days and years have their precise duration too. Yet closer to palaeontology, there is the precise specification of the Holocene's beginning in the annual Greenland ice layer at 11,700 b2k which – zooming out – is simply a level selected within a transition from glacial to interglacial conditions that itself took more than ten millennia, from the beginnings of warming some 18,000 years ago to the stabilization of sea level about 7,000 years ago. But here, as with all geological time units, there is clear reason for such precisely drawn divisions, to build a time framework that can be systematically and consistently used – vis-à-vis the distribution of fossils through time, for instance.

The extension of this logic to the definition of a fossil seems to me not quite so clear, or so urgent. Bertling and colleagues did not offer a suggestion of what the cadavers preserved within Holocene strata might be called. They did not mention, a little surprisingly, the term 'subfossil' which has been used here and there; perhaps this might be a label for the not-quite-fossils-yet, its own definition presumably being correspondingly strict so as not to stray into the Pleistocene. Even with such a halfway house in place, though, my uneasiness remains here, about a definition based arbitrarily on time, rather than by some measure of chemical or mineralogical change (if a strict definition here is helpful at all).

The discomfort could run a little deeper, if such a terminological barrier were to unconsciously build a conceptual one, between the organisms that we see living and dying now and those whose strata-encased mortal remains make up the stuff of our trade. If the present is the key to the past – and the past now also the key to the future – maybe we should keep the continually



moving doors between these states sensibly open, to encourage our contemplation of quite how intertwined are the worlds that they separate.

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Palaeontology's greatest ever graphs

Devonian biogeography: Bridging the tectonic revolution

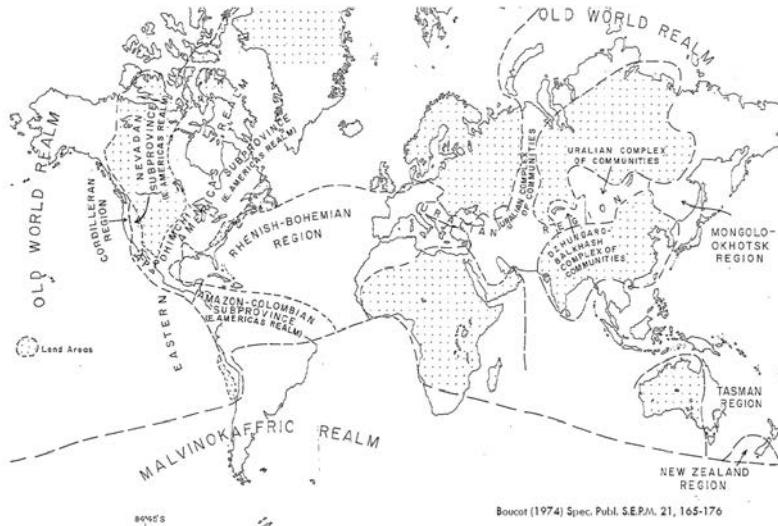


Figure 1. The 1974 revision of the first Devonian bioregionalisation by Boucot *et al.* 1969.

This month's graph is a map!

Biogeography has become an umbrella term, synonymous with seeking to understand the patterns of species occurrences and the factors that facilitated them. One of the many interests of those studying biogeography is bioregionalization. Bioregionalization is the process of assessing biotic and abiotic variability of the planet and categorizing it within spatial and temporal units, each with their own physical, biological and ecological properties. Each of us is familiar with bioregionalization in some form. As a modern example, we can describe the abiotic and biotic differences between the Tropics, the Arctic and the Antarctic. Biogeographic terms such as these are exceedingly useful, often used as a shorthand for their diagnosis in both modern ecological studies and palaeontological studies. The work done by Boucot *et al.* (1969) was pivotal, as it established the first Devonian bioregionalization and set the example for those that followed.

Based on brachiopod fauna, Boucot *et al.* (1969) laid the framework for a Devonian bioregionalization. They established the core realms; the Old World, Eastern Americas and Malvinokaffric (now the Malvinoxhosan, see Penn-Clarke and Harper 2019) realms and these terms and diagnoses are still used today. However, Boucot in 1974 expanded the Early Devonian bioregionalization to create a revision (Figure 1). In this work, Devonian bioregionalization became more hierarchical; provinces existing within regions, and regions existing within realms.



It is true that these concepts predated Boucot (1974), but this work in particular began the proliferation of Devonian regions and provinces, rode the crest of work done on other taxa (e.g. trilobites, Kobayashi and Hamada 1975), and had strong implications for palaeogeography.

After the presentation and revisions of Boucot's work, Devonian bioregionalization became an active field with a plethora of authors challenging (Bowman Bailey 1978; Kobayashi and Hamada 1975; Young 1986) or supplementing Boucot's original regions (see Afanasieva and Amon 2013; Bigey 1985; Blodgett *et al.* 1990; Penn-Clarke and Harper 2019 amongst others). This work has an interesting legacy within Devonian bioregionalization: with over 100 areas named since the 1974 revision, the discipline focused on reinventing the areas using new taxa and giving the regions new names rather than revising and testing. Testing a bioregionalization is both important and difficult because it requires a representative and functional area hierarchy. To use a modern example, one would test if the signal of tropical fish is reiterated in corals or echinoids, and if areas described as the 'Tropics' are more related to each other than to the Arctic areas, for example. Whilst the initial work in 1969 changed the direction of Devonian biogeography, to my mind the 1974 paper highlights the importance of revision and of rediagnosis.

The lack of testing of the Boucot bioregionalization is made very obvious by the fact that despite the revisions, challenges and amendments, it has never been completed. As with much palaeontological study, the focus of the bioregionalization was in globally Northern areas. Many modern areas and Devonian deposits are not placed within any of the regions or realms, thus were not appropriately diagnosed. To further complicate matters, the largest realm in the southern hemisphere, the Malvinokaffric (now the Malvinohosan, see Penn Clarke and Harper 2019), received a diagnosis based primarily on the absence of Old World or Eastern Americas realm characters. This particular realm has undergone revision (Penn-Clarke and Harper 2019) and now has a presence-based diagnosis. Despite this, the usage of 'Malvinokaffric' persists in the literature (Scheffler 2021; Sedorko *et al.* 2021; Videira-Santos *et al.* 2022 amongst others). Incomplete bioregionalization, without any checks on the use of names or their definitions, has been foundational in many biogeographic studies subsequent to Boucot (1974). Consequently, this has led to a confusing set of single taxon bioregionalizations and unstable area taxonomy (a hierarchical classification of names; see Ebach and Michaux 2017).

Despite the work required within the palaeobiogeographic field to resolve internal inconsistencies, Boucot's research has had broad ramifications in the palaeosciences, but particularly palaeogeographical studies. As can be observed in Figure 1, this bioregionalization was presented on a map of the modern Earth. Though plate tectonics was generally accepted in academia by 1970 (Frankel 2009), palaeomaps and geographies based on plate tectonics were only beginning to be produced. The work of Boucot *et al.* (1969) and Boucot (1974) was situated within a period that shifted from establishing strict geographies (see 'Land area' in Figure 1) and began commentary on the organization of the tectonic plates. The characteristics of the realms, regions and provinces became useful data which, when added to palaeomagnetic data, allowed assessment of tectonic arrangement and latitude. These techniques have become more advanced and remain used to not only build palaeomaps (Torsvik and Cocks 2016), but also to challenge them (Young and Lu 2020).



Although there are many areas for development within Devonian bioregionalization and biogeography in general, the establishment of consistent terminology for shifting biotic and abiotic patterns has broad ramifications in the palaeosciences. Boucot's 1974 bioregionalization was an important figure, as it was the first revision of a bioregionalization and suggested the best practice for single taxon studies. Biogeography is a multidisciplinary area of research and, just as it draws from multiple fields, it can have important contributions to them. The development of Boucot's (1974) bioregionalization has played an important role in understanding biotic and abiotic relationships through time and assisted in the development of Palaeozoic palaeoreconstructions. This is why this issue's graph that changed the world is a map.

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Job secrets a computational biologist does not want you to know

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Website: <<https://bjoelle.github.io/>>.

What is your professional background?

My original training was quite interdisciplinary, but with a focus on mathematics and computer science. I discovered computational biology during my master's programme, and I was immediately drawn to the idea of using mathematical and computational tools to answer biological questions.

During my PhD, I specialized in the use of birth-death models in Bayesian phylogenetic inference, which remains my primary focus of research to this day. In the course of my career, I have made contributions in designing and implementing new models, testing and validating existing methods, and generally improving the usability and accessibility of phylogenetic inference software. I have also taught in many different courses about Bayesian phylogenetic inference, including Taming the BEAST workshops, online RevBayes workshops, and Statistics and Modelling in Infectious Diseases (SISMID) classes.

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

I started working on the fossilized birth-death (FBD) process, a model integrating fossil evidence into phylogenetic inference, when I met Rachel Warnock (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany) during my PhD. Following my PhD, I continued this work as a postdoctoral researcher with Tracy Heath (Iowa State University, USA). I have run several simulation studies exploring the behaviour of the FBD process in phylogenetic inferences. In particular, I have studied the impact of fossil age uncertainty on the accuracy of inferences, and whether the FBD process can be used to estimate the age of fossils themselves. Another of my



Photo courtesy of J. Barido-Sottani.



projects explores and compares the different strategies for placing fossils in a phylogeny. As part of my current fellowship with H el ene Morlon at ENS in Paris I'm working on integrating fossils into more complex diversification models, such as models with branch-specific diversification or fossilization rates.

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

Phylogenetic inference with fossils relies mainly on three types of palaeontological data: fossil ages or age ranges, fossil taxonomical information and finally morphological data matrices. Since my work focuses on testing and evaluating inference methods, I have primarily used simulated data, but I use empirical datasets to calibrate the simulations and ensure they are realistic. I have used some empirical datasets which were previously published, as well as information from the Paleobiology Database (PBDB).

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

I have contributed to the R package FossilSim¹, which allows users to simulate phylogenies integrating fossils under a wide range of speciation, extinction and preservation models. FossilSim is also available as a web application through the R package FossilSimShiny², which allows users to experiment with the different models and easily visualize the resulting phylogenies.

For inference, I have used and contributed to two phylogenetic inference frameworks, BEAST2 and RevBayes. In particular, I have contributed code to the Sampled Ancestors package in BEAST2, which implements the fossilized birth-death process for phylogenetic inference with fossils. I have also developed MSBD³ and ClaDS⁴, two BEAST2 packages for birth-death models with clade- or branch-specific variations in diversification rates. I am currently working on expanding both of these packages to integrate fossil information.

Finally, I have contributed to the R package EvoPhylo⁵, which contains functions for automatically partitioning morphological character alignments, and for analysing rate estimates from a partitioned phylogenetic inference.

What is your favourite finding from this collaboration so far?

I don't think I would have a favourite, really. But I see more and more simulation studies being conducted on different aspects of phylogenetic inferences with fossils and I think the findings from my work have contributed to convincing people that these are needed and valuable studies, which is something I am proud of. In general, I think moving towards more testing and validation of the models and methods used in palaeontology is a very positive direction. These studies may not seem as exciting at first as the ones conducted on empirical datasets, but they are critical to establish that we can actually trust the empirical results.

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

I think communication is definitely one of the main challenges. One thing I've found in particular is that I'm not excited or interested in the same things as my more empirical collaborators. Palaeontologists tend to be interested in a specific clade, so their research questions will be tied to the history and characteristics of that clade. I'm more interested in the methods themselves and how well they perform in different conditions. For instance, when I

¹ <<https://cran.r-project.org/package=FossilSim>>

² <<https://cran.r-project.org/package=FossilSimShiny>>

³ <<https://bitbucket.org/bjoelle/msbd/>>

⁴ <<https://bitbucket.org/bjoelle/clads/>>

⁵ <<https://cran.r-project.org/package=EvoPhylo>>



ran my first simulation study on fossil age uncertainty (Barido-Sottani *et al.* 2019), several people were very interested by the age estimates we obtained for the Cetacean clade, whereas I saw that part of the study as purely an illustration and not the main results. In general, I sometimes get frustrated by the weight people put on empirical datasets in studies which validate new or existing methods. From my point of view, the most relevant results in these studies are on the simulated datasets, where we can make an explicit comparison between the true and estimated values. So there are definitely differences in mindset there.

Another challenge is communicating about the expectations of what phylogenetic inference methods can realistically accomplish, particularly in cases where the available data are limited. For instance, when we tested total-evidence approaches (*i.e.* phylogenetic inferences which use morphological characters in addition of or instead of molecular sequences), we found that inferences are not accurate with small data matrices of around 30 characters (Barido-Sottani *et al.* 2020). This is a very useful result for designing analyses, but it can be hard to communicate, because users are always very disappointed to learn that they may not have enough data to answer their questions. Some of that is of course on the developers, who in general do not like to talk about what can go wrong with their models or methods.

Overall, I think challenges regarding formats and vocabulary are more straightforward to work through because they are generally expected and understood by everyone. Differences in perspective, such as disagreements about what is important in a research project or how results should be interpreted and presented, are trickier because they touch on core parts of our work as researchers.

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

I think a good rule for collaboration with anyone is to first be very clear about what your goals are, and in particular what you specifically expect from that person. Speaking of myself, my potential contributions to a project are my experience in designing and running simulations, my knowledge of running and troubleshooting Bayesian inference tools, and general programming skills. On the other hand, I have little knowledge of empirical datasets, and I will likely not be able to help with identifying good empirical research questions, gathering datasets or interpreting empirical results. So these are all things to consider when deciding whether I am the right collaborator for a project. Establishing a clear research direction and/or lead author from the start will also be helpful if the project runs into communication challenges.

Once the decision has been made, I think it's important to consider that cross-discipline collaboration will likely require more discussion than collaboration with people of a more similar skill-set. In particular, asking questions and raising issues, even if they seem obvious to you, becomes critical as you may be the only one for whom these issues are actually obvious. Similarly, taking the effort to explain study choices or dataset limitations in detail will be very helpful to someone like me, who is less familiar with empirical datasets.

