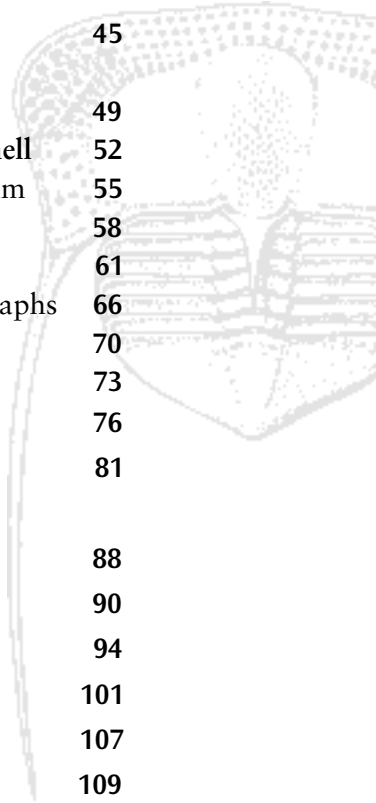


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The Palaeontology Newsletter

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Reminder: The deadline for copy for Issue no. 110 is 1st June 2022.

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Editorial

Like clams and brachiopods on the macroevolutionary time scale, we keep missing fellow palaeontologists, as one more in-person Annual Meeting had to be moved to an online format at short notice. Do you, reader, feel that you could use some good news for a change? All announcements past this point will be positive: the Annual Meeting was a massive success thanks to the superhuman team led by Rob Sansom. The level of the talks, the dramatism and the tension of the Palaeovision contest, and the engagement of the participants was on a par with that of any past in-person meeting, as you will find documented in the report by **Narimane Chatar** and **Léa De Brito**. The most junior cohorts of students, who might not have had the chance to attend in-person meetings in their new careers yet, deserve special recognition for keeping up the highest quality of work without the stimuli of in-person interactions. This year, we also welcome new Council members, who introduce themselves in this issue. The *Newsletter* has also gained an ECR support: **Hannah Bird** has volunteered to support us with her professional editing experience. You will likely notice a spike in editing quality in contributions that passed her scrutiny. Expanding the *Newsletter* as a vehicle of communication for the entire PalAss community includes **a refurbished role for the overseas correspondents**, who have now become Regional Correspondents and, thanks to the efforts of the Diversity Officer, will be given more space to contribute to the Newsletter's contents. If your region is not represented yet, please consider becoming a correspondent. Beyond that, you can contribute to the activities of the Association by nominating (or seeking nominations for) one of the Council positions starting next year, nominating a colleague for one of the awards and prizes of the Association, or applying to become an **Associate Handling Editor for Palaeontology and Papers in Palaeontology**. Thanks to the work of the Editorial Board and the Council's Diversity Group, the Association's publishing and membership strategies keep responding to changes in the academic landscape: you will find in this issue information on an **updated policy on preprints** and on a **60% waiver on membership fees for low-income countries**. The 66th Annual Meeting in Cork (Ireland) has been scheduled to take place from 18th to 24th July, which will hopefully minimize epidemiological constraints. The Progressive Palaeontology Conference in Lincoln (UK) will also take place in person, as well as online, from 14th to 16th June. With so much good news, there is no space here to enumerate all the contributions in this issue; I will only highlight to you that we are experimenting with a new column on interdisciplinary collaborations between palaeontology and other disciplines, kicking off with an episode on biomechanics. Are you an expert in a different field, trying to make sense of palaeontological problems? Please get in touch if you would like to share your experience.

I hope this issue gives you an impression of the diversity of initiatives being undertaken by the Association and a selection of scientific and public engagement highlights, as well as events to look forward to.

Emilia Jarochowska

Newsletter Editor

<newsletter@palass.org>

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



Association Business

Annual Meeting and AGM 2022

Notification of the 2022 Annual Meeting

The 2022 Annual Meeting of the Palaeontological Association will be held at the University of Cork, Ireland, on Tuesday 18th – Sunday 24th July, as an in-person meeting, and is organized by Professor Maria McNamara and colleagues.

Information on the 2022 AGM

The Annual General Meeting (AGM) will be held in December 2022. Details of this event will be communicated to Members in the coming months.

Nominations for Council

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

- Vice President
- Outreach Officer
- Meetings Coordinator
- Internet Officer
- Deputy Internet Officer (new position)
- Ordinary Members (x2)

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*.

All potential Council Members are asked to consider the following:

'Each Council Member needs to be aware that, since the Palaeontological Association is a Registered Charity, in the eyes of the law he/she becomes a Trustee of that Charity. Under the terms of the Charities Act 1992, legal responsibility for the proper management of the Palaeontological Association lies with each Member of Council'.

Further information on the responsibilities of Trustees can be obtained by e-mailing <secretary@palass.org>.

The closing date for nominations is **1st September 2022**. They should be sent in pdf format to the Secretary: e-mail <secretary@palass.org>.



Council vacancies: 'job descriptions'

Vice-President (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 sub-committees, particularly those tasked with making recommendations for the awards of grants.

Outreach Officer (three-year term)

The Outreach Officer works with the Publicity Officer and the Education Officer in the Public Engagement Group (PEG). The PEG has responsibility for all of the Palaeontological Association outreach activities. Currently they include organizing the Association's presence at the Lyme Regis and Yorkshire fossil festivals, co-coordinating the Engagement Grants, answering relevant enquiries, and initiating other activities that promote and develop palaeontological outreach and education for the Association. PEG members work closely together and their roles often overlap, but specific responsibilities associated with the Outreach Officer include devising and implementing new outreach activities for the Association.

Meetings Coordinator (three-year term)

The Meetings Coordinator ensures the Palaeontological Association is present at most of the major international meetings in the wider Earth Sciences domain, mainly by soliciting and/or organizing symposia that are hosted or sponsored by the Association, and via other initiatives. The Meetings Coordinator chairs the Annual Meeting Review Committee and interacts with the Annual Meeting organizers regarding the topic of the symposium at the Annual Meeting, and with other conveners of Palaeontological Association-sponsored symposia to avoid overlaps and enhance the visibility of a wide range of palaeontological topics. The Meetings Coordinator is also responsible for the evaluation of applications to and the administration of the Association's Postgraduate Travel Fund. The Meetings Coordinator may volunteer to sit on one or more of the Association sub-committees to review grants and awards.

Internet Officer (three-year term)

The Internet Officer position is one of the more time-consuming and rewarding roles, with year-round responsibilities. The Internet Officer interacts throughout the year with the numerous members on and off Council. In particular, they work closely with the Executive Officer, Secretary, Annual Meeting and ProgPal organizers. The main tasks are: running the Association's Amazon Web Services (AWS) cloud-based resources; administering the Association's internal ICT requirements (e.g. Google Workspace); updating the PalAss website content; maintaining the website's Drupal code-base (HTML, CSS, JavaScript, PHP and MySQL), custom website modules, and online payment systems; versioning these with Git/GitHub; and running the Association's online store. The role extends to ensuring the website meets current standards for accessibility, and that the Association's electronic data infrastructure meets current regulations. In addition they liaise with PalAss-hosted external websites (e.g. *Palaeontologia Electronica*). The busiest times of the year are in the lead up to ProgPal and the Annual Meeting (registration and abstract submissions) and during periods where



major systems require replacing, upgrading, or fixing. The Internet Officer also serves as the 'line manager' for the Deputy Internet Officer. For more information please contact the current Internet Officer (e-mail <internet@palass.org>).

Deputy Internet Officer (three-year term; new position)

The new position of Deputy Internet Officer is an exciting opportunity to support the Association and develop transferable skills. As a Trustee they will have a direct say in how the Association is run. As the title suggests, the holder will support the Internet Officer in their role and provide cover in the unlikely event that they are unavailable. They will also have a direct influence on the direction, aesthetic and functionality of the Association's online resources. During the three-year term there will be numerous opportunities to learn and develop new skills, and build upon those already held, as well as opening the possibility to stand as the Internet Officer in the future. Experience of any of the following **is not essential** but would be beneficial: basic knowledge of one or more of the following: HTML, CSS, Javascript, MySQL and PHP; code versioning with Git/GitHub; experience with command-line terminals (Windows, Linux or Mac OS); experience with a large-scale content management system (CMS) such as Drupal; experience of using Google Workspace (*e.g.* Google Doc/Sheets/*etc.*) and cloud-based hosting of applications such as Amazon Web Services (AWS). The Deputy Internet Officer will be supported in any area where additional knowledge and training are required by Association, for instance training to undertake the industry-recognized AWS certification (if desired). Many of the transferable skills imparted during the term in office are highly sought after in research and industry, and may be particularly beneficial for those in an early-career position. For more information please contact the current Internet Officer (e-mail <internet@palass.org>).

Ordinary Members (x2 vacancies; 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 on 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 or any other such career break. Nominators are reminded that neutral language (*e.g.* gender neutral) should be used in all nominations.

Palaeontological Association Awards/Medals selection procedures

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

Lapworth Medal

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



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



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

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

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

President's Medal

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



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

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

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

Hodson Award

The Hodson Award is conferred on a palaeontologist who has had no more than ten years of full-time experience after their PhD (excluding periods of parental or other leave, but not excluding periods spent working in industry) and who has made a notable contribution to the science. Please note that, in recognition of the disruption caused by the COVID-19 pandemic, Council has decided that 2020 should be discounted when calculating the years of full-time experience.



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

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

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

Mary Anning Award

The Mary Anning award is open to all those who are not professionally employed in palaeontology but who have made an outstanding contribution to the subject. Such contributions may range from the compilation of fossil collections and their care and conservation, to published studies in recognized journals. The candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of: (i) a statement confirming that the nominee is NOT professionally employed in palaeontology; (ii) a one-page career summary (font-size 12). The one-page career summary should outline the nominee's contribution to palaeontology. This should include details of the sorts of activities pertaining to development of fossil collections, curation, care and maintenance of fossil collections, publications relating to these fossil collections, evidence for outreach activities associated with these fossil collections. Nominations must be compiled into a PDF file of less than 10 MB and uploaded via the webpage before the deadline.

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

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

Gertrude Elles Award

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



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

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

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

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

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

Honorary Life Membership

Honorary Life Membership recognizes individuals whom Council deems to have been significant benefactors and/or supporters of the Association. Recipients will receive free membership for life.

The candidate must be nominated by two members of the Association (proposer and seconder; names and contact details required). The nomination must consist of a one-page statement (font-size 12) outlining the nature of their support for the Palaeontological Association. This should be uploaded via the webpage before the deadline.

The award will be considered by Council at its May meeting and announced at the AGM. The award will also be announced in the *Newsletter*, on the Association website and through social media.

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

Annual Meeting President's Prize and Council Poster Prize

The President's Prize is awarded for the best talk and the Council Poster Prize is awarded for the best poster at the Annual Meeting. All student members of the Palaeontological Association, and all members of the Association who are early-career researchers within one year of the award of a higher degree (PhD or MSc), excluding periods of parental or other leave, are eligible



for consideration for this award. Individuals may nominate themselves for consideration when submitting abstracts for the Meeting. The prize is announced immediately after the oral sessions at the end of the Annual Meeting. Winners will receive an official certificate and free membership to the Association for one year.

Best Paper Awards

The aim of these awards is to recognize papers published in either *Palaeontology* or *Papers in Palaeontology* and reward excellence in our field of science. The selection criteria are as follows: scientific breadth and impact; novelty of approach; and quality of writing and illustration. The awards are open to all authors irrespective of age and nationality; membership of the Association is not required. Frontiers reviews, rapid communications and regular research articles are all eligible. The selection procedure is that a list of all papers published in the year will be drawn up in October (when papers for the final part are allocated) and circulated around the science editors. The science editors are asked to nominate any paper that stands out, providing 2–3 sentences explaining why it is deserving. The Editor-in-Chief will draw up a shortlist of no more than five papers with supporting statements to circulate to the Editorial Board. The Editorial Board will then select winners by vote. Corresponding authors of winning papers will be offered 'Gold open access' paid for by the Association for one nominated paper submitted to *Palaeontology/Papers in Palaeontology* within the following 18 months (and subsequently accepted). In the case of joint authorship papers, the corresponding author can, by agreement, transfer the prize to one of the co-authors. The Editor-in-Chief will contact the winning authors and write short synopses for the *Newsletter*. An announcement of the awards will also be made at the AGM.

Undergraduate Prize Scheme

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

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

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



Innovations in Palaeontology Lecture Series and the PalAss Exceptional Lecturer

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

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

Format of the scheme:

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

Eligibility and selection process of the PalAss Exceptional Lecturer:

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



Selection of host institutions:

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

Expectations for host institutions:

- Each lecture must be widely advertised across the host institution. We particularly encourage advertisement of the Innovations in Palaeontology Lecture Series on social media.
- Host institutions are expected to pay for hospitality and offer a meal in a social environment to the PalAss Exceptional Lecturer.
- If the PalAss Exceptional Lecturer has to travel more than three hours to the host institution or cannot return home at a reasonable time, the host institution must offer at least one night of accommodation.

Deadlines each year:

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

GRANTS

Palaeontological Association grants are offered to encourage research, education and outreach through different means. Undergraduates, early-stage researchers, and otherwise unfunded persons are given special encouragement to apply. All of these awards and grants are core to the charitable aims of the Palaeontological Association. A full list of the Association's grants may be found on the Association's website (<<https://www.palass.org/awards-grants>>). Those with deadlines in the next six months or that run throughout the year are detailed below.

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

Note: the Grant-in-Aid rubric is currently being updated by Council, the information below is therefore likely to change in the near future. Please refer to the Association's website (<<https://www.palass.org/awards-grants>>) for the latest information.

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. Application must be made in good time (at least nine months before the start of the event) by the scientific organizer(s) of the meeting using the online application form. Such requests will be considered by Council at its May and October meetings each year. If the application is successful, we will require that the support of the Association is acknowledged, preferably with reproduction of the Association's logo, in the meeting/workshop/short course literature and other media. Enquiries may be made to the Secretary (e-mail <secretary@palass.org>).

Applications should be made through online submission via the appropriate page on the Association's website, for which you will need the following information:

- Title of meeting / workshop / short course
- Date and Place proposed
- 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 (also whether request is for a loan or a grant)
- Other sources of funding applied for
- Specific use to which requested funds will be put

Note: If funds are requested to support one or more keynote speakers, then full details of their names, affiliations and titles of presentations should be included. The application will be strengthened if the keynote speaker agrees to submit their paper as a review article for possible publication in *Palaeontology*.

The deadlines are **1st March** and **1st September** each year.

Engagement Grants

Awards are made to encourage educational outreach, public engagement and related initiatives in 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). 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 they can be 'proof of concept' case studies that have their own outcomes but that form the groundwork for a larger bid elsewhere. Applications from any country and applicants of any nationality are welcomed to apply.

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 (see below for details of the Required Supporting Information). 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 PDF format: a letter of confirmation from the meeting convenor which states the acceptance of the applicant's abstract, and a short status-confirming letter from the applicant's supervisor.
9. Funding from the Association must be acknowledged on your poster or in your presentation.

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

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

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

FROM GONDWANA TO LAURASIA

The 6th International Palaeontological Congress

Monday 7th to Friday 11th, November 2022
Khon Kaen, Thailand



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CONTACT

Mongkol Udchachon

Palaeontological Research and Education Centre, Mahasarakham University

Email: generalchair_ipc6@msu.ac.th; mongkol.c@msu.ac.th

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Palaeontological Association Postgraduate Travel Grant for IPC6 – Thailand

The Palaeontological Association is running a programme of travel grants to assist student members of the Association (doctoral and earlier) to attend the 6th International Palaeontological Congress in Thailand in order to present a talk or poster.

Terms and Conditions

Please read the following notes before applying:

- Applicants must be delivering a presentation (poster or oral) that falls within the scope of the Association's charitable aims.
- The maximum amount awarded will be £700 GBP.
- Applications can only be accepted from Student Members of the Association.
- Applications are to be made through the Association website before the 1st September 2022 deadline, and should include the personal details of the applicant and their career stage, the title of the accepted abstract, and details of other funding obtained towards the cost of the meeting. Two letters must also be attached, in PDF format: a letter of confirmation from the meeting convenor which states the acceptance of the applicant's abstract, and a short status-confirming letter from the applicant's supervisor.
- The grants can only be used for travel and accommodation and only one grant will be awarded per applicant. Multiple applications are not allowed.
- Funding from the Association must be acknowledged on your poster or in your presentation.
- Applications which fulfill these Terms and Conditions will be selected by a pooled lottery system (see below).
- Successful awards will be paid retrospectively on the submission of receipts for reasonable travel and accommodation costs.

Application selection process

Applications will be collated into two pools:

1. The first pool will be made up of applicants from low-middle income countries as defined by the World Bank. A minimum of nine applications will be drawn by lottery and awarded. In the event that there are fewer than nine applicants all applications will be grants without a lottery.
2. The second pool will be made up of all other applications not contained in the first pool, plus all applications not granted an award that were previously in the first pool. Applications will be drawn by lottery and awarded. The lottery will cease once the total amount awarded from both pools reaches the budget limit for the IPC6 travel fund as set by Council.

The deadline for this fund is 1st September 2022. 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 PalAss 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 2022 are **1st May (Progressive Palaeontology)** and **1st June (Annual Meeting)**.

Awards and Prizes AGM 2021

Lapworth Medal: Dr Angela C. Milner

In 2021 Angela Milner received the highest award bestowed by the Association in recognition of her highly significant contribution to the science of palaeontology by means of a substantial body of research and service to the scientific community. The Association was able to inform and present the Lapworth Medal to Angela prior to her death in August 2021.

Professors Paul Barrett and Emily Rayfield write: Angela has been a pillar of the palaeontological community for over four decades and has had a profound influence on generations of palaeontologists around the world. Following her first degree and PhD at the University of Newcastle, Angela spent almost her entire career at the Natural History Museum, London (NHM). During her time there, Angela rose through the ranks to become Deputy Keeper of Palaeontology (with stints as Acting Keeper), where she was not only a leading researcher, but also an exceptional administrator and one of the key figures in shaping the Museum's public offering. Angela was



almost single-handedly responsible for the current Dinosaur Gallery, the most popular exhibition in the NHM, which attracts over three million visitors per year. Her competence was actually a disadvantage in that she was frequently called upon to sit on administrative committees at the NHM and externally, and was in constant demand for her wisdom and organizational prowess.

In addition to leadership roles at the NHM, Angela had major impacts in less tangible, but more important, ways. She has an unsurpassed knowledge of the NHM fossil reptile, amphibian and bird collections, which enabled her to facilitate the work of thousands of colleagues from all over the world. Generous with her time and always encouraging, Angela provided guidance to hundreds of early-career researchers

and peers. Angela nurtured external students through Masters' and PhD degrees (including Richard Butler, Hilary Ketchum, Mark Young, Craig Hunn and Sarah Sangster) and hosted productive postdoctoral researchers (including Emily Rayfield, Patricio Dominguez-Alonso, Estelle Bourdon and Stig Walsh). From a personal perspective, one of us (PMB) wrote to Angela as a teenager crazy about dinosaurs and is still proud to have her letter: this was a major inducement to pursue the goal of becoming a palaeontologist. For both of us, Angela was an exceptionally important early career mentor and remained an important influence ever since. Many others in the field also owe Angela a debt of gratitude in terms of her support and sound advice. Finally, Angela has been a major advocate for women in science and a role model for others to emulate. Her impact was recently recognized by the Society of Vertebrate Paleontology, which awarded her Honorary Life Membership in 2018, one of that Society's highest honours.

Angela's research has been exceptional in its breadth and depth, with major impacts in many areas, but most especially on the somewhat divergent fields of early tetrapods and dinosaurs (including both Mesozoic and Tertiary birds). She is the world-leading authority on nectridean, aistopod and baphetid tetrapods and worked on these taxa for her entire career. Following her move to the NHM, Angela worked in parallel on non-avian dinosaurs, kicking off in spectacular fashion with her ground-breaking work on *Baryonyx* and reinventing herself as a theropod expert. Angela's bird-watching skills also came into play as she carried out pivotal work on *Archaeopteryx*, debunking claims that it was a forgery, as well as being one of the first palaeontologists to apply the emerging technology of CT-scanning in order to elucidate the brain morphology of this iconic taxon. Further CT work on Paleogene bird brains followed and Angela has worked on most major amphibian and reptile clades, spanning the Carboniferous to the Paleogene. One aspect of her work that is often under-appreciated is that she was one of the first to explore ancient biomolecule preservation and



Photo © Natural History Museum / Science Photo Library.



co-led efforts to recover collagen from 125 million-year old dinosaur bones. Her activities were not confined to collections-based research, however, as she was involved in major expeditions to Niger (1989) and China (1982), with the latter being the first major western palaeontological collaboration in the country, which helped to open the Chinese vertebrate palaeontology community to the outside world. After retirement, she continued an active research programme, working on dinosaurs and Carboniferous tetrapod footprints.

Angela has been an untiring member of our community and an ambassador for the subject as a whole. A stalwart of the Palaeontological Association for many years, as well as many other professional associations (including the Society of Vertebrate Paleontology, Geological Curators' Group and the Geologists' Association), Angela has reviewed countless papers, grant proposals, sat on endless grant and job panels in the UK and elsewhere, and written innumerable references to advance the careers of others. She has been a forceful advocate in public battles over the legality of fossil collecting and fossil ownership and in the preservation of natural history collections around the world, lending all of these issues the gravitas gained from long experience and deep consideration of these matters. Finally, although the NHM Dinosaur Gallery might seem to be enough of an outreach achievement in itself, for many years Angela was one of the principal public faces of dinosaurs in the UK and internationally. Always in demand for media interviews and documentaries, she also found time to author numerous popular articles including the NHM's best-selling dinosaur book, bringing cutting-edge scientific work to the attention of a wide audience.

President's Medal: Professor Anjali Goswami

Professors Jason J. Head and P. David Polly write: Professor Anjali Goswami is a vertebrate palaeontologist and evolutionary morphologist who combines quantitative analysis of extant and fossil morphology with phylogenetic, developmental and ecological datasets to model the evolutionary underpinnings of phenotypic diversity, and who conducts international field studies to discover Late Cretaceous vertebrates and biotic response to the K-Pg mass extinction event. Anjali received her PhD from the University of Chicago in 2005, after which she moved to the UK as a National Science Foundation



Photo courtesy of Anjali Goswami.

International Postdoctoral Fellow at Queen Mary, University of London and the Natural History Museum. From 2007 to 2009, she was a Junior Research Fellow at Kings College, Cambridge, and then a Lecturer in Earth Sciences at Cambridge. In 2009, she took a joint appointment lectureship in Genetics, Evolution & Environment and Earth Sciences at UCL where she was promoted to Professor in 2016. She is now Research Leader in Life Sciences at the Natural History Museum.



Anjali is a leading scholar of developmental and functional modularity and integration in vertebrates. Prior to her work, modularity was studied primarily by developmental biologists, only rarely by morphologists, and almost never by palaeontologists. Her research revealed that patterns of morphological correlation could be studied across entire clades of mammals, living and fossil. In recent years Anjali has expanded the boundaries of 3D morphological analysis by high-density 3-D geometric morphometric landmarks.

Her work has been ground-breaking through the quantitative analysis of morphology with developmental and genetic data to bridge the gap between a biologist's view of evolution and the macro-evolutionary view of palaeontologists who study the fossil record. By studying patterns of ontogenetic development in marsupials and eutherians, she has revealed how cranial differences are linked to function and metabolism, including how brain development and ossification sequences relate to the patterns of integration and constraint driven by reproduction and early neonatal behaviour. She has also led large projects on modularity and integration within phylogenetic and ecological contexts across Tetrapoda, including the most comprehensive studies to date on cranial disparity and diversification in extant and fossil vertebrates and their underlying drivers and constraints. Anjali and her students have investigated dinosaurs, birds, lizards and snakes, caecilians, and frogs. Her quantitative approaches have been widely adopted by palaeontologists and neontologists alike.

Anjali is also active in field palaeontology and in studies of early mammalian diversification. She has been a leader or key collaborator on studies of Mesozoic vertebrates, including clade dynamics, latitudinal biodiversity gradients through time, and Cope's rule in flying vertebrates. She has done research on Late Cretaceous and early Palaeogene vertebrates in India and Argentina, as well as global-scale analyses of mammalian biotic response to the K-Pg impact event. Anjali and her students have changed our assessment of mammalian survivorship across the extinction event through analysis of the phylogenetic relationships of Palaeocene eutherian mammals, examination of morphological disparity across the event, and analysis of evolutionary rates following the extinction. Her fieldwork in the poorly-sampled Late Cretaceous of India has produced new discoveries, including analyses of faunal similarities between Gondwanan landmasses, and most significantly, recognition of a radiation of Indian Late Cretaceous arboreal mammals.

In addition to her scholarly achievements, Anjali has made contributions through leadership and service. She served as vice president and trustee of the Linnean Society of London (and is now president-elect), where she promotes the integration of palaeontological and zoological approaches to evolution, including organizing an important, published symposium on clade dynamics in deep time. She edited several key journals in palaeontology and related disciplines (*Palaeontology*, *Journal of Vertebrate Paleontology*, *Paleobiology*, *Evolution*, *Biology Letters*, *PLoS ONE*), and currently serves a formative role on the editorial board of the *Annual Review of Earth & Environmental Science*, a journal that helps define new areas of research not only in palaeontology, but across the geosciences. She has held several offices in the Society of Vertebrate Paleontology, including member-at-large on its executive committee, chair-ship of its Program Committee, and most recently chair of its Development Committee, where she has led fundraising for the SVP Futures Fund to increase educational opportunities for BIPOC students through research and conference funding.

Anjali's accomplishments in bridging palaeontology with cognate biological disciplines make her a truly worthy recipient of the 2021 Palaeontological Association's President's Medal.



Hodson Award: Dr Russell J. Garwood

Dr Mark Sutton writes: Russell is a palaeontologist specializing in 3D reconstruction, computational approaches in palaeobiology, X-ray/Neutron techniques in earth sciences, terrestrialization, and the fossil record of the arthropods – if you can call such a broad CV ‘specialisation’. Following a degree and PhD at Imperial College in 2011, he subsequently held a position at the Natural History Museum, London and a PDRA at the University of Manchester. In 2012 he obtained an 1851 Royal Commission Research Fellow position at the University of Manchester. Following this he was appointed in 2015 to a permanent Lecturer position in Manchester, and promoted to Senior Lecturer in 2020.



Photo: Nick Edwards.

Throughout his career Russell’s publication record has been notable for breadth, volume and quality. If he has a ‘core’ research area it is in the phylogeny and evolution of terrestrial arthropods (especially chelicerates), but he has also published on fossil vertebrates, ammonites and plants, stromatolite geochemistry, open data standards, evolutionary simulation, phylogenetic and virtual palaeontology techniques and software, Ediacaran trace-fossils, the geochemistry of ophiolites, and more besides. As a long-standing collaborator, I can also attest to Russell’s astounding breadth of knowledge, insight and skills, as well as his consistent professionalism and enthusiasm for all aspects of our science.

