The Palaeontology Newsletter

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Reminder: The deadline for copy for Issue no. 96 is 9th October 2017.

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Editorial

Welcome to the summer issue of the PalAss Newsletter! Summer brings with it plenty of distractions – especially fieldwork, meetings, and (dare I mention?) holidays – but if you can bear to drag yourself away from the rocks / talks / beach, there is plenty in this issue to occupy readers for an hour or two (potentially whilst sipping a nice cool beer or cocktail?). In this issue we feature lots of Association news, most notably our President's recent honours and a forthcoming mentorship programme and an Association- and discipline-wide diversity study, in addition to our now-regular features on careers in palaeontology, a regional museum, palaeontology in the media and more (don't miss this issue's 'Taphonomy of a teabag'!). In the summer sun, autumn may feel far away – but please take note of the October deadlines for our various grant programmes. Whatever your plans, enjoy the summer and happy reading!

Maria McNamara
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Association Business

Annual Meeting 2017

Notification is given of the 61st Annual General Meeting.

This will be held at Imperial College London, UK, on Monday 18th December 2017, following the scientific sessions.

AGENDA

1. Apologies for absence
2. Minutes of the 60th AGM, Université Claude Bernard Lyon 1
3. Trustees Annual Report for 2016
4. Accounts and Balance Sheet for 2016
5. Discussion of membership fees
6. Election of Council and vote of thanks to retiring members
7. Report on Council Awards
8. Annual address

DRAFT AGM MINUTES 2016

Minutes of the Annual General Meeting held on Thursday, 15th December 2016 at Université Claude Bernard Lyon 1, France.

1. Apologies for absence. Dr P. Winrow, Dr L. G. Herringshaw, Dr T. J. Challands.

2. Minutes. Proposed by Dr C. T. S. Little and seconded by Prof. J. C. W. Cope, the minutes of the 2015 AGM were agreed a true record by unanimous vote.

3. Trustees Annual Report for 2015. Proposed by Dr F. L. Gill and seconded by Prof. E. J. Rayfield, the report was agreed by unanimous vote of the meeting. Prof. D. A. T. Harper reminded members of the change in status to CIO which would take place from 1st January 2017 and thanked Dr J. Hellawell and Prof. R. J. Twitchett for their hard work behind the scenes. Prof. D. A. T. Harper also thanked Dr A. R. T. Spencer for the Association's new website.

4. Accounts and Balance Sheet for 2015. Proposed by Dr C. J. Buttler and seconded by Dr M. E. McNamara, the accounts were agreed by unanimous vote of the meeting.

5. Election of Council and vote of thanks to retiring members.

5.1 Prof. D. A. T. Harper extended a vote of thanks to the following members of Council who were retiring from their positions this year: Prof. D. A. T. Harper, Dr D. J. Ward, Prof. C. H. Wellman, Dr F. Gill, Dr M. Munt and Dr R. J. Butler.

5.2 The following members were elected to serve on Council: President: Prof. M. P. Smith; Vice Presidents: Prof. E. J. Rayfield and Prof. R. J. Twitchett; Treasurer: Dr P. Winrow; Secretary: Dr C. T. S. Little; Editor-in-Chief: Dr A. B. Smith; Editor Trustee: Dr M. Ruta;

Newsletter Editor: Dr M. E. McNamara; Book Review Editor: Dr T. J. Challands; Publicity Officer: Dr L. G. Herringshaw; Education Officer: Dr C. J. Buttler; Outreach Officer: Dr L. M. E. McCobb; Internet Officer: Dr A. R. T. Spencer; Meetings Coordinator: Dr T. R. A. Vandenbroucke; Ordinary Members: Dr D. P. G. Bond, Dr A. M. Dunhill, Prof. A. S. Gale, Dr I. A. Rahman.

5.3 Dr M. D. Sutton and colleagues will organize the Annual Meeting in 2017 at Imperial College London, UK.

6. Association Awards. The following awards were announced:

6.1 The Lapworth Medal was awarded to Dr A. W. A. Rushton (Natural History Museum, London, UK).

6.2 The President's Medal was awarded to Prof. P. M. Barrett (Natural History Museum, London, UK).

6.3 Hodson Awards were presented to Dr S. C. R. Maidment (University of Brighton, UK) and Dr R. S. Sansom (University of Manchester, UK).

6.4 The Mary Anning Award was presented to Mr D. Ross (Staffin, UK).

6.5 Research Grants were awarded to: Dr R. B. J. Benson, University of Oxford, *Anatomy of the oldest candidate snake based on a new skeleton*; Dr C. Strullu-Derrien, NHM, London, A *search for aquatic fungi: understanding the origins of mutualists and parasites*; Dr J. Vinther, University of Bristol, *The diagenetic alteration of eumelanin – a squid's perspective*.

6.6 Under the Small Grants Scheme, the following awards were announced: Sylvester-Bradley Awards to Ms J. De Weirdt, Ghent University, *Testing global oceanic anoxia as an alternative cause for the Hirnantian (latest Ordovician) mass extinction*; Dr C. R. Keating-Bitonti, Smithsonian Institute, *Physicochemical importance of seawater carbonate saturation*; Dr J. C. Lamsdell, West Virginia University, *Breathing life into an extinct sea scorpion: revealing the gill structure of a three-dimensionally preserved eurypterid*; Mr H. Zhang, University of Bristol, *Revising Mammoth Evolution in Eurasia*; the Callomon Award to Mr L. Laibl, Charles University in Prague, *Postembryonic development of the olenelline trilobites from the Cambrian Series 2 strata of Newfoundland*; the Whittington Award to Ms Z. Wawrzyniak (University of Silesia), *Measuring genome size in the earliest fossil plants*; and Stan Wood Awards to Ms M. Johnson, University of Edinburgh, *A comprehensive anatomical, taxonomic, and phylogenetic analysis of Teleosauridae, and a look into macroevolutionary trends*; Ms E. Randle, University of Manchester, *Evaluating bite marks and predation of heterostracan ostracoderms (fossil, jawless vertebrates) during the rise of jawed vertebrates*.