Finally, I would really encourage people who use the tools I've developed to reach out to me with questions, even if they are just looking for punctual help and not full collaboration. I develop methods in part because I like to help other researchers, and getting feedback on the common issues that users encounter, or on data features which are not well handled by the existing methods, is also extremely helpful to me.



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 choosing to interpret "following in my footsteps" as "becoming a method developer" here, because this is the example I'm hoping to give. In this scenario I would absolutely recommend participation in classes on software and computer programming if you have the opportunity. Most research projects nowadays will have at least some component of programming and for phylogenetic inference specifically, large software frameworks (like BEAST2 or RevBayes) are becoming more and more prevalent. Implementing models in an existing framework, developed and maintained by other researchers, is a very different experience than writing your own scripts and requires more advanced skills. So having actual training in programming has been one of the most helpful things to me in my career. I also believe that it's a skill which is very transferable outside of academia, which is something young researchers have to think about, in my opinion. For similar reasons, I would also advise getting some basics in mathematics including statistics, probabilities and possibly some linear algebra (which is heavily involved in machine learning). Of course, I am biased here because my study programme was very strongly interdisciplinary and I have had classes in mathematics, statistics, physics, computer science, biology and even some economic theory. Even though I'm (of course) not using everything I learned, I personally found it extremely helpful in computational biology to have a good foundation in a lot of different fields. Programmes dedicated to computational biology have now become more widespread, but they were quite rare when I was a student, so I wouldn't be able to recommend a specific programme.

My last recommendation is to stay open-minded, and to not be afraid to try new things and new fields. In my case, I started working with palaeontological data more or less by accident and it ended up becoming one of my main areas of research.

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Spotlight on Diversity

Putting the history of palaeontology to work

In the last few years, the Earth sciences community has grown acutely aware of its lack of racial, gender and cultural diversity. As shown by the latest controversy over the repatriation from Germany of a *Ubirajara jubatus* specimen found in Brazil, palaeontology in particular finds itself at the centre of serious conversations regarding unethical practices and colonial legacies. A few examples of recent initiatives and publications illustrate the urgency of such issues shaped by the rich and complex history of palaeontology.

In 2017, filmmaker Lexi Jamieson Marsh and palaeontologist Ellen Currano launched a touring exhibition, *The Bearded Lady Project*, featuring black and white photographs of women palaeontologists wearing fake beards. This original initiative unravelled the stereotypes and gender biases that have long been defining the exclusive identity of palaeontologists and field scientists in general. In 2020, palaeontologists studying amber fossils from Myanmar were asked to stop acquiring new specimens in view of the humanitarian crisis happening in the Kachin region. This call raised the question of the extent of palaeontologists' ethical responsibilities regarding the wider ecosystem of their research. Finally, last year, a team of young scholars, led by Nussaibah Raja and Emma Dunne, published the results of a scientometric study showing how the colonial past is still determining access to the fossil record and research opportunities.

None of these issues exists in a historical vacuum. Therefore, a better and more widely shared understanding of palaeontology's complex history could shed some much-needed light on some of the pressing challenges faced by the palaeontological community, especially by its younger and rising members.

The question is: how could the history of palaeontology be better integrated into the training of palaeontologists to foster an always more inclusive, ethical and sustainable research community? The goal of this communication is to encourage future collaborations between historians and palaeontologists for the benefit of all the stakeholders of palaeontological research.

In a recent note published in this same *Newsletter* (106), historian Chris Manias highlighted that "palaeontologists and connected branches of natural history have recently been engaging in highly reflective ways with the history of their fields, with an agenda towards decolonizing them". Indeed, a significant number of scientific actors have been acknowledging the complex heritage of their disciplines and the collections they work with. Recently, palaeobiologist Pedro Monarrez and colleagues published an article discussing the extractive nature of palaeontology and the various manifestations of racism and colonialism lingering in geosciences academia. Palaeoartists, such as Mark Witton, have also begun to address the often-problematic legacies of their predecessors. Such communications recognize the social and ethical benefits of investigating the history of palaeontology.

The problem is that the history of palaeontology is either not being systematically taught to palaeontology students or mostly being taught as a chronicle of 'discoveries' made by a selected few (and mostly Western men). Such a narrative provides a skewed vision of the historical development of palaeontology, ignoring not only the multiplicity and diversity of actors



involved in scientific work, but also the situatedness of this work. Instead of providing the new generations of palaeontologists with the tools to think holistically about their science and understand its current ethical and policy challenges, such a vision of history prevents them from doing so. In other words, upcoming palaeontologists do not need to learn more about the history of their discipline, they need to engage with it with a sense of purpose.

Coincidentally, the palaeontological community can rely on the recent efforts of an active and growing contingent of historians of science, who are critically revising the history of palaeontology among other Earth sciences. Many historians are now giving particular attention to the entanglements of the reconstruction of deep time with colonialism, capitalism and extractive economies. Through these new analytical lenses, the past of palaeontology no longer appears as the epic story of 'fossil hunters' excavating exceptional specimens around the world, but as a series of histories involving a variety of scientific and non-scientific actors evolving in different social, economic and political contexts. These efforts represent a valuable resource for the palaeontological community to actively engage with the legacies crippling its efforts in diversification and ethical advancement. Finding ways to introduce the new historiography of palaeontology to students would help them navigate through the changing landscape of ethical standards, policies and laws that characterize the palaeontological field today. Through the discussion of the history of their discipline, they could imagine more sustainable and inclusive ways of studying the deep past. Just as students are being taught that the study of the fossil record can improve our understanding of present and future ecosystems, they should also be taught that the study of the historical record of their discipline can help them evaluate and improve their own practice and institutions.

Integrating this new historiography to palaeontology curricula raises obvious logistical and methodological questions, such as: who will teach this content to students? How much time can be reasonably allocated to discussing history? Where can palaeontologists and students follow recent developments in the historiography of palaeontology and Earth sciences? Which specific issues should the teaching of history be focusing on? Where could historians and palaeontologists regularly share their respective concerns and insights? These questions can only be answered through active discussions and collaborations between historians and palaeontologists. The sharing of resources, priorities and ideas is bound to prompt the emergence of specific, practical solutions, which could in time serve as templates for more ambitious educational reforms. The relationship between the history of science and science is a convoluted one. It had and will have its ups and downs. One thing remains for certain though – it is as critics of science that historians can provide their highest form of support to the scientific endeavour. While palaeontologists wrestle with complex issues regarding the future of their community, historians of palaeontology must also reflect on their own ethical responsibilities and how they can put their expertise to work.

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Mystery Fossil 29

Mystery Fossil: Palaeocyphonautes

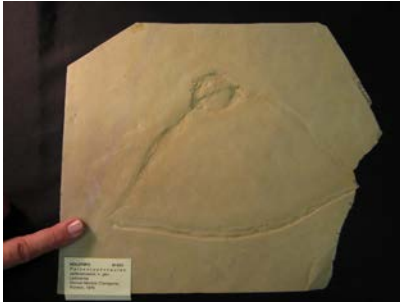


Figure 1. Holotype of *Palaeocyphonautes vertexacutatus* Vía Boada & Romero Díaz, 1978, the type species of *Palaeocyphonautes*, from the Triassic (Ladinian) of Alcover-Montral, Tarragona Province, Spain.

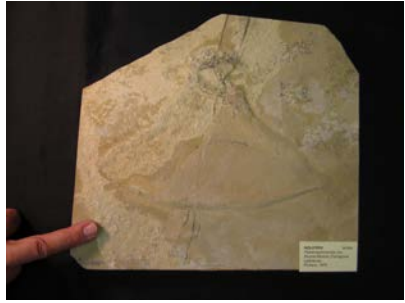


Figure 2. Holotype of *Palaeocyphonautes* viai Vía Boada & Romero Díaz, 1978.



Figure 3. Holotype of *Palaeocyphonautes rugosus* Vía Boada & Romero Díaz, 1978. The surface texture in this specimen recalls an 'elephant skin' microbial texture.



Figure 4. Bryozoan cyphonautes larva (from <https://www.eoas.ubc.ca/~swaterma/473-573/Handouts/IntroductoryZooplanktonFieldGuide_2014.pdf>). Width approx. 525 μ m.

Palaeocyphonautes (Figures 1–3) was created by Vía Boada and Romero Díaz (1978) for some enigmatic fossils collected from the Triassic (Ladinian) of Alcover-Montral in Tarragona Province, northeastern Spain. The genus name derives from the similarity of *Palaeocyphonautes* in overall shape to the planktotrophic cyphonautes larvae of some cheilostome bryozoans (Figure 4). This prompted Vía Boada and Romero Díaz to refer *Palaeocyphonautes* to the superphylum Lophophorata, which comprises Bryozoa, Brachiopoda and Phoronida. No phylum affiliation was specified by these authors, and they placed *Palaeocyphonautes* in the new family



Palaeocyphonautidae. Vía Boada and Romero Díaz described three species of *Palaeocyphonautes* – *P. vertexacutatus* (Figure 1), *P. viai* (Figure 2) and *P. rugosus* (Figure 3) – each based on a single specimen, and two additional specimens identified simply as *Palaeocyphonautes* sp. The Museo Geológico del Seminario in Barcelona houses Vía Boada and Romero Díaz's material.

All three species of *Palaeocyphonautes* are bedding plane impressions of low relief. They have a triangular bell-shape defined by a marginal ridge or groove (?part and counterpart), possess a ring-like structure at the presumed apex (seen particularly well in Figure 3), and lack any preserved skeleton. Measuring 23–24 cm in width, they are three orders of magnitude larger than the cyphonautes larvae with which they were compared. It seems likely that the differences used to define the three species reflect taphonomic or preservational variations and that only one species is present.

The Alcover-Montral deposit is a 70–80 metre-thick, finely laminated, dolomitic limestone containing fossils of land plants, jellyfish, molluscs, brachiopods, holothurians, fish and reptiles (Martí 1999). It is believed to have accumulated in shallow lagoons between dasycladacean mud-mound reefs, the allochthonous biota passively transported to the site of burial (Vía Boada *et al.* 1977). The inferred palaeoenvironment is broadly reminiscent of that proposed for the similarly lithographic limestone of the famous Solnhofen Lagerstätte in the Late Jurassic of Germany.

What might *Palaeocyphonautes* be? Based on the original material plus a few additional smaller specimens, Romero *et al.* (2005) interpreted *Palaeocyphonautes* as the adult stage of an ancestral bryozoan. This raises the problem of how a larval morphology could have functioned in an adult 100 times larger. Allometric considerations render this scaling up unlikely, and there is no evidence that *Palaeocyphonautes* possessed a bivalved structure like that of a cyphonautes larva. There is also no equivalent in cyphonautes larvae of the distinctive ring-like structure seen in *Palaeocyphonautes*. Some gastropod egg capsules bear a passing resemblance to *Palaeocyphonautes* (e.g. D'Asaro 2000) but not enough to be persuasive that *Palaeocyphonautes* is a gastropod egg. None of the palaeontologists and marine biologists shown photographs of *Palaeocyphonautes* has been able to offer suggestions as to the affinity of this problematical fossil. I'd be very grateful to hear any suggestions.

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>>**Future** Meetings of Other Bodies



6th International Meeting of Early-stage Researchers in Palaeontology (IMERP)
Lourinhã, Portugal 11 – 15 April 2023

The IMERP is aimed at early-stage palaeontologists, from undergraduate students to recent postdoctoral researchers, and hopes to bring young palaeontologists together from all over the world. The meeting's character is informal and its aim is to create a friendly environment where young researchers can present their work and meet other palaeontologists from many different fields of expertise. This year the meeting is combined with the XXI Encontro de Jovens Investigadores em Paleontologia (EJIP). The meeting's sessions will include presentations (oral and poster) from different fields of palaeontology, such as: vertebrate and invertebrate palaeontology, micropalaeontology, palaeobotany, taphonomy, palaeoanthropology, palaeoenvironment, palaeoclimate studies *etc.*

Meeting website: <<https://ejipimerp2023.wixsite.com/ejipimerp2023>>.



10th International Meeting of the Society of Avian Paleontology and Evolution (SAPE)
Málaga, Spain 8 – 12 May 2023

After more than two years of difficulties and restrictions due to the COVID-19 pandemic, leading to two postponements of this meeting, the organizers are pleased to announce that the 10th International Meeting of the Society of Avian Paleontology and Evolution (SAPE) will be held at the University of Málaga from 8th to 12th May 2023. The meeting is open to palaeontologists, ornithologists and anyone with a general interest in bird evolution. Birds are excellent models for addressing a wide range of scientific questions, and the organizers encourage students and professionals of relevant research areas – functional morphology, evo-devo, conservation palaeontology, molecular systematics, among others – to take part in the scientific sessions of the 10th SAPE Meeting. Abstract submission closes 31st March 2023.

Meeting website: <<https://sape2020.com/>>.



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 virtual conference developed in our field. The main aim is still the same: to give international projection to 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 the low-cost



registration fees; there is also a social fund for participants from low and lower-middle income countries. Abstract submission has now closed but registration is available online.

Meeting website: <<http://palaeovc.org/>>.



14th Conference on Mesozoic Terrestrial Ecosystems (MTE14)
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. The first time in the USA, Utah has been a major centre for new discoveries over the past 25 years in its nearly complete Mesozoic terrestrial section. 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. Abstract submission has now closed but registration is available online.

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 will also feature 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 will also remain the same to minimize the changes and all deadlines have been simply postponed by one year. The meeting will host communications regarding new achievements coming from any research field involving foraminifera; all contributions regarding or involving foraminifera are welcome. Abstract submission and online registration are open until 1st April 2023; on-site registration will be possible.

Meeting website: <<https://distav.unige.it/forams2022/iniziale>>.