Another key part of Russell’s research work is the development, documentation and dissemination of software, notably for the visualisation of 3D data (SPIERS) and the simulation of evolution (REvoSim, TREvoSim). These professional-standard packages are open-source and freely available to the community, largely thanks to Russell, and have been much used (*e.g.* more than 100 published studies have used SPIERS since 2012) – this uptake partly reflects Russell’s provision of many free training courses in tomographic techniques and in SPIERS at workshops and conferences over the last decade. In addition, he has worked towards (and advocated for) open standards in palaeontological data, especially but not exclusively as part of his fellowship of the Software Sustainability Institute.

His commitment to the training of the next generation of palaeobiologists and earth scientists is notable, having already supervised over 15 PhD, MPhil and Masters-project students on a wide range of topics (and acted as an informal collaborator with many others), and has examined three PhDs and an MPhil. He has also been pivotal in the rejuvenation of his department’s palaeobiology MPhil programme. His involvement with undergraduate teaching began early in his career while at Imperial, and at Manchester he has dived into this again with redoubled energy.

Research-driven public engagement has always been an integral part of Russell’s approach to science. Starting in 2011 he founded the successful public engagement website Palaeontology



[online], with the support of the PalAss; this enterprise is still going strong. He has been a regular contributor to public engagement and outreach events, from NHM engagement evenings through Science Festivals (e.g. Royal Society, Cheltenham *etc.*), and was a fellow of the Royal Institution (while that scheme existed). Russell's research has always captured media interest. He has been covered in broadcast media (e.g. ITV London, ITN, Reuters TV) and has given interviews on BBC Radio Wales, Radio 4, and in specialist science podcasts). Print/online media coverage has been equally successful, in publications including *The Times*, *The Independent*, *National Geographic*, and the BBC news website (to name but a few) – on which it has twice been the most read story.

It is for all the reasons above, and the many that have not been described, that Russell is a deserving recipient of the 2021 Hodson Award of the Palaeontological Association.

Mary Anning Award: Peter R. Tarrant

The Association's Mary Anning award is to those not professionally employed in palaeontology, but who have made an outstanding contribution to the subject. Peter Tarrant, our 2021 recipient of the award, is no exception. As a professional artist based in Shropshire, UK, he has dedicated over 50 years to the collection and description of palaeontological material and sites. The scope of his discoveries include numerous Silurian and Devonian vertebrates (heterostracans, acanthodians and placoderms), vascular plant material, arthropod remains, and other important remains from sites across Shropshire and the Welsh Borderlands. Peter's donation of these fossils to local and national collections has led to significant increases in our palaeontological understanding. Many of these collections have subsequently been used as the basis of notable scientific publications, either individually led by Peter or within a framework of collaboration. He is renowned for his engagement with the professional palaeontology community, and works with interested groups and academics of varying career stages in an open, friendly and generous manner. As well as the academic side of our science, he has played an important role in geo-conservation, working with the Geological Conservation Review (GCR) to evaluate and instigate fossil sites as protected Sites of Special Scientific Interest (SSSIs). For all these reasons The Palaeontological Association recognizes Peter Tarrant as the 2021 Mary Anning Award recipient.



Photo courtesy of Peter Tarrant.

Drs Robert Sansom and Emma Randle write: Peter lives and works in Shropshire as an artist but dedicates a substantial amount of time to palaeontological exploration. He has made an important contribution to the development of fossil collections in the UK through his exploration and collection, working tirelessly over 50+ years, primarily in the Welsh Borderlands area, to find new sites and retrieve specimens. In particular he has retrieved hundreds of Silurian and Devonian vertebrates (heterostracans, acanthodians, and placoderms), but also vascular plant material, arthropod remains, and other significant remains from sites across Shropshire. Peter has translated



these discoveries of new sites and new specimens into important public local and national fossil collections (primarily Shropshire and Ludlow Museums, Natural History Museum London).

Daniel Lockett of Shropshire Museums writes: Peter has been of regular assistance to curators over the last 50+ years helping to identify and sort the material he has donated. This began in the late 1960s with John Norton and has continued to the present day. In the last couple of years, he has been of help to the “Fossils in Shropshire” digitization project, flagging the most interesting or important specimens of fish material to make sure that they are a part of the material digitized. Furthermore, he has helped by identifying recent donations and their taxonomy. It is with the help and expertise of researchers like Peter that smaller museums make progress with their collections work.

Drs Robert Sansom and Emma Randle continue: Peter’s contributions go beyond discovery and curation of collections. He has translated new fossil finds into academic contributions, both on his own and with others. He has actively sought collaborations with academics from a variety of groups and career stages working in an open and friendly manner, generous with both his time and resources. This includes researchers in Australia, Europe and across the UK, and supporting PhD students. In addition he has played an important role in conservation, working with the GCR to evaluate and protect fossil sites as SSSIs. His discoveries include not only new taxa, but also insights into behaviour from trace fossils, and the geology and biostratigraphy of the region, and many ongoing active, far-reaching projects.

Honorary Life Membership: Professor George Sevastopulo



On an SCCS field-trip in Belgium in 2005. Photo: Markus Aretz.

Honorary Life Membership recognizes individuals whom Council deems to have been significant benefactors and/or supporters of the Association. In 2021 The Palaeontological Association awarded this honour to Professor George Sevastopulo. Council was able to inform George of his Honorary Life Membership prior to his death in September 2021.

Dr Patrick Orr writes: It is widely accepted that Professor George Sevastopulo MRIA clearly met these criteria. George’s support of the Association was exemplified by his having served diligently as an editor for *Palaeontology* for the past decade, one of the longest spells of unbroken service by an editor. This caps a much longer association with the Association, a particular highlight of which was the hugely successful Annual Meeting George organized in Dublin. George has also served as both a member of Council and on the Editorial Board. George was also acknowledged as a mentor – formal and informal – by many palaeontologists, past and present, both in Ireland and internationally. Upon the occasion of George’s retiring as an Editor for *Palaeontology*, and on the basis of his having been a long-time supporter of the Association’s activities and our discipline, it is fitting that Council bestowed Honorary Life Membership.



Annual Meeting President's Prize and Council Poster Prize

These prizes are awarded for the best oral presentation(s) and poster(s) at the Annual Meeting. All student members of the Association, and all members of the Association who are early-career researchers within one year of the award of a higher degree (PhD or MSc), excluding periods of parental or other leave, are eligible for consideration for these awards. These prizes are judged by a panel drawn from Council on the basis of presentation, novelty of work, strength of hypothesis and conclusions.

Council Poster Prizes for 2021 were awarded to:

- Nicole Barnes (University of Bristol), '*The Ecological Importance of Ediacaran Stems*'.
- Charlotte Bird (University of Birmingham; Natural History Museum London), '*Variable cynodont brain morphology: a case of natural or modeller bias?*'.
- Eloise S. E. Hunt (Natural History Museum London), '*The role of habitat density, migration and developmental mode in avian skull evolution*'.

President's Prizes for 2021 were awarded to:

- James Mulqueeny (University of Southampton; Natural History Museum London), '*Assessing the impact of climate change on the structural integrity of benthic foraminifera during the Palaeocene Eocene Thermal Maximum – implications for future climate change*'.
- Christopher Stockey (University of Leicester), '*Multivariate dental topographic metrics demonstrate the dietary breadth and specialisms of conodonts*'.
- Katherine Turk (Vanderbilt University), '*Priapulid trace fossils from the late Ediacaran of Namibia*'.

Best Paper Awards

The Palaeontological Association awards annual prizes to the best papers published in *Palaeontology* and *Papers in Palaeontology*, to recognize and reward excellence in our field of science. Each year the science editors (who have the task of steering papers through the review process) are asked to nominate papers that they feel stand out as being particularly noteworthy and that have scientific breadth and impact. For articles published in *Palaeontology*, the papers should have a wide impact and shape future research directions, and for *Papers in Palaeontology* novelty, breadth, quality of the description and a clear and robust discussion of why the fauna or flora has wider significance are sought.

The nominated papers are then voted on by the Editorial Board. The awards are open to all authors irrespective of age or nationality, and membership of the Association is not required. Frontiers reviews, rapid communications and regular research articles are all eligible. As in previous years both of the Association's journals are attracting many high-quality papers, making the choice very difficult for the Editorial Board.

This year's results are over the page —



Palaeontology

The following papers published in *Palaeontology* were shortlisted by the Editorial Board and announced at the Annual General Meeting 2021:

- ‘Dinosaurian survivorship schedules revisited: new insights from an age-structured population model’. By Eva M. Griebeler.
- ‘Systematic analysis of exceptionally preserved fossils: correlated patterns of decay and preservation’. By Sarah E. Gabbott, Robert S. Sansom and Mark A. Purnell.
- ‘Recognizing pulses of extinction from clusters of last occurrences’. By Joshua B. Zimmt, Steven M. Holland, Seth Finnegan and Charles R. Marshall.
- ‘Sporopollenin chemistry and its durability in the geological record: an integration of extant and fossil chemical data across the seed plants’. By Phillip E. Jardine, Carina Hoorn, Maxine A. M. Beer, Natasha Barbolini, Amber Woutersen, Giovanni Bogota-Angel, William D. Gosling, Wesley T. Fraser, Barry H. Lomax, Huasheng Huang, Matteo Sciumbata, Huajie He and Guillaume Dupont-Nivet.

The Editorial Board awarded the *Palaeontology* Best Paper Prize for 2021 to:

- ‘Recognizing pulses of extinction from clusters of last occurrences’. By Joshua B. Zimmt, Steven M. Holland, Seth Finnegan and Charles R. Marshall.

Papers in Palaeontology

The following papers published in *Papers in Palaeontology* were shortlisted by the Editorial Board and announced at the Annual General Meeting 2021:

- ‘Palynology of a short sequence of the Lower Devonian Beartooth Butte Formation at Cottonwood Canyon (Wyoming): age, depositional environments and plant diversity’. By Sol Noetinger, Alexander C. Bippus and Alexandru M.F. Tomescu.
- ‘The damselfly palaeofauna from the Eocene of Wyoming and Colorado, USA (Insecta, Odonata, Zygoptera)’. By Günter Bechly, Romain Garrouste, Arvid Aase, Jered A. Karr, Lance Grande and André Nel.
- ‘Evolutionary–phylogenetic pathway of the Cretaceous ammonite genus *Aegocrioceras* and its relationship to *Juddiceras* spp. and *Crioceratites* spp.’. By Manuel F. G. Weinkauf, René Hoffmann and Kurt Wiedenroth.
- ‘Lophotrochozoa in the Cambrian evolutionary radiation and the Pelagiella problem’. By Ed Landing, Gerd Geyer, Igor A. Jirkov and Stefano Schiaparelli.
- ‘The late Oligocene xenarthran fauna of Quebrada Fiera (Mendoza, Argentina) and its implications for sloth origins and the diversity of Palaeogene cingulates’. By François Pujos, Martin R. Ciancio, Analía M. Forasiepi, Michel Pujos, Adriana M. Candela, Bárbara Vera, Marcelo A. Reguero, Ana María Combina and Esperanza Cerdeño.
- ‘Redescription and phylogenetic affinities of the caimanine *Eocaiman cavernensis* (Crocodylia, Alligatoroidea) from the Eocene of Argentina’. By Pedro L. Godoy, Giovanna M. Cidade, Felipe C. Montefeltro, Max C. Langer and Mark A. Norell.
- ‘New insights into the affinities, autoecology, and habit of the Mesozoic fern *Weichselia reticulata* based on the revision of stems from Bernissart (Mons Basin, Belgium)’. By Candela Blanco-Moreno, Anne-Laure Decombeix and Cyrille Prestianni.
- ‘*Panderodus* from the Waukesha Lagerstätte of Wisconsin, USA: a primitive macrophagous vertebrate predator’. By Duncan J. E. Murdock and M. Paul Smith.



The Editorial Board awarded the *Papers in Palaeontology* Best Paper Prize for 2021 to:

- ‘Redescription and phylogenetic affinities of the caimanine *Eocaiman cavernensis* (Crocodylia, Alligatoroidea) from the Eocene of Argentina’. By Pedro L. Godoy, Giovanna M. Cidade, Felipe C. Montefeltro, Max C. Langer and Mark A. Norell.

PalAss Exceptional Lecturer

We are pleased to announce that Mark Williams from the University of Leicester has been appointed as the PalAss Exceptional Lecturer for 2022/23. Mark will present the Innovations in Palaeontology Lecture Series on human driven environmental change (proposed title: ‘*The Anthropocene: planetary scale change to the biosphere, and the future well-being of planet Earth*’) and we now invite interested institutions to apply to host this via the Association’s website. Please provide a timeframe (between September 2022 and May 2023) during which you would like Mark to give a lecture at your institution. The list of interested institutions will be forwarded to Mark on 1st May, 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 page 11 in this *Newsletter* or the website for further details.

New Council Members

Paul Barrett – Vice-President (he/him)



Photo courtesy of Paul Barrett.

I am an Individual Merit Researcher based at the Natural History Museum, London, where I have worked since 2003 following a fellowship at the University of Cambridge (Earth Sciences, 1996–1999) and a fixed-term teaching position at the University of Oxford (Zoology, 1999–2003). My research concerns the taxonomy, evolution and biology of non-avian dinosaurs, with particular interests in herbivory and trends in diversity through time. As a zoologist by background, I think of dinosaurs as living animals but also work on stratigraphy and dating. Most of my work is collections-based, but it includes macroevolutionary, macroecological and biomechanical perspectives, and I’ve worked on material from all over the world, with particular emphasis on southern Africa (South Africa, Zimbabwe, Tanzania), China and the UK, including an active African field programme in collaboration



with local colleagues. My only formal position with the Association has been a term as an Editor of *Palaeontology* but I have been a Member for nearly 30 years and have contributed to numerous PalAss publications and meetings. As someone who has sat on the councils of other societies, I wanted to bring some of that experience to help PalAss advance its current goals, particularly those related to professional standards, governance and ethics. I look forward to helping oversee some planned improvements to the Association's granting programmes and to discussions over many other issues currently impacting the subject.

Paul Taylor, Editor-in-Chief

I am delighted to join Council as the new Editor-in-Chief. Publishing has been at the heart of the Palaeontological Association since its foundation in 1957, and we currently publish two highly-ranked international journals, *Palaeontology* and *Papers in Palaeontology*. I aim to enhance the quality and reputation of these journals during this period of change and challenge for scholarly publications.

My background is as an invertebrate palaeontologist specializing on bryozoans, combining descriptive taxonomy with aspects of interpretive palaeobiology including biomineralization, functional morphology, palaeoecology, phylogeny and macroevolutionary patterns. Following doctoral research at the University of Durham on Jurassic bryozoans, I spent a couple of years as a postdoc at Swansea University where I was introduced to the delights of living bryozoans. In 1979 I was appointed to a post at the Natural History Museum in London where I was employed until my retirement at the end of 2018. My bryozoan research continues at the NHM where I am now a Scientific Associate, as do my efforts to make palaeontology more accessible to the public via such avenues as fossil folklore, urban palaeontology and writing popular articles and books.

I first joined the Palaeontological Association as a research student in the mid 1970s. This is my third spell on Council, having served as an 'Ordinary Member' from 1981–1984, and an Editor from 1986–1992.



Photo courtesy of Paul D. Taylor.

Nicola Vuolo, Publicity Officer

I am Nick: a palaeontologist and a science communicator. I did my PhD on Carboniferous and Permian conodont biostratigraphy in Italy, at the University of Milan. I was visiting researcher at University of Bristol, UK, where I worked on conodont feeding apparatus 3D reconstruction, and I explored conodont disparity at the P/T boundary during my post-doc at University of Lyon, in France.

In 2020–2021 I did my master's in science communication at SISSA University in Trieste, Italy. I'm currently working as project manager in European Projects communication, and I collaborate with



some of the main Italian scientific schoolbook publishers.

The Palaeontological Association has a special place in my heart and gave me the opportunity to meet many interesting people. As Publicity Officer I would like to carry on the job that has been done so far while exploring new ways to fully exploit the potential of social media communication.

There are lots of ideas going around in the Council's Public Engagement Group, so stay tuned and keep an eye on our Twitter account and Facebook page (@ThePalAss).

Feel free to contact me by e-mail to <publicity@palass.org> if you have ideas, comments or wishes. I hope this is the beginning of a wonderful journey together.



Photo courtesy of Nicola Viola.

Research Grant Awards AGM 2021

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 2021 Council agreed that the following applicants should receive awards: **Stephan Lautenschlager** (£2,395) for '*Changes in functional morphology during ontogeny – a case study in ornithischian dinosaurs*', **Vera Korasidis** (£9,900) for '*Montane refugia – a key to plant survival during the Paleocene–Eocene Thermal Maximum?*', and **David Bond** (£6,481) for '*Environmental change, evolution and extinction in the Triassic of northwest Pangaea*'.

Small Grant Awards AGM 2021

The small grants awarded by the Association for funding in 2021 include the Sylvester-Bradley, Collomon, Whittington and Stan Wood awards. Council agreed that the following applicants should receive Sylvester-Bradley awards: **Isabella Leonhard** (£1,491), **Giovanni Serafini** (£1,500), **Anubhav Preet Kaur** (£1,500), and **Luca Pandolfi** (£1,185). The Whittington Award was awarded to **Sean Smart** (£549) and Stan Wood awards to **Giulia Bosio** (£1,323) and **Chien-Hsiang Lin** (£1,500). The Collomon Award was made to **Bethany F. King** (£1,500). Details of the proposed research projects are given below.



Scaling relationships between measurements of the foramen magnum and body mass in Neornithes

Sean Smart

Accurate, testable estimates of body size (particularly mass) are key for inferring details about an extinct animal's physiology, biomechanics and ecology. However, in the absence of highly complete fossils, skeletal proxies must be used. These are features that correlate with a trait of interest and thus can be used to indirectly estimate its value. Currently most widely used proxies in vertebrates are based on limb bones of terrestrial vertebrates. However, this limits the ability to estimate body mass of species with fragmentary fossils, lacking limbs, and those which are non-terrestrial.

In this project, the utility of using the dimensions of the foramen magnum of the skull (the opening through which the spinal cord connects the brain) as a proxy for body size will be investigated. This structure was selected due to its universal presence in vertebrates, its robust structure (favouring fossilization), and its link to brain size, which is linked to body size. Modern birds (Neornithes) are the main focus group as they are abundant in collections, well studied, and their limbs are fragile, thus damaged or distorted during fossilization. Crocodylians and lepidosaurs are also examined to examine patterns across related groups, accounting for the effects of phylogeny within said patterns.

Petrography, mineralogy and geochemistry of fossil mammal bones from Mio-Pliocene marine depositional settings

Giulia Bosio

The Neogene marine successions of Tuscany (Italy) host numerous and important fossils of whales, dolphins and sirenians. The mammalian bone of which these specimens are comprised is highly sensitive to the surrounding environment, both pre- and post-mortem. The highly diverse palaeoenvironments (from deltaic to slope) witnessed by the Tuscan Neogene make the latter an ideal scenario for investigating the manifold taphonomic processes that affect marine mammal skeletons in different depositional settings and host sediments, where biostratigraphic and diagenetic processes at play are similarly different. We propose to engage in a detailed microscopical and compositional characterization of marine mammal fossils from selected Miocene and Pliocene localities of Tuscany via an integrative petrographic–mineralogical–geochemical approach. By detailing aspects such as the permineralisation degree of bones and their preservation style, this analytical campaign will hopefully disentangle the complex interplay of factors at play during the early fossilization, sheltering, and late post-mortem history of the bones. In a broader perspective, it will also impact the worldwide community of vertebrate paleontologists by disclosing new informative facets of their prime object of study – *i.e.*, fossil bone – with special reference to the relationship between its physical and chemical characteristics and the underlying taphonomic histories and scenarios.



A diverse early Pleistocene shark teeth assemblage from southern Taiwan

Chien-Hsiang Lin

Despite rich marine fossils in the Plio-Pleistocene strata in the Western Foothills of Taiwan, comprehensive studies on the elasmobranch records are lacking, meaning we have a very poor understanding of how and when the present fish biodiversity hotspot in the tropical–subtropical West Pacific has formed. Here, we propose to examine fossil shark teeth from the early Pleistocene Liuchungchi Formation in Chiayi, southern Taiwan. The Liuchungchi Formation (1.90–1.35 Ma) has been famous for its diverse marine fossils, including molluscs, crabs, sea urchins, barnacles and fish. It consists of dozens of sedimentary successions with thick sandstone and shale layers that indicate an offshore to shoreface environment. A total of 570 shark teeth from the museum collection and additional bulk sampling for small specimens will be examined to reconstruct the associated fossil shark community. The results would be the first attempt at advancing knowledge of fish spatio-temporal dynamics in the region.

Body size change in burrowing decapods through the Cenomanian–Turonian Boundary Event

Bethany F. King

Anthropogenic activities are the direct cause of increasing global surface temperatures and are predicted to have significant effects on marine ecosystems. One prediction is that the body size of marine animals will shrink in response to warming. Bioturbation of the sea floor causes significant changes to sediment biogeochemistry, and burrowing decapods from the infraorders Axiidea and Gebiidea produce some of the deepest and most complex burrows in the marine environment. A reduction in body size could have significant effects on their role as ecosystem engineers, as smaller animals will produce proportionately smaller burrows and reduce the oxic–anoxic interface, limiting nutrient cycling and productivity. The fossil record provides a unique insight into the response of animals to changing environmental conditions. Diameters of fossil crustacean burrows (Thalassinoides) can be used to indirectly test body size changes through past extinction events. Preliminary observations of the exposed chalk near Eastbourne suggest that the burrow diameter of Thalassinoides become significantly smaller through the late Cretaceous Cenomanian–Turonian Boundary Event. To better understand consequences for marine ecosystems past, present and future, a statistically robust dataset of Thalassinoides measurements from multiple sections will be collected through the event and correlated with palaeotemperature data from the isotopic analysis of bivalve and brachiopod shells from the same beds.

Holocene growth time series for the giant goby in the Adriatic Sea

Isabella Leonhard

In the Adriatic Sea, human activity and climate changes have altered fish species distributions and abundances during the last millennia and the combination of warming, anoxia and overfishing together are predicted to lead to shrinking. In this study, I test the hypothesis that the growth rates of a common demersal fish species, the giant Goby (*Gobius cobitis*) dropped during the late



Holocene in the northern Adriatic Sea due to climate warming. I will perform sclerochronological analysis on radiocarbon-dated fish otoliths. Radiocarbon dating allows determining the otolith age independently from their stratigraphic position. Otoliths are the aragonitic structures of the fish inner ear that serve, thanks to incremental growth, as environmental and life-history archives today and in the geological past. The originality of my approach is that I will be the first to use otoliths cut in half to perform sclerochronology directly on specimens in which radiocarbon age has been measured, thereby obtaining a high-resolution time series of changes in body size and growth dynamics, as well as life history parameters in the young fossil record. I want to create the first complete Holocene fish growth time series and establish a baseline for fish response to climate change.

Pelagic deadfalls from Northern Italy: a comparative study on Mesozoic vertebrate taphonomy

Giovanni Serafini

This research project will investigate several pelagic vertebrate deadfalls from the Mesozoic of Northern Italy. Specific geological formations spanning from the Middle Jurassic to the Upper Cretaceous of Italy are known for their unique fossiliferous content, pelagic palaeoenvironment and slow sedimentation rates, key features to ensure a long exposition of large vertebrate carcasses on the seafloor. In modern oceans the sinking and decomposition of cetaceans is a trigger for biodiversity in both deep-sea settings and shallower waters: specific and opportunistic exploiters of the carcass contribute to an ecological succession that can flourish for decades. Marine vertebrates from the Mesozoic represent a unique subject to investigate similar ecological and taphonomical processes in deep time. This project will compare patterns of preservation among different time periods with similar depositional features; a key point of this study will be the identification of fossil fauna (scavengers, invertebrate communities) and evidence of microbial activity to compare deadfall stages with modern whale-fall ecology.

Palaeoecological reconstruction of Quaternary herbivore communities in Siwalik Hills using ecomorphological approaches

Anubhav Preet Kaur

The Pinjore Formation (2.58–0.63 Ma) in northern India provides the most extensive record of Quaternary mammalian remains from India. Since the 19th century, scholars have conducted extensive surveys, made comprehensive collections, and undertaken detailed descriptions of fossils from the region. However, very few are described with a defined stratigraphic context. From the early 19th to early 20th centuries scholars were mostly involved with comprehensive collection and detailed taxonomic descriptions of the fossils. It is only in the mid-20th century with Barnum Brown and G. E. Lewis that the fossil localities were mapped and a detailed account of the stratigraphic association of the fossils was maintained. These collections are curated at the American Museum of Natural History and the Yale-Peabody Museum. Since January 2020, palaeontological surveys in the Pinjore exposures north of Chandigarh in northern India have been resumed to investigate the palaeoecological implications of hominin occupation in the region and better understand the taxonomic diversity, biochronology, and palaeoecology of Quaternary mammalian fauna in the



Siwaliks. As a result, six new fossil localities were identified from which a total of 978 specimens were collected. These specimens, in addition to the above-mentioned museum collections, are being investigated using craniodental ecomorphology for determining dietary niches and habitat preferences of the Pinjore mammalian fauna.

Taxonomy and phylogeny of enigmatic taxa from the late Miocene of Tuscany

Luca Pandolfi

The project aims to clarify the taxonomy and phylogeny of the enigmatic giraffid-like and antilopine-like mammals from 8 million years ago in islands of the Tusco-Sardinian archipelago through morphological, morphometric and cladistic approaches. Understanding the origin and relationships among Late Miocene extinct insular species of the Tusco-Sardinian archipelago is a major challenge in palaeontology, because these species experienced extremely different morphological adaptations in respect to contemporaneous mainland faunas. In addition, no new specimens and no new Tuscan localities yielding the *Oreopithecus*-assemblages have been so far discovered since the middle of the last century. An unpublished mammal fauna, collected from Botro della Canonica (Tuscany) and composed of several cranial remains of giraffids and antilopines, has been re-discovered recently in the palaeontological collections of the Natural History Museum in Basel. The systematic study of these remains, and a cladistic approach aimed at detecting plesiomorphic and apomorphic features, can shed light on the phyletic relationships of giraffid-like and antilopine-like mammals from V1–V2 *Oreopithecus* assemblages, and therefore can lead to new hypotheses on the colonization of the Tusco-Sardinian archipelago. By comparing the new specimens with type material from previous published localities and latest Miocene mainland species I will provide new insights into Miocene insular mammal origin and evolution.

Undergraduate Research Bursaries AGM 2021

The following Undergraduate Research Bursaries were awarded by Council in 2021 and reported at the Annual General Meeting:

Eryka Maria Kritikos (University College London) for '*A new crocodylomorph specimen from the early Eocene of Morocco and the phylogenetic relationships of Dyrosauridae*'. Supervised by Philip Mannion.

Francesca Warren (Durham University) for '*Using $\delta^{13}C_{org}$ to improve the timeline of the Cambrian explosion*'. Supervised by Martin R. Smith.

Madeleine Wasko (Harvard University) for '*Quantifying rates of pyritization through experimental decay and computed tomography*'. Supervised by Javier Ortega-Hernández.