6.7 Undergraduate Research Bursaries were awarded to: Ms C. Nicoll, Imperial College London, supervised by Dr P. D. Mannion, *New sauropod dinosaur remains from the Late Cretaceous of North Africa*; Ms C.-M. Lissens, Ghent University, supervised by Dr. T. R. A. Vandenbroucke, *Chitinozoan biostratigraphy of the elusive P. linearis graptolite biozone in Girvan, Scotland?*; Ms C. Bird, University of Birmingham, supervised by Dr I. J. Sansom, *Depth-related dispersal patterns in 'complex' conodonts*; Mr T. J. Raven, Imperial College London, supervised by Dr S. C. R. Maidment, *A new phylogeny of Stegosauria (Ornithischia: Dinosauria)*; Ms F. Pye, University of Leeds, supervised by Dr A. M. Dunhill, *Survival of the smallest? Trends in brachiopod size across the End-Triassic mass extinction*; Ms T. Slater, University of Worcester, supervised by Dr Kate Ashbrook, *Sharks with question marks: Impacts of a new fossil on*

interrelationships of early bullhead sharks; Ms H. L. K. Fu, Imperial College London, supervised by Dr M. D. Sutton, *Analysis of soft-tissues from a Silurian bivalve*; Ms R. Armfield, University of Cambridge, supervised by Dr D. B. Norman, *Small-bodied estuarine plesiosaur from the Middle Jurassic gap*; Ms D. Nala, University of Birmingham, supervised by Dr T. Dunkley Jones, *Coccolithophore cell size and growth rates across the Greenhouse-Icehouse transition*.

6.8 An Engagement Grant was awarded to Ms I. Gladstone, Bristol City Museum and Art Gallery, *Pliosaurus: dive into the Jurassic deep*.

6.9 The 2016 Best Paper Awards were presented to Dr A. Zacaï and colleagues for their paper entitled "Gauging scale effects and biogeographic signals in similarity distance decay analyses: an Early Jurassic ammonite case study" (*Palaeontology*) and to Dr E. Świerczewska-Gładysz for "Early Campanian (Late Cretaceous) Pleromidae and Isoraphiniidae (lithistid Demospongiae) from the Łódź-Miechów Synclinorium (central and southern Poland): new data and taxonomic revision" (*Papers in Palaeontology*).

6.10 The Golden Trilobite Award was given to <**www.phylopic.org**>.

6.11 The President's Prize was presented to Mr J. N. Keating (University of Bristol).

6.12 The Council Poster Prize was presented to Mr J. Moysiuk (University of Toronto).

7. Annual Address. The Annual Address entitled "Molecular thermometers: ancestral sequence reconstruction uncovers the history of adaptation to environmental temperature along the tree of life" was given by Prof. M. Gouy (Université Claude Bernard Lyon 1, France).

Trustees Annual Report 2016

The trustees present their report with the financial statements of the charity for the year ended 31 December 2016. The trustees have adopted the provisions of *Accounting and Reporting by Charities: Statement of Recommended Practice* applicable to charities preparing their accounts in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) (effective 1 January 2015).

OBJECTIVES AND ACTIVITIES

Objectives and aims

1.1 Aim: The aim of the Association is to promote research in Palaeontology and its allied sciences by (a) holding public meetings for the reading of original papers and the delivery of lectures, (b) demonstration and publication, and (c) by such other means as the Council may determine. In order to meet these objectives, the Association continues to increase its range of and investment in public engagement and other charitable activities, whilst continuing to support research, publications, and student and speaker attendance at national and international meetings including our flagship Annual Meeting.

Significant activities

1.2 Grants-in-aid for meetings and workshops: The Association provided funds to support the following meetings and workshops: 'Across space and through time: understanding evolution and ecology using paleobiogeography', GSA Annual Meeting Topical Symposium T136 (Dr A.M.

Dunhill, University of Leeds); 1st International Meeting of Early-Stage Researchers in Palaeontology (1st IMERP) (Dr C. Martínez Pérez, University of Valencia); 7th International Conference on Fossil Insects, Arthropods and Amber (Dr A.J. Ross, National Museum of Scotland, Edinburgh); 64th SVPCA Meeting (Dr P.L. Falkingham, Liverpool John Moores University); and 25th International Workshop on Plant Taphonomy (Dr C.T. Gee, University of Bonn).

1.3 Public meetings: Three public meetings were held in 2016, and the Association extends its thanks to the organizers and host institutions of these meetings.

60th Annual Meeting. The Association's Annual Meeting is its flagship meeting and this year was held on 14–17 December at Université Claude Bernard Lyon 1, France. Prof G. Cuny, Dr B. Lefebvre, Dr V. Perrier and Dr J. Vannier, together with local support from colleagues and PhD students, organized the meeting, which included a symposium on 'Assessing palaeoenvironments and palaeobiology through geochemistry' and comprised a programme of internationally recognized speakers. There were 267 attendees. The Annual Address was entitled 'Molecular thermometers: ancestral sequence reconstruction uncovers the history of adaptation to environmental temperature along the tree of life' and was given by Prof. M. Gouy (Université Claude Bernard Lyon 1). The President's Prize for best oral presentation by an early career researcher was made to Mr J.N. Keating (University of Bristol). The Council Poster Prize for best poster presentation by an early career researcher was presented to Mr J. Moysiuk (University of Toronto).

Progressive Palaeontology. This is an annual, open meeting for research students in palaeontology and allied sciences to present their work to an audience of their peers. The 2016 meeting was organized by Ms G.L. Benevento and a team of other students, and was held at the University of Oxford in May. There were 117 attendees, of which 17 (15%) were non-UK based.

Lyell Meeting. The Association was one of the joint co-organizers of this annual meeting. The 2016 Lyell Meeting was held in March at Burlington House, London, on the topic of 'Palaeoinformatics: synthesising data from the past to illuminate the future', organized by Dr K.G. Johnson (Natural History Museum, London) and Dr J.R. Young (University College London).