20th European Association of Vertebrate Palaeontologists (EAVP) Conference
Sabadell, Catalonia, Spain 26 June – 1 July 2023

The twentieth meeting of the EAVP will be hosted by the Institut Català de Paleontologia Miquel Crusafont (ICP) in Sabadell, near Barcelona, at the end of June 2023. The meeting will take place in two different venues in Sabadell city centre, with three pre- and post-conference field-trips in the nearby Pyrenean region. The meeting will include five pre-conference workshops and roundtables on the first day followed by three full days of talks and posters. Abstract submission closes 31st March and registration is open until 1st June 2023.

Meeting website: <<https://eavp2023.icp.cat/>>.

**Society for Experimental Biology Annual Conference session A14**

Edinburgh, UK 6 – 7 July 2023

The SEB Centenary Conference 2023 will feature session A14: Experimental Palaeobiology – bringing fossils “back to life”. The session topic will cover a variety of studies which (in their broadest sense) aim to draw conclusions on functional morphology, biomechanics and physiology in extinct organisms, often by using data gathered from modern species to provide interpretations on the biology of organisms in the fossil record. This will include, but will not be limited to: anatomical descriptions and comparative dissection; comparative physiology; sensory mechanics; hard-tissue microstructural analyses; kinematics; multi-body dynamics; computational fluid dynamics; *etc.* Topics are intended to range across the mechanical and physiological spectrum, incorporating aspects of feeding, locomotion, sensory perception, physiology, *etc.* The session will run over two half days, the afternoon of 6th July and the morning of 7th July. Early-bird registration ends on 5th May 2023.

Meeting website: <<https://www.sebiology.org/events/seb-centenary-conference-2023/sessions/animal.html>>

**Palaeo Down Under 3 (PDU3)**

Perth, Australia 10 – 14 July 2023

Palaeo Down Under is the quadrennial conference of the Australasian Palaeontologists and aims to highlight palaeontological research, education and outreach throughout Australasia. This is the third conference held, following the inaugural conference in Orange, New South Wales in 2000 and PDU2 in Adelaide in 2016. Each conference spotlights the palaeontology of the host state, with PDU1's central theme of Palaeozoic correlations of the New England region, while PDU2 focused on Ediacaran/Cambrian palaeontology. Early life and microbialites will likely be a key theme for the Perth conference, although the full programme will cover palaeontological research across Australia, New Zealand and neighbouring countries.

Meeting website <<https://www.australasianpalaeontologists.org/pdu3>>.

**4th International Congress on Stratigraphy (STRATI 2023)**

Lille, France 11 – 13 July 2023

Following the first congress in Lisbon, Portugal in 2013 and subsequent congresses organized in Graz, Austria in 2015 and Milan, Italy in 2019, the 4th International Congress on Stratigraphy (STRATI 2023) will be held in Lille, France in mid-July 2023. The main sessions including keynote talks and regular lectures will take place in the recently-opened University of Lille LILLIAD Learning Center Innovation on the campus of the Cité Scientifique at Villeneuve d'Ascq (15 minutes by metro from Lille city centre). Several pre- and post-conference excursions and a one-day field-trip are scheduled to take place before and after the main meeting, covering stratigraphical successions from the Palaeozoic, Mesozoic and Cenozoic. The congress will also host meetings of the ICS and its



submissions, together with workshops and social activities. Abstract submission is now closed but registration remains open, with on-site registration possible.

Meeting website <<https://strati2023.sciencesconf.org>>.



2nd Asian Palaeontological Congress (APC2)

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 be open until 15th July 2023, although the abstract deadline is 31st March 2023.

Meeting website: <<https://www.apc2.org/>>.



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. This conference will bring together ecologists, palaeontologists, Earth system scientists and biogeographers who are interested in fundamental drivers, applications of (palaeo)ecological patterns in understanding past and present, and 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.

Meeting website: <<https://www.cpeg2023vilnius.chgf.vu.lt/>>.



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>.

**94th Annual Meeting of the Paläontologische Gesellschaft (PalGes)**

Jena, Germany 18 – 22 September 2023

For the first time since the founding of the Paläontologische Gesellschaft in 1912, the annual meeting will take place in Jena in central Germany, only the second time the meeting has been held in Thuringia since the 1925 meeting in Weimar. The Institute of Geosciences (IGW) at the Friedrich-Schiller-Universität Jena will be hosting the meeting in the city on the river Saale. Thuringian palaeontology has a long tradition and is famous for fossils from the Permian, Triassic and Quaternary; there will be a diverse range of excursions available covering fossil sites from the late Palaeozoic to the Quaternary. The main theme of the meeting will be 'From Early Life to the Neandertals'. The first circular is available on the website with more details to come.

Meeting website: <<https://www.palaentologische-gesellschaft.de/en/conferences/annual-conference/>>.

**XIth International ProGEO Symposium**

Loughborough, UK 9 – 11 October 2023

The organizing committee and the International Association for the Conservation of Geological Heritage (ProGEO) invite 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.

Meeting website: <www.progeo2023.com>.

**Geological Society of America (GSA) Annual Meeting**

Pittsburgh, PA, USA 15 – 18 October 2023

The annual meeting of the Geological Society of America is a large meeting held in October each year covering a wide range of topics, including palaeontology. The Paleontological Society have their annual meeting and banquet at the event and sponsor a wide range of short courses, topical and discipline sessions relating to palaeontology. For 2023 there will be a short course on ecological niche modelling and the Schuchert Talk will be given by Melanie Hopkins.

Meeting website: <<https://community.geosociety.org/gsa2023/home>>.



11th European Conference on Echinoderms (ECE11)

Lyon, France 16- 20 October 2023

The European Conference on Echinoderms is a rare opportunity to bring together scientists from different countries, disciplines and generations, in one meeting dedicated to both extant and extinct echinoderms. The 11th edition will take place at the Université Claude Bernard Lyon 1, France. It will include a pre-conference excursion (11–15 October) to the Villefranche-sur-Mer marine station (close to Nice, on the French riviera), four days of indoor sessions in Lyon (16–17 and 19–20 October), and one mid-conference excursion to Ardèche, including a visit to the Callovian (Middle Jurassic) La Voulte Lagerstätte. This long-awaited meeting will be the first in-person echinoderm meeting after an almost four-year hiatus due to the COVID-19 pandemic. Registration opens on 31st March and abstract submission closes on 15th May.

Meeting website: <<https://ece11.univ-lyon1.fr/fr>>.



Society of Vertebrate Paleontology (SVP) 83rd Annual Meeting

Cincinnati, OH, USA 18 – 21 October 2023

The annual meeting of the Society of Vertebrate Paleontology (SVP) is a large international conference for vertebrate palaeontology researchers. This year the meeting will take place in October and will be held at the Duke Energy Convention Center located in downtown Cincinnati, close to local landmarks and places of interest. As in previous years there will be three days of technical sessions, specialist symposia, an awards banquet, exhibitions and field courses. Abstract submission is expected to open in early April 2023. For more details see the website.

Meeting website: <<https://vertpaleo.org/>>.



XV International Palynological Congress and XI International Organization of Palaeobotany Congress (XV IPC-XI IOP)

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.

Meeting website: <<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/meetingevents/future-meetings/add-future-meeting>>.



Meeting REPORT



The 6th International Palaeontological Congress (IPC6)

Khon Kaen, Northeast Thailand 7 – 11 November 2022

The International Palaeontological Congress (IPC) is organized every four years with the backing of the International Palaeontological Association. The previous meeting was held in Paris in 2018, which the first author (MAS) was fortunate to attend for the first time when he was about to wrap up his studies in the UK. In November 2022, the sixth IPC was held in Khon Kaen, Thailand, which coincidentally was very near to our home country of Malaysia. The meeting was led by the Palaeontological Research and Education Centre of the Mahasarakham University, with the main theme 'From Gondwana to Laurasia'. Upon touchdown, a shuttle bus conveniently transported the participants from the airport to the Pullman Khon Kaen Raja Orchid Hotel and Convention Centre, where the Meeting was based. The Meeting comprised four days of talks and posters in the 26 sessions representing a variety of aspects of palaeontology, plus an ostracod workshop, Palaeoyouth conference, and the PalaeoArt Illustration Contest exhibition. There were also pre-, mid- and post-congress excursions to different parts of Thailand to explore the diverse geology and wonderful culture of Thailand.

The first day of the main meeting started with welcome speeches from the Minister of Natural Resources and Environment of Thailand, the Governor of the Khon Kaen Province and the President of the Mahasarakham University. The keynote speeches were later given by David Harper, Eric Buffetaut, Clive Burrett and Renbin Zhan. **David Harper** gave profound lessons from deep time using the big three mass extinctions as an example; **Eric Buffetaut** gave a talk about Henrie Marie Ducrotay de Blainville who was notable for coining the word 'palaeontologie' (see *Newsletter 111* for more); **Clive Burrett**, who was part of the organizing committee, gave a summary of the progress in our understanding of the geology and palaeontology of Thailand; **Renbin Zhan** on the other hand talked about China's contribution to the field of palaeontology in the twenty-first century. All of the participants were then directed to parallel sessions which were held in eight separate venues inside the hotel. MAS was interested in the history of palaeontology and new fossil findings in the Asian region. As such the session 'hidden histories revealed in the scientific revision of palaeontological collections' convened by the International Commission on the History of Geological Sciences (INHIGEO) was an obvious choice for him to attend. MAS was able to present on the history of graptolites studies in Peninsular Malaysia on the second day and had the pleasure of personally meeting **Jörg Maletz**, one of the present authorities on graptolite studies. MAS feels immensely blessed as a young researcher for being able to learn so many things from an experienced scientist in the same field. Later on, we also managed to attend the Loy Krathong, the festival of the light lantern on the Khon Kaen Lake, which was a colourful festival where people gathered together and placed a floating decorated basket on the lake. There were also parades, singing, dancing and a huge amount of food stalls to satisfy our curiosity about Thailand's unique cuisine.

The third day was a free day where people could attend workshops, go for the mid-day excursion, or just take a break for the day. MAS decided to join a small group for a tour to the Palaeontological



Research and Education Centre of Maharakham University and was able to see the wonderful fossil collections stored and being prepared in the Institution. The participants that joined the trip were also invited to visit the Mushroom Museum, witness the signing of a MoU between Maharakham University and the delegates from China, and tour the Wat Pa Wang Nam Yen (Phuthawaranaram Temple). On the fourth day, the talks resumed, on several different topics including palaeoenvironments, ostracods research and Southeast Asia vertebrates fossil-finding. Later that night was the gala dinner, where participants were again served more excellent food and interacted with one another. On the fifth and final day of the Meeting, there were talks on various topics including the Palaeozoic carbonate platform and an open session on methodology. The participants were then asked to gather together for a quick closing statement from the organizing committee before the meeting finally reached its conclusion.



Muhammad Aqqid Saporin (left) and Ros Fatimah Haji Muhammad (centre) with Malaysian colleagues in the impressive conference venue. Photo courtesy of MAS.

The current IPC managed to involve a lot of Southeast Asian participants. Other Malaysian delegates included a group led by the second author (RFHM) from Universiti Malaya. She is currently the leader of a research project on Quaternary fossils from karstic caves in Peninsular Malaysia.



Her team benefited tremendously from attending the 'Late Neogene–Quaternary continental ecosystems, zoogeography, and biotic exchange across the Asia-Pacific' session. The team presented three topics from findings of their research and found the discussion with researchers such as **Julien Louys**, **Kantapon Suraprasit**, **Alexandra van der Geer** and **Jaroon Duankrayom** to be fruitful and expand their research scope. The visit to Fossil Proboscidean Museum in Nakhon Ratchasima has strengthened the team's collaboration with Thai researchers and a subsequent visit is being planned for comparison studies with the Museum collection. RFHM had been interested in visiting dinosaur sites in the Khorat district ever since she learned about them during her undergraduate days. However, this was delayed for many years, and she described her experience of participating in the mid-conference excursion as enlightening and considered that as a tick in the box for any geologist. And going through pebbles to look for fossils at the sand pit fossil site is a bonus. Among her unforgettable memories is the opportunity to visit the cultural site and museum in Prasat Phimai while listening to Alexandra van der Geer who is also well-versed in Sanskrit. It was a wholesome day filled with exciting culture and science.



The mid-conference excursion to a dinosaur site in the Khorat district. Photo courtesy of RFHM.

MAS would like to give massive thanks to the Palaeontological Association for the travel grant that enabled his attendance. We also give huge props to the IPC6 committee, especially the General Chair **Mongkol Udchachon**, for giving their all and holding the international conference just as the world started to recover from the COVID-19 pandemic. We hope to see everyone again for the next IPC in South Africa in 2026!

Muhammad Aqqid Saporin

Universiti Teknologi PETRONAS, Malaysia

Ros Fatihah Haji Muhammad

Universiti Malaya, Malaysia



— OBITUARIES —

Michael Gwyn Bassett 1943 – 2023

Michael “Mike” Bassett died on Sunday 15th January 2023, following a long illness. He would have been 80 years old on 31st March. Mike was born in the town of Barry, just outside Cardiff, South Wales, UK. He first studied Geology at the University of Wales and graduated with a BSc Honours degree in 1964. Mike continued his education at University College, Swansea where he gained his PhD in 1968 for a major monographic study on the Silurian (Wenlock) stratigraphy and brachiopods of Wales and the Welsh Borderland. Even before his graduation, he joined the Amgueddfa Cymru – National Museum Wales, Cardiff in October 1967. Mike worked there for the next 40 years, firstly as Assistant Keeper of Geology (until 1977) and subsequently as Senior Keeper and Head of the Geology Department until his retirement in 2008. For a number of years, he was an Honorary Professor and Lecturer at Cardiff University and he also spent many extended sabbaticals abroad, in particular at the Natural History Museum, Oslo, Norway and also in Stockholm and Uppsala, Sweden, while working on his many Gotland projects. Mike supervised many PhD students both in the UK and in Sweden, and generously assisted and participated in many international research projects.



Mike Bassett in 2006. Courtesy of Cindy Howells.