Ellen Campbell (University College London) for '*Palaeobiodiversity analyses of late Palaeozoic and early Mesozoic echinoids*'. Supervised by Jeffrey Thompson.

Maximilien Derème (University of Bristol) for '*Microvertebrates from the Middle Jurassic of Hornsleasow, Gloucestershire*'. Supervised by Michael Benton.

Andrei Olaru (Vanderbilt University), for '*Exploring Tribrachidium heraldicum and the late Ediacaran rise of suspension feeding*'. Supervised by Simon Darroch.



Engagement Grants AGM 2021

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 2021 AGM were:

Electric voice theatre for '*Voices for the future: Mary Anning*' (£5,000) – an award-winning contemporary music-theatre acappella ensemble, commissioning, revisiting, and creating vocal music by UK women composers for theatrical performance, and participating in creative multi-disciplinary collaborations, particularly with women working in STEM.

Aline Ghilardi (£5,210) for '*Brazil's deep time*' – for a project to popularise the geological and ecological history of this part of South America through its fossils in a ten-episode YouTube series presented by native palaeontologists. The series will be published in Portuguese with curated Portuguese and English captions and will include original footage from fieldwork across the country, as well as from local museums and laboratories.

Caubi Kuhn (£5,000) for '*Fossils go to school*' – a project to expand a travelling exhibition aimed at providing access to the museum collection and fossil replicas related to the prehistory of the state of Mato Grosso, Brazil, to schools and communities located close to fossiliferous sites. The expected results include the democratization of access to museum collections, the strengthening of teaching in rural schools and traditional communities, and stimulating the development of new actions to preserve the palaeontological heritage in these places.

Career Development Grants AGM 2021

The Association's Career Development Grant is 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 2021 AGM:
Alessio Capobianco, Arindam Roy, and Nidia Alvarez Armada.



Association announcements

Associate Handling Editors for *Palaeontology* and *Papers in Palaeontology*

The Editorial Board of *Palaeontology* and *Papers in Palaeontology* invite applications from early-career researchers to join the editorial team as Associate Handling Editors. Through this process we aim to give early-career researchers the opportunity to gain experience with editorial work in major international journals, while also receiving mentoring from existing Handling Editors, and increase the diversity of the editorial team.

Associate Handling Editors will be assigned a discipline-specific mentor from among the existing team of Handling Editors, and will be given a training seminar on the processes of handling papers and using editorial software. The Associate Handling Editors will be assigned up to 2–3 papers per year, and will be expected to make final decisions in consultation with their mentor. Associate Handling Editors will be appointed for three years with a review point after 12 months.

We invite early-career researchers to self-define, but applicants should already have obtained their PhD. We aim to recruit 4–5 Associate Handling Editors in the first instance, who will be chosen based on disciplines in which we need additional editors.

Applications will be reviewed by a panel comprising the members of the Editorial Board and the Publications Officer. Each application will be evaluated independently by reviewers using the following criteria:

- Discipline area within Palaeontology
- Experience of publishing and reviewing
- How becoming an Associate Handling Editor would support the applicant's career

Applications can be made online at <<https://www.palass.org/publications/associate-handling-editors-palaeontology-and-papers-palaeontology>>, where some extra details are provided.

The deadline for applications is **1st April 2022**.

Call for PalAss Regional Correspondents

At the Palaeontological Association, we are looking for Regional Correspondents who cover the entire globe, and who can inform us on particular social, economic, political and other challenges that students and researchers in their region might be facing and that might affect their studies, scientific work and contributions. The ultimate aim of this action is for us to stay updated, particularly as western media can be selective in their coverage. The role of a Regional Correspondent would be to e-mail the Diversity Officer whenever necessary to inform them about an emerging situation (e.g., war, economic crisis, etc.). The Diversity Officer will take this into account, and present it to Council for consideration. Regional Correspondents should expect to be contacted when necessary by the Diversity Officer, particularly if a discussion or a clarification of a certain topic is needed.



If you are a palaeontologist (at any career stage including undergraduate studies), and you are eager to share with us the situation in your region/country of residence, please write to the Diversity Officer (<diversity@palass.org>) including your name, career stage and country/region of residence. The Diversity Group will then select a pool of applicants to cover most of the world and present this to Council for approval. We apologize in advance for rejecting some applications: when we receive more than one application to cover the same region or country, we will offer the role to the first person to apply. Other candidates will be considered in the next round (with one round every two years).

Palaeontology needs us all to work hand in hand to achieve a healthy, diverse, inclusive, productive and happy community. The deadline for this call is **1st April 2022**.

Farid Saleh

Diversity Officer

Inclusive membership fees

The Palaeontological Association understands that people from low-income countries have limited means to join international associations. As such, they have less access to up-to-date scientific literature and they benefit less often from grants and awards delivered by these associations. For all the above reasons, the Palaeontological Association will start giving people from low-income countries (according to the World Bank) a 60% waiver on their membership fees starting in September 2022. This includes people renewing their memberships. We hope that this action will result in an increased geographical presence of the Association and will make our community more diverse and inclusive.

Farid Saleh

Diversity Officer

Updated Association policy on preprints

Preprints are versions of scientific manuscripts that have not been through formal peer-review or publication in a journal. They may be posted online prior to or at the same time as submission to a journal. We are happy to consider submissions to our journals that have been made available as preprints, but authors should be aware that initial Editorial Board decisions take novelty and timeliness of submissions into account, and this is evaluated on a case-by-case basis.

Authors are asked to upload any preprint of their submitted manuscript at the submission stage as a Supplementary File. Should their article be accepted for publication authors will be required to update preprint records with a DOI link to the final published article.

Upload of a preprint at the same time as submission or following submission is also acceptable. Please be aware that preprints including new taxonomic names should not be uploaded to preprint servers unless the new proposed taxonomy is redacted before publication of the final version of record.

Editorial Board

Palaeontological Association



ASSOCIATION MEETINGS



66th Annual Meeting of the Palaeontological Association
University College Cork, Ireland 18 – 24 July 2022

The Annual Meeting of the Palaeontological Association will be held at University College Cork (UCC), which was founded in 1845 close to the former site of the school of learning originally established by St Finbarr in 606 AD. The organizing committee is chaired by Prof. Maria McNamara, with help from Dr Chris Mays and other members of the School of Biological, Earth and Environmental Sciences at UCC. The e-mail address for all Meeting matters is <annualmeeting2022@palass.org>.

Programme

The 66th Annual Meeting will be held from **18th to 24th July 2022**. The Meeting will begin with various events targeted at the general public on Monday 18th July and an early-career researcher event on Tuesday 19th July. Workshops, laboratory tours and the symposium will take place on Wednesday 20th July, followed by the core scientific sessions on Thursday 21st and Friday 22nd July. There will be a two-day post-conference field-trip on Saturday 23rd and Sunday 24th July. All scientific sessions, workshops and the symposium will take place on the University's main campus on Western Road, Cork. The early-career researcher event will take place on the University's Distillery Fields campus on North Mall, a 15-minute walk along the River Lee from Main Campus. The public events will be split between Main Campus and Distillery Fields. The scientific sessions will take place in the Boole lecture theatre complex on Main Campus and will include several parallel sessions in adjacent theatres. Note that the Association AGM will **not** take place as usual during the Annual Meeting but will be scheduled for a date in December and held as a virtual AGM; details will be posted on the PalAss website (<www.palass.org>) closer to the time.

Meeting format

The Palaeontological Association and the meeting organizers are committed to hosting a safe in-person meeting. 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 current pandemic outlook in Ireland is positive and the Irish government has lifted most restrictions, including those applying to socialization and indoor gatherings. At the time of print, mask-wearing is required in retail settings and on public transport; it is not required in hospitality settings (e.g. pubs and restaurants). At UCC, facemasks are required in corridors but not in lecture theatres and other venues. It is anticipated that the remaining COVID-19 restrictions will be lifted imminently. The level of restrictions and the broader global situation are, however, subject to change; we will update delegates via the Association's website and via direct circulars where necessary. Full details of University and national COVID-19 protocols and restrictions will be provided on the Association's website and updated when necessary.

Should developments in the COVID-19 pandemic render an in-person meeting impossible, the in-person meeting will be cancelled by 4th July at the latest. In this scenario, the Annual Meeting will be rescheduled for 19–21 December and will be a virtual meeting hosted by the UCC team. All



delegates registered for the in-person meeting will be transferred automatically to the December virtual meeting and the major portion of their registration costs refunded. Talks and posters accepted for the in-person meeting in July will automatically transfer across to the virtual fall-back meeting in December (unless a presenter cannot attend). The virtual talks will be pre-recorded and submitted by speakers prior to the end of November; virtual posters will be made available to delegates during the conference. Full details of the virtual meeting will be provided if necessary and in due course.

At the time of registration, delegates submitting abstracts will be asked to indicate whether they will be available during the December dates. Should a delegate indicate that they are not available in December, this will not preclude registration for the in-person meeting and will not factor into the decision-making process regarding abstract acceptance).

If a virtual December meeting is required, new registrations will be possible in the autumn for a small registration fee.

The July meeting will include selected virtual elements.

We are investigating options for potential live streaming of elements of the Meeting to the PalAss YouTube channel. The live stream will not afford the opportunity to interact directly with the meeting hosts or delegates.

A limited number (*circa* 10) of oral presentation slots have been ring-fenced for delegates from low-middle income countries 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 July and will be expected to attend via Zoom to answer questions from the audience.

Non-attendance by presenters

Oral presenters forced to withdraw at the last minute have the option to submit a pre-recorded talk to be played during their scheduled slot.

Poster presenters forced to withdraw may choose to courier their poster to UCC for display as part of the poster sessions. Alternatively presenters may make arrangements with a local printing company (<www.snap.ie>) to print the poster and deliver it to UCC.

Monday 18th July: Public fossil expo

The Meeting will begin with an interactive public fossil exhibition at the School of Biological, Earth and Environmental Sciences from 16:00–19:00 on 18th July. The core of the exhibition will be several exhibits delivered by staff and students of the School of Biological, Earth and Environmental Sciences at UCC. Meeting delegates are very welcome to participate in the exhibition, either by contributing to the UCC exhibits or by bringing a fossil or other prop(s) of their own. The number of delegates who can be accommodated is limited; slots will be allocated on a first-come-first-served basis. Interested delegates should e-mail <annualmeeting2022@palass.org> for further details and to reserve a slot.

Monday 18th July: Royal Irish Academy Discourse Lecture

The exhibition will be followed at 20:00 by a public lecture that forms part of the Royal Irish Academy Discourse Lecture series (<<https://www.ria.ie/public-engagement/royal-irish-academy-discourse-series>>). The discourses are the oldest and most renowned series of talks in Ireland, with



the first Discourse presented in 1786. The RIA discourses were traditionally the occasions reserved for the most distinguished academics to first present and discuss new work in public, and today aim to bring thought leaders to the Academy to discuss important contemporary issues. Historical Discourses of note include those by Robert Mallet on his pioneering work on earthquakes, and by Sir William Rowan Hamilton on quaternion algebra. Recent speakers include various Nobel Laureates, former president of Ireland Mary McAleese and former Secretary General of the European Commission Catherine Day.

The July lecture represents the first time that the Discourses are associated with a major scientific meeting. The theme of the Discourse will be biodiversity and environmental change; the speaker will be announced in the May *Newsletter*.

Tuesday 19th July: Early Career Researcher event: Career Links workshop

There will be a full-day early-career researcher (ECR) event, “Career Links workshop”, on 19th July at the School of Biological, Earth and Environmental Sciences. The event will run from 09:00 to 17:00 and will focus on networking. The event will be open to all meeting delegates but will be of particular interest to those 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 their peers and senior researchers in their field, and to learn more about career progression options and strategies. A secondary goal is to help senior researchers make connections with up-and-coming researchers in their field who may become future collaborators and/or members of their research group. The event is free (including lunch, but participants will have to pay for dinner). 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.

09:00 – 09:30 Registration (participants can register for the full meeting here)

09:30 – 10:00 Tea, coffee, scones

10:00 – 10:15 Welcome

10:15 – 10:45 Introductions

10:45 – 12:00 Peer meet-up in research zones

12:00 – 12:45 Lunch

12:45 – 13:30 Five-minute lightning talks by senior researchers focused on their labs and research

13:30 – 14:30 Meetup with senior colleagues in research zones

14:30 – 15:00 Tea break

15:00 – 16:15 Ten-minute talks on career paths (2 x tenured academics and 2 x PhD graduates now working in non-academic careers)

16:15 – 17:30 Panel discussion on career pathways with all senior academics present

18:00 – 20:00 Dinner at nearby restaurant (optional)



Wednesday 20th July: Workshops, Lab tours and Symposium

On the morning of 20th July delegates have the option of participating in one of several workshops held in the Áras na Mac Léinn building on Main Campus. Specialists from Transmitting Science will deliver at least one workshop and meeting delegates are free to suggest others; contact local organizers to discuss. Several classrooms have been booked for the workshops from 09:00 – 12:00.

Concurrent with the workshops, there will be tours of the palaeontology/taphonomy and microbeam laboratory facilities at the School of Biological, Earth and Environmental Sciences. Places on the tours are limited and will be allocated on a first-come, first-served basis at time of registration.

In the afternoon, the Annual Symposium will run from 13:00 to 17:00 with the theme “Chemical fossils”. The full schedule and list of speakers and talk titles will be published in the May issue of the PalAss *Newsletter* and online on the Association’s website in May.

Delegates may opt-in for a packed lunch; delegates may select options for different dietary requirements at time of registration.

Thursday 21st and Friday 22nd July: talks and posters

Thursday 21st July will feature a full day of talks and posters, followed by the Annual Address given by Daniela Schmidt (Professor in Palaeobiology, School of Earth Sciences, University of Bristol, UK). The Annual Dinner will be subsidized thanks to the generosity of our sponsors. Attendance at the dinner is capped so places will be allocated at time of registration on a first-come, first-served basis.

Friday 22nd July will again be a full day of talks and posters.

On both days delegates may opt-in for a packed lunch. Delegates may select options for different dietary requirements at time of registration.

Saturday 23rd July and Sunday 24th July: field-trip

A two-day post-conference field-trip will visit the Carboniferous rocks of North Clare on Ireland’s Atlantic seaboard. Delegates will visit several Lower Carboniferous (Viséan) sites in the remarkable Burren region and Upper Carboniferous (Namurian) sites along the coast, including the Cliffs of Moher. The Burren is the largest glaciokarst in Europe and is celebrated for its spectacular scenery but also its unique flora and archaeological heritage. The visually stunning Cliffs of Moher, which rise to over 200 m above sea level, are the longest sea cliffs in Europe and host internationally important seabird colonies. The field-trip will visit various sites of palaeontological and geomorphological interest and will include several short hikes on uneven terrain.

The trip will depart Cork at 08:00 on the 23rd, returning *ca.* 19:00 on the 24th. The field-trip fees will include overnight accommodation, transport and all meals; there will be two tiers of accommodation options (*i.e.* with one less expensive option). The number of participants will be limited due to coach capacity so places will be allocated on a first-come, first-served basis at time of registration.



Getting to Cork

Cork is a relatively small city. The North Mall campus of the University is a five-minute walk from the city centre, and the main campus is a 15–20 minute walk from the city centre.

Cork has excellent connections with the rest of Europe. Its international airport (ORK) is a hub for Aer Lingus and Ryanair and features daily flights to various destinations in the UK (Birmingham, Edinburgh, Liverpool, London and Manchester) and Europe (including Amsterdam, Paris, Geneva, Gdansk, Poznan and Munich). For a full list of destinations see <<https://www.corkairport.com/destinations/destinations>>. From Cork airport it is a 15–20 minute taxi journey to the city centre.

Cork is connected to Dublin by train and bus, including various direct bus services to Dublin airport via Aircoach (<www.aircoach.ie>) and Gobe (<<https://gobe.ie>>). Dublin airport is a major transport hub with direct flights to over 190 destinations worldwide. Cork bus station is in the city centre and Kent train station is a ten-minute walk from the city centre.

Registration

Registration and abstract submission opened in early March. Full details of registration costs and abstract formatting details are available on the meeting website. The deadline for early-bird registration and abstract submission is 14th April at 23:59 BST. It will not be possible to submit an abstract after that date. Registration after 14th April will incur additional charges and will close on 16th May. Registration and bookings for specific meeting events (public fossil exhibition, ECR event, workshops, lab tours, Annual Dinner and field-trip) will be taken on a strictly first-come, first-served basis.

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

Accommodation

There are several hotels and guesthouses in the immediate vicinity of the University within a 5–10 minute walk of the conference venues. There are many additional hotels, guesthouses and hostels in the city centre, along with plenty of pubs and restaurants. A limited number of rooms will be available at discounted rates in several of these accommodation providers and in the University halls (student accommodation). Alternatively accommodation can be booked using the usual online resources, e.g. <www.booking.com>. A list of suggested accommodation options, including details of discounted rates across all price points possible, is available on the PalAss website. Be advised that discounted rates may not be available if booking late.

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 (or euro equivalent) will be available to student presenters who are travelling from outside Cork. 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, and before 30th June 2022. Please title the email "Travel Grant Request". No awards can be made to those who have not followed this procedure.



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 June at 23:59 BST. Please see <<https://www.palass.org/awards-grants/grants/palaeontological-association-carer-s-bursary>> for further details.

Nursing facilities

There are baby changing facilities and a nursing room on both Main Campus and the North Mall campus. 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 (e-mail <annualmeeting2022@palass.org>).

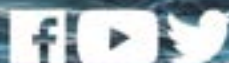
Accessibility

All buildings in the University are accessible via ramps and/or lifts. A quiet room will be available for individual use if required.



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news



Palaeontology in the news

The end of 2021 brought the exciting news of an extraordinarily well-preserved embryo of a Late Cretaceous oviraptorid dinosaur found in a fossil egg in Ganzhou, in southern China. The embryo description was published on 21st December by Dr Lida Xing and other colleagues in the scientific journal *iScience* – the news quickly spread in newspapers, all the major scientific dissemination magazines and of course on social media. Wonderful 3D and artistic reconstructions of the ancient embryo populated the Internet, as well as the hashtags #dinosaur and #embryo.

Fossilized dinosaur eggs are not that rare, but it is very uncommon for them to have a preserved embryo inside and, even when it is present, the embryo bones are usually not articulated anymore. Dr Fion Waisum Ma, who worked on the Ganzhou fossil, said that it is “the best preserved dinosaur embryo ever found in history”. Clearly, this find is important for understanding oviraptorid theropod ontogenesis, alongside the relationship between them and the avian-theropods. It is therefore ironic that this egg lay in the storeroom of the Yingliang Stone Natural History Museum of Nan’an in China for more than 15 years before it was rediscovered in 2015. The egg was donated to the Museum in 2000, after being found in the Shale Industrial Park in the city of Ganzhou. In 2015, a staff member of the Museum noticed the bones sticking out from the eggshell and 3D scanning confirmed that there was a fossil inside.

This extraordinary fossil was therefore buried twice: once under layers of rocks and soils and once in a museum basement. This case is not unique, though. Museums may have up to millions of items in their collections and almost all of them are stored in boxes and shelves in the storerooms. For example, the Natural History Museum of London, in the UK, has more than 80 million items in its collections.

With those numbers, some items will easily go unnoticed, or be misplaced, or simply ignored for decades. There is the case of a series of beetles collected by David Livingstone during his expedition along the Zambesi River between 1858 and 1864; they were stored at the Natural History Museum, London, then forgotten, only to be rediscovered in 2014. Equally, there is the ‘mystery skeleton’: a 65,000-year-old human skeleton that lay in a dusty wooden box in the physical anthropology section of the Penn Museum in Philadelphia for years, before being rediscovered during the process of digitization of the Museum’s archives. A collection of barnacles donated by Charles Darwin to the Royal Natural History Museum of Denmark was displayed on different Museum shelves for years because people didn’t know they all came from the same Darwin collection. Alfred Russel Wallace’s butterflies didn’t have a better fate. His collection was mixed with other butterflies in 3,340 drawers at Oxford University Museum of Natural History. Wallace’s butterflies were identified and grouped together much later, in 2013, by a 17-year-old student during her four-week internship. Long-beaked echidna were thought to have become extinct in Australia 11,000 years ago until a specimen originally found in Australia in 1901 and then misidentified was rediscovered in the storerooms of the Natural History Museum, London in 2009. A collection of Jurassic fossil insects collected by the geologist Charles Moore in the 1800s was left unwrapped until 2011 when the Bath Royal Literary and Scientific Institution received a grant to restore Moore’s collection. Hence, the articulated oviraptor embryo from Ganzhou is no isolated case when it comes to being overlooked.



The position of the fossil, with the head lying ventral to the body and the back curled along one end of the egg, is a posture that has never been identified before in a non-avian dinosaur and is reminiscent of those of the late-stage modern bird embryo. This 'lost and found' fossil calls for further investigation into the true origin of this pre-hatching behaviour.

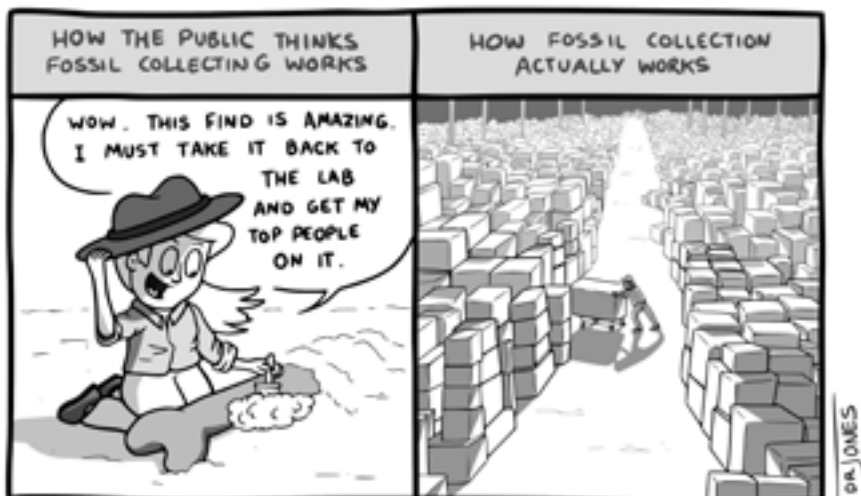
In the last two years, since the pandemic outbreak, many palaeontologists and scientists in general have been spending more time studying the items already in their institutions' collections, since looking for new specimens has been almost impossible because of COVID-19. Maybe the silver lining of this stressful period is that more lost specimens will be found in museum and university storerooms where the next great discovery may lie in a dusty box, under a stairwell full of spiders' webs or in a dark, creepy basement.

Nicola Vuolo

Publicity Officer

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

A winged reptile from the winged island

In 2017, PhD student Amelia Penny found something that looked like a sharp-toothed jaw buried in the Jurassic limestones of the Isle of Skye in the Inner Hebrides of Scotland. Though the island is known for being rich in fossils, particularly from the Jurassic period, Amelia's discovery is particularly special. Another PhD student, Natalia Jagielska, led an in-depth study of the fossil, revealing that it belongs to the world's largest Jurassic pterosaur.

A Gaelic name, *Dearc sgiathanach* (pronounced Jark Ski-an-Ach), was given to the extraordinary creature in honour of the Isle of Skye. *Dearc sgiathanach* means "winged reptile", which is a fitting name for a creature with an average wingspan of 2.5 metres.

This 170-million-year-old fossil is incredibly well preserved, which is quite rare for a pterosaur: these creatures had very light bones to enable them to fly, like modern birds, hence the rarity in finding articulated pterosaur fossils. There is a gap in the pterosaur fossil record in the Middle Jurassic, around 174–164 million years ago, and *Dearc sgiathanach* seems a good starting point to fill this. The fossil will be studied further and displayed in the National Museum of Scotland, in Edinburgh.

News of such a special find quickly spread in and outside the palaeontological community. It was reported by general media and of course it went viral on social media. The evocative appearance of this pterosaur is particularly inspiring for palaeoartists giving their own interpretation of it. Yet artistic production is not limited only to *Dearc sgiathanach* as its fellow pterosaurs are currently under the spotlight, with some very interesting artistic reconstructions. Wonderful examples may be found on Twitter, following the hashtag #palaeoart.

For an ancient world that cannot be immortalized by any camera, art is the only way to glimpse how it was to live on a planet inhabited by gigantic, scary and fascinating creatures such as *Dearc sgiathanach*.

NEWS



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Dinosaurs' silent spring

Chicxulub meteorite, that played a major role in the extinction of dinosaurs, collided with the Earth during the Northern Hemisphere's springtime. This is what an international team of researchers, led by VU Amsterdam, recently discovered.

The team was able to draw its conclusions thanks to high-resolution, synchrotron x-ray scans of the bones of a fish that died right after the meteorite impact. Fish bones have growth patterns very similar to tree rings, allowing the scientists to find out that the studied fish died in the spring.

This could have made a huge difference for the living creatures that inhabited our planet at the end of the Cretaceous Period. The plants and animals in the Northern hemisphere were hit by the catastrophe during their spring and were more severely affected. Indeed, spring is a difficult time for life. Even if it is always seen as the season of rebirth and renewal, spring is a period in which most animals must care for their fragile offspring, or they need to look for food after the long winter. Even plants employ lots of energy in producing seeds and spores. Creatures living in the Southern Hemisphere, where it was late autumn, may have been in hibernation or sheltering.

The research was published in *Nature* in February 2022 and the news was picked up by several newspapers and online journals – and of course it was shared and debated on Twitter, under the hashtags #meteorite, #dinosaur and #spring.

The disastrous impact of the meteorite was so out-of-scale that it would have wiped out dinosaurs and many other creatures despite the season, but it seems that the Northern Hemisphere plants and animals suffered more than the Southern ones from the meteorite impact.

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2022. The reign of the dinosaurs ended in spring. VU Amsterdam. <<https://vu.nl/en/news/2022/the-reign-of-the-dinosaurs-ended-in-spring>>.

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 Aldo Benites Palomino, Daniel Madzia and Mónica Alejandra Gómez Correa.

Aldo Benites Palomino is a Peruvian in Switzerland, pursuing a PhD in the Palaeontological Institute & Museum at the University of Zurich.

Q1: How did you end up in Switzerland?

I started my palaeontological career in Peru many years ago, as part of the Vertebrate Palaeontology Department, Natural History Museum of Lima. Despite its foundation 20 years ago, the collection it holds has become one of the most important ones due to the almost 100 vertebrate holotypes stored within it. As a volunteer during my first undergrad years I mostly helped with collections and curatorial stuff. In 2015 I was tasked with a long-forgotten part of the collection, collected during the 1990s. These materials were extremely interesting as nobody had worked on them and represented a completely unknown assemblage of marine mammals. One of the skulls from this collection became my Honours thesis and was later published. In 2019 I became a fellow at the Smithsonian Tropical Research Institute from where I started to work on other materials, and through our group leader there, Carlos Jaramillo, I made a direct connection with the group in Zurich. I ended up moving to Switzerland to start a Masters three weeks before the first lockdown, and here I am ... two years later in my first PhD year.



Photo © Aldo Benites Palomino.

Q2: How is your position funded?