1.4 Publications: The journals *Palaeontology* and *Papers in Palaeontology* are published by Wiley. During 2016, the following volumes were published: *Palaeontology* volume 59, comprising six issues; and *Papers in Palaeontology* volume 2, comprising four issues. The Association is grateful to Amgueddfa Cymru – National Museum Wales and The Lapworth Museum of Geology (University of Birmingham) for providing storage facilities for publication back-stock and archives. Council thanks Mr N. Stroud for assistance with the typesetting and production of the *Palaeontology Newsletter*.

1.5 Research Grants: A total of ten applications for Palaeontological Association Research Grants were received. Three were recommended for funding in 2016, totalling £21,482, and were awarded to: Dr R.B.J. Benson, Oxford University, 'Anatomy of the oldest candidate snake based on a new skeleton'; Dr C. Strullu-Derrien, Natural History Museum, London, 'A search for aquatic fungi: understanding the origins of mutualists and parasites'; and Dr J. Vinther, University of Bristol, 'The diagenetic alteration of eumelanin – a squid's perspective'.

1.6 Small Grants Scheme: The scheme received 22 applications. Eight were recommended for funding in 2017, totalling £10,615. Small grants were awarded as follows: Dr Z. Wawrzyniak (University of Silesia in Katowice) received the Whittington Award; Mr L. Laibl (Charles University in Prague) received the Callomon Award; Ms M. Johnson (University of Edinburgh) and Ms E. Randle

(University of Manchester) received Stan Wood awards; Ms J. De Weirdt (Ghent University), Dr J.C. Lamsdell (West Virginia University), Dr C. Keating-Bitonti (Smithsonian Institution) and Mr H. Zhang (University of Bristol) received Sylvester-Bradley awards.

1.7 Undergraduate Research Bursary Scheme: The scheme attracted 13 applications. Nine were recommended for funding in 2016, totalling £14,000, as follows: Ms C. Nicholl, Imperial College London, supervised by Dr Philip Mannion; Ms C.-M. Lissens, Ghent University, supervised by Dr Thijs Vandenbroucke; Ms C. Bird, University of Birmingham, supervised by Dr Ivan Sansom; Mr T. Raven, Imperial College London, supervised by Dr Susannah Maidment; Ms F. Pye, University of Leeds, supervised by Dr Alex Dunhill; Ms T. Slater, University of Worcester, supervised by Dr Kate Ashbrook; Ms H.L. Fu, Imperial College London, supervised by Dr Mark Sutton; Ms R. Armfield, University of Cambridge, supervised by Dr David Norman; and Ms D. Nala, University of Birmingham, supervised by Dr Tom Dunkley Jones.

1.8 Publicity, outreach and engagement: The Association continues to promote palaeontology and its allied sciences to the national print media, radio and television. The Association is a major financial supporter of the Lyme Regis Fossil Festival and the Yorkshire Fossil Festival (held in Scarborough in 2016). At both festivals, the Association had displays and activities for the public, which were organized and staffed by members of Council, the Executive Officer and volunteers. The Public Engagement Group (PEG), consisting of the Outreach Officer, Education Officer, Publicity Officer, Executive Officer, President and the Treasurer, was formed in 2016 to oversee the management of the Association's outreach and engagement activities going forward. The PEG will decide on expenditure of the group budget (currently £30,000 per annum), supporting recurring festival activities, Engagement grants, and commissioned projects.

1.9 Engagement Grants: The scheme received a total of three applications in 2016. One was recommended for funding, totalling £15,000, and was awarded to Ms I. Gladstone (Bristol City Museum and Art Gallery), 'Pliosaurus: dive into the Jurassic deep'.

1.10 Online activities: The online activities of the Association continue to expand with greater emphasis on social media (Facebook; Twitter). The Association continues to be the sole host for the online-only journal *Palaeontologia Electronica*, as well as continuing to host websites for other societies (The Palaeontographical Society; International Organisation of Palaeobotany), palaeontological online resources (EDNA fossil insect database; the Kent Fossil Database), and online outreach projects (Palaeontology [Online]). The Association Twitter account, @ThePalAss, had 3,104 followers at the end of 2016, an increase of 985 on the numbers at the end of 2015.

1.11 Awards: The Lapworth Medal, awarded to people who have made a significant contribution to the science by means of a substantial body of research, was presented to Dr A.W.A. Rushton (Natural History Museum, London). The President's Medal, awarded to a palaeontologist within 15 to 25 years of their PhD in recognition of outstanding contributions in their earlier career, coupled with an expectation that they will continue to contribute significantly to the subject in their further work, was presented to Prof. P.M. Barrett (Natural History Museum, London). The Hodson Award, for a palaeontologist within ten years of award of their PhD who has made an outstanding contribution to the science through a portfolio of original published research, was awarded to two recipients: Dr S.C.R. Maidment (University of Brighton) and Dr R.S. Sansom (University of Manchester). The Mary Anning Award, for an outstanding contribution by an amateur palaeontologist, was made

to Mr D. Ross (Staffin, UK). Honorary Life Membership was awarded to Dr H.A. Armstrong for long-term service to the Association. The Golden Trilobite Award, for high quality amateur and institutional websites that promote the charitable aims of the Association, was made to PhyloPic <**http://phylopic.org**>. The 2016 Best Paper Awards for *Palaeontology* and *Papers in Palaeontology* respectively were made to Dr A. Zacaï and colleagues for their paper entitled 'Gauging scale effects and biogeographical signals in similarity distance decay analyses: an Early Jurassic ammonite case study', 59(5), 671–687; and Dr E. Świerczewska-Gładysz for 'Early Campanian (Late Cretaceous) Pleromidae and Isoraphiniidae (lithistid Demospongiae) from the Łódź-Miechów Synclinorium (central and southern Poland): new data and taxonomic revision', 2(2), 189–233. Council also awards undergraduate prizes to outstanding students in university departments where palaeontology is taught beyond Level 1; a total of 22 were awarded throughout the year.