Mike served as the Secretary General and First Vice Chairman of the International Commission on Stratigraphy, IUGS (1992–2000). At that time, he made very significant contributions to the development of the International Geochronological Scale and, especially, subdivision of the Silurian System. He was also deeply involved in development of the Ordovician chronostratigraphy and the organization of the first Ordovician meetings and symposia, and edited many of the resulting symposium volumes.

Mike had a very broad interest in geology and palaeontology, but his main field was the palaeontology and stratigraphy of the Lower Palaeozoic. He was a very active author, and published over a hundred articles and edited numerous books. Mike was widely known as an outstanding expert on Palaeozoic brachiopods, biostratigraphy and facies developments worldwide, but particularly in the UK and Scandinavia. He also made important contributions to the study of brachiopod palaeobiology, especially their lifestyles, early ontogeny and phylogeny.

During his long scientific career, Mike received a number of awards and recognitions related to his research. In particular, he was awarded with a DSc from the University of Wales in 1984. He received an Honorary Doctorate from Uppsala University in 2000 and in December 2006 he was appointed as the President of the Palaeontological Association for two years. In 2006 Mike received



the prestigious Edward D'Ewes Fitzgerald Coke Medal from the Geological Society of London and in 2010 was awarded Honorary Life Membership of the Palaeontological Association. In 2011 he was elected fellow of the Learned Society of Wales.

Mike was very interested in popular science and published on a wide range of popular science topics, including among others, 'Formed stones, folklore and fossils' and 'Fossil plants from Wales'. During his time as Keeper of Geology, he significantly raised the profile of Amgueddfa Cymru – National Museum Wales, which became an internationally recognized Palaeozoic research centre, creating strong research links, not only in North American and European countries, but also with Argentina, China and developing countries such as Kazakhstan, Iran and Uzbekistan. He also played a key role as the organizer of a number of highly successful exhibitions, such as the ground-breaking 'Dinosaurs from China' (1986–1987), 'Mammoths and the Ice Age' (1991–1992) and 'Flight' (2001). The highly popular, award-winning permanent exhibit 'Evolution of Wales' in Amgueddfa Cymru – National Museum Wales is one of his long-lasting legacies.

Mike was very hospitable and generous and had a steady stream of visitors to Cardiff, who enjoyed staying with him. He was very interested in sports and had a successful early career as a rugby player, and during his time in Uppsala, Sweden, he coached the local rugby team. Following retirement, Mike actively continued his research, dedicated to such topics as geotourism on Gotland, descriptions of many new types of brachiopod faunas, particularly from Gotland, and wider aspects of brachiopod biogeography. The last paper he authored was published in 2017. It was dedicated to the early ontogeny of the Silurian brachiopod *Coolinia*. He was a true giant within his field. He now lives in our memory as an outstanding scientist and a great colleague and friend.

Lars E. Holmer

Uppsala University, Sweden

Leonid Popov

Mansoureh Ghobadi Pour

Amgueddfa Cymru –

National Museum Wales, UK



Mike looking at a copper smelting pit site (5th millennium BCE) in the brachiopod-rich Cambrian beds, Timna National Park, Israel. Courtesy of Lars Holmer.



L. R. M. ‘Robin’ Cocks 1938 – 2023

Photo courtesy of Trond Torsvik.



Robin Cocks was arguably the world’s most distinguished student of brachiopods, and his death on 5th February 2023 deprives the scientific world of a lifetime of expertise and scholarship. During his many years at the Natural History Museum, London, UK he rose to become Keeper of Palaeontology (1986–1998), but never lost his enthusiasm for science – indeed, he was still working on new papers a few weeks before he died. It seems unlikely that his equal will be seen again.

Robin was of the generation that was young during the Second World War. After a gruelling time in a preparatory school he was educated at Felstead School near London. He was obliged to do National Service in the years that followed and served his time in Malaysia with the Royal Artillery, where the fierce sun took its toll on his typically English fair complexion (this may be implicated in the skin cancers he suffered from later in life). The University of Oxford followed, and after gaining a first-class honours degree in geology he completed a DPhil (1965) on Silurian rocks and faunas supervised by Stuart McKerrow, who later became a friend and colleague. When he was appointed in the same year to the British Museum (Natural History) (later known as the Natural History Museum, London) as Scientific Officer, Howard Brunton was also taken onto the staff. Apparently, they were such outstanding candidates that *both* were employed, which seems unimaginable today. Brunton was assigned the Upper Palaeozoic brachiopods and Cocks the Lower Palaeozoic. Robin was promoted to Senior Scientific Officer and then Principal Scientific Officer as his career progressed, and Ellis Owen completed the brachiopod ‘team’ with his expertise in Mesozoic species. It is sad to reflect that the brachiopods once had three full-time specialists in the ‘BM’ (as it was known) where now there are none.

From his appointment onwards a steady stream of systematic papers on brachiopods were published from Robin’s hand that continued until last year. By the mid-1990s he had become as expert on Ordovician as on Silurian brachiopods, and eventually claimed to have named a new genus for every letter of the alphabet. His compass extended globally, from a secure base in the Silurian (Llandovery) of Britain, to a series of papers on the Ordovician of Kazakhstan with his long-time collaborator Leonid Popov. Such monographs may not be the height of fashion, but they will endure. At the same time, Robin was always anxious to describe himself as a geologist, and he enjoyed sorting out the stratigraphy of the Silurian rocks in Britain. He and McKerrow spent summers in Newfoundland attempting to apply the relatively new science of plate tectonics to the complex geology of that island, where the story of the vanished ocean Iapetus is preserved. Robin later became a central figure in the debate about exactly where to draw the boundary between the Silurian and Devonian Periods. A definitive volume of papers of the ‘BM Bulletin’ edited by Robin in 1990 helped secure the international retention of the British names of the standard chronostratigraphic Silurian subdivisions.



A recurring theme in Robin's research became the reconstruction of ancient geography when it became clear that continental distributions were very different in the Palaeozoic from those at the present day. This research burgeoned in the 1980s and 1990s in conjunction with the present writer, since brachiopods and trilobites taken together allowed new insights into the 'signatures' of ancient continents and their margins. After Robin reached the mandatory retirement age in 1998 he continued this theme, particularly with Prof. Trond Torsvik in Norway, whose computer modelling permitted a more sophisticated treatment of ancient geography. Many new continental reconstructions were published during the first decade of the twenty-first century. The collaboration was summarized in a book published in 2017 by Cambridge University Press that has already become indispensable to palaeontologists and tectonic geologists around the world.

During Robin's time as Keeper he maintained a generally light touch, preferring to let his best scientists pursue their own line of research without his intervention, so long as they produced the 'goods', mostly in the form of published papers. Judging by external recognition it could be said that the Palaeontology Department at that time was at the zenith of its reputation, for example, having two Fellows of the Royal Society (later three) elected from the staff, which was previously unequalled. As an administrator, Robin liked to get the official stuff out of the way quickly – so that he could return to his beloved brachiopods. This businesslike approach sometimes resembled brusqueness, and his deputies, the ammonite specialists H. G. Owen or M. K. Howarth, occasionally had to tactfully intercede. Despite his administrative burden Robin somehow managed to make huge contributions to the Brachiopoda for the *Treatise on Invertebrate Paleontology* – at that time edited by the forceful Sir Alwyn Williams. This was a testament to his organizational skills as well as his scholarly command and extraordinary memory. Over many years he had gathered specimens of the type species of brachiopod genera that came together in this definitive summary, which is likely to remain current for the foreseeable future.



Robin (centre) in 1992 with his fellow brachiopod specialists at the Natural History Museum, London. Photo courtesy of Richard Fortey.

Robin Cocks served many academic societies and international committees. On the palaeontological front he is the only person who has been president of all the appropriate UK-based learned



societies. He was president of the Palaeontological Association (1986–1988), a group with which he was concerned from its early days, and helped towards its current status as the leading organization of its kind in Europe and beyond. He was president of the Palaeontographical Society (1994–1998), which published several of his major papers on brachiopods. The pinnacle of his service to the geological community was arguably as president of the Geological Society of London (1998–2000), where he had previously been responsible for important decisions on the independent future of its publishing arm that made a vital contribution to the survival of the Society. Finally, he presided over the Geologist's Association (2004–2006). On the international level he was a voting member of the Silurian Subcommittee of the IUGS for many years, and was a Commissioner of the International Commission on Zoological Nomenclature for two decades (1982–2002).

Robin had to cope with health problems that might have deterred a lesser soul. He had successful treatment for a facial cancer in 1984, but the radiotherapy from the procedure inadvertently 'killed' his jawbone, and in 2006 he was given an operation to replace it with an artificial substitute. Unfortunately, the nerves serving to enervate one side of his face were irretrievably damaged during the operation, paralyzing this area. Many secondary problems arose from this unfortunate accident, not least with voice projection, all of which he ignored with great courage. To his friends, he seemed indestructible during his 'retirement' years, when he did not allow any health impediment to interfere with his research: if anything, the brachiopods and palaeogeography served to keep him going.

Robin's contribution to science was recognized by the Geological Society with the award of their Coke Medal in 1995, the Dumont Medal of Geologica Belgica in 2003, and the Lapworth Medal of the Palaeontological Association in 2010. He was awarded an OBE, one of the highest honours in the UK, in 1999. Away from his work, he was a devoted family man. He is survived by his wife Elaine (née Sturdy) whom he married in 1963, his three children and eight grandchildren.

Richard Fortey

Natural History Museum, London, UK

William John Varker **1940 – 2022**

Dr William John Varker, a long-time member of the Palaeontological Association, Yorkshire Geological Society and corresponding and voting member of the International Union of Geological Sciences Sub-commission on Carboniferous Stratigraphy, died in late October 2022, aged 82.

John completed a PhD on conodont faunas and stratigraphy of the Yoredale Series in the Askrigg and Alston regions of the UK under the supervision of Dr Alan Higgins at the University of Sheffield. Following this he joined the staff of the Department of Earth Sciences at the University of Leeds as a Lecturer in Palaeontology, where he continued his work on conodont biostratigraphy. I was John's first PhD student at Leeds and undertook a project on conodont biostratigraphy in the Craven Basin of Yorkshire. I benefited much from John's guidance and support during my PhD and could not have wished for a better supervisor!



Following his PhD, John continued to undertake conodont biostratigraphic and taxonomic research mainly on Carboniferous material. He established the conodont multi-element genus *Syncladognathus* (Rexroad and Varker 1992), building on his work on the conodont 'form' genus "*Apatognathus*" (Varker 1967). He also continued to work on the Yoredale series (e.g. Varker 1968; Varker and Higgins 1979) and on marine bands in the coal measures of northern England.

Reflecting his deep interest in all matters Carboniferous, John was an active participant in Palaeontological Association Carboniferous field meetings in the 1970s and 1980s in Wales, Ireland, England, Germany and Belgium. These meetings brought together Carboniferous stratigraphers and biostratigraphers from around the world to visit important Carboniferous sections, and to network and develop collaboration with colleagues working on Carboniferous stratigraphy and biostratigraphy.

John organized bus tours from Leeds so that eager student and staff participants from the University of Leeds and Carboniferous specialists from the British Geological Survey Leeds Office could economically and socially travel together to enjoy these meetings. The photo below was taken on the PalAss Carboniferous Field Meeting in Belgium, 1974 and shows famous Carboniferous specialists of the day with whom we students interacted and learnt so much from.



William John Varker on the PalAss Carboniferous Field Meeting in Germany, 1981. Photo courtesy of Ian Metcalfe.



Group photo taken on the PalAss Carboniferous Field Meeting in Belgium, 1974. Photo courtesy of Ian Metcalfe.



John was heavily involved with the IUGS Sub-commission on Carboniferous Stratigraphy (SCCS) and spent five years as a voting member on the Working Group for the mid-Carboniferous boundary Global Stratotype Section and Point (GSSP), visiting and conducting research on potential boundary sections in Germany, France, Ukraine, China, Mongolia and several parts of the USA. He conducted substantial conodont work (e.g. Varker 1991; 1993) on the Stonehead Beck section near Cowling, Yorkshire, a candidate for the GSSP which eventually lost out to the Arrow Canyon section in Nevada, USA.

John was a great stalwart of the Yorkshire Geological Society and served on the Society's Council. He served as Assistant Secretary from 1980 to 1984 and General Secretary from 1994 to 1998, and was awarded Honorary Membership of the YGS in 2002. In 2013, John volunteered to serve for a second time on the YGS Council and carried out the role of Membership Secretary from September 2015 to June 2019.

Apart from his university teaching and research, John was also heavily involved in adult education and community outreach. John loved fieldwork and leading field-trips for students and for local geological and natural history societies, which benefited from his extensive geological and local history knowledge. In addition to his scientific interests and prowess, John became well known for his oil on canvas reproductions of paintings by my own favourite artist L. S. Lowry and he was even commissioned by local councils to produce such reproductions for their boardrooms! In his later years, John became interested in the evolutionary history of bees and took up beekeeping, becoming a member of the Sheffield Beekeepers' Association.

John died very soon after the passing of his beloved wife Valerie and long after the untimely death of his son Nicholas. He is survived by his son Jonathon, daughter-in-law Joanne, and grandchildren Matthew, Daniel and Scarlet. He will be sorely missed.

Ian Metcalfe

University of New England, Australia

Acknowledgements

I am grateful to Prof. Paul Wignall, University of Leeds for information.

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Research Grant REPORTS

A chemical clue to an abominable mystery? Chemotaxonomy of basal angiosperm pollen and cuticles

Phillip E. Jardine

Institute of Geology and Palaeontology, University of Münster, Germany

The main aim of this project was to build on recent research that has used sporomorph (pollen and spore) and plant cuticle chemistry as a classification tool, to assess the potential of using this technique for unravelling the early evolution of angiosperms (flowering plants). The specific focus was the ANA (Amborellales, Nymphaeales and Austrobaileyales) grade taxa, which are the earliest diverging crown angiosperms, and therefore key to understanding angiosperm evolution. By analysing pollen and cuticle chemistry from extant representatives of both the ANA taxa and a wider array of seed plants, I wanted to get a better handle on whether we could classify these taxa using their chemical signature, whether there is a phylogenetic signal in pollen and/or cuticle chemistry, and whether one biopolymer or the other would be more suitable for classifying fossil specimens. Associated ideas and questions developed during the early part of the project, partly in response to ongoing research (e.g. Jardine *et al.* 2021), so, in addition to the main objectives, this project presented an opportunity to address a broader set of uncertainties regarding controls on biopolymer chemistry and how we use these data in the fossil record.