Via the SNSF (Swiss National Science Foundation) my lab receives funds that cover my PhD. Needless to say Switzerland is a pretty expensive country and PhD positions are the ones funded (not masters).

Q3: What is your project about?

My project explores the diversity of two groups of toothed cetaceans in the Neotropical (Colombia, Peru & Venezuela) region: sperm whales (Physeteroidea) and extinct relatives of the Ganges river dolphin (Platanistoidea). The fun fact is that palaeontological research has mostly been carried out in temperate regions across the world, but most modern (and extinct) diversity does not occur in these regions, meaning that any conclusion we might infer could be heavily skewed. This is why my project focused solely on the Neotropical region and two groups that were extremely diverse in the past.



Q4: What surprised you most about living in Switzerland?

The fact that science is so well funded. This was an amazing change for my life.

Q5: Apart from friends and family what do you miss most about Peru?

FOOD. Any Peruvian will tell you that – here, in France or in China. We are extremely picky with food due to the large diversity of biomes we have around. There is no wrong choice with Peruvian food and I do really miss going to a local market and finding 50 varieties of potatoes or 40 species of fish to eat. The access to such diversity on a local level and at such affordable prices is something that I do miss a lot.

Q6: How has the pandemic affected your situation as a palaeontologist abroad?

Access to collections has been difficult. But nothing too tedious as I already had enough data collected from many years, so I did use last year to wrap up projects I did not focus on before. I was even lucky enough to carry out additional fieldwork in Peru, which was tremendously fruitful. Having fewer people around for travel was beneficial too, as I did not have to care that much about logistics and other stuff related to it. This was extremely useful, since the lab in Lima is small and cannot host many people around. Technology was also really helpful when travelling as I had access to two sophisticated 3D scanners for my collections work.

As I do not use my Twitter account for solely palaeontological content, I prefer that other palaeontologists follow me on Instagram: @Peruvianwhale



Daniel Madzia is a Czech in Poland, employed as an Assistant Professor at the Institute of Palaeobiology of the Polish Academy of Sciences.

(The photograph is used with permission from an anonymous source.)

Q1: How did you end up in Poland?

I moved to Poland for my Master's thesis because I wanted to specialize in dinosaur palaeontology. That was basically impossible in the Czech Republic. Even though Poland does not have many more of their own dinosaur discoveries, there are rich collections of Mongolian dinosaur specimens in Warsaw, housed at the Institute of Palaeobiology of the Polish Academy of Sciences. Studying these collections is, I believe, a

dream come true for every palaeontologist interested in these vertebrates, regardless of where they originate from.

So, for my Master's thesis I focused on Mongolian titanosaurs. When I finished, I wanted to continue my adventures with dinosaurs but that was not possible at that time so I started PhD studies on marine reptiles, pliosaurids and mosasaurs. After finishing the PhD, I started to work at the Institute of Palaeobiology and could move back to dinosaurs as my primary group of interest.

Q2: How is your position funded?

I am currently employed as an Assistant Professor and my studies are mostly funded through a grant awarded by the Polish National Science Centre.

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

My current project is focused on the phylogenetic relationships and historical biogeography of European ornithischians.

Q4: What surprised you most about living in Poland?

When I moved to Poland, I was sincerely surprised how friendly and open Poles are. It is not that Czechs are not friendly, but it just seemed so much easier to find new friends in Poland.

Q5: Apart from friends and family what do you miss most about the Czech Republic?

A good beer! And fried cheese. I also miss people who understand the rules of ice hockey...

Q6: How has the pandemic affected your situation as a palaeontologist abroad?

Speaking of research, apart from obvious things like having more difficulties while planning to travel abroad, the pandemic has actually affected my situation rather positively. I know it sounds weird and I almost do not believe that I am really saying this, but since the pandemic started and I have worked from home, I have been much more productive. I am not entirely sure why that is because I have generally less time to work now but, apparently, I have got more “space” and “freedom” now.

Daniel Madzia tweets at @danielmadzia



Photo: Tasnuva Ming Khan.

Mónica Alejandra Gómez Correa is a Colombian in Germany, studying for her PhD and employed as a research assistant in the Geology Institute at Hamburg University. She is part of the Emmy Noether Group Palaeobiology and Mass Extinctions.

Q1: How did you end up in Germany?

I came to Germany to do my masters degree in Palaeobiology. I found out about the programme through the DAAD office in Bogota. I applied to different masters programmes in Europe and decided on Germany. Once my place on the course was confirmed, I sorted out the visa, certified copies of everything and all the paperwork, took my life savings, applied for a loan to finance my first year of studies and travelled to Germany. Staying in Germany – that is another story – however, after my first year, I realized I wanted to stay in Europe

because of the opportunities available to continue doing research.

Q2: How is your position funded?

I am employed at the University of Hamburg as a research assistant in the Palaeobiology and Mass Extinctions group. My position and PhD project are funded by the Emmy Noether Programme of the Deutsche Forschungsgemeinschaft (DFG).

Q3: What is your project about?

The research group I am part of primarily focuses on quantitatively investigating and integrating high-resolution records of environmental and ecological changes during the Permo–Triassic



climate crisis. My PhD research focuses on the microfossil record to understand ecological changes of marine ecosystems associated with climate change and extinction. Furthermore, I would like to integrate fossil and geochemical records to better understand the main drivers of the Permo–Triassic crisis.

Q4: What surprised you most about living in Germany?

The schedule for public transport and the schedules for everything in general. After three years of living in Germany, the “Ruhetag”, when supermarkets, shops and many other things are closed on Sundays, is still surprising. Fortunately, the bakeries are open on Sundays, so it is still possible to survive and enjoy the immense varieties of bread in Germany.

Q5: Apart from friends and family, what do you miss most about Colombia?

Fruits, vegetables, fresh food and the mountains. I grew up in Bogota, a big city located 2,600 metres above sea level surrounded by the Andes, meaning mountains are part of my sense of home. In Colombia, we have fruits everywhere all year long – it is a paradise! So I grew up eating fruit and vegetables all the time, drinking fresh homemade juice, picking up mangoes, mandarines and oranges with my grandfather. Although I know you can also buy some of those in Germany, the taste is just not the same.

Q6: How has the pandemic affected your situation as a palaeontologist abroad?

The pandemic hit right before I started my masters thesis, so no fieldwork, lab work or internships could take place – all of these exciting plans I had were cancelled. I had to swap my plans to produce a thesis based on data from a database, work through extra semesters to finish, and navigate a job market which had few to no-palaeo-related jobs available and restricted opportunities for non-EU students. Personally, I was also constantly worried about the situation in Colombia and I was not able to visit my family for two years. Still, I believe that the last visit home gave me the strength to finish. On the bright side – just before the pandemic started – I joined the GeoLatinas community. I found support and encouragement to keep going and continue looking for opportunities. Without the pandemic and the GeoLatinas community support, I would not have applied to Hamburg and be where I am now.

Alejandra tweets at @Mokasaurus

Legends of Rock

Louis R. Purnell

How many times have palaeontologists faced discrimination in their workplace or community, because of gender, ethnicity or another protected characteristic? For many of us, such struggles are often constant in our lives, creating and imposing barriers. Throughout history there are those who have stood up against such barriers and overcome them through great endeavours, resulting in legacies that inspire the following generations. One such individual is Louis R. Purnell, who did not just overcome such barriers once but twice – in the American military and in academia, becoming the first African American Curator of the Smithsonian Institution.

Louis was born in Maryland on 5th April 1920, to a railroad worker and a teacher. He graduated from Cape May High School in New Jersey as third in his class, falling in love with the idea of flying



Louis R. Purnell in Airman's Uniform, ca. 1942. Smithsonian Institution Archives.

and studying due to the presence of a nearby airfield. In 1939, he left to study Psychology at Pennsylvania's Lincoln University, but the onset of World War II resulted in him enrolling in Civilian Pilot Training. He became one of the 124 licensed Black pilots in the United States within the year, joining the seventh class of African American Army Air Force aviation cadets stationed at Tuskegee, Alabama. Unsurprisingly, there were tensions between the Black pilots and local white residents of Tuskegee. Despite the racism that fuelled these tensions, he was commissioned as 2nd Lieutenant on 3rd July 1942, being assigned to the 99th Pursuit Squadron also known as the Tuskegee Airmen, subsequently becoming captain. During the war, he flew on 88 missions over North Africa and Europe and was awarded the Distinguished Flying Cross and the Air Medal for his service.

After the war, Purnell returned to Lincoln University, graduating in 1947 and briefly working as a speech therapist at Howard University in Washington DC. Due to economic struggles, and listening to the counsel of his wife, he sought work in more stable jobs in government; yet none of them satisfied his intellectual curiosity. After over a decade, Louis obtained an intellectually stimulating temporary job as a museum specialist in the Division of Invertebrate Paleontology and Paleobotany in the Smithsonian National Museum of Natural History, subsequently turning it into a permanent position.

Over the ensuing years, he travelled on the Oceanographic Research Ship *USNS Chain*, where he identified and catalogued numerous marine specimens. During this period, he declared he wanted to create a new catalogue based on his research and enrolled in Geology classes at George Washington University. In 1968, he published the *Catalogue of Type specimens of Invertebrate fossils*. However, while other academics would have been celebrated due to their successes, Purnell was not, as he was Black and not white and, therefore, seen as posing a threat to academia due to his race. Thus, even though he was well qualified, he failed to achieve promotions due to the colour of his skin. Can we genuinely say: things are significantly different today, with people being denied roles or positions due to their skin colour or another protected characteristic, regardless of their academic ability or achievements?

Not being deterred by racial discrimination and seeking to further his intellectual ventures, Purnell applied for a position in the Smithsonian National Air and Space Museum. The head curator denied him this, as he did not want any "Blacks" in his museum. Have things really changed today?

Nonetheless, the Astronautics chair Frederick C. Durant hired Louis in the Astronautics Department, where he catalogued hundreds of specimens the Museum had collected.

We believe that those who stand up for truth and justice should be remembered favourably, even if they are ridiculed during their lives, While those who discriminate should be relegated to the waste bins of history, regardless of their academic achievements and prowess.



Louis R. Purnell, Jr., Curator of Astronautics, in front of airplane at NASM, ca. 1980s. Smithsonian Institution Archives.

After negotiating with the companies that supplied NASA, Purnell reached an agreement where he was able to obtain all spacecraft, spacesuits and equipment that had entered space for the Museum, dramatically enriching the collections. After long years and many great academic accomplishments, he became Assistant Curator in 1972, finally being promoted to Curator of NASM in 1980. He was the first Black curator of the Smithsonian. As Curator, Louis promoted the visibility of African Americans in the Museum and managed to temporarily display “Black Wings, exploring the history of the Tuskegee Airmen” that subsequently became a permanent exhibition. He retired in 1985 but remained a consultant to the Smithsonian until he sadly passed away in 2001 due to cancer.

Louis R. Purnell’s life was not just one of a World War II unsung hero, but

also an unsung hero in academia, challenging and pursuing his intellectual curiosity regardless of the racism and discrimination that he faced at every turn. During his retirement, he stated that he had to be twice as hard as his white co-workers and was only able to pursue his intellectual passions as he learned to “roll with the punches” and “overlook the prejudice”. Even today, for minority ethnic palaeontologists these statements hold true. Have we not made any progress at all? One could argue that the conditions have worsened as manifestations of prejudice have become more subtle, with perpetrators facing no repercussions. Ultimately, Louis Purnell was denied access to the field of Palaeontology and what a loss this is, considering his vast and grand achievements in academia.

Will we as a community continue to allow such outdated practices and discrimination to continue, further diminishing palaeontology and not learning from the mistakes and wrongdoings of those who have come before us?

Cassius Morrison (he/him)

University College London and Natural History Museum London, UK

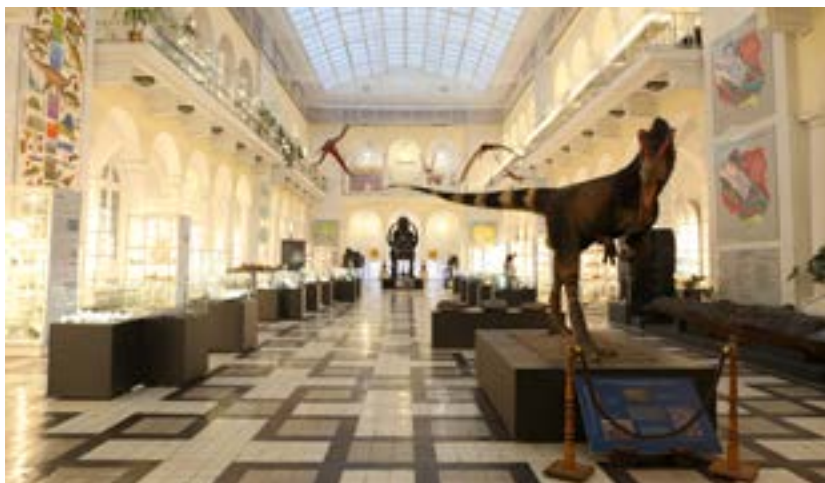
Marco Ramley (he/him)

Palaeontologists against Systemic Racism



Behind the Scenes at the Museum

The Geological Museum of the Polish Geological Institute



The main hall of the Geological Museum (photo: Marlena Świło).

The Polish Geological Institute – National Research Institute (PGI-NRI) was established in 1919 as a response to the urgent need for an institution conducting works in different scopes of geology right after regaining independence in 1918. The Geological Museum was founded almost immediately the same year, as part of the PGI. The first curator (and future General Director of the PGI) Jan Czarnocki began the hard work of building collections appropriate for the national institution. His efforts resulted in over 180,000 specimens housed in the Museum during the 1920s.

The first headquarters of the PGI, along with the Museum, were located in the Staszyc Palace in Warsaw. Unfortunately, the palace did not have enough space to house all offices and laboratories, so most of the collections were stored in boxes, without permanent exhibition. The new building for the PGI was designed by Marian Lalewicz, a renowned Polish architect, and was inspired by the Mining Institute in Petersburg and British Geological Museum in London, as well as by the works of the famous Italian architect Antonio Corazzi and by Wawel Castle in Kraków. It has a vast central exhibition hall and smaller offices around it for the employees, with laboratories in a separate building. The Museum moved to the new headquarters located near Rakowiecka Street in Warsaw in 1930. At last, with enough space, the Museum could spread its wings to become the biggest facility of its kind in Poland. Extensive geological works, conducted by PGI, resulted in a proliferation of housed collections (a few hundred thousand specimens in 1939) and in the first exhibitions: 'Geology of Poland' and 'Mineral resources'.

During the Second World War, the building itself and most of the specimens were severely damaged due to the heavy bombing of the capital city of Poland, and military actions of the Warsaw Uprising in 1944. Only 30% of the collections were rescued. Immediately after the War the Institute began



to rebuild its headquarters and the Museum collections. Innovations in geological research techniques, extensive fieldwork and specimen acquisition efforts quickly resulted in the Museum regaining its pre-War position as the leading Geological Museum in Poland. In the late 1950s, one of the most recognizable specimens came to the main hall – the skeleton of the woolly mammoth that later became the signet of the Museum logo.



Woolly mammoth skeleton in the main hall (photo: Marlena Świło).

Since reopening after the War, permanent exhibits have been constantly developed to respond to the needs of the public. The last comprehensive change focused on formal education, especially that of high school and university students, as well as on full representation of minerals, rocks and fossils found in Poland. For many years now, museums have been broadening their target audiences to combat the exclusion of certain communities. With that in mind, the permanent exhibition underwent many modifications in recent years. That included, for example, presenting the results of the latest famous discoveries of Polish scientists such as the oldest tetrapod tracks in Zachełmie, one of the biggest placoderms from the Plucki locality in the Holy Cross Mountains, and well-preserved dinosaur tracks from Borkowice. A completely new full exhibition project is currently being developed and is scheduled to be completed within the next few years.

Education in the Geological Museum does not end with the exhibits. Our goal is to educate and make science interesting to the public. We organize and take part in different types of events throughout every year. We have a diverse offering of lessons and workshops for schools and other groups adjusted to all ages starting from preschool. Our visitors can take part in many international events, such as Dinosaur Day, Earth Day or Night of the Museums, as well as in more local ones, but none the less enjoyed by the public, for example the Science Festival in Warsaw. One of our most renowned events is the nationwide contest called “Our Earth” organized for over 20 years now! Museum staff also travel to other cities and smaller towns with educational opportunities for local communities that may not have the chance to visit us otherwise. The Geological Museum also publishes books, brochures and educational leaflets.



Exhibition “Mineral Resources” (photo: Marlena Świło).

Beside the increasing focus on education, the Geological Museum is constantly fulfilling its role as an important repository of geological specimens. The Museum is the only museum in Poland that stores a complete collection of rocks found in Poland, fully reflecting its geological structure. It includes minerals, rocks, natural resources, flora and fauna fossils, as well as microfossils. The collections are available for scientific, educational and exhibition purposes. They can be researched on site, loaned or accessed online, as we are constantly digitizing all specimens, making them available for everyone.



We are also available for hire. So far the Geological Museum has hosted film-makers, commercial production companies and artists performing in our main hall. Marian Lalewicz's architecture and some few-million-year-old specimens turned out to make an interesting backdrop for the creative industry, resulting in the Geological Museum starring on the big screen and on TV.

The last two years have not been an easy time for museums worldwide and the situation continues. As the pandemic made us face circumstances never seen before, we started to evolve. Our response has been to intensify our activities online as this channel of communication is independent of any lockdowns dictated by health measures. Some of our events, *e.g.* Children's Day 2021, took place only on the Internet. We prepared different types of activities and contests to make a stay-at-home easier to endure, especially for children. Besides that, we constantly develop our web page and you can follow us on Facebook to stay up to date and cast an eye over news posted by our staff.

And the icing on the cake is: the Geological Museum of the Polish Geological Institute is available for free! We are open from Monday to Friday plus Sunday each week for anyone hungry for some geology and no ticket is necessary to visit our exhibitions.

Magda Sidorczuk

The Geological Museum of the Polish Geological Institute



Life-sized reconstructions of early tetrapods from the Devonian (Geological Museum archive).

You can visit the The Geological Museum of the Polish Geological Insittute on the Web at

<<https://www.pgi.gov.pl/en/>>



Behind the Scenes at *another* Museum

The Natural History Museum, London collections are on the move

We are all familiar with feeling the squeeze, financially and on our waistbands, at the start of the New Year. But once those chocolates are finished and you have fought the impulse to slump on the sofa again instead of going on a spine-tinglingly cold, dark, wet, windy (at least in the UK...) winter run, you will be back to yourself in no time. For many of us at the Natural History Museum (London, UK) however, this year and many years to come will be dedicated to battling a different bulge – of the millions of collections housed across the Museum's sites, as we set out to develop a new centre for collections and research.

A brief history of the Natural History Museum collections

The origins of the collection at the Natural History Museum date back to 1753. Following the death of the physician and collector Sir Hans Sloane, his collection of more than 71,000 objects including coins, books, natural history specimens and more, was bought by the British government. This diverse collection formed the foundation of the British Museum, which opened its doors for the first time in 1759.

By the late 1850s space was running out, and driven by the new Superintendent of the natural history collection, Richard Owen, the case was made for the development of a new museum dedicated to natural history. What followed was the Natural History Museum at South Kensington, the 'cathedral to nature' we see today. Since then, the collections have continued to grow to around 80 million specimens, providing a comprehensive record of the natural world, past and present, and enabling researchers to deliver new insights into life on earth and address global challenges from biodiversity loss to emerging infectious diseases.

The Natural History Museum today & tomorrow

As history has a habit of repeating itself, almost 150 years later the Museum is bursting at the seams again and in need of new space to ensure the safeguarding of the collections for future generations. The collections now span multiple buildings at South Kensington and Tring (about 50km north-east of London), and extensive stores in South London and

Boston Spa, Yorkshire (some 280km north of London). In addition, some of these Victorian and post-war buildings are no longer able to provide the suitable environmental conditions needed to protect the collections, putting them at risk of deterioration.



Professor Richard Owen, F.R.S., wearing the robes of Hunterian Professor of Comparative Anatomy c. 1855. Owen was the man who gave dinosaurs their name and prompted the development of the Natural History Museum, London. © The Trustees of the Natural History Museum, London.



Cue the Natural History Museum at Harwell – a cutting-edge new science and digitization centre which will be located at Harwell Campus in Oxfordshire. By 2027, the new centre will be built and housing over 28 million specimens, around a third of the collection, and 5,500 linear metres of library material, alongside leading-edge research and digitization facilities. It will provide a modern infrastructure for the study of natural history collections and a bespoke environment to ensure collections are safe, accessible, and digitally available.



Collections Assistants have begun collecting a wide range of data on the collections that will be moving to Harwell. Here they measure up a Megaloceros specimen (left) and a drawer of molluscs.
© The Trustees of the Natural History Museum, London.

Why is this important?

The Natural History Museum at Harwell will of course enable us to tackle the perennial problem of space – space to store, study, care for and share the collections, but it is also a key catalyst for growing science, transforming collections-based research and delivering new solutions for nature. Cutting-edge research spaces, molecular laboratories, and the acceleration of digitization will widen access to the collections for even more scientists and partners to pursue new research questions, explore and discover the collections and unlock the treasures of the natural world.

We will also be able to release space in historical galleries in the Museum at South Kensington which are currently used as storage areas, meaning a new and improved experience for visitors.

What has happened so far?

Since receiving funding in 2020, extensive planning for the build of the centre and the move of collections has taken place. This included making the important decision last year on which collections will be relocated to the Natural History Museum at Harwell. For Earth Sciences this includes **fossil mammals**, **fossil invertebrates**, **micropalaeontology** and **ocean bottom sediments**, along with the **associated library collections**. Later this year we will finalise plans and begin to prepare collections for the move, a process which will take at least five years to complete. For more insight into the move preparations, and more, take a look at the Natural History Museum at Harwell blog.

What does this mean for collections users?

As we set out to prepare for the move of over 38 million objects in total around the existing Museum sites and to Harwell Campus, access to staff and collections will unfortunately be affected. Intermittent disruption to collections access for visits and loans is expected until at



least 2027. We will try to reduce the impact of the move wherever possible, so please contact the relevant curator to discuss any potential projects **as soon as possible**.

We hope to have an early indication of when collections closures will take place by the end of this year, which will be communicated through the Natural History Museum at Harwell newsletter, along with other updates and opportunities to get involved with the project. You can sign up for news at <https://www.nhm.ac.uk/about-us/harwell.html>.

We look forward to sharing more with you on this epic journey!

Alice Weatherston

Natural History Museum, London, UK

For more information:

Website: <https://www.nhm.ac.uk/about-us/harwell.html>

Blog: <https://naturalhistorymuseum.blog/category/our-science/nhmharwell/>

Twitter: https://twitter.com/NHM_Harwell

LinkedIn: <https://www.linkedin.com/showcase/79667305/admin/>



Over five million specimens – around 6% of the Museum's collection – have now been digitized and released on to the Museum's Data Portal where they can be freely accessed globally. The value of digitizing the whole collection is estimated at over £2bn, with benefits across food security, biodiversity conservation, medicine discovery, minerals exploration and more. © The Trustees of the Natural History Museum, London.



Ocean waves

Simplify me when I'm dead, as Keith Douglas put it in his characteristically direct way. In his case, fate stepped in to emphasize this logic. Killed in action in 1944, three days after D-Day, his taxonomic description as 'war poet' is secure, uncomplicated by consideration of the path that his considerable talent might have taken in the times of peace and (eventually) plenty that followed.

It is a sentiment that can apply to palaeontology, too, not least as Douglas meant it not as an invitation but as a statement, to encapsulate the ravages of time and memory. It might even be called a first law of taphonomy, as shown so admirably some years ago by that amiable cabal of Rob Sansom, Sarah Gabbott and Mark Purnell. They, with exquisite care and no little *sangfroid*, rotted down the mortal remains of baby lampreys and of the lancelet *Amphioxus*, both of which represent early stages of the vertebrate line, examining the ever sorer-looking corpses with the most rigorous forensic curiosity. 'Advanced' features, they found, like eyes and mouth structures, decayed away well before more 'primitive' parts of the body like the notochord. 'Stemward slippage', they called it, the tendency of badly-preserved fossils to look as though they were lower down on the evolutionary tree than they really were. Do not over-interpret those dodgy fossils! – was the take-home message, something that probably needs endless repeating, given the optimism endemic in our trade.

But those lines by Douglas were not brought to mind, in this case, by a palaeontological study, even one as ingenious and memorable¹ as that decay experiment. Rather, it came as I read an account by Brian Gardiner on the irrepressible Edward Forbes and the Red Lions, as geology and palaeontology were going through their energetic adolescence in the mid-19th century. The basic story has already been told in this column², of Forbes escaping from a sumptuous but strait-laced British Association dinner in Birmingham and, taking quite a cohort of the members with him, hastening to the Red Lion inn where they feasted on beef and beer and generally made merry, having so much fun that this subversive pattern was set for many years afterwards. Forbes was the unquestioned Lion King, starting the proceedings with grace ('Brother Lions, let us prey...') and chanting his 'poetic effusions' with 'not the remote idea of tune' but to the amusement of all nevertheless.

It's one of the more charming and invigorating episodes from the early days of our science, and so it was nice to delve a little further into the mayhem through Gardiner's researches – made even more pleasant by absorbing the narrative from an old-fashioned paper offprint: the more primitive branches of the publishing evolutionary tree definitely provide a more congenial microenvironment for the reader. And here was a surprise: one of the key members of the irreverent Lions was none other than Richard Owen. Owen? That pillar of the Establishment, founder of the Natural History Museum, awarded a residence and a knighthood by the royal family and a pension by the Prime Minister. A great scientist, yes, who invented the Dinosauria – but also with a fearsome reputation for envy, malice and plagiarism. Even the mild-mannered Charles Darwin 'cherished his hatred' for him after one of Owen's many ventures into skullduggery³. Was this a man at home among the jokes and the songs and the carefree high spirits of Forbes' rabble-rousers?

¹ Smelly, too—but that of course helped make it memorable.

² Mystery Mountain of Mars, in *Newsletter* 81.

³ This was when he attempted to stop funding for the botanical collections at Kew Gardens, it seems to try to grab the collections for the British Museum.



Indeed he was. Gardiner notes how Andrew Crombie Ramsay, by 1848 quite the establishment figure himself as London professor en route to becoming the Geological Survey's Director, recalled Owen being 'capital' and making a 'most humorous speech', contrasting the merriment all around with the 'horrors of the Royal Society ... listening to a dull paper, with the prospect of one still duller before them'. In these surroundings, Owen was, from such accounts, ebullient, imaginative, with an endless stream of stories. The sunny-natured Forbes, of course, was always nearby at those meetings, a man who no-one seemed to hate, whose generosity of spirit seemed all-encompassing. He genuinely *liked* Owen and the two became lifelong friends, exchanging scientific ideas as well as sharing the ribaldry of the Lions. Not that Forbes wasn't aware of the darker side of Owen's character: he saw it all too clearly, and sometimes tried to smooth over the bitter altercations that arose between Owen and others. He wrote later of Owen as 'one of the oddest human beings I ever came across', and thought that he had two 'spiritual policemen', one 'pulling him towards good impulses ... and the other towards evil'. Forbes clearly had an uncanny ability to bring the good policeman into play, perhaps most perfectly so amid the warmth and good company of the Red Lions.