1.12 Forthcoming plans: The Association will continue to make substantial donations from General and Designated funds to promote the charitable aims of the Association. The Executive Officer and Treasurer are to undertake a review of the financial position, and future budgets, during 2017. Resources will be made available to continue a similar programme of grants, meetings, outreach and public engagement activities. A donation has been made to the Biodiversity Heritage Library in order to scan back issues of all of the Association's publications so that they become freely available online. Development of the Association's new website launched at the 2015 Annual Meeting has continued throughout 2016 and will be ongoing into 2017. The listserver PaleoNet will be hosted on the Association server from 2017. Volume 60 of *Palaeontology* and volume 3 of *Papers in Palaeontology* will be published. The 61st Annual Meeting will be held in December 2017 at Imperial College London. The 2017 Progressive Palaeontology conference will be held at the University of Leicester. In early 2016, Council's proposal to convert to a Charitable Incorporated Organisation (CIO) was agreed by the membership at an Extraordinary General Meeting held on 16th March 2016. The process of converting to a CIO was completed in 2016 and the Association would like to thank Mr K. Lawrey, Learned Societies' Liaison Officer of The Foundation for Science and Technology, for assistance during this process. The Association will operate as a CIO from 1st January 2017 and the unincorporated charity will then cease. A revised constitution will then be in place.

Public benefit

1.13 The Trustees confirm that they have referred to the Charity Commission's guidance on public benefit when reviewing the charity's aims and objectives, in planning future activities and setting the grant-making policy for the year.

ACHIEVEMENT AND PERFORMANCE

Charitable activities

2.1 Meetings support: During 2016, the Association agreed to support a total of seven palaeontological meetings, symposia or workshops worldwide (in the UK, Austria, Germany, Spain and the USA). In addition, our Postgraduate Travel Grant scheme supported six postgraduate students to present their work at national and international conferences not directly supported by the Association: Mr P.L. Godoy (University of Birmingham), Ms R.L. Rees-Owen (University of Leeds), Ms C.G. Kenchington (University of Cambridge), Mr A. Roy (University of Bristol), Mr D. Datta (Indian Institute of Technology Kharagpur) and Mr A. Askew (University of Sheffield). The Association's support enabled the worldwide dissemination of research to the benefit of the global palaeontological community.

2.2 Publications: During 2016, 156 papers were submitted to either *Palaeontology* or *Papers in Palaeontology*. Of these, 126 (81%) were considered to be within scope by the Editorial Board and 78 (50%) were subsequently accepted following peer review; a further 13 papers are still awaiting submission of a revised manuscript before a final decision is made. This represents an upward trend in submissions, and is accompanied by an improvement in the Impact Factor of *Palaeontology*, which increased from 2.24 to 2.312. The average time from acceptance to publication was reduced for the third year running to 39 days for papers published in volume 59 of *Palaeontology* (some of which had been published online in 2015), and 48 days for those in volume 2 of *Papers in Palaeontology* which tends to include longer papers; the overall average of 42 days is within our target. The Association continues to sponsor a rising number of Dryad data records; in the 2016 volumes 44 papers had associated data files, representing 51% of papers published in 2016.

2.3 Support for research: In 2016 the Association agreed to fund the research activities of 20 early career researchers based in five countries (UK, Belgium, Poland, Czech Republic and USA). Two of this year's Undergraduate Research Bursary awardees presented their work at the 2016 Annual Meeting. Apart from directly benefiting the career development of the individuals concerned, the Association's funds enabled more palaeontological research to be undertaken worldwide than would otherwise have been the case. Overall, more grants were awarded in 2016 compared to the previous year (from 18 to 20). Compared to 2015, applications for Research Grants decreased from 11 to ten and thus success rates rose slightly from 27% to 30%. For the Small Grants Scheme, applications increased (from 19 to 22), but success rates were almost the same (from 37% to 36%), because one more was awarded. The number of applications to the Undergraduate Research Bursary Scheme increased (from ten to 13) compared with 2015, with a consequent decrease in success rate (from 80% to 69%).

2.4 Outreach, education and public engagement: During 2016, the Association supported the two major UK fossil festivals, in Lyme Regis and Scarborough, which attracted respectively an estimated 12,000 and 8,000 members of the general public of all ages, the latter being a substantial increase from 2015. Secondary school students were particular beneficiaries of the Association's outreach and education activities, with a dedicated event associated with the Lyme Regis Fossil Festival, and an Association-hosted careers event at the Yorkshire Fossil Festival. Lyme Regis also saw the launch of our new diorama postcards, painted by Mr J. McKay, which have proved to be extremely popular. Three applications were received during 2016 for Engagement grants and one was awarded. Continued use of social media, in particular the Association's Twitter account and Facebook group, has enabled the rapid and regular dissemination of research news, including new publications, meetings and other information, to a growing audience.

FINANCIAL REVIEW

Financial position

3.1 Summary of expenditure: Total charitable expenditure, through grants to support research, scientific meetings and workshops in 2016 was £411,737. Governance costs were £16,584. Total resources expended were £480,468. The Association continues its membership of the International Palaeontological Association and remains a Tier 1 sponsor of *Palaeontologia Electronica*, and the *Treatise on Invertebrate Paleontology*.

Reserves policy

3.2 Reserves: As of 31st December 2016, The Association holds reserves of £728,484 in General Funds, which enable the Association to generate additional revenue through investments, and thus to keep subscriptions to individuals at a low level, whilst still permitting a full programme of meetings to be held, publications to be produced, and the award of Research Grants and Grants-in-Aid. They also act as a buffer to enable the normal programme to be followed in years in which expenditure exceeds income, and allow new initiatives to be pursued. The Association holds £147,259 in Designated Funds which contribute interest towards the funding of the Sylvester-Bradley, Hodson, Callomon, Whittington and Stan Wood awards and towards the Jones-Fenleigh fund. Total funds carried forward to 2017 totalled £875,743.