One such question is how much climatic and environmental variation impacts on biopolymer chemistry. The more abiotic variation affects the chemical signature of sporomorphs and cuticles, the more challenging it will be to use that chemical information for classification. Conversely, if there is a strong environmental control on biopolymer chemistry, then this could pave the way for new proxies to reconstruct palaeoenvironmental change, as has been done with ultraviolet-B variation (Lui *et al.* 2023).

We decided to address this issue using leaves from *Ginkgo biloba* plants that had been experimentally grown at elevated CO₂ concentrations, to see whether cuticle chemistry would be affected by past atmospheric pCO₂ variations (Jardine *et al.* 2019). Attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopic analysis of leaves grown at 400, 1,200 and 2,000 ppm showed no consistent difference among pCO₂ treatments, suggesting that chemical classification should be possible across changing pCO₂ levels in the past. We did identify differences between the abaxial (lower leaf surface) and adaxial (upper leaf surface) cuticles, and since the ATR analysis of the leaf surface revealed a similar chemistry to previous analyses of isolated cuticles, our results suggested that it is possible to work with intact leaves as a rapid means of assessing cuticle chemistry (Jardine *et al.* 2019).



An outstanding problem in palynology is how we go about removing the cellular contents from fresh pollen and isolating the sporopollenin wall, since this is all that we find in the fossil record. Often this is done with acetolysis, which is a quick and efficient way of removing the non-sporopollenin components of sporomorphs. However, we now know that this leaves a chemical imprint on the resultant sporopollenin (Jardine *et al.* 2021), which leads to the question of how acetolysing sporomorphs impacts our understanding of relative chemical similarities and differences among taxa, and what this means for classifying sporomorphs and quantifying the phylogenetic signal in sporopollenin. So, as a prelude to the main ANA-focused analysis for this project, I carried out some experiments comparing a range of processing approaches and reagents, applied to 15 species from across the vascular plant phylogeny. I found that these different approaches converge on a broadly similar underlying set of chemical relationships among taxa, and a phylogenetic signal in sporopollenin chemistry is supported (that is, more closely related species have on average more similar chemistries). A manuscript on this work has recently been submitted, and all being well it will appear in a journal near you in the not-too-distant future.

For the main analyses of this project – analysing pollen and cuticle chemistry, with a focus on the ANA taxa but with a broader range of angiosperms and gymnosperms included as well – most of the sample collection took place back in 2019. I spent an enjoyable few days sampling pollen from plant specimens at the Herbarium Hamburgense in Hamburg, Germany, as well as making regular trips to botanical gardens of the universities of Münster and Bonn to collect pollen and leaves. Travel disruption caused by the COVID-19 pandemic meant that I could not, as planned, travel to the University of Nottingham, UK, to analyse all of this material myself, but happily Matt Kent took on the challenge of running the pollen samples at Nottingham, while I have been analysing the leaves using the ATR-FTIR at the University of Münster. For various reasons, including me being committed to other projects over the last couple of years, the data generation for this project is only just nearing its end. However, preliminary analysis of the data that have been generated suggests clade-based groupings in both pollen and cuticle chemistry (Figure 1), with the potential to discriminate between angiosperms and gymnosperms and subclades within them.

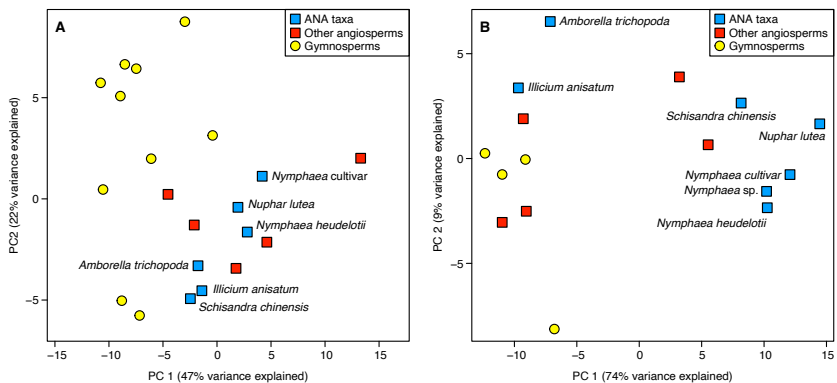


Figure 1. Principal Components Analysis scatterplots of the preliminary FTIR datasets. A) pollen; B) leaves. For clarity, only the points representing ANA taxa are labelled in the plots.



On this cliffhanger I'll wrap up this report, but at least this project is now on its way to completion, and the resultant three papers are hopefully an acceptable set of outputs for this grant. The early part of the project, including the herbarium and botanical garden sampling, and thinking about phylogenetic controls on biopolymer chemistry, led to development of the DFG grant that has been keeping me gainfully employed and busy for the past three years, so I also consider that a very positive outcome from doing this work.

Acknowledgements

Thanks to the Palaeontological Association for the funding (grant number PA-RG201802) and patience, and to Barry Lomax, Matt Kent, Wes Fraser and Klaus-Holger Knorr for collaborating on this research.

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Harnessing the power of the Metabolic Index for palaeontological studies

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In his classic analysis of the Phanerozoic fossil record, Sepkoski (1981) categorized marine metazoan diversity into three great evolutionary faunas: the trilobite-dominated Cambrian fauna; the brachiopod-dominated Palaeozoic fauna; and the mollusc-dominated Modern fauna. The increased diversity associated with the expansion of each new fauna coincides with a decrease in diversity of the preceding fauna. Although a causal mechanism driving these faunal turnover events remains elusive, they coincide with periods of widespread environmental perturbations, especially during the end-Permian mass extinction, which saw the demise of the Palaeozoic fauna. The taxonomic selectivity at the end-Permian extinction has led to the hypothesis that the kill mechanism was likely physiological in nature, with hypercapnia (the physiological effects of elevated pCO₂) emerging as a top candidate (Knoll *et al.* 2007).

Two recent lines of evidence, however, have brought the role of hypercapnia and/or ocean acidification during the end-Permian extinction (and other mass extinctions associated with the 'deadly trio' of global warming, de-oxygenation and ocean acidification) into question. First, meta-analyses of multiple stressor experiments on modern marine organisms have suggested that the negative biological effects of elevated CO₂/ocean acidification are relatively minor compared to



de-oxygenation, warming, and the synergistic interaction of warming and low oxygen (temperature-dependent hypoxia) (Reddin *et al.* 2020; Sampaio *et al.* 2021). Second, an ecophysiological investigation into the end-Permian mass extinction shows that temperature-dependent hypoxia could explain the biogeography of this mass extinction, and that the magnitude of the extinction could largely be generated by oxygen loss and warming alone (Penn *et al.* 2018). That study used theoretical ecophysiotypes generated from probability distributions of laboratory-measured physiological traits (mainly on the Modern fauna). Thus, while temperature-dependent hypoxia can currently explain the biogeography and severity of the extinction, it cannot account for the clear physiological and taxonomic selectivity.

The Palaeontological Association Research Grant funded new respirometry experiments to compare the aerobic physiologies of extant representatives of the Palaeozoic fauna and the Modern fauna. Our goal was to determine whether differences in their aerobic physiologies can largely explain the differences in extinction selectivity during the end-Permian mass extinction. Using the 'Metabolic Index' framework (see Penn *et al.* 2018; Stockey *et al.* 2021) we analysed the minimum oxygen concentration required for animals to maintain their standard metabolic rate (known as *Pcrit*). These experiments used custom respirometry chambers designed for organisms like brachiopods with low metabolic rates (Figure 1); these represent, to our knowledge, the first *Pcrit* measurements for palaeontologically relevant organisms like brachiopods and crinoids.



Figure 1. A) Stanford researchers Kyra Anderson and Kemi Ashing-Giwa set up experimental respirometry chambers for brachiopods at the University of Washington Friday Harbor Laboratories, USA. B) Close-up of experimental chamber. The chamber has a double-hulled construction, allowing temperature-controlled water to circulate through the middle volume. The internal chamber (holding articulate brachiopod *Terebratalia transversa*) has a false floor with a stir bar underneath to enable water mixing. Standard metabolic rate and the minimum oxygen level required to maintain standard metabolic rate were measured for multiple individuals at multiple temperatures, allowing us to compare physiological traits between extant members of the Paleozoic and Modern faunas.



We measured *Pcrit* for multiple individuals across multiple temperatures, which allowed us to calculate the parameters of the Metabolic Index, specifically hypoxia tolerance and the temperature sensitivity of that oxygen requirement. Although our work was affected by COVID-19, we were able to conduct analyses at the University of Washington Friday Harbor Laboratories, Hopkins Marine Station, and our home lab at Stanford University, USA. Overall, we have completed detailed respirometry measurements from four sea urchins, one crinoid, two asteroids, two ophiuroids, three brachiopods, four gastropods, five bivalves and two sea anemones.

The data show clear physiological differences between extant representatives of the Palaeozoic and Modern faunas. Specifically, the Palaeozoic fauna shows a greater tolerance for hypoxia, but they are also more vulnerable to changes in temperature than members of the Modern fauna. We then tested these results using an independent biogeographic dataset that was derived from mapping the oxygen-temperature conditions of >400 species' range data as described in the field guide *Beneath Pacific Tides* (Jensen *et al.* 2018). We found similar patterns of temperature-dependent hypoxia tolerance as with the direct respirometry experiments. Overall, these analyses suggest that aerobic physiological differences may explain extinction selectivity during the end-Permian mass extinction. Next steps will focus on re-running the analyses of Penn *et al.* (2018) to model responses of the Palaeozoic and Modern faunas to environmental change during this event and comparing these model results with the fossil record.

These analyses are currently in preparation for publication by Stanford University graduate student J. Andres Marquez, who is leading that project. This grant also helped fund new analyses on the purple sea urchin *Strongylocentrotus purpuratus* which led to development of an absolute version of the Metabolic Index (more suitable to studying cooling events in the fossil record) and the first exploration of how *Pcrit* varies across ontogeny and biogeography. These manuscripts are currently in review and were led by Stanford University postdoc Dr Murray Duncan, now a professor at University of Seychelles.

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Small Grant REPORTS

A new and unique Kem Kem beds (mid Cretaceous) locality near the oasis of Tarda, southeastern Morocco

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Introduction

The mid Cretaceous Kem Kem Group of Morocco (?Albian – Cenomanian) (Ettachfni and Andreu 2004; Ibrahim *et al.* 2020), represents a dominantly fluvial environment (Ibrahim *et al.* 2020) with a diverse but biased vertebrate taphocoenosis (Smith *et al.* 2023). The assemblage includes elasmobranchs, osteichthyans, turtles, crocodyliformes, dinosaurs (theropods and sauropods but, surprisingly, no ornithischian body fossils) and ornithocheirid and azhdarchoid pterosaurs (Ibrahim *et al.* 2020; Smith *et al.* 2023 and references therein). The dinosaur assemblage, for which the deposit is world-famous, is dominated by large predators including the giants *Spinosaurus* and *Carcharodontosaurus*. The lack of ornithischians is particularly intriguing (Lang *et al.* 2013), and likely due to taphonomic factors as yet not fully understood. Despite the lack of ornithischian body fossils, several footprints have been assigned to Ornithopoda by Ibrahim *et al.* (2014). A new Kem Kem Group fossil site near the remote oasis of Tarda, Errachidia Province in the southeast of Morocco was discovered during fieldwork in the early spring of 2019. This new site has an abundance of dinosaur footprints preserved as three-dimensional casts, some of which can be tentatively assigned to ornithopods, as well as theropods and sauropods. Preliminary investigation revealed several vertebrate-rich horizons above the footprint-bearing beds. One horizon comprised a micro-vertebrate-rich sand with fish, shark, dinosaur and pterosaur remains collected.

Of particular note at this new locality is a distinctive stratigraphic sequence that differs radically from that seen in all of the 'classic' Kem Kem Group localities elsewhere in the Tafilalet Basin and adjacent areas where the Kem Kem Group is exposed (*e.g.* southern thrust belt of the Atlas Mountains). In particular, an alternating sequence with sharp boundaries of clays and medium sandstones is persistent for at least 7 m of the section, with a notable thickening upwards of the sandstones. This sequence may represent a unique lacustrine phase within the basin, a hypothesis that requires testing by sediment sampling, section logging and outcrop mapping. This project aimed to investigate and describe the sedimentological and palaeontological aspects of this unique Kem Kem Group locality.

Methods and preliminary results

Joint fieldwork by the University of Portsmouth, UK and Université Hassan II de Casablanca, Morocco, along with the assistance of a colleague from Sapienza University of Rome, Italy, was

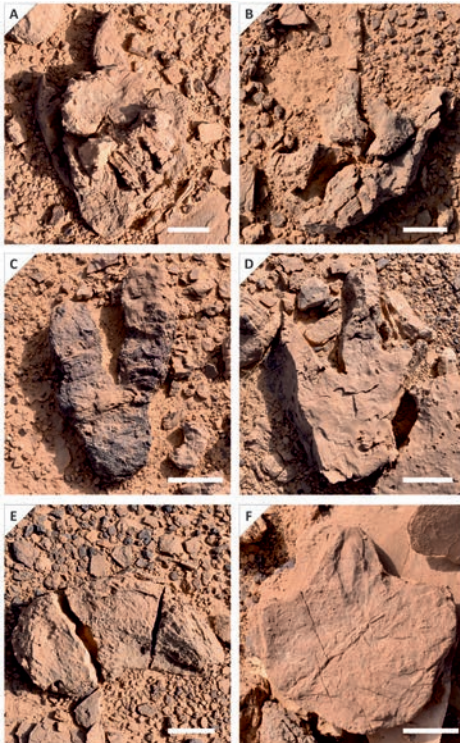


undertaken at the Tarda site in November 2022 after a lengthy wait due to COVID-19 travel restrictions (Figure 1). The footprint site was mapped using a DJI Inspire 2 drone which took approximately 600 photographs at a height of 25 m. The photographs were processed in Agisoft Metashape to produce a photogrammetric model of the area. Other dinosaur prints were mapped, measured and photographed manually. A representative sample of footprints were collected and accessioned to the collection of the Faculté de Sciences Ain Chock (FSAC) at the Laboratoire de Géosciences, Université Hassan II de Casablanca. The microvertebrate-bearing unit was sieved to extract fossil vertebrate remains for future identification and systematic description.