Owen was genuinely grieved by Forbes' untimely death in 1854 – though the bad policeman swung into action afterwards, as he usurped the title of Lion King even though lacking priority, not being the longest-serving Lion. A (mostly) bad hat, therefore, though one delights in the way in which historical scholarship of one of the more outlandish pathways through palaeontology's history can help resist mortality's simplification.

It might be time, too, to take a less simple view of an idea thought long dead: one of Forbes' claims to notoriety in science, away from the foaming tankards and irreverent verse, was in his Azoic Hypothesis. This was the suggestion that life in the oceans diminished from the surface, to disappear completely in its deep, dark, cold depths, much as life progressively disappears as one approaches very high mountain tops. Based on the trend he observed in shallow waters while carrying out the studies, in the Adriatic Sea, that would give him his 'father of oceanography' reputation, he extrapolated it to predict that the oceanic abyss – then unplumbed – would be lifeless.

It was a simple and bold concept that, though, was eventually to hit the brick wall of reality, as ships' sounding lines, laboriously heaved from the deep, came up with deepwater animals – worms, starfish and such – tangled up in them. The concept lasted perhaps even longer than it should have done, as Forbes was a transparently nice man and some of those taking aim at the Azoic Hypothesis did so, well, rather more irascibly. Nevertheless, the hypothesis melted away as the scale and diversity of abyssal life became clear. Cold, dark and pressurized it may be down there, but life adapts, and makes a living from the rain of nutritious detritus drifting down from the warm sunlit seas above.

Still, it was Charles Darwin, in 1860, a decade after Forbes' death, who put his finger on another central problem, when confronted with indisputable evidence of starfish hauled up from a couple of kilometres depth. Is it not curious, he asked, how water so deep should still have oxygen for such animals to breathe⁴?

⁴ Quoted in <<https://www.deepseanews.com/2011/05/deep-sea-101-forbes-fully-evidence-of-deep-sea-life-ignored/>>.



Curious, indeed. How does oxygen to support complex life get so far down? – when even a lake one-hundredth its depth can be stagnant and anoxic at its base. It was known even then that the oceans moved in curious ways, as Benjamin Franklin had charted the Gulf Stream the previous century. But it was to take some while longer to realize that, as polar sea-ice freezes each winter, it sends cascades of water pouring into the abyss, carrying nutrients and – crucially – oxygen to reach virtually all parts of the ocean floor, and allow in the abyssal life that demolished the Azoxic Hypothesis.

That is today, of course, and in a uniformitarian world, that would be that. But the Earth, as we now know, has had other kinds of ocean states, very unlike that of today. Take the world of the Early Palaeozoic graptolite shales of Wales and Scotland – only just beginning to be explored in Forbes' day – or of the Cretaceous oceanic anoxic events. Here, animal life, abundant at the surface, had flickered out in mid-water for want of oxygen, with much of the deep ocean floor lifeless, bar the endless microbial mats. In these kinds of oceans – which occupied quite some chunks of Earth history – the Azoxic Hypothesis would be a fair reflection of reality.

Oceanic anoxia – its nature, controls and wider effects – have been big business in geology and palaeontology for some decades now, not least because the resulting strata have included a good deal, if not most, of the world's oil source rocks. As the results of *that* big business inject half as much again carbon dioxide in the air as there should be (and rising), yet other trains of thought might be followed.

One of the most telling patterns in this phenomenon is that anoxic conditions, by and large, are encouraged by warm climate states – partly because of the lack of sea-ice in those times to drive deep, cold, oxygenated ocean currents, and partly because warmer water holds less dissolved oxygen. A focus on the ocean here is appropriate. As our climate now warms, the atmosphere is, in planetary terms, something of a sideshow. Because we landlubbers happen to live within it, it grabs the headlines through record-breaking droughts, forest fires, hurricanes and the like. But, it is the ocean that is inexorably absorbing by far the greater part of the extra heat now being trapped at the Earth's surface, or what is now called Earth's Energy Imbalance, as the fossil-fuelled greenhouse effect kicks in.

How much heat? Well, Lijing Cheng and very many oceanographic colleagues (in a paper headed 'Another Record' ...) put together all the data for 2021 from the panoply of devices now used to take the temperature of Earth's oceans. These oceans, they said, had absorbed – depending on the measures used – either 14 (± 11) or 16 (± 10) zettajoules of heat in 2021 relative to the previous year. Let's average that, and say 15 zettajoules. Here, of course, the problem arises of how to translate such impressive mathematical rigour into meaning for the common mortal, a similar kind of conundrum that the palaeontologist is often faced with in trying to get across a sense of geological time to a public audience.

A zettajoule, now, is 1 followed by 21 noughts (so we are well beyond the kind of numbers quoted even for geological ages): unintelligible in itself, especially in stark contrast to the humble joule, which is the energy needed to raise 0.239 grams of water by 1°C or – in a quirkier example provided by Wikipedia – to lift a medium-sized tomato⁵ by one metre. The example used to illustrate current ocean heat input by John Abraham, one of the paper's authors, in an

⁵ By medium-sized Wikipedia means 101.97 grams, just in case you thought imprecision was setting in.



accompanying newspaper article⁶ was the continuous operation of 440 billion toasters, or seven Hiroshima-scale atom bombs exploding every second. Now, the first is imaginative if a little surreal. And the atom bomb analogy had previously been used in reporting on an earlier paper by the Oxford physicist Laure Zanna and her colleagues: too much on the scary side, she told me, and luckily outside most people's direct experience: so we mooted the alternative explanatory potential of a cup of tea. Her colleague Jonathan Gregory kindly translated the results of their study (0.5 W m^{-2} over the ocean area totalling $1 \times 10^{14} \text{ W}$, unimaginable to me) into teamaking terms: making a billion mugs of hot tea and pouring them into the sea – every second. That brought things closer to home.

So, with this new study, what is now brewing in the oceans? Heating a mug of tea needs about 100,000 joules⁷. With a little rough and ready arithmetic, dividing that into the 15,000,000,000,000,000,000,000,000 joules – pencil-crossing out the zeroes on a scrap of paper, in properly rustic fashion – and then dividing that by 31,536,000 (the number of seconds in a year) gives 4,760,000,000 mugs of hot tea entering the ocean each second: that is, if my shaky arithmetic is correct, naturally⁸. Or, to be properly scientific about this, anthropogenic ocean heat input is now running at 4.76 gigamugs/second (GMu/s).

These are large numbers, and it is sobering that the energy directly expended for global human use each year (from all sources) is a considerably smaller number, of about half a zettajoule – or just 0.16 GMu/s in our new measure. So, make a mug of tea with fossil energy, and you are simultaneously pouring a dozen or more mugs into the sea (I suspect the actual comparison is not quite straightforward, involving carbon emission rates and lifetimes in the ocean/atmosphere system and goodness knows what, but it may well be something like that). Heaven alone knows how the equation is changed by adding a biscuit.

Still, the upshot is that the warming oceans are becoming that little bit closer to an Azoic state. The word now used is deoxygenation, as the oceans hold some 2% less oxygen than half a century ago, and falling (Oschlies *et al.* 2018) – not a simple top-to-bottom decline, but rather via an expansion of the mid-water oxygen minimum zone. The oceans are on the move, back towards some of their kinds of past, as described in a whole boxful of palaeoceanographic studies.

Which of the kinds of past? A thought-provoking example came out a couple of months ago, when Renato Salvatelli and colleagues looked at sediments below the Humboldt Current off Peru that date back to the last interglacial phase, some 130,000 years ago, to see how its palaeontology compares to today's prodigious – and prodigiously fished – production of anchovies. The chemical clues in the sediment suggested temperatures a little (some 2°C) higher than typical of the Holocene, and oxygen levels rather lower. There were lots of fish remains in the sediments too – mostly not of anchovies, but of much smaller fish such as gobies, which could cope rather better with those conditions. If that is to be the near future off the Peruvian coast, the authors noted, then the fish will be both harder to catch and less tasty to eat.

That is a relative small step on the way along to a greenhouse world, and greenhouse oceans, all the way to those kinds of oceans that do not bear thinking about, such as those of the Paleocene-

⁶ <<https://www.theguardian.com/commentisfree/2022/jan/11/ocean-temperatures-earth-heat-increase-record>>.

⁷ Or, a lot of tomatoes to lift.

⁸ Please do check – those misplaced decimal points can be so embarrassing.



Eocene Thermal Maximum in what is now Tanzania, then as now in subtropical latitudes. In an analysis of foraminifera (Aze *et al.* 2014), one of the key findings was that much of the section lacked these usually abundant microfossils, probably because it was simply too hot for such organisms to live in oceans that may have reached, or exceeded, 40°C. One of the past's scarier worlds, then, though one that may be all too easy to return to, just by letting our collective normal life take its course, as Kevin Burke and colleagues showed in 2018 with the help of a most beautifully designed back-to-the-future diagram – little chance of missing the message *there*.

To simplify an ocean... It is one of the visions obtained from the use of the 'backwards telescope' – another of Keith Douglas's evocative phrases – that is our stock-in-trade. There is clearly a lot of work to do to unravel the complexities of that grim simplification. Sobering stuff, for sure – and so perhaps all the more need to call on the kind of free-wheeling spirit and camaraderie the Red Lions used to conjure up at their more energetic soirées. It is a spirit that may come in most handy, when the forwards telescope is wheeled in.

Jan Zalasiewicz

University of Leicester, UK

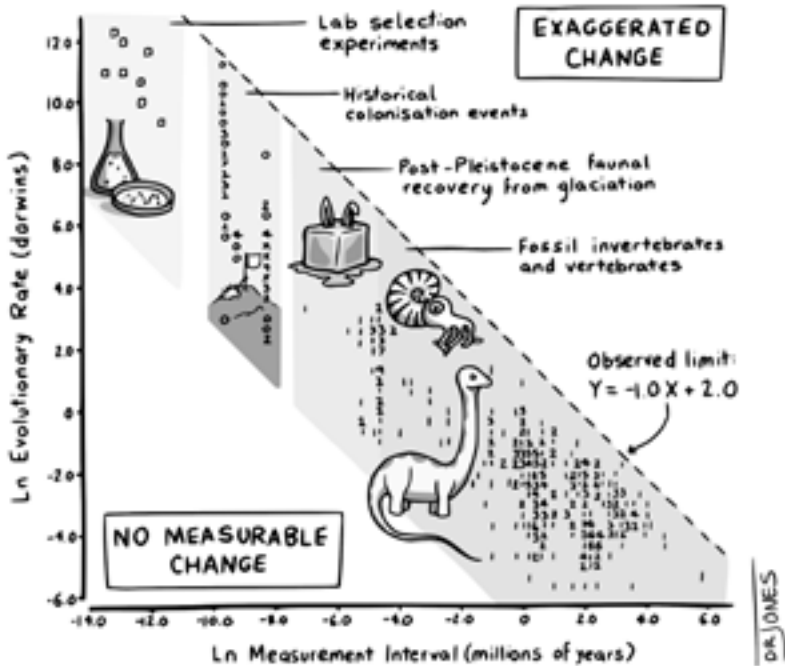
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Palaeontology's greatest ever graphs

Inverse relationship of evolutionary rates and interval of time over which rates were measured



The rates at which morphological evolution proceeds became a central palaeontological contribution to development of the neo-synthetic theory of evolution in the mid-twentieth century (Simpson, 1944; Haldane, 1949). Many decades later we can say retrospectively that three questions must qualify the study of those rates. First, how is rate being measured? Second, at which level or for what type of biological organization is rate being measured, e.g. within a species or within a clade (Roopnarine, 2003)? Third, why do we care about rate? In other words, what might we learn from knowing the speed of morphological evolution?

The figure presented here illustrates a compilation of rates of morphological evolution calculated within species, or within phyletic lineages of presumed relationships of direct ancestral-descendant species (Gingerich, 1983). The most obvious feature is the inverse relationship between rate and the interval of time over which a rate is measured. The compilation included data derived from laboratory experiments of artificial selection, historical events such as biological invasions, and the fossil record. The rates are calculated in units of "darwins", i.e., the



proportional difference between two measures divided by elapsed time standardized to units of 1 million years (Haldane, 1949). This makes 1 darwin roughly equivalent to a proportional change of 1/1000 every 1,000 years. Haldane's interest in rates was to determine how quickly phenotypically expressed mutations could become fixed in a population, and he expected the fossil record to be a potential source of suitable data. Later, Bjorn Kurtén (1959), pursuing this line of thinking was, I believe, the first to note that morphological change, and hence rate, decreased as the interval of time between measured points increased. Kurtén, who was measuring change in lineages of mammals from the Tertiary, Pleistocene and Holocene, throughout which rates increased progressively, suggested two alternative explanations for the inverse relationship: (1) increasing rates reflected increasingly variable climatic conditions as one approached the Holocene, or (2) the trend is a mathematical artifact. Philip Gingerich compiled significantly more data and suggested that the decline of rates as measurement interval increases might indeed be an artifact, yet a meaningful one. To grasp the significance of Gingerich's argument, we must dissect both the figure and Kurtén's second explanation.

The displayed rates vary by many orders of magnitude, and Gingerich divided them subjectively into four domains, with the fastest rates occupying Domain I and coming from laboratory measures of change on generational timescales. The slowest rates, Domain IV, hail exclusively from the fossil record. Kurtén suggested that, as the geological span over which a rate is calculated increases, the higher the frequency of unobserved reversals of change. Thus change that might have accumulated during an interval could be negated to some extent during a longer interval, leading to a calculated rate that is slower than true generational rates. Gingerich regressed his compiled rates against the interval of measurement, and not only validated Kurtén's observation for a much broader set of data, but additionally asserted that if one then scales rate against interval, the result is unexpectedly uniform. This implies no difference between true generational rates, rates of presumed adaptation during historical events, and phyletic changes between species on longer timescales. It is a simple leap from here to Gingerich's main conclusion, that the process or evolutionary mode operating within the domains is a single one, and there is thus no mechanistic distinction between microevolutionary and macroevolutionary processes.

Perhaps unsurprisingly, the first notable response to Gingerich's claim was made by Stephen Gould (1984), a founder of the Theory of Punctuated Equilibrium, and a major force in the then developing macroevolutionary programme. A major tenet of that programme is that there exists a discontinuity between microevolutionary processes that operate during the temporal span of a species, and macroevolutionary processes that are responsible for speciation events and other phenomena which occur beyond the level of populations, such as species selection. Gould objected strongly to Gingerich's argument, and presented two non-exclusive alternative explanations. Appearing to initially accept a constancy of rate across scales, Gould argued that the inverse relationship between rate and interval must require the amount of morphological change to also be constant. He found Gingerich's calculated slope of 1.2, however, to be suspiciously close to 1, pointing towards two psychological artifacts. First, very small changes are rarely noticed and hence reported, essentially victims of the bias against negative results. Second, instances of very large change tend to be overlooked because we would not recognize the close phyletic relationship between the taxa. This second explanation strikes directly from the macroevolutionist paradigm. Gould proposed that the very high rates measured at the shortest



timescales (Domain I) are a biased sample that ignores the millions of extant populations that exhibit very low rates. This bias creates an incommensurability with rates measured from the fossil record, which would be low if morphological stasis is the dominant mode of evolution on the long term.

Gingerich and Gould, observing the same data, arrived at opposing explanations. Neither party, unfortunately, were free of their own *a priori* biases concerning the evolutionary mechanism(s) responsible for the data. A deeper consideration of the underlying mathematics reveals a richer framework behind the data and figure than either worker acknowledged. Fred Bookstein (1987) provided the first insight by modelling unbiased or symmetric random walks as null models of microevolutionary time series. Bookstein pointed out that for such series, the frequency of reversals is about equal to the number of changes in the direction of net evolution between any two points. In other words, if a species trait increased by a factor of x when measured at times t_1 and t_2 , the number of generations for which the trait increased is roughly equal to the number of generations for which it decreased (in the limit as series length approaches infinity). “Rate” becomes meaningless for such a series beyond a single generational step! In one fell swoop, Bookstein rendered the entire argument moot, unless one could reject the hypothesis that the mode of trait evolution conformed to a random walk. He also, however, opened the door to a better understanding of the inverse relationship: measures of morphological change over intervals greater than two consecutive generations cannot be interpreted independently of the mode or modes of evolution that operated during the intervals.

In order to understand this, imagine a time series of morphological trait evolution generated by an unbiased random walk. That is, for any given generation the trait's value, logarithmically transformed, can decrease or increase with equal probability by a factor k , the generational rate of evolution. The expected value of the trait after N generations will be $x_0 \pm kN^{0.5}$ (see Berg, 2018 for an accessible explanation), where x_0 is the initial value of the trait. Selecting any two generations in the series and calculating an interval rate then yields $(x_1 - x_0)/N = kN^{0.5}/N = kN^{-0.5}$. Logarithmic transformation of the interval, as done in the figure, will thus yield a slope of -0.5. Alternatively, suppose the mode of evolution was incrementally directional (a biased random walk), then the expected rate would simply be kN^a , where $a > -0.5$. The expected rate generated by a perfectly directional series would be kN^0 , yielding a slope of rate versus interval of 0 (I'll leave the proof to readers; or see Gingerich, 1993 or Roopnarine, 2003). And finally, a series that was improbably constrained in a manner often envisioned by Gould and others as stasis (Roopnarine *et al.*, 1999), would yield a slope close to -1. Gingerich (1993) exploited these relationships, using all the available observations from a stratophenetic series to classify the underlying mode, and presumably test the frequency with which various modes account for observed stratophenetic series: slope 0 – directional, ~ -0.5 – random, -1 – stasis. The method suffered complications arising from the regression of a ratio on its denominator (Gould, 1984; Sheets and Mitchell, 2001; Roopnarine, 2003), and the fact that the statistics of evolutionary series converge to those of unbiased random walks as preservational incompleteness increases (Roopnarine *et al.*, 1999). It is nevertheless intimately related to the appropriate mathematics (Roopnarine, 2001).

Ultimately, we can use these relationships to understand that the inverse proportionality between rates and their temporal intervals is compelled to be negative because of mathematics, and only mathematics. Given that no measures of morphology are free of error, and that it is highly



improbable that any lineage will exhibit perfect monotonicity of evolutionary mode during its geological duration, then all slopes of the relationship must lie between -1 and 0. Furthermore, the distribution of data within and among the four domains by itself tells us very little about mode, for it consists of point measures taken from entire histories, and those measures cannot inform us of the modes that generated them. Gingerich's method (1983, 1993) might have been problematic, but it provided a foundation for further developments that demonstrated the feasibility of recovering evolutionary mode from stratophenetic series (Roopnarine, 2001; Hunt, 2007). Perhaps it is time to circle back to this iconic figure and broadly reassess the distribution of evolutionary rates in the fossil record (Voje, 2016).]

Peter Roopnarine

*Institute for Biodiversity Science and Sustainability
California Academy of Sciences, USA*

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Job secrets a biomechanist does not want you to know

Pasha van Bijlert is a junior researcher working on vertebrate palaeontology at the Faculty of GeoSciences, Utrecht University. He holds a BSc and MSc in Human Movement Sciences from Vrije Universiteit Amsterdam, and a BMus (in music) from Codarts University of the Arts (Rotterdam). Pasha has lived in the Netherlands for most of his life, but was born in India, where he lived for three years. Twitter: @PashavanBijlert

What is your professional background?

During my studies, I worked at Naturalis Biodiversity Center, the Dutch natural history museum, for three years. I worked there as a 3D technician and anatomist, and I was tasked with 3D scanning, digitally restoring and 3D printing fossil specimens. Since the autumn of last year, I have been working as a junior researcher at Utrecht University, where I'm studying the locomotor biomechanics of extant and extinct vertebrates (in particular dinosaurs) using physics simulations.



Photo: Tom Brown.

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

Although I technically studied *Human* Movement Sciences, both my BSc and MSc theses were focused on locomotion of *Tyrannosaurus rex*. I have been applying techniques commonly used for human (rehabilitation) studies to dinosaur skeletons.

For my BSc thesis, I focused on the role of the tail of *T. rex* at walking speeds, which led to my first publication (<<https://doi.org/10.1098/rsos.201441>>). I combined my MSc with my work at Naturalis. At Naturalis, I digitally reconstructed a *Triceratops* and *T. rex*, which have formed the basis for several skeletal mounts throughout Europe and Asia. My MSc thesis was focused on running speed of *T. rex*, using the revised 3D reconstruction I had made for the Museum.

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

3D surface scans of (sufficiently) complete dinosaur skeletons, and where possible supplemented with CT-scans. Surface scans are enough in many cases (e.g., multibody dynamics), but when you want to look at stress-distributions (e.g., using the finite element method or beam theory), you will want CT-scans as well. In certain cases, trackway data is also valuable, with the caveat that (in general) you cannot link a trackway to a specific taxon.

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

Physics simulations provide a way to test (locomotor) biomechanical hypotheses in palaeontology. In general, biomechanics can give you insight into predictions made using functional morphology. If a skeletal feature is so unique that you expect it to have impacted the success of a taxon, a musculoskeletal model should behave differently (or not...) if you incorporate that feature.



We're usually dealing with taphonomically distorted fossils, while we actually want an idealised representation of the animal during life. You pick up a lot of 3D modelling and reconstruction tricks along the way to deal with this. Lastly, biomechanical analyses generally require a lot of coding, which is an incredibly valuable skill to have – even outside of academia.

What is your favourite finding from this collaboration so far?

T. rex has a bit of a mythology surrounding it, often getting labelled as the biggest, fastest, meanest predator. *T. rex* apparently excelled at everything, even when it was just walking around – walking speed estimates for large theropods were nearly twice as high as extant animals, including long-legged taxa such as giraffes and elephants. For my first paper I presented a model of *T. rex* locomotion that suggests slower walking speeds, placing it more in line with our understanding of modern animals. I like to think that this helps normalise *T. rex* a bit, and hopefully gets lots of people thinking about my favourite subject: dinosaur tails.

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

We're dealing with varying amounts of available evidence in the two fields. In a human study, you usually want to include somewhere between 30–40 participants, to make sure you're not too focused on the morphology of just one individual. In palaeontology you would be lucky to have two relatively complete specimens of a taxon, so you need to be mindful that you do not try to study something with an effect that is too small.

Biomechanical studies in palaeontology need varying levels of access to soft-tissue data of living animals, to ensure your model has reasonable estimates for the unknown parameters. These data may be hard to acquire at times.

You also might be surprised to learn how little the other knows of your field, but this definitely works in two directions. This realization can help you decide how to write down the work so that it is accessible to experts from both fields.



Simplified T.rex musculoskeletal model with muscles marked in red by Pasha van Bijlert .



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

A biomechanist who is not familiar with palaeontology might be surprised at the types of analyses that are used in biomechanical analyses of fossils – some of these techniques are not used in extant biomechanics at all. If you're interested in performing a biomechanical analysis of a specimen, I would recommend involving a biomechanist early on in the conception of the project. They could help you to formulate a more interesting (from a mechanical perspective) research question.

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?

Some practical advice first:

Learn 3D modelling (I prefer Blender, there are many online tutorials).

Learn how to code (Matlab is popular amongst biomechanists, Python is more marketable after your studies, and likely more powerful).

Email a biomechanics researcher whom you find inspiring, and ask them if they are keen on supervising a student (usually the answer is yes!).

I took a very unconventional path, by studying a completely unrelated field and then applying the techniques I learned to palaeontology. This has allowed me to develop my own perspective on palaeobiomechanics, and I was quite fortunate to have been given the opportunity to do so.

I do not know of any study programmes that specifically focus on the combination of palaeontology and biomechanics – certainly not in the Netherlands. For my MSc programme, I was given permission by the study board to replace all the clinically-oriented courses with physics and mathematics courses from the mechanical engineering faculty at TU Delft. This gave me a much stronger foundation to apply the techniques I had learned to fossils in both my theses, and this is an approach I can recommend. Basically, study (bio)mechanics at an engineering faculty, as a supplement to a more conventional palaeontology or (palaeo)biology study programme, and find (a) supervisor(s) who can help you apply these techniques to a fossil specimen.

In the Netherlands, students cannot study palaeontology directly. You either study geology and do biology on the side (in which case I would recommend Utrecht University), or you study biology and learn some palaeontology on the side (in which case I would recommend Wageningen University, because of their strong zoology department). In the UK, I believe the universities of Manchester, Liverpool and Bristol (amongst others) have opportunities for students looking to do a biomechanical project, and reaching out to the Royal Veterinary College may also provide you with inspiring opportunities.



Spotlight on Diversity

Difficulties at palaeontology job interviews

The Palaeontological Association aims to promote our discipline by providing support and increasing employment and professional development of palaeontologists. This includes removing barriers for under-represented groups and fostering inclusive hiring practices. This requires an extensive understanding of the challenges/difficulties palaeontologists face during job interviews. We carried out a survey asking palaeontologists who have applied for jobs to share their experiences. Twenty-four people answered the survey. Most respondents faced difficulties related to a lack of mentoring (48%), followed by barriers related to gender (38%), age (33%), appearance (24%), social background (19%), race (10%), nationality (10%), disability (10%) and sexual orientation (5%). None of the responses mentioned barriers related to religion. In an open-ended question, respondents mentioned problems with administration and required documents. Respondents think that job interviews could be made more inclusive by:

- Providing longer application windows;
- Offering the opportunity to do interviews remotely for people with disabilities;
- Making the questions available prior to interviews for people with accessibility issues;
- Providing a general introduction that summarizes that the employer is supportive of diversity and inclusion actions, which will then give the interviewee the opportunity to express themselves freely;
- Including comfort breaks;
- Offering the interviewee the opportunity to take a break from the general stressful atmosphere, *e.g.* by offering them space where they can retreat to in order to calm down and recover;
- Removing alcohol from interview events or even eliminating social events from the interview process;
- Reducing judgements on the candidate's appearance;
- Increasing the understanding of work-life balance;
- Increasing the transparency of the process by providing feedback on the candidate's performance when the procedure is finished;
- Decreasing the level of experience required for "entry-level" positions and considering the level of experience in relation to the education stage.

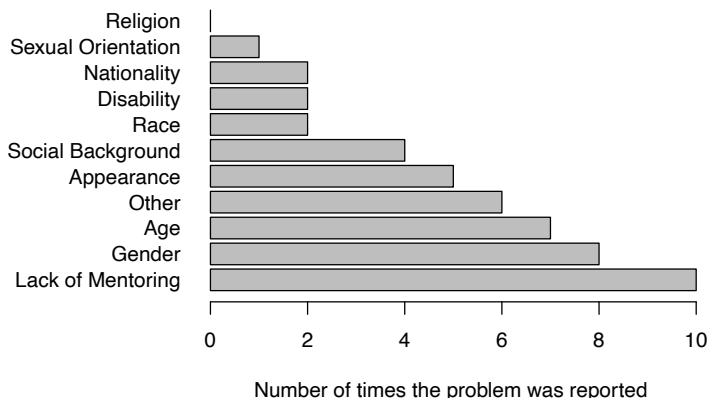
Many palaeontologists highlighted that the difficulties they faced were caused by their mentors not helping or guiding them to find a position and, in some cases, not agreeing to provide a reference letter.