STRUCTURE, GOVERNANCE AND MANAGEMENT

Governing document

The governing document of the Palaeontological Association is the Constitution adopted on 27th February 1957, amended on subsequent occasions as recorded in the Council and AGM minutes.

Organizational structure

The Association is managed by a Council of up to 20 trustees, led by the President. The Association employs an Executive Officer and a Publications Officer. The trustees are elected by vote of the Membership at the Annual General Meeting, following guidelines laid down in the Constitution.

Risk management

The trustees have a duty to identify and review the risks to which the charity is exposed and to ensure appropriate controls are in place to provide reasonable assurance against fraud and error.

In the previous year, the trustees had considered succession planning for the Executive Officer to be a risk to the Association. During 2016 a new Executive Officer took up employment following a transition period with the outgoing Executive Officer to allow effective transfer of knowledge and experience and to minimize risks to the Association. This transfer is now complete.

The trustees consider that the Association is in a sound financial position. Membership numbers and revenues from publications remain strong.

A number of external websites and their associated databases are hosted on the Association's server and during 2016 a new Internet Hosting Service Agreement has been drawn up to minimize risk. This will be signed by all parties in due course.

There are a small number of residual risks around the Association's transition to CIO status, although the trustees believe that appropriate arrangements have been made to enable a smooth transition.

Membership:

Membership on 31st December 2016 totalled 1,128 (1,086 at end 2015). Of these, 617 were Ordinary Members, 169 Retired Members, 20 Honorary Members, 286 Student Members and 36 Institutional Members. There were 49 institutional subscribers to *Papers in Palaeontology*. Wiley also separately manage further institutional subscribers and arrange online access to publications for those Institutional Members on behalf of the Association.

REFERENCE AND ADMINISTRATIVE DETAILS

Registered Charity number: 276369

Principal address: Ainsley House
12 Waddington Street
Durham
DH1 4BG

Trustees:

The following were elected at the 2015 AGM to serve as trustees during 2016:

Prof. D.A.T. Harper	President
Prof. E.J. Rayfield	Vice President
Dr D.J. Ward	Vice President
Prof. R.J. Twitchett	Secretary
Dr P. Winrow	Treasurer
Dr A.B. Smith	Editor-in-Chief
Dr M. Ruta	Editor Trustee
Prof. C.H. Wellman	Editor Trustee
Dr A.R.T. Spencer	Internet Officer
Dr M.E. McNamara	Newsletter Editor
Dr T.J. Challands	Book Review Editor
Dr L. Herringshaw	Publicity Officer
Dr F.L. Gill	Outreach Officer
Dr C.J. Buttler	Education Officer
Dr T.R.A. Vandenbroucke	Meetings Co-ordinator
Dr R.J. Butler	Ordinary Member
Dr C.T.S. Little	Ordinary Member
Dr M. Munt	Ordinary Member
Dr I. Rahman	Ordinary Member

Independent examiner: Corfield Accountancy Limited
Chartered Accountants
Myrick House
Hendomen
Montgomery
Powys
SY15 6EZ

Bankers: NatWest
Sheffield City Centre
42 High Street
Sheffield
S1 2GE

Approved by order of the Board of Trustees on 26th June 2017.

Independent Examiner's Report to the Trustees of The Palaeontological Association

I report on the accounts for the year ended 31 December 2016 set out on pages 9 to 16.

Respective responsibilities of trustees and examiner

The charity's trustees are responsible for the preparation of the accounts. The charity's trustees consider that an audit is not required for this year (under Section 144(2) of the Charities Act 2011 (the 2011 Act)) and that an independent examination is required. The charity's gross income exceeded £250,000 and I am qualified to undertake the examination by being a qualified member of ACA ACMA.

It is my responsibility:

- to examine the accounts under Section 145 of the 2011 Act;
- to follow the procedures laid down in the General Directions given by the Charity Commission (under Section 145(5)(b) of the 2011Act); and
- to state whether particular matters have come to my attention.

Basis of the independent examiner's report

My examination was carried out in accordance with the General Directions given by the Charity Commission. An examination includes a review of the accounting records kept by the charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts, and seeking explanations from you as trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit, and consequently no opinion is given as to whether the accounts present a 'true and fair view' and the report is limited to those matters set out in the statements below.

Independent examiner's statement

In connection with my examination, no matter has come to my attention:

(1) which gives me reasonable cause to believe that, in any material respect, the requirements

to keep accounting records in accordance with Section 130 of the 2011 Act; and

to prepare accounts which accord with the accounting records and to comply with the accounting requirements of the 2011 Act

have not been met; or

(2) to which, in my opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

Ms M. R. Corfield ACA ACMA
Corfield Accountancy Limited
Chartered Accountants
Myrick House
Hendomen
Montgomery
Powys SY15 6EZ

Date: 26th June 2017

THE PALAEONTOLOGICAL ASSOCIATION

Statement of Financial Activities for the Year Ended 31 December 2015

	Notes	Unrestricted funds £	Designated funds £	31.12.16 Total funds £	31.12.15 Total funds £
INCOME AND ENDOWMENTS FROM					
Donations and legacies		42,485	17,326	59,811	83,523
Charitable activities	**3**				
Public Meetings		40,081	—	40,081	35,460
Publications		287,947	—	287,947	268,753
Investment income	**2**	13,848	112	13,960	13,796
Total		384,361	17,438	401,799	401,532
EXPENDITURE ON					
Raising funds	**4**	41,852	—	41,852	32,667
Charitable activities	**5**				
Public Meetings		84,705	—	84,705	72,736
Grants & Awards		69,289	13,109	82,398	52,945
Administration		70,192	—	70,192	45,441
Publications		184,737	—	184,737	169,202
Governance Costs		16,584	—	16,584	20,989
Total		467,359	13,109	480,468	393,980
Net gains/(losses) on investments		74,439	—	74,439	4,647
NET INCOME/(EXPENDITURE)		(8,559)	4,329	(4,230)	12,199
RECONCILIATION OF FUNDS					
Total funds brought forward		737,043	142,930	879,973	867,774
TOTAL FUNDS CARRIED FORWARD		728,484	147,259	875,743	879,973

CONTINUING OPERATIONS

All income and expenditure has arisen from continuing activities.