At least six footprint morphologies were identified including three distinct theropod morphotypes, tridactyl prints with possible affinities to Ornithopoda and manus and pes sauropod prints (Figure 2). Most footprints were randomly distributed but some were in distinct trackways including a sauropod trackway which extended for several hundred metres and was likely from a very large to gigantic animal.



Figure 1. The author delighted to have found a possible ornithopod foot cast at the Tarda oasis site during November 2022 fieldwork. © Roy Smith.



Upcoming analyses

Analysis of the drone data is ongoing in order to fully map the footprint site and determine the length of some of the sauropod trackways. Size estimates for the sauropod tracks are still to be completed, in particular comparisons with trackways and isolated tracks of giant sauropods in Australia, Mongolia and Spain (e.g. Thulborn 2012).

Figure 2. A selection of dinosaur footprints from the Kem Kem Group at the Tarda oasis site. A-D theropod footprints; E, a sauropod manus print; F, a footprint with possible affinities to Ornithopoda. Scale bars are 100 mm. © Roy Smith.



Acknowledgements

This project was made possible by the Palaeontological Association's Small Grants Scheme (Callomon Award PA- CA201901). I would like to thank my colleagues Prof. Samir Zouhri (Université Hassan II de Casablanca), Prof. David M. Martill and Dr Nizar Ibrahim (University of Portsmouth, UK) and Dr Gabriele Bindellini (Sapienza University of Rome, Italy) for assistance with fieldwork and the processing of drone data.

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First plesiosaur from the early Cretaceous of Arctic Canada and the biogeography of marine reptiles during the J–C transition

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Introduction

In 1952, a Danish geologist found a fossil plesiosaur at Ellesmere Island (Nunavut, Canada), and brought it to Copenhagen, Denmark for preparation (Troelsen 1952). During the Jurassic–Cretaceous interval, the present Ellesmere Island was part of the Sverdrup basin, which linked the European and North American portions of the Arctic Sea (Balkwill 1978; Schneider *et al.* 2020). This specimen thus offers an opportunity to address the relationships and biogeographical patterns of marine reptiles across the Jurassic–Cretaceous transition in the Arctic. However, when it was understood what this specimen could contribute, it had to be relocated. It had stayed in the Natural History Museum of Denmark collections in Copenhagen for many years, split into several units, and was affected by a flooding some years back. Some parts had been taken in and out for labelling or



study, but the specimen was never formally described. The aim of this project was to assemble and describe the plesiosaur and compare it to occurrences of marine reptiles from Europe and the Americas.

Assembling the pieces

Work in the collections in Copenhagen by the curators and myself made it possible to assemble the parts of the skeleton. In addition to several containers located by the curators in two different locations in the off-site storage facility (Figure 1), an additional set of skeletal elements was found in the Zoological Museum, housed in downtown Copenhagen. These were mis-labelled as a ‘Scoresbysund plesiosaur’ but are now confirmed to belong to the plesiosaur from Ellesmere Island. After being reassembled, the specimen (NHMD 189834) was studied, photographed and measured. Plesiosaurs in the Smithsonian National Museum of Natural History, USA and the Natural History Museum of Oslo, Norway were studied for comparison.



Figure 1. Two of the boxes with plesiosaur fossils from Ellesmere Island that were located and unpacked in the collections of the Natural History Museum in Copenhagen as part of this project.

Preliminary results and discussion

The plesiosaur preserves all four propodials (Figure 2), some flipper and girdle elements, 22 vertebrae and many ribs. The elements are three-dimensional, and many preserve surface details, but there are also weathered and incomplete elements. Our results suggest that the plesiosaur belongs to the long-necked, small-skulled plesiosaur family Cryptoclididae (Callovian–Hauterivian), which together with pliosaurids replaced rhomaleosaurids and microcleidids in the Middle–Late Jurassic.

Palynostratigraphy had been performed in advance of this study and ascertained the age of the plesiosaur as Berriasian–early Valanginian, originating from the Deer Bay Formation. Generally, macrofossils from this formation are rather scarce. This has been hypothesized to result from adverse taphonomy and diagenesis as well as human collection bias, or from the Sverdrup Basin being relatively isolated at the time (Mutterlose *et al.* 2019). However, there are good opportunities for investigating the basin, due to high-quality outcrops. The continuous Rollrock section holds fossils from several organism groups (Mutterlose *et al.* 2019; Schneider *et al.* 2020; Ingrams *et al.* 2021), offering an opportunity to study Jurassic–Cretaceous turnover at different ecosystem levels.



Tectonic activity and eustatic sea level fall toward the end of the Jurassic caused provincialism in marine reptiles, with a separation of Tethyan and Boreal faunas. This trend was reverted during the Late Valanginian, when a rising sea level promoted a more cosmopolitan fauna (Mutterlose *et al.* 2003). Cryptoclidids are known from the UK, Spitsbergen, USA, Russia, and possibly Argentina and Cuba (Roberts *et al.* 2017). Some taxa presumably had a circum-Arctic distribution, but phylogenies also suggest ties to South American and European taxa, and specimens from connecting areas are needed to establish whether marine reptile distribution patterns were controlled by climate (Foffa *et al.* 2018). The specimen from Ellesmere Island is the only comprehensive plesiosaur known from the Sverdrup basin. The specimen is contemporaneous to the Slotsmøya Member Lagerstätte, Spitsbergen (Delsett *et al.* 2016). Together, these finds fill a stratigraphic gap between Mid–Late Jurassic taxa from Europe and Early–Late Cretaceous ones from North America. The results from this project are currently being prepared for publication.

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Figure 2. One out of four preserved propodials from the Ellesmere Island plesiosaur (NHMD 189834). Scale bar is 50 mm.



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Undergraduate Bursary REPORT

A new crocodylomorph specimen from the early Eocene of Morocco and the phylogenetic relationships of Dyrosauridae

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Introduction

Dyrosauridae is an extinct family of Neosuchian crocodyliforms that were mainly aquatic and inhabited marine and coastal environments (Jouve *et al.* 2008; Hastings *et al.* 2011). Members of Dyrosauridae survived the end-Cretaceous (K-Pg) extinction event at 66 Ma, partly due to niche partitioning, where they show high diversity and morphological differences that may have helped reduce diet competition between individuals (Hastings *et al.* 2011; Jouve *et al.* 2021). The earliest dyrosaurids are known from the Campanian (83.6–72.1 Ma) of the Late Cretaceous, and survived until the middle–late Eocene (47.8–33.9 Ma) (Brochu *et al.* 2002; Jouve *et al.* 2005; 2021). Of the two described species in the genus *Dyrosaurus*, *D. phosphaticus* is known from phosphatic deposits in Tunisia dated to the Palaeocene (66.0–56.0 Ma) (Arambourg 1935;1952), whereas *D. maghribensis* is known from phosphatic deposits in Morocco, from the Ypresian, early Eocene (56.0–47.8 Ma) (Jouve *et al.* 2006). This report describes new Dyrosauridae material (NHMUK PV R 36759) from the Ypresian of Morocco. Phylogenetic analysis has been conducted in order to assess whether NHMUK PV R 36759 can be considered a separate species, or if the material belongs to *Dyrosaurus maghribensis* (Jouve *et al.* 2006).

Methods

In order to describe NHMUK PV R 36759, measurements of all the visible features in the specimen (Figure 1) were taken and recorded. Previously published papers allowed comparisons between NHMUK PV R 36759 and Dyrosauridae. The dataset used for phylogenetic analysis consisted of 41 taxa (Jouve *et al.* 2021). A time-scaled tree was then created using RStudio (R Core Team 2022), using Cal3.

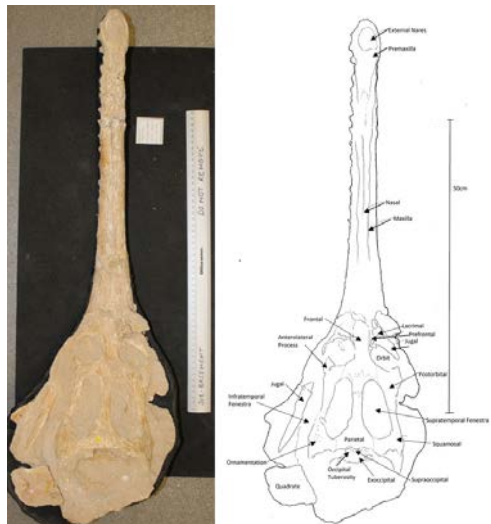


Figure 1. NHMUK PV R36759 in ventral view and corresponding line drawing, with key features labelled, drawn using Procreate.

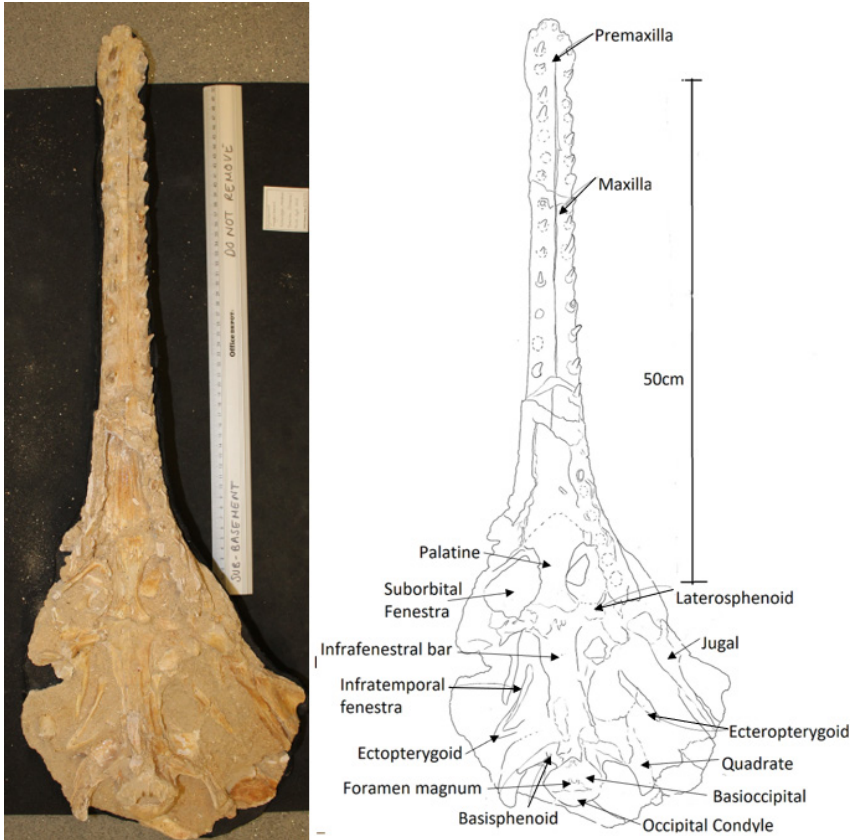


Figure 2. NHMUK PV R36759 in dorsal view and corresponding line drawing, with key features labelled, drawn using Procreate.

Results and discussion

NHMUK PV R36759 description

The dyrosaurid material (Figures 1 and 2) consists of a skull, lower jaw, and thoracic region separated into three blocks. The features are confined to a matrix of soft, fine-grained, phosphatic sand, and, as such, the fenestrae and any cranial openings are filled with sediment. The specimen is well preserved, with limited distortion in the cranial and postcranial portions; however, parts of the posterior and lateral-most portions of the skull, such as the quadrate and jugals, as well as the posterior-most portion of the post-cranial skeleton, are missing.

Phylogenetic analysis

NHMUK PV R36759 has been assigned to *Dyrosaurus* new spp., based on its shared synapomorphies with other species of the genus, such as: an elongated, tubular rostrum (snout proportions); and a T-shaped interfenestral bar. Comparisons of NHMUK PV R36759 with previously described dyrosaurids show differences in morphology that motivate its new taxonomic placement, such



as: oblique skull roof margins; distinct convex curve laterally at the level of the supratemporal fenestrae and more concave curve posterior to it; smaller alveolar space between D2 and D3 teeth than D3 and D4; enlarged D3 and D4; and an anterodorsally, rather than anteriorly, oriented D1.

NHMUK PV R36759 was catalogued as a specimen of *Dyrosaurus maghribensis* but the phylogenetic analysis places it as an outgroup to the two *Dyrosaurus* species and later branching than the sister taxa *Arambourgisuchus khouribgaensis* (Figure 3). This suggests a larger African clade, encompassing *Dyrosaurus maghribensis*, *Dyrosaurus phosphaticus*, NHMUK PV R36759, and *Arambourgisuchus khouribgaensis* that may include more members.