Even though this pilot survey was open for a mere three weeks and attracted a small number of 24 answers, it highlighted that long-known issues with job interviews are still alive and well. In the open answers, three respondents reported experiencing suspected discrimination or lack of information concerning their family situation or outright negative comments on this topic from the committee. Here we offer our personal perspective on this small set of answers, inviting comments from readers. Previously, discussions on concerns about the ability to combine work



and personal life have focused on women in academia. This leads to a dangerous situation where, on one hand, search committee members may assume that this topic is specific to women, creating potential for conscious or unconscious bias. On the other hand, it may also lead to assumptions that other gender expressions are not interested in this aspect. Palaeontology is, for many, a field- or lab-intensive occupation. In addition, many university cultures expect attendance at social gatherings that may impinge upon private time – not least dinners with job candidates, which may exclude parents of young children from the committee and lead to the committees being mostly staffed with people who themselves have no family obligations and, thus, would not consider or empathise with such obligations borne by the candidate.

With conferences returning to an in-person format, visits to collections and a widespread expectation of academic mobility, many early-career scientists will see the distance between them and their families grow, their support networks dissolve, and their physical and mental health deteriorate as they find themselves unable to maintain healthy free-time activities owing to frequent travels and irregular work schedules. These issues have certainly been exacerbated during the two years of the pandemic. Our view, reinforced by the survey results, is that transparent information about how the potential job can be reconciled with a healthy family life should be an indispensable part of the information package offered upfront and in equal measure to all candidates. This includes transparency concerning the salary and any financial or administrative measures available to caregivers. Ideally, a job interview or campus visit should include an opportunity to talk with a representative of an HR or DEI office who can answer the candidate's questions on this topic. The respondents reported being uncomfortable with having to ask about family and work-life balance in their interviews and fearing that this may sabotage the process. We feel this discussion should be clearly separated from the evaluation of the academic merit of the candidate, and candidates should have a clear way of informing themselves outside of the part of the interview that addresses their qualifications.



Difficulties at job interviews reported by 24 respondents to an online survey carried out in January 2022.

It is striking that disability continues to be a major barrier for many candidates. Three respondents mentioned the need for questions being provided in advance, with one reporting that their request to have the questions written in the chat to increase accessibility had been ignored in an interview. One of our survey respondents wrote:



I get the impression that having disabilities is perceived as detrimental in the sciences so I find myself reluctant to disclose them. I am autistic, so for my work the hyperfocus I have can be very beneficial. But I have a hard time looking people in the eye and it is challenging to meet in person, so interviews can be particularly difficult. Zoom interviews have made it a bit easier, since I don't have to look anyone in the eye.

Another thing that would really help would be providing the interview questions in advance. I know it is not standard practice but being asked to come up with a quick response to something I was not prepared to answer – especially if I do not have time to interpret it correctly – is crushing. I can answer any question you give me about my specialty, but if you ask me to “tell us about a time when you resolved an issue as a supervisor”, I will not have any idea if you want to hear about how I fixed a tool for someone or how I stopped my cats from fighting with one another. I need time to think about what the purpose of the question is and how my previous actions can benefit the company I want to work with.

We note that live interviews are not only part of the hiring process, but also of many scientific grant applications (e.g., ERC, NWO) and invite discussions from the *Newsletter* readership on how this may affect the professional perspectives of palaeontologists with disabilities.

This pilot survey highlighted that, in spite of much literature (e.g., Dutt *et al.* 2016; McCallum *et al.* 2018; Wolfe and Riggs, 2018; Popp *et al.*, 2019) and popular resources on academic job interviews, the lack of mentoring, lack of feedback, and lack of transparency remain major barriers for palaeontologists. It is a small discipline and palaeontologists will often find themselves competing for general Earth sciences, environment or biology positions. To strengthen the participation of palaeontologists in the education of students and the public, in public engagement, policy and – finally – in shaping future research and funding, it is in the interest of tenured palaeontologists to provide support and mentoring to their junior colleagues. For the follow-up to this piece, we would like to invite palaeontologists with experience in the hiring process to share their recommendations and diagnoses of the major hindrances. Are jobs in palaeontology becoming scarce? Are palaeontologists not prepared well enough to compete with other Earth and Life scientists? Is their training insufficient or perhaps the jobs fail to attract the best qualified candidates, who prefer to step out of academia? How well are committee members prepared to interview disabled candidates?

Farid Saleh (he/him)

Diversity Officer

<diversity@palass.org>

Emilia Jarochovska (she/her)

Newsletter Editor

<newsletter@palass.org>

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>>**Future** Meetings of Other Bodies



5th International Congress on Ichnology (ICHNIA 2022)

Florianópolis Island, Brazil 4 – 8 April 2022

Every four years ichnologists from around the world join to discuss the progress of the science and share experiences and ideas. Previous congresses have been held in Argentina, Poland, Canada and Portugal, and Brazil is the next hub of ichnology to share some of the vast heritage of ancient and modern biogenic structures. The 5th edition of ICHNIA was planned for 2020 but, due to the pandemic, was postponed to April 2022. Keynote speakers include Karen Chin (University of Colorado Boulder), Koji Seike (Geological Survey of Japan) and Anthony J. Martin (Emory University).

Please see the website for further information and updates: <<https://www.ichnia2020.com/>>.



Marine Reptiles Conference 2022

The Etches Collection, Kimmeridge, UK 3 – 5 May 2022

This conference has been rescheduled from May 2020 due to the coronavirus pandemic. Originally postponed to October 2020, it was postponed further as delegates were polled and preferred an in-person meeting. All professionals, amateurs and enthusiasts of marine reptiles are invited to attend. The primary focus will be on the fossil record, covering not only marine reptiles but also the other organisms that formed part of their ecosystems. A session will also take place on modern reptiles, and we welcome abstracts from researchers studying all aspects of this field.

For more information please visit the website: <<http://www.marinereptiles.org/>>.



Fossils, Phylogenies, Genomes, Embryos & the Evolution of the Deuterostomes

The Natural History Museum, London, UK 12 May 2022

This meeting highlights cutting-edge advances in the understanding of the evolution and development of the phylum Deuterostomia with a range of speakers, including leaders and emerging stars in the fields of palaeobiology, evolutionary biology and developmental biology. The meeting is based around the thematic contributions of the late R. P. S. “Dick” Jefferies, who worked for most of his career at the Natural History Museum, London, and who provided valuable insights across a number of fields, from deuterostome evolution, to palaeobiological models, to cladistics.

Meeting website: <<https://www.eventbrite.com/e/fossils-phylogenies-genomes-embryos-the-evolution-of-the-deuterostomes-tickets-228801691017>>.



Tracing Monsoon, Ocean currents and diagenetic carbon Redistribution (TIMOR)

Vienna 19 – 22 May 2022

NEW DATES

This workshop aims to develop an IODP mission-specific platform (MSP) proposal to study two separate but complementary topics in a single expedition: (1) the early diagenetic redistribution of carbon via the microbially-driven oxidation of organic carbon, the dissolution of aragonite and the



precipitation of calcite, and (2) the palaeoclimatic and palaeoceanographic impacts of Quaternary Monsoon and Indonesian Throughflow variability in the Timor Sea. Both experienced and early-career researchers are encouraged to apply.

Travel support is available for early-career scientists from ECORD countries. Please see the Meeting website for more details: <<https://www.plymouth.ac.uk/whats-on/timor>>.



**9th International Meeting on Taphonomy and Fossilization (TAPHOS) and
6th ICAZ Taphonomy Working Group Meeting (ICAZ-TWG)**
Alcalá de Henares, Madrid, Spain 5 – 12 June 2022

This meeting was postponed from September 2020. The 9th edition of TAPHOS and the International Council for Archaeozoology will bring together palaeontologists and archaeologists and also calls on other researchers to participate, such as forensic scholars, molecular biologists, histologists and anthropologists. A special tribute will be paid to Sixto Fernández-López, founder of the TAPHOS meetings, and to Peter Andrews for his innovative work on small mammal taphonomic methodology and palaeoenvironmental interpretations.

For more information please visit the website: <<https://taphostwg.es/home/>>.



14th Conference on Mesozoic Terrestrial Ecosystems
Salt Lake City, Utah, USA 9 – 11 June 2022

This is a conference on all aspects of Mesozoic terrestrial palaeontology, palaeoecology, palaeoclimatology and palaeogeography. Generally held every four years, the pandemic caused the meeting to be delayed by one year. Held for the first time in the United States, Utah has been a major centre for new discoveries in its nearly complete Mesozoic terrestrial section over the past 25 years. MTE14 includes pre-meeting field-trips to local museums and a four-day trip up and down through Mesozoic across Utah, and a post meeting trip to the region around Dinosaur National Monument.

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



11th European Palaeobotany and Palynology Conference (EPPC)
Stockholm, Sweden 19 – 22 June 2022

The 11th European Palaeobotany and Palynology Conference will be held in Stockholm as a physical (on site) meeting jointly at the Swedish Museum of Natural History and at the adjacent Stockholm University. The scientific programme will cover all aspects of palaeobotany and palynology. The meeting will provide palaeobotanists and palynologists with an opportunity to present and discuss their research and meet one another four years after the previous conference in the series in Dublin. The meeting will include three full days of scientific sessions, with some additional options for pre-conference workshops and short pre- and post-conference excursions. The organizing team of Swedish palaeobotanists and palynologists invites you to spend midsummer week in Stockholm, present your latest results, and enjoy the sights, sounds and flavours of Sweden.

For updates see the Facebook page: <<https://www.facebook.com/11thEPPC>>.

**The 5th International Conodont Symposium (ICOS 5)**

Wuhan City, China 24 – 27 June 2022

ICOS 5 was postponed from 2021 due to the pandemic. Considering the pandemic situation, the symposium will be organized as a combined offline (on site), and online virtual meeting. The scientific programme will cover all aspects of conodonts over three full days of scientific sessions followed by a post-symposium field-trip.

The symposium will take place at the campus of China University of Geosciences (CUG), Wuhan. It will be organized by State Key Laboratory of Biogeology and Environmental Geology (CUG) and School of Earth Sciences (CUG). Wuhan is the capital city of Hubei Province in Central China, the biggest city in the middle reach of Yangtze River. Wuhan Tianhe International Airport is well connected with international flights from many countries, and Wuhan is well connected by airplane and high-speed trains with Beijing, Shanghai and Guangzhou.

**International Conference on Modern and Fossil Dinoflagellates (DINO 12)**

Palacio Congressos De Canarias, Gran Canaria, Spain 4 – 8 July 2022

This conference has been postponed from July 2020 with the aim of holding the event in a safe environment and attracting the participation of scientists from all over the world. The International Conference on Modern and Fossil Dinoflagellates (DINO) has been held on a continuous basis in different parts of the world since 1978. For this edition, DINO12 will be framed within the common topic of global warming, but preserving the essence of the meeting, in which the dinoflagellates and their cysts are the major protagonists. As is usual, the conference will gather biologists working with modern dinoflagellates and geologists working with fossil dinoflagellates. For more information please see: <<https://dino12conference.com/>>.

**Palaeo Down Under 3 (PDU3)**

Virtual meeting 11 – 15 July 2022

Palaeontologists from Australia, New Zealand and around the world are expected to participate in Palaeo Down Under 3 (PDU3) in Perth (Australia). A full conference programme is proposed, covering all aspects of palaeontology and associated disciplines. PDU3 will include guest keynote lectures, general and thematic sessions, symposia and posters. Due to the global pandemic, the AAP will be broadcasting its first virtual conference, providing an opportunity for members to participate from all over the world without the need to travel.

For details please see the website: <<https://www.australasianpalaeontologists.org/pdu3>>.

**7th International Conference on Trilobites and their Relatives**

Cincinnati, Ohio, USA 14 – 18 July 2022

The 7th International Conference on Trilobites and their Relatives was postponed due to COVID-19. This international conference occurs every four years and attracts professional scientists, graduate and undergraduate students, amateur palaeontologists and interested members of the public. The



goals of the conference are to present and discuss recent progress on all aspects of trilobites and their relatives (e.g., morphology, evolution, phylogeny, ecology, development and geography).

For further information please e-mail <bhunda@cincymuseum.org>.



World Congress of Malacology 2022 (WCM 2022)

LMU Biocenter, Munich Germany 1 – 5 August 2022

The World Congress of Malacology (WCM) will be hosted by the Staatliche Naturwissenschaftliche Sammlungen Bayerns (SNSB) and the Biological and Medical Faculty of the Ludwig-Maximilians-Universität (LMU) Munich during the first week of August 2022. The theme of WCM 2022 will be all aspects of diversity, function, ecology, evolution and conservation of extant and fossil Mollusca. Special topics of the Congress will include evolutionary and developmental aspects, taxonomy, phylogeny, palaeontology, genomics and functional morphology, as well as all methodological innovations concerning malacological aspects. The organizers wish to explicitly welcome the next generation of malacologists from across the globe, including those at bachelor level to those in the postdoctoral phase of their career. The organizers will encourage their contact and the exchange of ideas and experiences with the – no less welcome – already established scientists from the various fields of malacology from all countries and continents. Registration is now open.

For more information see <<https://www.wcm2022.bio.lmu.de>>.



18th International Nannoplankton Association Meeting (INA 18)

Avignon, France 28 August – 3 September 2022

The INA brings together the world's approximately 200 nannofossil and nannoplankton (coccolithophore) scientists, and this biennial meeting is their main venue for the exchange of information. The meeting rotates amongst different continents and is back in Europe for the first time since Athens in 2017. Early bird registration opens in early 2022.

For more details please see the website: <<https://ina18.sciencesconf.org/>>.



11th International Symposium on Cephalopods Present and Past

Natural History Museum, London, UK 12 – 16 September 2022

This is an early call for anyone interested in joining the 11th International Symposium on Cephalopods Present and Past to sign up for our mailing list by registering using the online form at <<https://forms.office.com/r/jSQDae7TWM>>.

For more information please e-mail <ISCPP11@nhm.ac.uk>.



6th International Palaeontological Congress (IPC6)

Khon Kaen, Thailand 7 – 11 November 2022

The International Palaeontological Congress convenes every four years. The 6th International Palaeontological Congress will be held in Thailand in November 2022 and the organizers are



assembling an exciting and informative programme. There will be symposia on one or more days covering all aspects of our science and its connections to biology and Earth and planetary science, from the Archean to the Holocene, and from all continents. Workshops will be organized on palaeontological techniques, probably as one-day mid-conference events. Details of scientific sessions/symposia are already available online. Sessions of IGCP 700 Carbonate Build-ups in South East Asia and other IGCP projects will be in the programme as well as several field-trips.

For more information, visit our website at <<https://ipc6.msu.ac.th>>.



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

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

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



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

The Congress celebrating 200 years of modern palaeobotany, postponed from September 2020, was due to take place in May 2021. Reviewing the various levels of coronavirus infections and the processes implemented by various countries, the organizers postponed the meeting further, 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 will take place in 2022. These conferences are held biannually and usually alternate between European and world events.

For more details please see the 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/meetingsevents/future-meetings/add-future-meeting>>.



Meeting REPORTS



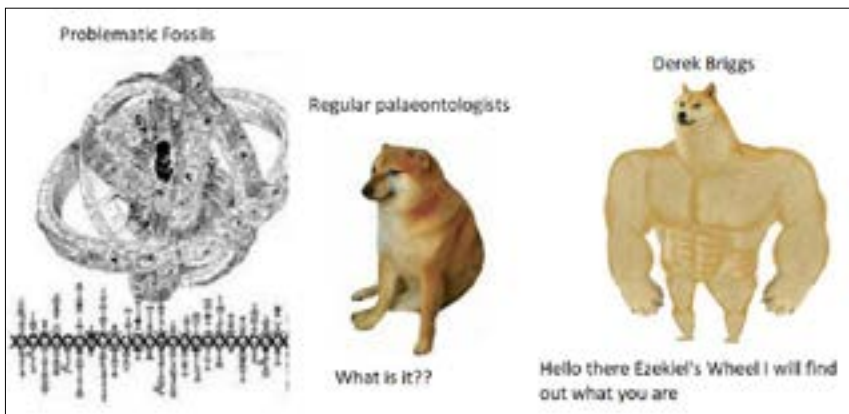
65th Annual Meeting of the Palaeontological Association

Virtual meeting hosted by

University of Manchester 17 – 20 December 2021

The 65th Annual Meeting of the Palaeontological Association was organized by the University of Manchester and held online, with the organizing committee (chaired by Robert Sansom and Russell Garwood) making the difficult decision to switch the conference to a virtual meeting due to the pandemic. Still, they were able to provide us with an amazing meeting with a Slack workspace gathering 307 people, posters available on demand on the PalAss website, and live Zoom sessions throughout.

The meeting started on Friday 17th December, with the pre-conference workshop 'Social justice in Palaeontology: case studies and future actions' held by Emma Dunne and Nussaibah Raja. This was followed the next day by the annual Symposium 'The problem of Problematica: pushing the limits of the fossil record' with talks by six international invited speakers (Heda Agić, Derek Briggs, Abderrazak El Albani, Xiaoya Ma, Emily Mitchell and Max Telford) on various topics related to resolving the affinities and evolution of problematic fossil taxa. The symposium officially started with Derek Briggs' talks on different problematic taxa, such as the Tully Monster, which led to the first PalAss21 memes being shared on the Slack workspace. The whole symposium informed us about some really interesting but weird taxa and how our understanding of those taxa can evolve by describing new material or trying innovative methods such as CAT scans, synchrotron, elemental maps, isotope analyses or X-ray tomography.



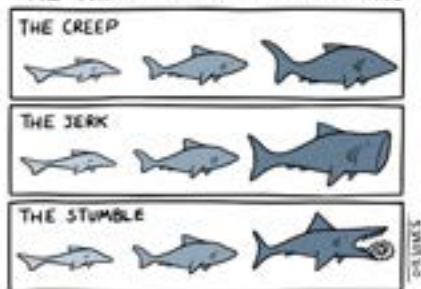
Meghan Jenkinson's meme on Derek Briggs's talks.

In the evening, everyone gathered to attend the Palaeovision Fossil Contest presented by Jack Matthews and Duncan Murdock with six candidates: the University of Erlangen-Nuremberg, the



University of Oxford, the European Photonic Institute for Non-destructive Analysis of Ancient Materials, Cambridge Zoology, Cambridge Earth Sciences and the Future Palaeontologists of India. After finishing second in the Palaeovision Fossil Contest 2020, the **University of Erlangen-Nuremberg** came back this year with a really strong entry focused on the belemnite, which led them to win the contest despite really intense competition. This was a well deserved victory but all candidates should be proud of their high-quality entries, which really enlightened our evening.

THE THREE MODES OF EVOLUTION



Sunday 19th December began with two parallel sessions in the morning: Precambrian & Cambrian Life and Mesozoic Life. The Precambrian & Cambrian Life session allowed researchers to present several different topics about phyla radiation, from Ediacarian (~635 Ma) to Cambrian Stage 4 (~514 Ma). Ranging from 'Conga Lines' aged ~565 Ma to trilobites from south Australia through priapulids, Ediacaran frondose taxa *Charniodiscus concentricus*, a new Cambrian specimen of

Rotadiscus grandis and mechanisms of phosphatization. Topics in the Mesozoic Life session included various talks on the extended embryo retention model for the origin of amniotic eggs, branched structures in pterosaurs, archosaurs from fissure fills, as well as some interesting reflections on how dinosaur etymology reflects inequity. The second part of the morning continued with two sessions in parallel: Comparative Morphology & Feeding (A) and Phylogeny & Evolution. These covered all aspects of palaeontology from vertebrate to invertebrate, but also presented different methods including cutting-edge techniques like automated high-density geometric morphometrics.

The afternoon started with a single session on Sampling & Biases, talking about diversification events, fossil record biases and morphological disparity of vertebrates. This was followed by the Annual General Meeting and the prize giving in which some exceptional names in our field were honoured: **George Sevastopulo** received Honorary Life Membership, **Peter Tarrant** the Mary Anning Award, **Russell Garwood** the Hodson Award, **Anjali Goswami** the President's Medal, and the late **Angela Milner** was recognized with the prestigious Lapworth Medal. Then, the Annual Address was delivered by Professor Emily Rayfield who discussed the form and function of animals in the fossil record with a review of numerous published but also ongoing studies on biomechanics.



Again, parallel sessions ran on Monday 20th December with those in the morning covering Exceptional Preservation, Climate, Environment, Conservation, Comparative Morphology/Feeding and Cenozoic Life. The Exceptional Preservation session gathered different amazing discoveries on preserved soft tissues, aged from Early Cambrian to Lower Devonian, whilst also allowing researchers to present taphonomic studies about the origin of animal lineages.



UNRECOGNISED FUNCTIONS OF BIZZARE ANIMALS



Talks in the Climate, Environment & Conservation session covered a broad range of topics from how climate controls ecological ascendancy of dinosaurs to climate impact on the structural integrity of benthic foraminifera. Then a second Comparative Morphology session (B) started, focused on craniomandibular anatomy this time. In parallel, the Cenozoic Life session included topics about ratite eggshells from India, limb bone growth, Passeriformes, early eutherian mammals and Felidae.

The last two sessions of PalAss21 started with Palaeozoic Life early in the afternoon, covering skeletal evolution, Radiodonts from Morocco,

early vertebrates, conodonts, Early Devonian flora from South Africa and Arthropleura from the Mississippian of England. Finally, Macroevolution was spotlighted with some great talks on euarthropod evolution, morphological disparity of fungi, early diversification of ammonoids, archosauromorph radiation and placental skull evolution.



Ninety-five posters were presented during the meeting, divided into ten sessions, with the Slack workspace providing an ideal platform to allow interesting exchanges and questions to be raised. Three student posters were acknowledged for their quality, created by **Eloise Hunt**, **James Mulqueeny** and **Charlotte Bird**.

On behalf of all delegates, we would like to thank the organizing committee of the PalAss Annual Meeting 2021 for this amazing conference and especially considering the circumstances. Moving to a fully virtual meeting some days before the starting date must have been challenging but we are so glad to have been able to experience the exceptional work being conducted by our peers.

Narimane Chatar and Léa De Brito
University of Liège, Belgium



**Social Justice in Palaeontology: Case Studies & Future Actions**Virtual workshop accompanying the Annual Meeting *18 December 2021*

At 1AM on 18th December from the comfort of my bedroom I virtually attended one of the most informative and important workshops I've had the luck to have participated in. The workshop was held during the Annual Meeting of the Palaeontological Association. It was an important step forward and such a breath of fresh air. As much as I love palaeontology and much of the community, we as a collective have a lot to work on when it comes to social justice.

This workshop was part educational talk, part informal forum for potential solutions for these ethical problems. Five broad topics were covered: the repatriation of stolen fossils, ethics of working on fossils from conflict zones, research in resource-poor settings, parachute science and internal colonialism, and commercial fossil dealing.

Repatriation of stolen fossils dealt with the ethics of working on fossils which were illegally removed from their country of origin. Much of the focus of this talk was on how richer countries often publish and benefit from specimens removed illegally from poorer countries. Often this is without any input from local scientists, and no plan or intention to return the fossils. The second half of the discussion was largely on how to approach this in the future, including journals imposing restriction on what they would publish on, or creating rules requiring local scientist input and plans for repatriation.

When talking about working on fossils from conflict zones, Burmese amber dominated the conversation. Most people familiar with palaeontology would be aware of the stunning fossils preserved in the amber of Myanmar. Unfortunately, the mining and sale of this amber helps fund campaigns of oppression and violence against multiple of Myanmar's ethnic minorities. The speakers strongly suggested that no matter whether you are involved in collections, research or administration, we should all boycott these fossils.

Though all these topics are interlinked, parachute science and working in resource-poor settings are almost inseparable. Parachute science refers to scientists from richer countries coming to work in poorer countries, and then removing the specimens and analysing and publishing on the data all with minimum to no input from local scientists. Many of the solutions to parachute science overlap heavily with the topic of working with people in lower-resource countries. This is namely to involve locals and scientists of the area, making sure you contribute to the community, whether it be monetarily or educationally. Importantly, the fossil should make its way back to the country of origin as it is part of their nation's natural history.

Commercial fossil dealing was presented as a very tricky topic. On one hand, some important fossils have been recovered through the private sale of fossils. However, many more fossils have been lost this way. Another issue is the lack of clarity behind the acquisition of these fossils. In particular, private auctions will often not disclose whether the fossils were obtained illegally or from conflict zones. This is a difficult issue to navigate – as these are private organizations, palaeontologists have little to no control over their actions.

After the talks were finished, we were divided into smaller groups to discuss the individual topics. I was in a group discussing parachute science and internal colonialism. This more freeform



discussion quickly expanded in scope, and it became clear that we all found that the systems and checks in place around ethics in palaeontology are severely lacking.

We then came back together to share ideas and discussion. What was immediately apparent was that these issues are deeply systemic, and often rooted in the colonialist structure from which palaeontology emerged.

Though this workshop was incredibly well conducted, informative, and generated lots of excellent discussion, it was clear that we were preaching to the converted. The ideas and problems discussed here need to be brought to a wider audience. This idea of social justice in palaeontology needs to become an integral part of conferences, meetings and research moving forward. Someone suggested that there should be keynote speakers specifically addressing social justice issues, while others suggested that we should all be integrating these ideas into our future talks. We concluded that action and pressure need to come from both the top and the bottom. My fellow early-career researchers talked about how we can more actively push for change when designing projects with our PIs and supervisors, because more senior staff have more power to change the systems of ethics we operate within.

This workshop was a much-needed step in the right direction, and the organizers should be immensely proud of their work. Palaeontology has the power to reach, and fascinate just about anyone, and we need to do all in our power to make sure everyone equally enjoys and benefits from it.

Ray Chatterji (he/him)

The University of Adelaide, Australia

Note from the Editor

The workshop was organized by Emma Dunne and Nussaibah Raja. The contributors were (presenters are in bold, experts in brackets):

- Group 1: **Katie Collins**, Aline Ghilardi, Natalia López Carranza, Paul Stewens (with Juan Carlos Cisneros and Aura Fossati)
- Group 2: Natalia Jagielska, Caroline Buttler, Nicholas Gardner, Rachel Warnock (with Donna Yates)
- Group 3: Georgia Knauss, Catalina Pimiento, William Foster (with Doris Schroeder)
- Group 4: Isaiah Smith, Aldo Marcelo Benites Palomino, Thomas Wong Hearing, Kenneth De Baets, Zahra Al Iawati (with June Rubis and Sibusiso Biyela)
- Group 5: Emma Hanson, Yara Haridy, Ted Endo (with Paul Barrett)



3rd Palaeontological Virtual Congress

Virtual environment 1 – 15 December 2021

The increasing use of virtual platforms to communicate science encouraged us to create the first Palaeontological Virtual Congress (PVC) in December 2018, followed by the second edition in May 2020, with the purpose of spreading, worldwide, the most recent scientific advances in palaeontology in a fast, easy and economical way. Our initiative was pioneering in palaeontology, being the first exclusively virtually developed conference in our field. In these challenging times of pandemic, online platforms have gained great relevance and are key to keeping up the drive for science communication among peers and enthusiasts. Even when online meetings became the norm, we believed that a new edition of the meeting (3rd PVC) could still play a relevant role by giving international projection to the palaeontological research carried out by groups with limited economic resources, as well as in promoting the participation of palaeontologists from developing countries around the world. With this in mind, for the first time we created a social fund for participants from low and lower-middle income countries listed as such by the World Bank. Additionally, to increase the range and diversity of nationalities and areas of expertise, this year we introduced ambassadors: participants who wished to advertise the meeting among colleagues in their country and/or speciality.