The notes form part of these financial statements.

THE PALAEONTOLOGICAL ASSOCIATION

Balance Sheet
At 31 December 2016

	Notes	Unrestricted funds £	Designated funds £	31.12.16 Total funds £	31.12.15 Total funds £
FIXED ASSETS					
Investments	**9**	656,325	—	656,325	619,336
CURRENT ASSETS					
Debtors	**10**	133,822	26,004	159,826	142,252
Cash at bank		—	121,255	121,255	156,603
		133,822	147,259	281,081	298,855
CREDITORS					
Amounts falling due within one year	**11**	(61,663)	—	(61,663)	(38,218)
NET CURRENT ASSETS		72,159	147,259	219,418	260,637
TOTAL ASSETS LESS CURRENT LIABILITIES		728,484	147,259	875,743	879,973
NET ASSETS		728,484	147,259	875,743	879,973
FUNDS	**12**				
Unrestricted funds:					
General fund				728,484	737,043
Sylvester-Bradley				29,665	31,451
Jones-Fenleigh				26,313	25,750
Hodson				3,301	6,293
Callomon				5,476	5,113
Whittington				14,883	14,549
Stan Wood				67,621	59,774
				875,743	879,973
TOTAL FUNDS				875,743	879,973

The financial statements were approved by the Board of Trustees on 26th June 2017.

The notes form part of these financial statements.

THE PALAEONTOLOGICAL ASSOCIATION

Notes to the Financial Statements for the Year Ended 31 December 2016

1. ACCOUNTING POLICIES

Basis of preparing the financial statements

The financial statements of the charity, which is a public benefit entity under FRS 102, have been prepared in accordance with the Charities SORP (FRS 102) 'Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their accounts in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) (effective 1 January 2015)', Financial Reporting Standard 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland' and the Charities Act 2011. The financial statements have been prepared under the historical cost convention with the exception of investments which are included at market value, as modified by the revaluation of certain assets.

The charity has taken advantage of the following disclosure exemption in preparing these financial statements, as permitted by FRS 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland':

- the requirements of Section 7 Statement of Cash Flows.

Income

The charity's income principally comprises subscriptions from individuals and institutions which relate to the period under review, and sales of scientific publications.

All income is recognized in the Statement of Financial Activities once the charity has entitlement to the funds, it is probable that the income will be received and the amount can be measured reliably.

Expenditure

Liabilities are recognized as expenditure as soon as there is a legal or constructive obligation committing the charity to that expenditure, it is probable that a transfer of economic benefits will be required in settlement and the amount of the obligation can be measured eliably. Expenditure is accounted for on an accruals basis and has been classified under headings that aggregate all cost related to the category. Where costs cannot be directly attributed to particular headings they have been allocated to activities on a basis consistent with the use of resources.

Allocation and apportionment of costs

Administrative costs have been allocated to the various cost headings based on estimates of the time and costs spent thereon.

Taxation

The charity is exempt from tax on its charitable activities.

THE PALAEONTOLOGICAL ASSOCIATION

Notes to the Financial Statements – *continued* for the Year Ended 31 December 2016

1. ACCOUNTING POLICIES – continued

Fund accounting

General Funds are unrestricted funds which are available for use at the discretion of the Council in furtherance of the general objectives of the charity and which have not been designated for other purposes.

Designated funds comprise unrestricted funds that have been set aside by Council for particular purposes. The aim of each designated fund is as follows:

- Sylvester-Bradley Fund: Grants made to permit palaeontological research.
- Jones-Fenleigh Fund: Grants to permit one or more delegates annually to attend the Symposium of Vertebrate Palaeontology and Comparative Anatomy (SVPCA) meeting.
- Hodson Fund: Awards made in recognition of the palaeontological achievements of a researcher within ten years of the award of their PhD.
- Callomon Fund: Grants made to permit palaeontological research with a strong fieldwork element.
- Whittington Fund: Grants made to permit palaeontological research with an element of study in museum collections.
- Stan Wood Fund: Grants in the area of vertebrate palaeontology ideally involving fieldwork, due to generous donations in memory of the Scottish fossil collector Mr Stan Wood.

2. INVESTMENT INCOME

	31.12.16 Unrestricted funds £	31.12.15 Total funds £
Deposit account interest	3,684	3,827
Investment Income	10,276	9,969
	13,960	13,796

THE PALAEONTOLOGICAL ASSOCIATION

Notes to the Financial Statements – *continued* for the Year Ended 31 December 2016

3. INCOME FROM CHARITABLE ACTIVITIES

	Public Meetings £	Publications £	31.12.16 Total activities £	31.12.15 Total activities £
Scientific Meetings	40,081	—	40,081	35,460
Scientific Journals	—	281,466	281,466	259,392
Special papers	—	1,368	1,368	4,287
Offprints	—	—	—	475
Newsletter	—	405	405	—
Field Guides	—	4,211	4,211	4,289
Distribution	—	497	497	310
	40,081	287,947	328,028	304,213

4. RAISING FUNDS

	31.12.16 Unrestricted funds £	31.12.15 Total funds £
Voluntary Income Costs Administration	38,116	28,917
Investment Management Costs Stockbroker Fees	3,736	3,750
	41,852	32,667

5. CHARITABLE ACTIVITIES COSTS

	Direct costs £	Support costs £	Totals £
Public Meetings	84,705	—	84,705
Grants & Awards	82,398	—	82,398
Administration	59,897	10,295	70,192
Publications	184,737	—	184,737
Governance Costs	—	16,584	16,584
	411,737	26,879	438,616

6. TRUSTEES' REMUNERATION AND BENEFITS

There were no trustees' remuneration or other benefits for the year ended 31 December 2016 nor for the year ended 31 December 2015.