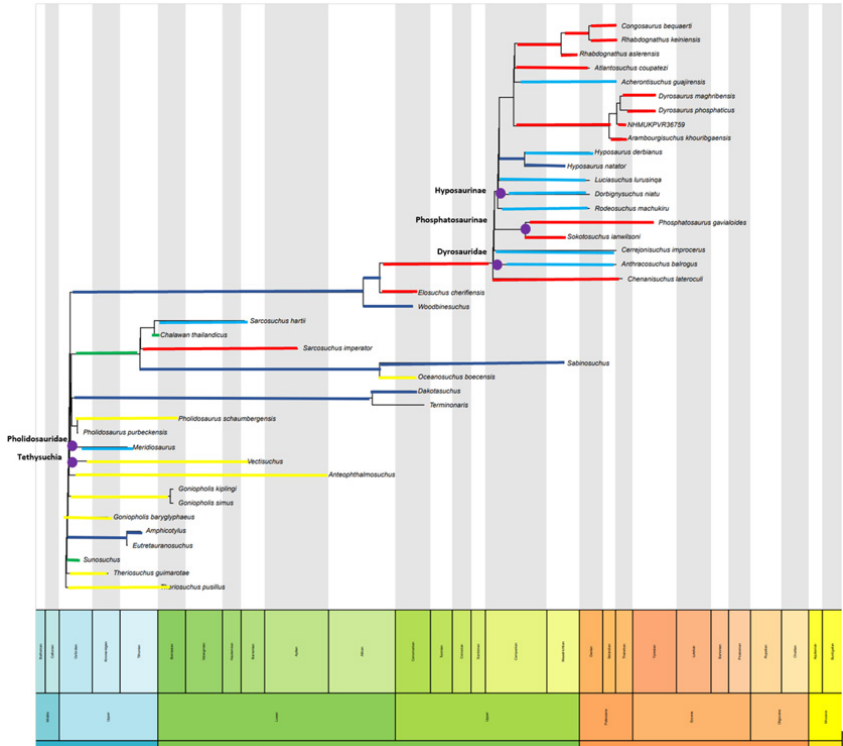


Figure 3. Time-scaled phylogenetic tree of 41 taxa against the ICC time periods, produced in RStudio, using the package 'strap' (Bell and Lloyd 2015). The biogeographic data from BioGeoBEARS (Fig. 3) has been combined with the time-scaled tree from Cal3 analysis.

Conclusion

NHMUK PV R36759 possesses two synapomorphies unique to the genus *Dyrosaurus* which include: long and narrow snout taking up 73–75 % of the total skull length; and a T-shaped interfenestral bar. The specimen differs from existing species of the genus *Dyrosaurus* in the following characters: oblique skull roof margins; distinct convex curve laterally at the level of the supratemporal fenestrae and more concave curve posterior to it; smaller alveolar space between D2 and D3 than D3 and D4; enlarged D3 and D4; anterodorsally, rather than anteriorly, oriented D1, which motivate the



placement of NHMUK PV R36759 as a new species. The phylogenetic tree saw similar relationships to the analysis run by Jouve *et al.* (2021), with support for Dyrosauridae, Phosphatosaurinae and Hyposaurinae. The placement of NHMUK PV R 36759 as an outgroup to *Dyrosaurus* and sister taxa to *Arambourgisuchus khouribgaensis* has implications for the diversity of dyrosaurids in the Eocene of Africa.

Acknowledgments

I am grateful to the Palaeontological Association for the Undergraduate Research Bursary (PA-UB202101). Major thanks to Philip Mannion for supervising and guiding me through this project. For access to the specimen used in this project I would like to thank all the staff at the Natural History Museum, London, who made me feel very welcome, but especially Susie Maidment who arranged visits for me. I want to thank Cecily Nicholl for her help with morphological identifications and general feedback on characters. I'm also extremely grateful to Sebastian Groh who put up with my many questions and frustrations with RStudio analysis.

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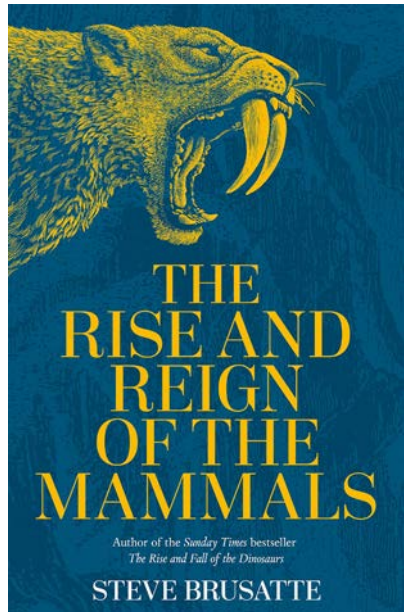
Reviews



The Rise and Reign of the Mammals

Steve L. Brusatte, 2022, HarperCollins, £20.00, ISBN: 9780063242081.

Steve Brusatte's first book, *The Rise and Fall of the Dinosaurs*, has received critical acclaim as a debut masterpiece, and since reading it I have been eagerly awaiting *The Rise and Reign of Mammals*. Upon receiving the hard copy in the post, I first noted the impressive jacket art. In gold metallic detail is one of the most famous prehistoric mammals; the sabre tooth cat in the classic pose, bearing its remarkable dagger-like canines. This cover is vivid, and re-appointing Andrew Davidson and Todd Marshall in its design means that Brusatte's novels complement each other on the bookcase. Marshall is also once again commissioned for decorative chapter headings and supplementary artwork which add an eloquent pictorial dimension to the book. Brusatte's former student, Sarah Shelley, also contributes informative and educational diagrams that are useful in illustrating concepts that are hard to conceive in one's mind – for example, the repurposing of the jawbone to become our inner ear bones!



Brusatte starts his book in the Permian Era, tracking the evolutionary split of ancestral tetrapod vertebrates into two groups; the synapsids and the diapsids. The diapsids gave rise to reptiles such as crocodiles and snakes while the early synapsid proto-mammals eventually gave rise to us. From here, the book focuses on the evolutionary history of ancient mammals during the time of dinosaurs and their major diversification after the Chicxulub impact. Significant effort is placed into describing the Earth-wide climate cataclysms, such as the shifting of the continents and major extinctions driven by volcanic eruptions, an asteroid strike, sea level rises and ice ages that mammals have endured. Brusatte transitions smoothly from this global perspective to the detailed analysis of tiny dental and skeletal developments to emphasise that over the course of some hundred million years, archaic mammals survived such upheavals as a result of numerous lineages evolving and piecemeal developing the traits we recognize as mammalian today. These adaptations include milk production, temperature regulation, hair, bigger brains and stable locomotion.

The book then touches upon the intersection of molecular biology with palaeontological research in recent years. Brusatte details the significance of DNA-based genealogies in bringing resolution to long-standing evolutionary debates on mammalian ancestry and migration. Finally, we are led to the arrival of mammals today. There are details on the evolution of bats, whales, mammoths



and the homo lineage. Modern humans are afforded a brief portrayal to highlight what a small part of global history we are and yet how unfairly large our impact has been. Turning away from the strange twists, the turns of fate, and the apocalyptic destruction that dictated our evolutionary history, Brusatte closes with sobering remarks regarding our ethical and moral responsibility to reduce our global impact and preserve our diverse planet. A message which resonates deeply upon completion of a book that induces an intimacy with our mammalian family that is, perhaps, lost in everyday life.

Throughout the book, there is a genius balance between descriptive story-telling and examinations of scientific concepts. Each chapter begins with a fictional tale of fascinating species and environments lost to the passage of time, which enriches the reader's understanding and appreciation of the later factual aspects. As in *The Rise and Fall of the Dinosaurs*, Brusatte interweaves numerous personal anecdotes and introduces many fellow scientists – past and present – in the story of mammal evolutionary research, which makes complex scientific techniques feel more relevant and relatable to every audience. Pioneers such as Amusuya Chinsamy-Turan and Ornella Bertrand are introduced at the forefront of modern research and renowned scientists such as Zofia Kielan-Jaworowska, Robert Broom and Walter Kühne are revered for their discoveries in the face of past adversities. Even the bibliography reads as an engaging scientific account. Rather than a stereotypical list of citations used to write this book, the cited literature is further recommended, debated, refuted, clarified and detailed in an informal review that adds depth to the main narrative.

Despite the book navigating some complex research and evolutionary processes, Brusatte makes this material accessible to scientist and layman alike with his clear and friendly prose. This book is a highly engaging work of popular science which convincingly shows that the evolutionary story of mammals is just as fascinating as that of the dinosaurs. Overall, *The Rise and Reign of the Mammals* is a fascinating, informative and highly entertaining read!

Holly Smith

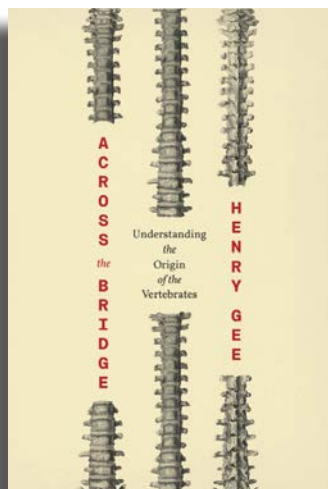
Holly is a palaeontologist, taphonomist and geologist based in Durham, UK. She is shamelessly plugging herself here as currently applying for academic jobs and post-docs as she recently graduated her PhD! She can be found on twitter: @pa1aeophd

Across the Bridge: Understanding the Origin of the Vertebrates

Henry Gee, 2018, The University of Chicago Press, £23.00,
ISBN: 9780226403052.

When Thomas asked me to write this book review, I gladly accepted. It was flattering to learn my opinion might be worth something, especially to my esteemed colleagues in the PalAss. However, I soon realized that this review is a double-edged sword. Henry Gee, after all, is a senior editor of *Nature*. I certainly don't want to be remembered as the person who trashed one of his popular science books. So it is with no small amount of trepidation that I began this review...

Across the Bridge: Understanding the origin of the Vertebrates is a 2018 book by Henry Gee, which presents a synthesis of developmental, palaeontological and phylogenetic evidence concerning the origin of vertebrates from invertebrate ancestors. It is a fascinating subject that merits attention. Indeed, this is not the first time Gee has written about it; his 1996 book *Before the Backbone* explored similar themes. This book acts as a sequel of sorts and is meant to complement, rather



than supplant, Gee's earlier work. I haven't read *Before the Backbone* so *Across the Bridge* will have to stand on its own merits, at least in this review.

Across the Bridge is presented unabashedly as Gee's personal synthesis, rather than a conservative review of the scientific literature. The reader is forewarned in the preface that some of Gee's views, in particular interpretations regarding some Cambrian fossils, may be controversial. This allows Gee to present some interesting ideas and I think it benefits the overall structure of the book. Gee introduces the reader to the morphological and developmental "chasm" separating invertebrates from vertebrates and then builds his synthesis as the titular bridge, to guide the reader across this chasm. In this he is successful, even if the bridge, by his own admission, is a bit shaky in places.

Across the Bridge is not overly long, amounting to just over 200 pages excluding the chapter notes. But it is dense. This is partly a necessity of the subject matter. Understanding evolutionary developmental hypotheses of vertebrate origins requires substantial phylogenetic, embryological and anatomical background knowledge. These disciplines have their own specialist terminology, which is difficult to avoid and also requires explanation. As such, the beginning of this book feels a little like an uphill battle in which Gee attempts to bring his readers up to speed. It is difficult to evaluate how successful he has been in this respect. Personally, I found the introduction to phylogenies quite easy to follow, whereas the embryological introduction was quite a slog. That said, I have spent considerably more time in my career thinking about phylogenies than development. In the preface, Gee indicates that *Across the Bridge* is written to be accessible for students. Given my experience, I'd guess that it is considerably more accessible to biology students than it is to those of a more geological or palaeontological persuasion.

The book is split into 15 chapters, each ending with a short summary of the main ideas. This is a welcome addition for the reader, allowing time to chew over the denser sections. It also made reviewing this book considerably easier! Chapter 1 introduces the main characters; vertebrates, tunicates, cephalochordates, hemichordates and echinoderms. Specific attention is given to tunicates here, exploring the surprising fact that these unassuming tissue sacks, rather than the fish-like cephalochordates, are, in fact, vertebrates' closest cousins. The basic principles of phylogeny and embryology are outlined in chapters 2 and 3 respectively. Chapters 4 to 10 take a more thorough look at the anatomy and embryology of the living deuterostome groups introduced previously. The reader is then briefly introduced to some putative deuterostome associates in chapter 11, namely chaetognaths and Xenoturbella. Chapters 12 and 13 get into the meat of the matter. Chapter 12 provides an evolutionary developmental perspective on the origin of key vertebrate systems and reviews two of the most influential hypotheses of vertebrate origins: the 'new head hypothesis' outlined by Gans and Northcutt, and Romer's 'dual animal hypothesis'. Chapter 13 looks inward and considers the evolution of fundamental vertebrate visceral organ systems such as the nervous system, urogenital system and the adaptive immune system. In chapter 14, fossils enter the fray. The reader is introduced to some notorious problematica,



including cambroernids, vetulicycstids, vetulicolians, yunnanozoons and other “squished slugs”. Finally, in chapter 15, these separate lines of evidence are drawn together into a singular narrative, rationalizing the evolutionary sequence through which the complex vertebrate body-plan was assembled.

As I mentioned before, this book was published back in 2018 (I hasten to add that while I have taken my sweet time with this review, I have not, in fact, been reviewing it for the last four years!). In the meantime, our understanding of the phylogeny of deuterostomes has changed fairly dramatically. In particular, a study by Kapli *et al.* (2021) questions the validity of deuterostomes, pointing out that the molecular support for the clade is equivocal. I was acutely aware of this fact as I read *Across the Bridge*. Of course, I'm not expecting Gee to have predicted the future. Rather, I want to point out that Gee's approach in *Across the Bridge*, much like this book review, is a double-edged sword. By presenting his personal synthesis, Gee is able to construct an engaging and thought provoking narrative. Yet this narrative is built upon scientific assumptions that seem a lot less robust than they did back in 2018. It left me wondering whether Gee's beautiful synthesis will ultimately be slain by ugly facts. Will the titular bridge look even more shaky in another four years? Maybe Gee will shore up its supports with a revised edition? Time will tell.

So what do I make of *Across the Bridge*? Well it might be a bit dense in places, and it's not quite the current synthesis it used to be, but I can't deny that it is engaging. Reading this book inspired part of a fellowship application draft and prompted me to sign up to the “Fossils, Phylogenies, Genomes, Embryos & the Evolution of the Deuterostomes” meeting at the Natural History Museum, London last May. In short, it got me thinking, which is a noble goal for any good science book. This is really a fascinating subject and Gee provides a broad synthesis, integrating embryology, phylogeny and palaeontology in an intuitive and satisfying way. If you have any interest in the origin of animals or the evolution of development, I would recommend it wholeheartedly.