In this edition of the congress we hosted 535 participants from 56 countries, with seven ambassadors from China, Germany, Italy, Mexico, Panama, the Philippines and Switzerland. For the 15 days' duration, a total of 282 contributions were presented in a variety of formats (video presentations, slide presentations or posters), distributed in four general sessions and eight different thematic sessions (*i.e.* virtual palaeontology; palaeontological heritage in the 21st century; the multiple perceptions of fossils; conservation palaeobiology – bridging past and future; palynology, palaeoenvironment and palaeoclimate; molecular palaeontology; new advances in stratigraphy and palaeontology in Taiwan; and coevolution of life and environment during the key geological transitions) (for the complete list of contributions see our webpage at <<http://palaevoc.org>>). A selection of the contributions presented will be published soon in a special issue of the international journal *Earth and Environmental Science Transactions of The Royal Society of Edinburgh*. The congress included seven keynote lectures which were given by **Anusuya Chinsamy-Turan**, **Ignacio Escapa**, **Xiaoya Ma**, **Octávio Mateus**, **Maria McNamara**, **Karen Moreno** and **Donald Prothero**.

The congress also featured three virtual field-trips: through the fossil Lagerstätte of the Heng-Chung Peninsula (Taiwan); Shigang town and the Tien-De-Da-Yuan museum (Taiwan); and the Anaga Palaeopark (Canary Islands, Spain).

The success of the congress was a direct consequence of the different organizations that offered support and helped to advertise it to their membership (see a complete list of our sponsors at <<http://palaevoc.org/index.php/sponsors/>>). The organizers are grateful to the PalAss for supporting the event (via Grant-in-aid number PA-GA202103), thereby allowing us to keep the fees as low as possible and allowing the participation of a great number of people with limited resources.

Humberto G. Ferrón

University of Valencia, Spain

On behalf of the Organizing Committee



3rd Palaeontological Virtual Congress

The results!



535 scientists from 56 countries



282 contributions



3 Virtual field trips

Anaga palaeopark



Fossil lagerstätten of Heng-Chung peninsula



Shigang town & Tien-De-Da-Yuan museum



4 General thematic sessions

19 communications



Palaeozoic

49 communications



Mesozoic

48 communications



Cenozoic

15 communications



General palaeontology

8 Proposed thematic sessions

26 communications



Virtual Palaeontology

3 communications



The multiple perceptions of fossils

12 communications



Palynology, Palaeoenvironment and Palaeoclimata

16 communications



New Advances on Stratigraphy and Palaeontology in Taiwan

9 communications



Palaeontological Heritage in the 21st Century

10 communications



Conservation Palaeontology – Bridging Past and Future

7 communications



Molecular Palaeontology

58 communications



Co-evolution of life and environment during the key geological transitions

Thank you for your enthusiastic participation!

See you in the next edition!

Sponsors



Organisers





— OBITUARIES —

John W. Murray DSc FGS 1937 – 2021

On 25th October 2021, John Murray (Emeritus Professor of Geology, National Oceanography Centre, University of Southampton, UK) died at home near Southampton. John was one of the leading micropalaeontologists of the twentieth century and, in his passing, the UK has lost not only an authority on foraminifera but a true gentleman. He was a quiet, efficient researcher, often appearing shy to those who did not know him, but blessed with a dry sense of humour. Throughout his life, his work was characterized by a thoroughness of purpose and a deep-seated knowledge of the subject.

John William Murray was born in London and, like many other children at that time, was evacuated to the north of England during the war. In the post-war period the family was based in Worthing (West Sussex) and the first sign of his future interests was when, for his sixteenth birthday, he asked his parents for a biological microscope with which he developed his

passion for biological (and geological) microscopy. John went to Imperial College London to read geology and – in his first year – was introduced to the world of foraminifera by David Carter. In 1958/1959 he undertook a small research project on the planktic foraminifera from one of the new boreholes drilled for the Channel Tunnel Site Investigation, the micropalaeontology for which was being led by David Carter. His PhD research (1959–1961), also supervised by Carter, was a study of the benthic foraminifera of Christchurch Harbour in Dorset. This required regular sampling of the sediments, staining the foraminifera to separate the living assemblage from the dead assemblage and taking suites of physico-chemical readings (temperature, salinity, pH, *etc.*). This research generated a life-long passion for benthic foraminifera and, despite not having a university biological qualification, an understanding of their biology and ecology.

Being based in Imperial College from 1956 to 1961, much of the time working with David Carter, he was clearly influenced by Dr Gwynn Thomas, one of the founders of the Palaeontological Association. In the absence of The Micropalaeontological Society (founded in 1971), John became a member of the Palaeontological Association. He became Editor of *Palaeontology* (1974–1979) and went on to be Vice-President and then President (1990–1992). In 1985 he edited the '*Atlas of Invertebrate Macrofossils*' that was published by the Association and was, for many years, a standard reference for many undergraduate programmes.



Image courtesy of Richard Murray.



Following his PhD research on the foraminifera of Christchurch Harbour, he held a post-doctoral scholarship at the Laboratory of the Marine Biological Association (Plymouth) in 1961–1962 during which appointment a series of important papers on the foraminifera of Plymouth Sound and the English Channel were generated. This position was followed by his appointment to a lectureship at the University of Bristol (1962–1975) from where he moved on to a Professorship (and Head of Department) at the University of Exeter (1975–1989) and eventually the University of Southampton (1989–2003). From 2003 he was an Emeritus Professor of Geology in the National Oceanographic Centre as well as a Long-Term Visitor to the Natural History Museum, London.

While remaining an active member of the Palaeontological Association, John was a major contributor to other societies, including the Geological Society of London (Hon. Secretary 1989–1992), the Cushman Foundation for Foraminiferal Research (Associate Editor of *Journal of Foraminiferal Research* 1976–1984) and – in particular – as Chairman (1978–1980) of the (British) Micropalaeontological Society followed by a period as Editor-in-Chief of the *Journal of Micropalaeontology* 1993–1997).

It was, however, his PhD research on modern benthic foraminifera that generated his enduring passion for estuarine and near-shore environments. Marine biologists often ignore foraminifera and the investigation of these fascinating protists is usually left to those with a geoscience background. In the late 1960s, scanning electron microscopes began appearing in British universities and John used this new system of imaging to produce his *Atlas of British Recent Foraminiferids* in 1971. This was followed (in 1973) by the first of his landmark books on the *Distribution and Ecology of Living Benthic Foraminiferids*. These two volumes, coupled with his two later books on benthic foraminifera, established John as the leading authority on the foraminifera from modern estuarine and near-shore environments: a position recognized by the award of the Wollaston Fund of the Geological Society (1981), the T.N. George Medal of the Glasgow Geological Society (1991), the Joseph A. Cushman Award (2001), the Coke Medal of the Geological Society (2007) and the first recipient of the Brady Medal of The Micropalaeontological Society (2007).

While John was at the University of Bristol, Prof. W. F. Whittard involved him in sea-floor sampling of the English Channel. This prompted an interest in Cenozoic foraminifera and, together with PhD student Chris Wright, John studied the Paleogene foraminifera of the Isle of Wight and adjacent areas of Europe. Their *Special Paper in Palaeontology* (1974) provided much of the information that would appear in the 1981 and 1989 volumes of the *Stratigraphical Atlas of Fossil Foraminifera* which John edited with D. Graham Jenkins. The 1989 edition of the *Atlas* remains a benchmark publication, although many would argue that it is in need of revision with 30+ years of progress in stratigraphical micropalaeontology to be included.



Image courtesy of Richard Murray.



In the last ten years, however, John decided to give up his ‘picking brush’ and devote more time to his other passion – painting. John had been an artist for a great many years and, in his retirement, enjoyed going away to locations such as the Lake District, where he could paint alongside a group of like-minded individuals. At a celebration of John’s life on 20th November 2021, the room was adorned with 100+ of his paintings. It was a touching occasion, with members of his close family present, alongside a few micropalaeontologists and some of his Hampshire-based art group. Numbers were limited by the COVID-19 restrictions, although it is hoped that we will be able to mark his immense contribution to micropalaeontology at a later date.

John is survived by his brother, two sons and their families. We thank Richard Murray for providing the photographs of John used in this tribute.

Malcolm B. Hart

University of Plymouth, UK

Haydon W. Bailey

Natural History Museum, London, UK

George Demetrius Sevastopulo 1941 – 2021

George Sevastopulo, who passed away on 16 September 2021 in Dublin, Ireland, will be warmly remembered by a generation of students as an inspirational teacher and mentor, and by his colleagues as generous friend who was always great company and who liberally gave of his time and advice. His reach was global and he had many friends and colleagues in geological, palaeontological and gardening spheres in particular.

Born in November 1941 and raised in East Africa, India and the UK, George originally studied Physics at the University of Cambridge, UK, but switched to Geology and graduated with a BA, later taking an MA. He first came to Ireland in 1963 as a field assistant to a Cambridge PhD student who was engaged in fieldwork on the Magharees, a group of islands off the Dingle Peninsula in County Kerry. The pair became marooned due to poor weather, and it was rumoured locally that they were members of the gang that had carried out the Great Train



George at a Departmental Christmas party at Trinity College in 1984. Photograph courtesy of Patrick Wyse Jackson.



Robbery! Having made their way back to the mainland George visited Trinity College Dublin to call on R.G.S. Hudson, the noted Carboniferous stratigrapher and palaeontologist (and first President of the Palaeontological Association). This timely meeting set in motion a train of events that were to lead to his academic career. In the following year he returned to Dublin and commenced a PhD study under 'Hud's' supervision; this focused on Irish Carboniferous crinoids, a subject that remained a lifelong passion, and the degree was conferred in 1970.

He spent his entire academic career at Trinity where he was successively Junior Lecturer (1966), Lecturer (1969) and Associate Professor (1982). He was elected to Fellowship in 1977 and retired in 2004 as Fellow Emeritus, continuing to work and contribute to the Department until shortly before his death. Outside Trinity his academic standing was acknowledged in his being elected a member of the Royal Irish Academy in 1988 and he served this body with great distinction, recently chairing its Culture and Heritage Working Group.

Crinoids aside, George's insatiable curiosity and drive led him to investigate many aspects of Ireland's geology, especially stratigraphy, macro- and micropalaeontology and economic geology, all subjects that he lectured and published on. His output over nearly six decades was extensive and it is noteworthy and typical of his spirit of generosity that most projects were collaborative in nature and that usually he was listed last in the authorship even when he had played a major role in the design, implementation and writing up of the research for publication.

A number of lifelong friendships and academic collaborations developed as a result of his participation at international symposia and meetings on echinoderms. He and Gary Lane of Indiana University, USA had a mutual interest in microcrinoids, and they produced eleven publications, many appearing in *Journal of Paleontology*. These included assessments of *Kallimorphocrinus* species, one new, and various accounts of Silurian to Pennsylvanian faunas. This collaborative work began in earnest during George's sabbatical spent at Bloomington, Indiana between March and September 1979 which also saw him work with Harold Strimple.

A later collaboration with Johnny Waters resulted in biostratigraphic assessments of Mississippian blastoids from Ireland. When Bill Ausich spent a sabbatical in Dublin in 1992, hosted by George, they revised the crinoids of the celebrated locality at Hook Head, County Wexford, which was a favourite of his. The resulting monograph was published by the Palaeontographical Society in 2001 – this authoritative work described 43 species in 25 genera of which seven were new. The authors' interest in Irish mythology is reflected in the new generic names, some of which honoured ancient Irish tribes or kings and queens. George's productive collaboration with Bill continued for over three decades and yielded several papers including a recent offering on homology in posterior interarray plates in crinoids.

George's interest and research in stratigraphy developed rapidly after his arrival in Ireland and together with colleagues such as David Naylor and his students Andy Sleeman and Ian Johnston he worked on early Carboniferous sequences in southern Ireland. In the late 1980s and early 1990s a series of studies of thermal and burial histories of Irish rocks based on palynological and conodont data were published in collaboration with Geoff Clayton and others. He continued to return time after time to questions on Ireland's stratigraphy and just before his death published with John Graham, another Trinity colleague, on successions of the latest Devonian and earliest Carboniferous.



George and Bill Ausich at the Neolithic tomb, Newgrange, Co. Meath, Ireland in 2004. Photograph by Tom Kammer.

George's expertise on Irish Carboniferous geology was utilized to good effect in the Geological Society synthesis on the correlation of these sequences in Britain and Ireland as well as in the chapters published in three editions of the *Geology of Ireland* edited by his friends and colleagues Charles Holland and Ian Sanders. George had a long association with the IUGS Subcommittee on Carboniferous Stratigraphy. He was a Voting Member from 1996 to 2004 and oversaw the work as chair of the 'Working Group to establish a boundary close to the existing Tournaisian–Viséan boundary within the Lower Carboniferous' that began its deliberations in 1996 and made its final recommendations in 2001. His standing amongst his peers was recognized when in 2000 he was nominated unopposed and ratified as Chair-elect of the SCCS, but due to ill health he didn't occupy the role for long.

In retirement he continued his crinoid and stratigraphical research and also embarked on provenance studies of the stone types utilized by the builders of early burial tombs and carvers of Irish High Crosses and other monuments in Ireland.

George was a regular participant at annual Palaeontological Association meetings, where he gained some notoriety as host of the 'Friends of the Irish' session that usually took place in his hotel room. He did much to develop Trinity's post-doctoral presence in the 1970s and 1980s by inviting a number of graduate students that he had heard speak at PalAss meetings to take up funding and come to Dublin: these included fellow crinoidologists Steve Donovan and Mike Simms. He served as a skilled, insightful handling editor for *Palaeontology* and *Papers in Palaeontology* for many years. George's other contributions to the Association, which included leading field-trips to Ireland, membership of Council during the 1970s and of the Publications Board, were typically understated. He was not self-serving, nor did he try to advance his personal standing, but was rather modest of his achievements which were very significant. He was very pleased nevertheless to have been elected an Honorary Life Member of the Association in 2021.



Many students and peers will recall his insightful lecturing and teaching especially in the lab and in the field. He was engaging with all audiences, was an excellent teacher, and he extended his pedagogical output to lecturing on gardening to national and international groups. His passion outside geology was for Alpine plants, and he and his wife Rose maintained a beautiful garden in north Dublin which was featured in the national press on occasion. His maxim was that students should be curious and investigative. While some students were undoubtedly somewhat anxious when attending his small group seminars, he was never condescending and pointed them gently towards suitable readings and resources, and encouraged them to question, interrogate and reason for themselves. He had an encyclopedic knowledge of all facets of geology and could provide details of relevant and often obscure references with ease; perhaps what was most surprising to visitors to his office in Trinity was his ability to immediately put his hand on an offprint, book or specimens under discussion. To mark his contribution and his life the Palaeontological Laboratory in the Museum Building in Trinity where he taught for many years will be renamed in his honour.

George made an enormous contribution to the understanding of echinoderm palaeobiology and Carboniferous stratigraphy worldwide, and he enriched the lives and careers of many students, colleagues, and friends. He will long remain close to the hearts of those whose lives he touched.

Patrick N. Wyse Jackson

Trinity College Dublin, Ireland



Undergraduate Bursary REPORTS

Using $\delta^{13}\text{C}_{\text{org}}$ to improve the timeline of the Cambrian explosion

Francesca Warren

Department of Earth Sciences, Durham University, UK

Introduction

Cambrian oceans experienced periods of anoxia, eustatic sea level change, mass extinctions and radiations (Woods *et al.* 2011). Stable carbon isotope ratios of sedimentary organic matter ($\delta^{13}\text{C}_{\text{org}}$) can be used as a proxy for these events, such as the Late Cambrian Steptoean positive carbon isotope excursion (SPICE) (Woods *et al.* 2011; LeRoy *et al.* 2021) and the Hellnmaria-Red Tops Boundary (HERB) (Landing *et al.* 2020). In this study, mid-Late Cambrian shale samples were obtained from Merevale cores #1 (M1) and #3 (M3) for $\delta^{13}\text{C}_{\text{org}}$ to expand on records produced by Woods *et al.* (2011). In addition, bulk sedimentary nitrogen isotopes ($\delta^{15}\text{N}_{\text{tot}}$) are generated to reconstruct local redox conditions. The resultant curve will be used to explore biodiversity changes in the late Cambrian such as the 'Phytoplankton Revolution' (Saltzman *et al.* 2011) and the Great Ordovician Biodiversity Event (GOBE).

Methods

Merevale cores M1 and M3 were sampled at the British Geological Survey (Keyworth, UK): samples were taken at intervals of 16 feet (ft) in the stratigraphic interval investigated by Woods *et al.* (2011) and extended by 321ft and 565ft at 4ft intervals in M1 and M3 respectively. Preparation methods were done according to Plint *et al.* (2017) and all isotope measurements were performed in the Stable Isotope Biogeochemistry Laboratory (SIBL) at Durham University.

Discussion and conclusions

At the base of M3, our data replicate the results produced by LeRoy *et al.* (2021), showing a negative $\delta^{13}\text{C}_{\text{org}}$ excursion (Figure 1), correlating with an increase in upwelling within the region. Our M3 samples show some scatter, which may have been as a result of instrument issues at the time. Due to continued technical difficulties with the stable isotope mass spectrometer, we were unable to rerun samples to ascertain reliability.

The SPICE (Figure 1) represents a period of growth in primary productivity and an expansion of the oxygen minimum zone causing global anoxia (*e.g.* Woods *et al.* 2011) which will have influenced biodiversity. Unfortunately, we were unable to acquire the Oldbury Quarry samples used by Woods *et al.* (2011) to bridge the gap between M1 and M3, so our results miss the main peak of the SPICE. The rapid increase of $\delta^{15}\text{N}_{\text{tot}}$ at the top of M3 (coinciding with the start of the SPICE, Figure 1), suggests an increase in anoxia in which primary productivity relied heavily on denitrification processes. $\delta^{15}\text{N}_{\text{tot}}$ analysis of the Oldbury Quarry samples is needed to confirm the extent of this



denitrification associated with the SPICE. The positive $\delta^{13}\text{C}_{\text{org}}$ excursion at ~500ft (M1, Figure 1) is suggested to correlate to the Sunwaptan negative carbon isotope excursion (SNICE), which indicates global sea level rise (Sial *et al.* 2013).

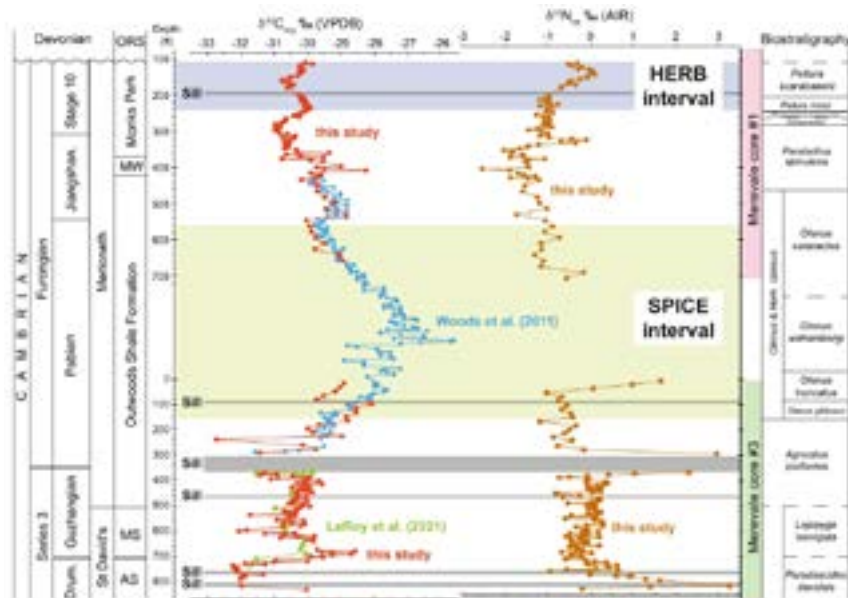


Figure 1. Stratigraphy and geochemical results of M1 and M3. The borehole thickness does not equate to stratigraphic thickness as the borehole was not taken perpendicular to dip (Woods et al. 2011). Ages and biostratigraphy zones have been depicted from: Woods et al. (2011), LeRoy et al. (2021) and Cramer and Jarvis (2020); and Woods et al. (2011), Taylor and Rushton (1971) and Geyer (2020) respectively.

Our $\delta^{13}\text{C}_{\text{org}}$ M1 data reveal two negative excursions in Stage 10 (Figure 1). We have correlated the uppermost excursion at 160ft, with the global HERB (Amzy 2018) confirmed through biostratigraphy. Interestingly, a positive $\delta^{15}\text{N}_{\text{tot}}$ excursion was also recorded during the HERB. This may indicate upwelling and/or overturning of the ocean, leading to anoxia and denitrification. The $\delta^{13}\text{C}_{\text{org}}$ excursion we have found at 280ft (-30.2‰ to -31.2‰) suggests that there were possible fluctuations in upwelling and productivity blooms preceding the HERB. It would be interesting if further study also found this correlated globally, as it may have influenced productivity and biodiversity. Outside of these positive $\delta^{15}\text{N}_{\text{tot}}$ excursions, the nitrogen isotope record suggests nitrification (*e.g.* oxygen-rich oceans) dominated the regional oceanic nitrogen cycle.

Our results have been affected by sills, most apparently within M3 (Figure 1). There is positive $\delta^{15}\text{N}_{\text{tot}}$ and more negative $\delta^{13}\text{C}_{\text{org}}$ spikes surrounding them, with the $\delta^{15}\text{N}_{\text{tot}}$ results seeming to be the most influenced. Therefore, spikes caused by sills are not included in our final interpretations.

The data generated in this study suggest there is a link between carbon and nitrogen isotope cycles in this region. The SPICE suggests increased anoxia and denitrification, which may correspond to a major bioproductivity event. The HERB event and excursion found at 280' is linked to oceanic upwelling which led to anoxia and denitrification. Each of these excursions will have affected the



marine biodiversity. Despite the current link being tentative, I propose the possibility that the SPICE, the HERB and upwelling fluctuations between these indicated with our 280' excursion and the SNICE, were precursors to biodiversity changes at the End-Cambrian and Early Ordovician, such as the Phytoplankton Revolution (Saltzman *et al.* 2011) or the Great Ordovician Biodiversity Event (GOBE), caused by denitrification events pushing communities into the shallower photic zone. Further research into these links is required.

Acknowledgments

I wish to thank the Palaeontological Association for providing the Undergraduate Research Grant (PA-UB202102) for this project and the BGS Core Repository staff at Keyworth for allowing access to the cores. Thanks to my supervisors: Dr Matthias Sinnesael, Dr Darren Gröcke and Dr Martin Smith. Sample collection and analysis were supported by the Leverhulme Trust Research Project Grant (RPG-2019-223 to M. Smith).

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Quantifying rates of pyritization through experimental decay and computed tomography

Madeleine Waskom

Department of Organismic and Evolutionary Biology, Harvard University, USA

Summary of proposal and goals

The fossil record contains many instances of exceptional preservation of non-biomineralized tissues, possibly thanks to the combination of physical, chemical and biological processes. Pyritization represents one of the most common modes of exceptional preservation, and leads to the formation of spectacular animal fossils that inform the organization of decay-prone anatomical structures. The abundance and unique qualities of pyritized fossils in Lower Palaeozoic deposits have prompted interest on the precise mechanism responsible for this type of exceptional preservation. The fossilization of soft-tissues indicates that pyritization occurs rapidly, but pyritization is microbial-mediated, and mineralization is typically a longer process. Pyritization occurs when sulfide produced by sulfate-reducing bacteria and reactive iron combine (Gabbott *et al.* 2004). Despite an understanding of the diagenetic process responsible for pyritization, there are open questions regarding the exact biogeochemical conditions and timeline of the formation of fully pyritized animal macrofossils. By utilizing micro-computed tomography (micro-CT), I was able to non-invasively observe a time series of experimental vials, with decay occurring in the sediment. This project explored the conditions for pyritization in a closed system through a combination of experimental taphonomy and micro-CT imaging.

Methods

I collected fresh organic-rich estuarine sediment containing sulfur-reducing bacteria from Belle Isle Marsh in Boston, Massachusetts, USA. The sediment was passed through a 2 mm sieve to remove large pieces of organic matter and was deoxygenated with 75 ml of a 1.3 mM sodium sulfide solution. Commercially-acquired notostracans of the genus *Triops* were reared until adulthood, then euthanized by freezing. Six glass 250 ml vials were filled with sediment, completely covering 1-2 *Triops* carcasses. After covering the sediment with the deoxygenated seawater with added 50 ml of 0.3 mM ferric iron chloride, the vials were sealed tightly (Figure 1). Vials were kept in an incubator at 18°C between weekly scans. Scans were performed on the Skyscan1173 micro-CT scanner in the Digital Imaging Facilities in the Museum for Comparative Zoology, reconstructed in NRecon (supplied by Bruker Corporation) and visualized using Dragonfly software (ORS 2020). Scans were performed with Al 1.0 mm filters, with a voltage of 100 kV. Following week 10 of the experiment, vial #2 was dissected; the remaining vials were scanned until week 16 when vials #1, 3 and 4 were dissected.

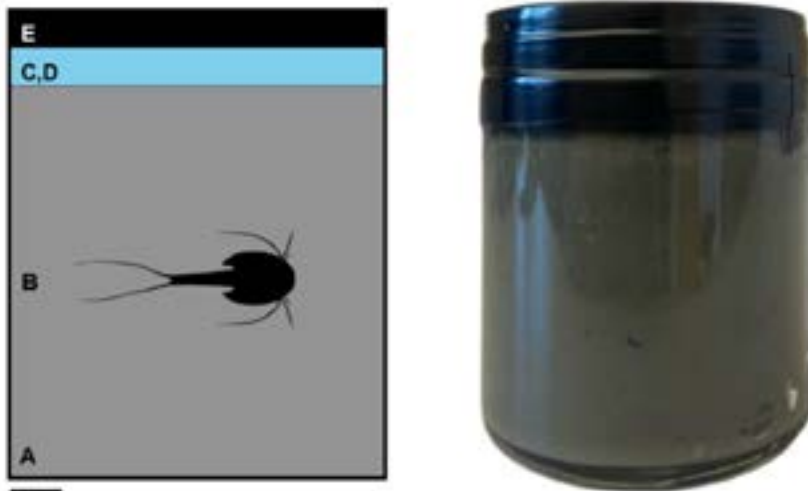


Figure 1. Experimental setup model and vial. A) marsh sediment with naturally occurring sulfate-reducing bacteria; B) *Triops* carcass; C) Anoxic artificial seawater; D) added ferric iron (Fe^{2+}); E) vial sealed tightly used for micro-CT imaging.