Trustees' expenses

The total travelling expenses reimbursed to 19 Members of Council (2015: 20) was £15,989 (2015: £12,153).

THE PALAEONTOLOGICAL ASSOCIATION

Notes to the Financial Statements – *continued* for the Year Ended 31 December 2016

7. STAFF COSTS

Analysis of Staff Costs and Remuneration

	£ 2016	£ 2015
Salaries	80,338	59,582
Social Security Costs	5,567	3,925
Pension Costs	12,288	22,513
Total	98,193	86,020

During 2016 a new Executive Officer took up employment following a transition period with the outgoing Executive Officer to allow effective transfer of knowledge and experience and to minimize risks to the Association.

The average monthly number of employees during the year was as follows:

	31.12.16	31.12.15
Publications	1	1
Administration	1	1
	2	2

No employees received emoluments in excess of £60,000.

8. INVESTMENT GAINS AND LOSSES

All gains and losses are taken to the Statement of Financial Activities as they arise. Realized gains and losses on investments are calculated as the difference between sales proceeds and their opening carrying value or their purchase value if acquired subsequent to the first day of the financial year.

Unrealized gains and losses are calculated as the difference between the fair value at the year end and their carrying value. Realized and unrealized investment gains and losses are combined in the Statement of Financial Activities.

Investment Gains/Losses	31st December 2016	31st December 2015
Realized Gain/(Loss)	£9,577	(£292)
Unrealized Gain/(Loss)	£64,862	£4,939
Total per Statement of Financial Activities	£74,439	£4,647

9. FIXED ASSET INVESTMENTS

Investments are initially recognized at their transaction value and subsequently measured at their fair value as at the balance sheet date. The statement of financial activities includes the net gains and losses arising on revaluation and disposals throughout the year.

THE PALAEONTOLOGICAL ASSOCIATION

Notes to the Financial Statements – *continued* for the Year Ended 31 December 2016

10. DEBTORS: AMOUNTS FALLING DUE WITHIN ONE YEAR

	£ 2016	£ 2015
Prepayments	57	1,261
Accrued Income – receivable within one year	159,769	140,991
	159,826	142,252

11. CREDITORS: AMOUNTS FALLING DUE WITHIN ONE YEAR

	31.12.16 £	31.12.15 £
Trade creditors	43,325	19,098
Taxation and social security	—	1,553
Other creditors	18,338	17,567
	61,663	38,218

12. MOVEMENT IN FUNDS

	At 1.1.16 £	Net movement in funds £	At 31.12.16 £
Unrestricted funds			
General fund	737,043	(8,559)	728,484
Sylvester-Bradley	31,451	(1,786)	29,665
Jones-Fenleigh	25,750	563	26,313
Hodson	6,293	(2,992)	3,301
Callomon	5,113	363	5,476
Whittington	14,549	334	14,883
Stan Wood	59,774	7,847	67,621
TOTAL FUNDS	879,973	(4,230)	875,743

THE PALAEONTOLOGICAL ASSOCIATION

Notes to the Financial Statements – *continued* for the Year Ended 31 December 2016

12. MOVEMENT IN FUNDS – *continued*

Net movement in funds, included in the above are as follows:

	Incoming resources £	Resources expended £	Gains and losses £	Movement in funds £
Unrestricted funds				
General fund	384,361	(467,359)	74,439	(8,559)
Sylvester-Bradley	1,848	(3,634)	—	(1,786)
Jones-Fenleigh	1,219	(656)	—	563
Hodson	6	(2,998)	—	(2,992)
Callomon	1,827	(1,464)	—	363
Whittington	1,834	(1,500)	—	334
Stan Wood	10,704	(2,857)	—	7,847
TOTAL FUNDS	401,799	(480,468)	74,439	(4,230)

13. RELATED PARTY DISCLOSURES

There were no related party transactions for the year ended 31 December 2016.

14. INVESTMENT PORTFOLIO 2016: ***see pages 22–23*.**

Detailed Statement of Financial Activities for the Year Ended 31 December 2015

	31.12.16 Unrestricted funds £	31.12.15 Total funds £
INCOME AND ENDOWMENTS		
Donations and legacies		
Donations	17,360	34,175
Subscriptions	42,451	49,348
	59,811	83,523
Investment income		
Deposit account interest	3,684	3,827
Investment Income	10,276	9,969
	13,960	13,796
Charitable activities		
Scientific Journals	281,466	259,392
Special papers	1,368	4,287
Offprints	—	475
Newsletter	405	—
Field Guides	4,211	4,289
Distribution	497	310
Scientific Meetings	40,081	35,460
	328,028	304,213
Total incoming resources	401,799	401,532
EXPENDITURE		
Raising donations and legacies		
Administration	38,116	28,917
Investment management costs		
Stockbroker Fees	3,736	3,750
Charitable activities		
Scientific Journals	60,144	51,996
Newsletters	16,475	16,971
Marketing	2,750	2,298
Publication Costs	73,409	69,079
Editorial Costs	31,959	28,858
Public Meetings & Costs	84,705	72,736
Grants & Awards	60,916	37,821
Research Grants	21,482	15,124
Administration	59,897	45,441
	411,737	340,324
Support costs		
Governance costs		
Trustees' expenses	15,989	12,153
Accountancy and legal fees	595	574
Administration	10,295	8,262
	26,879	20,989
Total resources expended	480,468	393,980
Net (expenditure)/income before gains and losses	(78,669)	7,552
Realized recognized gains and losses		
Realized gains/(losses) on fixed asset investments	74,439	4,647
Net (expenditure)/income	(4,230)	12,199

This page does not form part of the statutory financial statements.

Palaeontological Association year ended 31st December 2016.