Joe Keating

Joe is a postdoctoral research associate at the University of Bristol, UK working in the Benton lab on morphological evolution. He can occasionally be found looking for old fish in welsh ditches, or on Twitter: @evopa1aeo

Skeletons: The Frame of Life

Jan Zalasiewicz and Mark Williams, 2018, Oxford University Press, £18.99, ISBN: 0198802102

Question: what is it that links trilobites, Terry Pratchett and tumbleweeds?

The answer lies in a fascinating book entitled *Skeletons: The Frame of Life* by palaeobiologists Jan Zalasiewicz and Mark Williams, both from the University of Leicester, UK. The premise of the book is simple: looking back through time to when skeletons began to appear in lifeforms. The authors delve very deeply indeed, travelling from the Cambrian Explosion up to more or less the present day, casting their net wide in the species they discuss.

Beginning as mentioned in the Cambrian, the authors discuss at length exoskeletons from species such as *Lapworthella* (named after geology great Charles Lapworth) and *Nidelric*, one of many



animals that make up the catch-all group ‘small shelly fossils’. Also mentioned in detail is the glorious *Wiwaxia* with its “punk-style haircut” of an exoskeleton, as well as the aforementioned trilobites in all of their varied glory.

The next obvious step is endoskeletons, which is where the next chapters duly take us. The authors gather together animals such as sharks, echinoderms and us humans and discuss the evolutionary steps that created an internal structure, rather than the ‘armour-plating’ of exoskeletons.

Refreshingly, the book doesn’t simply start at the beginning and plod its way through each time period; rather, it dips into various other avenues and takes the reader on a quite pleasing, never dull journey though skeletons in all of their forms. This includes, rather intriguingly, plants and their ‘skeletons’ as such, from tree trunks right the way through to so-called ‘moving plants’ (hence tumbleweeds), in a way that really does make you think.

Size is also discussed, with chapters headed “Mega-Skeletons” and “Mini-Skeletons”, where we learn about the evolution of animals such as corals and dinoflagellates (and several in between). There is also a chapter on flying animals, which begins with a winged arthropod called *Rhyniognatha hirsti* and finishes with bats by way of pterosaurs and *Archaeopteryx* (a favourite of this reviewer).

The book wraps up with a chapter called “Skeletons on Alien Planets”, which discusses everything from the Curiosity Rover on Mars (a human-built skeleton) to American president Bill Clinton’s excited announcement of the discovery of fossilized bacteria in a Martian meteorite (sadly later debunked), before briefly introducing the concept of possible Martian stromatolites. It then ends on a philosophical note, questioning whether, somewhere out in the universe, another race is in the process of creating skeletons made of metal, able to withstand the pressures of life on another planet.

Skeletons is a superb, highly enjoyable book on what is admittedly a rather niche subject. It is packed with scientific facts that would be familiar to anyone with an undergraduate level of education in the subject area, but is written in a way that the average layperson with an interest in palaeontology or evolution would understand. It also reads as somewhat of a palaeontological history of skeletal discoveries, which was very informative and engaging. Perhaps the most delightful aspect of the book is that the humour of the authors shines through in their writing; several times this reviewer laughed out loud at their descriptions or anecdotes (hence – finally – the link to Terry Pratchett, who is mentioned by name). Highly recommended.

Melanie Brehaut

Melanie is a mature student studying for an undergraduate degree in Geology with The Open University in the UK. An Aussie who has lived in Northern Ireland for over twenty years, she loves rocks, horror movies, books and her cat Nergal.





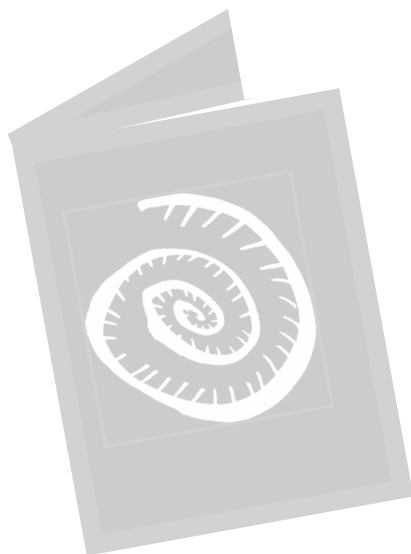
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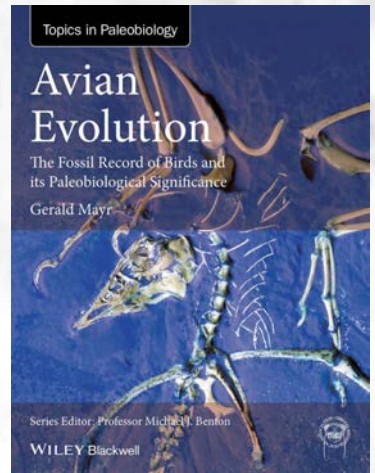
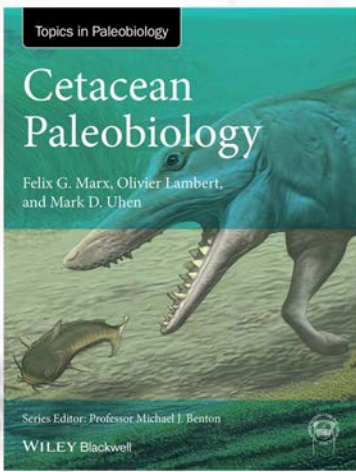
We are often approached by publishers to review books, and normally Thomas passes these on to appropriate reviewers. But, we are always looking for new reviewers – so if you are interested in reviewing a book, or you have some media you would like to review, please contact Thomas and we can find the right project for you! e-mail: <bookreview@palass.org>.

As it happens, and rather amazingly, we have no books awaiting review at the moment as everything we have is out with reviewers! There will be more soon.

Dr Thomas Clements

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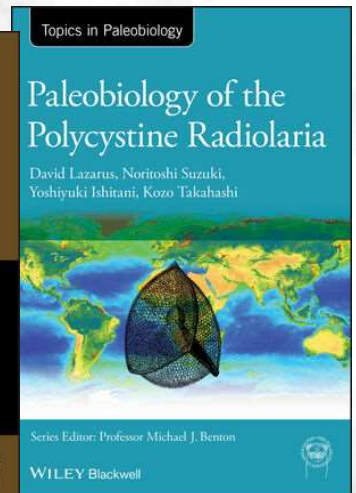
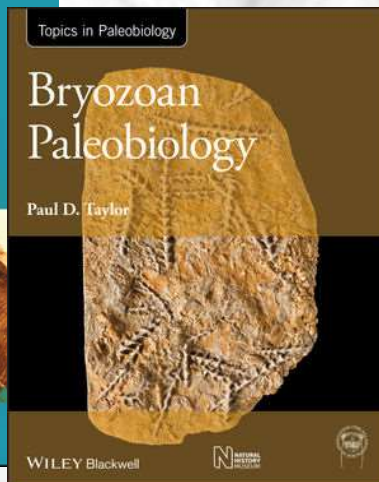
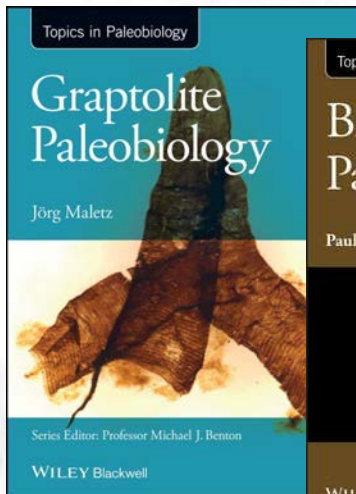




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Careers Q & A

Professional palaeontologists in the wider world

Elisa Guasti completed her PhD (2002–2005) on palaeoenvironmental changes based on planktic foraminifera and organic dinocysts in the Southern Tethys at the University of Bremen in Germany. Afterwards, she moved to work in industry as a (bio)stratigrapher for Fugro Robertson in North Wales (2005–2007), then at the Applied Research Dutch Institute (TNO) in the Netherlands, and later at NAM/Shell (2012–2016). She then switched career trajectory, working as programme officer for the Dutch



Photo © Elisa Guasti.

funding agency (NWO) and, since 2022, she has been a grant advisor and programme manager of the Netherlands Earth System Science Centre (NESSC) at Utrecht University.

When you were a child, what did you want to become when you grew up? As a child I wanted to become a scientist but also an archaeologist. These were my two passions. When I was about 9 or 10 years old I had a microscope, plus I was collecting minerals and also reading about archaeology.

How did you first get interested in geology, and specifically palaeontology? During high school I had the chance to work in an office offering science education to schools and several geologists were working there, so I learnt more about the discipline. I was also volunteering in an archaeological site where half of the people had a humanistic background and half were geologists, so for a couple of years I was surrounded by geologists - I was fascinated by the discipline and decided to study geology. Also, I always liked palaeontology and, at the University of Parma, Italy, I had a great teacher of micropaleontology. From that basic course, I decided micropalaeontology was going to be my path.

What was your experience like working as a biostratigrapher in the North Sea and Middle East, amongst other regions? As a biostratigrapher working offshore I really liked seeing how the discipline could help during drilling; how useful the little bugs were and there was lots of trust from other people in my job. I also enjoyed the environment, which was very respectful. It was a big group working together in the middle of nowhere in the sea; you could talk to people from all over the world and learn a lot from different disciplines. Also going to work by helicopter was fascinating!

How did you make the transition from that to now working as a Research Support Officer at Utrecht University, Netherlands? During my career in industry I was always connected to research and set up projects from initial ideas, as well as presenting at conferences and discussing with partners to arrange contracts and finance. After I left industry, I found these skills valuable to move to a different path until I eventually achieved my current job.



What does your job involve on a daily basis? The job varies a lot; I switch often from programme manager tasks to the grant advisor role depending on the current activities. As grant advisor, I am involved in the pre-submission phase (helping researchers while writing their proposals, preparing the budget, reading and discussing the proposal) and also in the post-award phase (helping with contracts). Additionally, I organize training activities for the researchers on different funding grants. Then part of my time is dedicated to NESSC, a virtual research centre that encourages multidisciplinary collaboration to research climate change and model the future.

Can you tell me more about being the programme manager for the NESSC, and what its significance is? As programme manager I keep in regular contact with the scientific director, the manager assistant (for administrative tasks) and the communications/outreach expert to ensure progress is made on the project's goals. But there are also administrative aspects of ensuring budgets are adhered to and the steering committee is kept involved in decision-making.

What is the biggest highlight of your work as a palaeontologist/geologist so far? Difficult question; I really enjoyed working on the topic of my PhD on the palaeoenvironmental changes in the Southern Tethys in the early Palaeogene and all of the travelling involved. Then, working offshore I experienced how microfossils really help drilling, especially in important decision-making moments, such as when setting the casing or working across faults.

What gives you the most satisfaction in your work, and what do you not enjoy so much? I really enjoy talking to researchers about what they do and experiencing their enthusiasm, but I also like working with them to overcome any obstacles when putting their proposals together. Some administrative tasks are not my favourite part of the job.

Do you have any opportunity to still work in research areas of interest to you, or if not, do you miss the 'hands on' aspect of being a (bio)stratigrapher? I have not worked on research projects for a few years and sometimes I miss it. However, my current job is still a good opportunity to be close to research and up-to-date with what is happening in my disciplines of interest.

Do you have any tips for anyone wishing to transition into research support roles? Think carefully if you really want to leave research or the technical work you could do in companies or institutes. Once you leave, it is more difficult to go back into technical work. The good part is that it is a great place to be close to research without doing the research, which some people prefer, like myself.

If you could take a workplace habit from one field to the other, what would it be? Try to learn as much as possible about things not completely related to your job descriptions and be open to new challenges. These qualities can be useful for the next job application or a challenging new task. In Italy we have a saying: "impara l'arte e mettila da parte", which translates to something like: "learn the skill and put it aside", which basically means learn the skill because you never know if it will be useful at some point.

Is there a skill you wish you had been taught at university that would be useful in industry? What turned out to not be useful at all? It's difficult to say after so many years, but I think I wish I'd had more contacts with companies, to learn what possibilities there were in industry with the qualifications and skills I had. Nowadays, I see that universities offer more opportunities for students to get involved with companies and they encourage exploring options post-education, but it was different in my day.

What are your future ambitions? Also a very difficult question; I just started this job and I am still learning a lot – let's see what the future will bring!



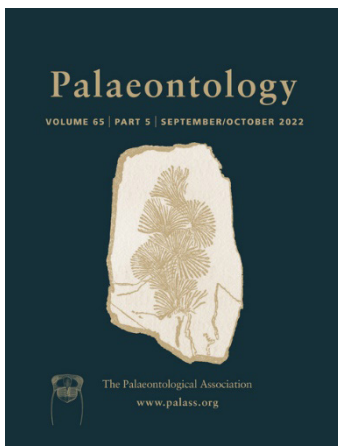
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Cover illustration: *Cloudina* from the upper Ediacaran of Lijiagou in Shaanxi Province, China (image courtesy of Prof. Shuhai Xiao). Specimen height approx. 2–3 mm.





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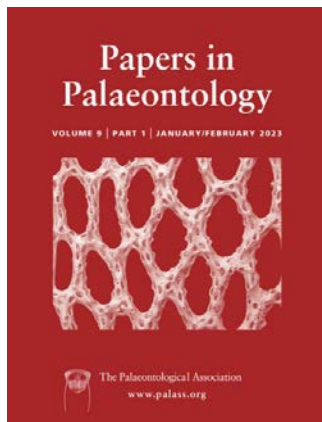
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Cover: Silicified phylloporinid bryozoan from the Ordovician Edinburg Formation of Virginia, USA. NHMUK PD5424; SEM image taken by P.D. Taylor.

View ≈ approximately 2 mm.





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