Results

In the initial scans (week 0), the *Triops* carcass appeared less dense than the surrounding sediment. The carcass continued to become less dense and more distinct from the sediment in the micro-CT scans around week 5 and remained close to the density of water to the end of the experiment. As organic matter decayed, the void space may have filled with pore water or body fluids, appearing less dense relative to the surrounding matrix.

The sediment in the first two weeks of scanning appeared as a homogeneous density, but by week 5 concretions of denser material formed and remained present in the remaining weeks (Figure 2 B and C). Scanning electron microscopy spot analysis of a concretion indicated complex mineralogies, being composed primarily of carbon with crystals of silica and an iron rich mineral. No iron monosulfides or pyrite were detected. In the week 10 scans and through to the week 16 scans, less dense bubbles also appeared in the top of the vials, which may have been a product of decay. When opening vial #2 (Figure 2), only the carapace and mandibles were recovered, indicating extensive decay consistent with previous *Triops* decay experiments (Hegna 2012).

This work demonstrated that micro-CT is capable of detecting alterations of the carcass and surrounding sediment during early diagenesis as informed by changes in density. The experiments did not produce pyritization of the carcass as intended. Although the precise experimental conditions responsible for producing full-body pyritization remain a work in progress, we demonstrated that micro-CT is a viable method for visualizing physical and chemical changes resulting from decay under experimental conditions without the need to exhume the carcasses, which would disrupt the taphonomic process and alter the outcome. This approach opens the possibilities of performing long-term taphonomic experiments.

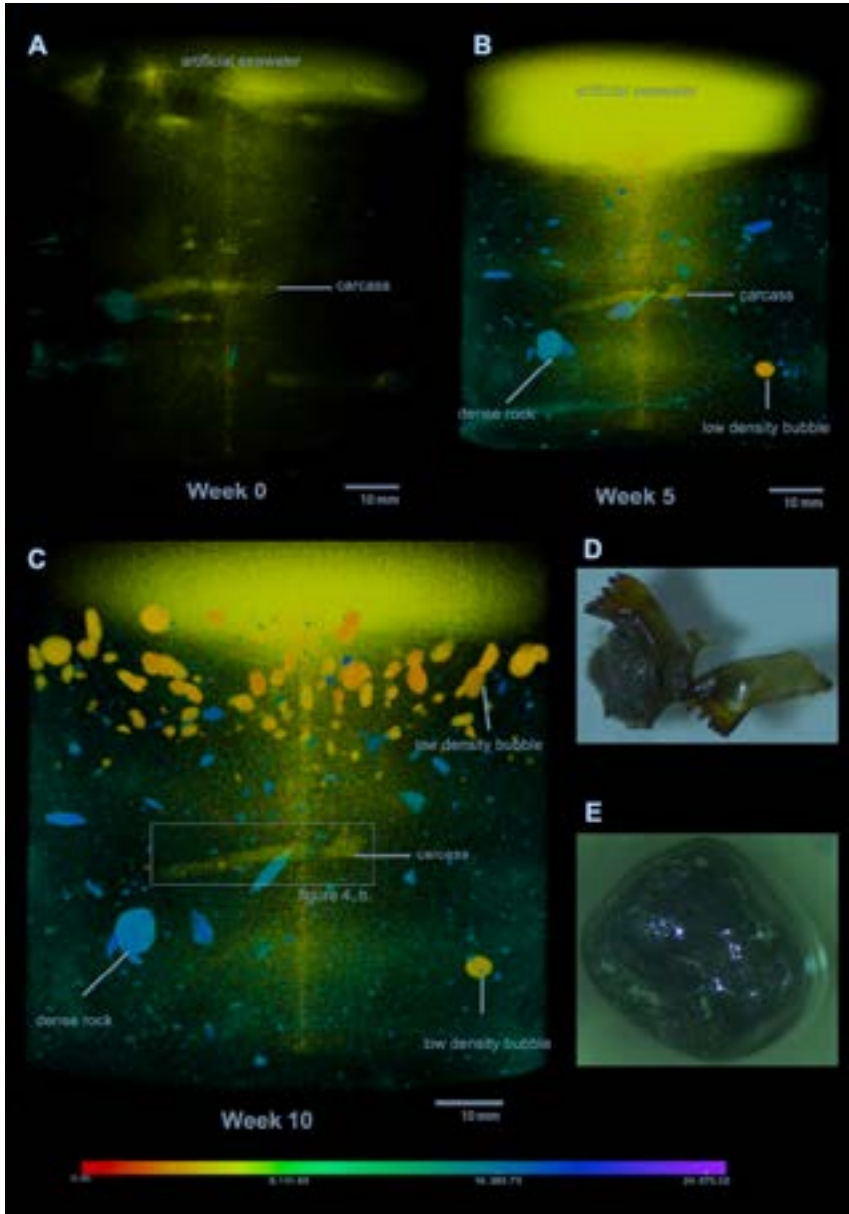


Figure 2. Time series of decay experiments visualized through CT data. A) week 0 scan (beginning of experiment); B) week 5; C) week 10 (end of experiment); D) isolated *Triops* mandibles recovered from sediment after ten weeks of decay; E) dense concretion formed during the experiment. Coloured gradient shows relative densities in tomographic data. Purple denotes higher density and red lower density material relative to sediment. Green denotes sediment density and has been removed to visualize carcass and other structures.

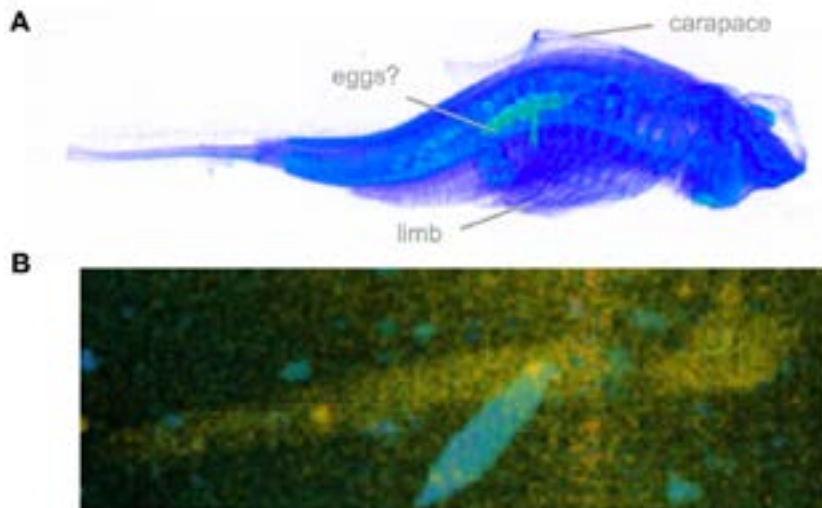


Figure 3. Anatomy of *Triops carcass*. A) micro-CT scan of a female *Triops*, completed after staining the specimen in Lugel's iodine; B) *Triops* after ten weeks of experimental decay, from Figure 2.

Future directions

This remains an ongoing project and I am working to refine the conditions necessary for pyritization of invertebrate carcasses in a laboratory setting. This includes the use of sediment with a lower organic content that would facilitate pyritization taking place within the carcass exclusively, providing continuous influx of sulfate and iron to ensure the availability of reactants, as well as maintaining an anoxic environment. An additional round of the experiment is underway where half the specimens have been inoculated with pyrite to provide nucleation sites.

Acknowledgements

Many thanks to the Palaeontological Association for the Undergraduate Research Bursary (PA-UB202103) that supported this project. This work was presented in a poster at the 2021 PalAss Annual Meeting.

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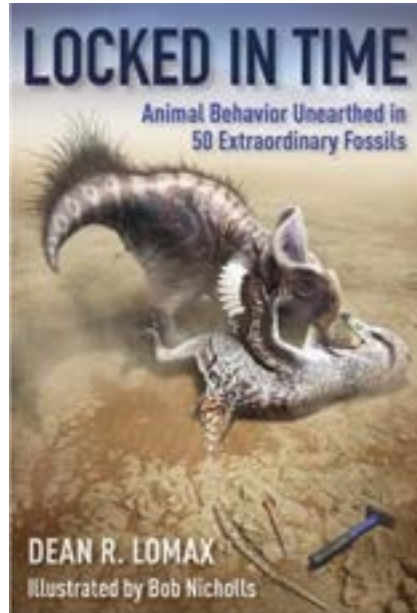
Reviews



'Locked in time: Animal Behaviour Unearthed in 50 extraordinary fossils'

Dean Lomax (Illustrated by Bob Nicholls), 2021, 296 pp., Columbia University Press. ISBN: 9780231552080.

Not to be confused with the 1985 novel by Lois Duncan, '*Locked in time: Animal Behaviour unearthed in 50 extraordinary fossils*' by Dean Lomax is a pop science book that has received stellar ratings on both UK and US Amazon websites, as well as on goodreads.com, averaging 4.9/5 stars. The high score on book retailer websites is quite apt for many reasons: the easy-to-understand language written in a casual and engaging way, great accompanying images of all sorts of beasts, and generally good value for your money. The cover image is quite dramatic and enticing, with a colour illustration of a battle to the death of a *Protoceratops* and *Velociraptor*, which is also later described in the book with more images. The book is divided into five chapters that break down into 50 bite-size sections – one per extraordinary fossil. This division makes it easy to follow and comfortable to switch to each new fossil subject, as the sections are usually around four pages long with illustrations to break



up the text. Although the illustrations are eye-catching and help the reader imagine what all of these fantastic creatures could have looked like, I found some of the layouts in the first part of the book a bit jarring; in places the text would be cut off at awkward parts, or the image would disrupt the flow of text.

The images in the book vary from beautiful illustrations to author selfies. There are plenty of photographs of fossils *in situ* and beautifully-prepared museum specimens beside the elaborate illustrations. This shows the reader the 'full picture' of how and why palaeontologists reconstruct each animal the way they do, and that it is no easy task. Of course, there are also photographs of the author standing awkwardly next to fossils. We all have a few of these in our camera rolls, especially after trips and conferences. A few of the illustrations are fun and quirky with the culprits being painted in embarrassing, or rather unflattering, situations, such as the *Borophagus secundus* caught mid defecation, or the pair of mating *Allaöchelys crassesculpta*.

Not all of the images and text are fun and light-hearted. The author manages to touch on sensitive and grim subjects such as mass stranding, cancer, and the case of the babysitting *Psittacosaurus*



that was found with a group of younger dinosaurs buried alive by a volcanic debris flow. *Locked In Time* is filled with truly fascinating and exceptional cases of preservation, which helps get the reader excited about parts of palaeontology they may not have known about previously. For example, the topic of tumours, fossilized farts and urolites (fossilized imprints left by urinating animals), that may not get as much media attention as a newly uncovered *Tyrannosaurus* or *Ankylosaurus*. Other examples the author writes about include fossil specimens of pregnant Plesiosaurs, a pair of *Confuciusornis* fossils that allowed palaeontologists to determine their sex, and terrifying fight scenes immortalized by the fossils of wrestling Mammoths (or the pair of dinosaurs that can be seen illustrated on the cover).

Even being fun, light-hearted and colloquial in form, Lomax manages to touch on some issues that palaeontologists know all too well: the time-consuming process of excavation, issues with discoveries and ownership, the naming of new specimens, and the process of coming to conclusions about how and what happened to the animals while they were alive. The author also makes sure to not just dive into complex terminology, but with ease also explains the basics for the newer readers to the science. One of the main points that I like about the book is that Lomax did not just pick the big 'name brand' dinosaurs, instead opting to expand the knowledge base of the reader by writing about a wide range of fossils, from horseshoe crabs to giant ground sloths. Overall, if I had to put a numerical value to the review, I would give it a 7/10. I will happily send a copy of '*Locked In Time*' to my nephew and would not be surprised if others also thought of this as a great gift for any other budding palaeontologists.

Aija Zāns

A perpetual student, cat lady, and sarcastic opinionated gremlin. Can be found on twitter @GeoZans, but doesn't tweet much.

Dinosaurs – How We Know What We Know

Mary Higby Schweitzer, Elena Rita Schroeter, Charles Doug Czajka, 2020, 562 pp., CRC Press, ISBN 9780367563813.

If you are looking for a book about dinosaurs you can choose from dozens, if not hundreds, of titles. With *Dinosaurs – How We Know What We Know*, Schweitzer and colleagues have added another one to that ever-growing list. Given this plethora of literature on everyone's most-loved (or most-hated...) fossil organisms, you may wonder what sets this book apart from others?

Despite what the title suggests, this is not necessarily a book about dinosaurs. In fact, if you are a dinosaur enthusiast you may be disappointed. The book does not provide an in-depth account of every single dinosaur species ever discovered, intricate details on dinosaur anatomy, or pages full of skeletal diagrams and reconstructions. Rather, the book uses the popularity of dinosaurs, but also the vast amount of research on them, to introduce a wide range of topics in palaeontology, biology and earth sciences.

The first chapter outlines the fundamental principles of how 'science' works. It briefly covers what data and types of data there are, what separates observations from interpretations, and how researchers test scientific hypotheses. The following chapters are dedicated to basic topics in earth sciences: from the formation of the earth and plate tectonics to rock classification and



stratigraphy – these chapters provide a solid overview of the geological aspects surrounding dinosaur palaeontology. This is complemented by chapters dealing with more biologically themed topics, such as the origin of life, taxonomy and phylogeny, as well as a primer of evolutionary processes. In these chapters, the book never loses the connection to its actual protagonists. The link to dinosaurs is always clear, even if they are just playing a supporting role in these introductory chapters (for example, the question of how we know when dinosaurs lived is used as a prompt to outline different dating methods).

In the next chapters, we finally get several pages just dedicated to dinosaurs: dinosaur evolution, dinosaur systematics, and dinosaur anatomy! The chapters provide a brief but good overview of all things dinosaur before moving on to other topics. The second half of the book covers a variety of palaeobiological content, including ecology, physiology and growth, functional morphology, taphonomy and – of course – mass extinctions.

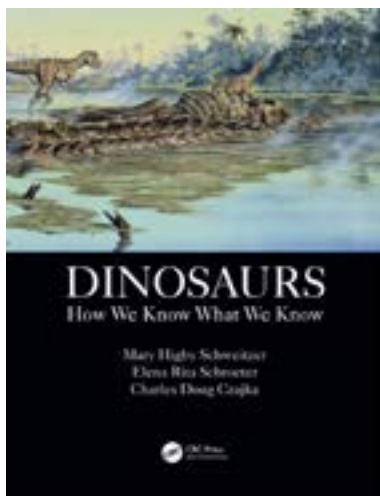
Although the content purely dedicated to dinosaurs makes up only a small part of the book, the authors manage very skilfully to harness the popularity of dinosaurs to introduce and discuss topics relevant to palaeobiology more broadly. They do so in a very entertaining but informative way, ending every chapter with a discussion of what we do not currently know and what the open questions in (dinosaur) palaeontology are.

Dinosaurs – How We Know What We Know is a textbook primarily aimed at undergraduate and college students. It is easily accessible to kids from the age of around 12, interested amateurs, and I am sure that even seasoned palaeontologists can learn a thing or two. Personally, I may have found a perfect companion book for my 3rd/4th-year module on evolutionary palaeobiology.

As mentioned above, this is not just a book about dinosaurs, but more broadly an up-to-date overview of the current state of knowledge, research, and (yet) unanswered questions in palaeontology. So, come for the dinosaurs, but stay for all the other interesting content that palaeontology and earth sciences have to offer.

Stephan Lautenschlager

Stephan is a 'professional dinosaur enthusiast' and lecturer in Palaeobiology at the University of Birmingham, UK. He can be found on Twitter: @PalaeoStephan.

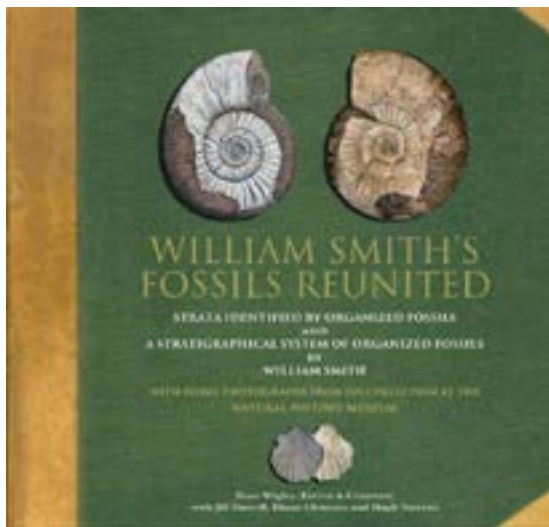




William Smith's Fossils Reunited

Peter Wigley (editor) with Jill Darrell, Diana Clements and Hugh Torrens, 2018, 160pp, Halsgrove Publishing, ISBN: 9780857043375.

When I lived in Wales, I had two poster-sized maps, one the current UK geology map and the other William Smith's map of 1815. I often used to look at them and wonder, 'How on earth did William Smith do it?'. In the early nineteenth century both the roads and the technology were unsophisticated, but it was his grit, determination and intelligence that got him to his place of eminence. He happily walked a hundred miles to one surveying job. Unfortunately, his business acumen failed him, leading to a debtor's prison sentence and the forced sale of his fossils.



The 'ins and outs' of William Smith's career have been well documented and are accessible in the very readable *'Map of the World'* by Simon Winchester. This book makes clear the efforts and vicissitudes he faced – as well as that incredible moment when he realized the significance of the strata he saw in his work.

William Smith's Fossils Reunited takes us one stage further in an understanding of Smith by showing us the illustrations of fossils he published in his original two volumes and how his original fossils found their way into the Natural History Museum, London.

William Smith's Fossils Reunited is no lightweight book, physically it weighs in at about 1.3 kg and measures roughly 26 cm square (this corresponds to 'quarto' size and reflects the size of the original publications). I have to say it does not sit very comfortably on my current bookshelves. It has been printed on a heavyweight paper, presumably to facilitate the photographic reproduction and longevity of the publication.

In *William Smith's Fossils Reunited*, the frontispiece is a portrait of William Smith painted in 1837, which is only two years before his death. It shows quite a stern-faced gentleman with a clear feel for the determined individual that he was.

William Smith's Fossils Reunited starts with an extensive introduction to the two volumes combined within its covers: 1) *Strata Identified by Organized Fossils* and 2) *A Stratigraphic System of Organized Fossils* (that references the specimens of the original geological collection in the British Museum). There is also a detailed description of the process Smith had to go through with the British Museum to sell his fossils to them. I don't think the Museum can be proud of that part of its history.



The body of the book starts with the Strata Identified by Organized Fossils. This was produced by Smith and James Sowerby, who engraved the images. This section consists of four separate sub-volumes of four or five plates each preceded by some introductory text from Smith. It is organized by geological formation as defined by Smith.

If we take the first formation as an example, it is entitled 'London Clay' and the illustrations are prefaced by Smith's description of the geology together with the names of the fossils and the sites where he found them. Each original page from Smith's work has been paired with photographs of Smith's original fossils as they now exist in the Museum. Smith had the bright idea to colour each page with the strata colour of his 1815 map. I have to say, for me that idea made the viewing of the illustrations quite hard in some cases because of a loss of definition of the images and the associated fossil names (it is even worse when you get to the Greensand). Fortunately, the editors of this volume chose a pale lemon colour as backing for the photographic images.

What struck me immediately, being no student of the history of scientific illustration, is how interpretative the illustrator can be. Assuming no degradation of the fossils over time, Sowerby, in many cases, shows much more detail than the corresponding modern photographs. The modern photographs themselves are well taken with even illumination and no shadow effects.

Unfortunately, not all of Smith's fossils can now be found. The editors have either substituted a similar fossil or simply left a blank outline where none exists. On the photographs modern names have been used to be compared with those used by Smith. In an appendix the editors have provided a very useful listing by plate number of Smith's strata name, the modern strata name, Smith's fossil name and the modern name. I was very grateful for this; I missed the text reference to this appendix and I feel it could perhaps have been made more apparent to the reader, although it does appear in the table of contents.

I have to say I think the editors should be applauded for their efforts in putting together the Strata Identified by Organized Fossils. I found it very pleasing.

However, when it comes to reproducing the Stratigraphical System of Organized Fossils, the editors have decided to put Smith's original text (of which there is a great deal) into three column format. Even with my new reading glasses I found the text rather small for comfortable reading. I can understand the wish of the editors to compress the text in favour of the illustrations, but I feel double column format would have worked better. To be fair to the editors, it is a difficult book to deal with – especially being, for the most part, a catalogue of specimens. The editors have taken the opportunity in this section to include some photographs of modern species corresponding to planned but unpublished plates.

The final section of *William Smith's Fossils Reunited* consists of a series of eight maps on which the editors have identified the locations Smith collected from, based on his original 1815 map (and various iterations thereafter that showed more localized sites). These maps are rather beautiful and the accompanying text makes them an excellent resource for the reader. The maps are supported by a listing of the fossil locations numbered to the individual sites on the maps. Again, I find the type size just a little bit difficult. The final section is the 'Plate Fossil Listing' to which I referred earlier; it too is in a very small type face.



Overall, I feel this is a very good publication that, for me – very much an amateur in the field – brought William Smith into the modern era. You can treat this simply as a picture book or you can read it in more detail and delve into the mind of the man himself and his collection. I think I still have a lot of reading to do.

Guy Moody

Guy retired from the pharmaceutical industry over ten years ago. During his retirement he has been revisiting some of the parts of his ancient Zoology degree that he can remember. These include palaeontology and geology. He has given talks on dinosaurs, the origin of birds and Ediacaran fauna to his local U3A.

Books available to review

The following books are available to review. Please contact the Reviews Editor Thomas Clements (e-mail <bookreview@palass.org>) if you are interested in reviewing any of them.

- *Otherlands: A World in the Making*, by Thomas Halliday
- *Explorers of Deep Time*, by Roy Plotnick

Dr Thomas Clements

PalAss Reviews Editor,
c/o Department of Geology
School of Geography, Earth and Environmental Sciences
University of Birmingham
Edgbaston
Birmingham B15 2TT
UK





Careers Q & A

Professional palaeontologists in the wider world



Trix, Tyrannosaurus rex specimen excavated in Montana and on display at Naturalis Biodiversity Center in Leiden in the Netherlands. Photo: Marten van Dijk.

Anne Schulp is a vertebrate palaeontologist in the Netherlands. He studied Earth Sciences at Vrije Universiteit Amsterdam, completing his MSc in 1998. He was curator at the Maastricht Natural History Museum from 1998 to 2013 and, during his position there, he completed his PhD on mosasaurs with VU Amsterdam in 2006. In 2013, he moved to the national Natural History Museum of the Netherlands, Naturalis Biodiversity Center in Leiden, where he holds a position as a researcher. Since 2019, he divides his time between Naturalis and Utrecht University, where he is professor of vertebrate palaeontology. Next to these duties, he is honorary curator of palaeontology at Teylers Museum in Haarlem.

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

Too many things to choose from, really. I've always been fascinated with technology, physics, chemistry, pretty much everything in the wider realm of STEM; I did give physics serious consideration, but ended up doing Earth sciences as it's a very multidisciplinary field and, quite honestly, the best biotope if you want a broad interest in natural sciences to flourish.

How did you first get interested in palaeontology?

Very early on already when I was at primary school. When you pick up a fossil or two the magic kicks in and before you know it, the collection grows ... and grows.

What was the biggest highlight of your work as a palaeontologist?

Too many highlights to mention, but having had the opportunity to build the new dinosaur gallery of the National Museum, including "getting a *T. rex* to the Netherlands" and running into a herd of *Triceratops* while doing so as well, I think that would qualify as a highlight or two.

What are your responsibilities in your job?

At this point, I am involved in exhibition development at Naturalis (needless to say, we won't stop now the new museum has opened), and I have quite a bit of outreach responsibilities. We have a few excavations running, including Naturalis' involvement together with partners in the UK and US in a



dig in the Morrison Formation in the US. My interest in mosasaurs keeps me involved in the digs in the Cretaceous in the south of Angola, and every year we welcome, in collaboration between Utrecht University and Naturalis, a group of students in our dig in the Triassic of Winterswijk, in the east of the Netherlands. I'm supervising a handful of PhDs and BSc and MSc students and, together with my teaching responsibilities, I never really have the opportunity to get bored.

What gives you the most satisfaction in your career?

The really nice thing about my career so far is that I have been able to combine research with the opportunity to share this "finding things out about animals long dead"-stories far and wide with our audience, our visitors. The combination of a position at a museum with a professorship at a university really does provide the best of both worlds. So, long story short, the most satisfying part, in my experience, really is sharing the fun of palaeontology with a wide audience.

What are the worst things in your job?

Not too many complaints, to be honest. I'm not too fond of administrative duties; e-mails with "please make an account first" to get little things done and dealt with are, well, among the things that remove the human scale from many things. The number of online hoops I had to jump through to co-supervise a BSc student project from a different university were hoops no-one is waiting for. And of course, the fundraising part of the job, that's all part of the game I think, and we probably all dream of not having to spend too much time there – but that's the way it is.

Do you have any tips for students who consider taking a similar career path?

Doing anything which has the words "Too similar" included is probably never a good idea. Try to approach this question, maybe, in an 'ecological' way: what are the special interests,

talents, what is the drive or your inspiration that would really help in finding a niche in palaeontology that works fine for you, and for you only? What is it that makes you stand out? Do you speak a language no-one else speaks? Are you an experienced scuba diver? Veterinary scientist? Or well-versed in a field in mathematics no-one ever thought would be useful in palaeo but turns out to be? I think we've moved very much beyond the point where palaeo was a descriptive science wedged between the geo and bio faculties; we've seen the value and the opportunities when other fields connect; some of the most interesting and most innovative career steps in years to come are probably to be taken by students who bring in really new perspectives from fields beyond geo and bio.

Is there a skill you wish you had been taught at University that would be useful in your work outside of the academic environment? What turned out not useful at all?

In my case, the philosophy of science course did not resonate too well, but that's probably not an issue with philosophy of science *per se*, but rather with a teacher with an inordinate fondness of utterly useless philosophers, *don't get me started on that*. Something that wasn't really part of the curriculum in the late '90s was science communication. I made up for that with two internships, one in science journalism and one in exhibition development; that taught me a lot, landed me the job at the Maastricht Museum as well as a career as a free-lance science writer, and a few years later I found myself back at my alma mater to help in curriculum development in – yes – the 'communication' track in the new MSc programme.

What are your future ambitions?

I hope I will be able to keep on doing what I do now: doing research, hopefully inspiring new palaeontologists, and keeping up the outreach through wonderful exhibitions and other activities.



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TAXONOMY/NOMENCLATURE UPDATE

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

Newsletter copy

Information – whether copy as such or Newsletter messages, review material, news, emergencies and advertising suggestions – can be sent to Emilia Jarochowska, e-mail <newsletter@palass.org>. The *Newsletter* is prepared by Nick Stroud, and printed by Y Lolfa, Talybont, Ceredigion.

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