Nominal	Holding	Cost (bought pre 2016) £	Value end 2015 £
£20,000	UK 4.5% Gilt 07/03/19 GBP 0.01	20,092.99	22,502.00
£18,000	UK 4.75% Stock 07/03/20 GBP 100	18,145.87	20,887.00
£64,176.46	COIF Charities Fixed Interest Fund	85,000.00	84,353.54
1,425	BP Ord 25c shares	5,047.35	5,045.00
600	Royal Dutch Shell B shares	4,422.42	12,406.00
522	Royal Dutch Shell B shares	3,847.50	4,925.00
600	BHP Billiton $0.5 shares	4,341.48	4,560.00
600	South32 Ltd (Di)	700.26	315.00
437	IMI Ord 25p shares	4,267.00	3,765.00
1,728	Melrose Indust Ord 0.1p	5,562.00	5,027.00
252	Melrose Indust new ord 6.857143p		
180	CRH ord EUR 0.32		
1,100	Smith(DS) ord GBP 0.10		
500	Halma ord GBP 0.10		
420	Experian Ord 10C	3,444.95	5,044.00
300	Diageo Ord GBP 0.28	5,826.00	5,570.00
200	Persimmon Ord 10p	2,258.00	4,054.00
200	Persimmon Ord 10p	2,258.00	4,054.00
70	Reckitt Benckiser Group ord GBP 0.10		
300	Unilever PLC Ord GBP 0.031111	4,326.21	8,780.00
170	Astrozeneca Ord 25c	8,145.00	7,848.00
450	Glaxo Smithkline Ordinary 25p shares	7,083.98	6,178.85
200	Glaxo Smithkline Ordinary 25p shares	3,148.44	2,746.15
300	Relx Olc GBP 0.1444		
175	Carnival Plc Ord USD 1.66	3,996.49	6,766.00
1,000	BT Group Ordinary 5p shares	3,446.05	4,717.21
1,150	BT Group Ordinary 5p shares	3,962.95	5,424.79
2,277	Vodaphone Group Ord USD 0.11428571	3,434.00	5,032.00
700	National Grid Ord GBP 0.113953	3,648.26	6,563.00
2,250	Barclays 25p Ord shares	4,867.00	4,925.00
1,465	HSBC Holdings Ordinary 0.5 US Dollar shares	4,534.00	7,855.00
1,200	Great Portland Estates Ord	8,503.00	9,936.00
600	Mercantile Investment Tst Plc ord GBP 025		
2,000	Blackrock Throgmorton Trust ord 5p		
4,400	TR Property Ord 25p shares	7,560.85	13,257.00
1,500	Jupiter Ord 2p	6,066.00	6,776.00
4250	Fidelity EUR Value Ordinary 25P shares	4,059.07	7,395.00
650	RIT Capital Partners Ordinary £1 shares	4,903.90	10,927.00
670	Blackrock World Mining Ord 5P	4,019.09	1,213.00
3,900	Edinburgh Dragon Trust Ordinary £0.20 shares	4,478.10	9,419.00
1,225	Brown Advisory US Equity Value £B	14,789.62	21,144.00
425	Findlay Park Partners US Smaller Companies	6,158.47	23,304.00
2,825	Ishares S&P 500 GBP	20,319.63	39,070.00
150	GLG Japan Corealpha Equity I Acc	22,838.31	21,653.00
1,200	Eastspring Investments Japan Dynamic Rg GBP Cap		
30	Roche Hldgs Ag Genusscheine Nvp	3,335.33	5,622.00
35	Roche Hldgs Ag Genusscheine Nvp	3,891.22	6,559.00
6,600	Fund Partners Ltd Crux European Spl Situation	7,140.00	10,991.00
26	Veritas Asset Mgmt Veritas Asian A GBP	8,182.27	10,272.00
900	JPMorgan Am UK Ltd Emerging Markets I Instl	5,043.10	4,626.00
300	Morgan Stanley	9,958.00	8,850.00
4,443	Aberdeen Investment Property Trust B	4,681.00	5,526.00
800	BH Global Ltd ord GBP		
4,400	Invesco Fund Managers Targeted Y Acc		
25	Marshall Wace UcitS Funds Plc GBP Acc		
9,000	Charities Property Fund Income		
1,283.80	COIF Charities Investment Fund Acc Units	75,000.00	153,452.49
	Total	436,733.16	619,336.03

Schedule of Investments (Note 14 to the Accounts)

Proceeds (sold in 2016) £	Cost (bought in 2016) £	Gain realised during 2016 £	Value end 2016 £	Gain unrealised during 2016 £
			22,235.00	-267.00
			20,874.00	-13.00
			89,166.77	4,813.23
			7,262.00	2,217.00
			14,124.00	1,718.00
8,621.04		3,696.04		
			7,839.00	3,279.00
470.17		155.17		
			4,545.00	780.00
4,147.20		-879.80		
1,576.02	834.75	741.27		
	4,426.82		5,094.00	667.18
	4,569.69		4,489.00	-80.69
	5,232.04		4,488.00	-744.04
			6,611.00	1,567.00
			6,330.00	760.00
			3,552.00	-502.00
3,812.34		-241.66		
	5,325.75		4,820.00	-505.75
			9,878.00	1,098.00
			7,544.00	-304.00
			7,029.00	850.15
2,842.14		95.99		
	4,438.20		4,347.00	-91.20
			7,219.00	453.00
			3,669.00	-1,048.21
5,002.81		-421.98		
			4,551.00	-481.00
			6,661.00	98.00
			5,028.00	103.00
			9,624.00	1,769.00
			8,022.00	-1,914.00
	10,171.60		10,284.00	112.40
6,461.52	6,557.27	-95.75		
13,109.56		-147.44		
6,399.87		-376.13		
			7,799.00	404.00
			12,253.00	1,326.00
1,479.11		266.11		
12,329.24		2,910.24		
25,128.84		3,984.84		
			30,272.00	6,968.00
			51,472.00	12,402.00
22,486.39		833.39		
	13,436.12		15,559.00	2,122.88
			5,551.00	-71.00
5,866.84		-692.16		
			12,996.00	2,005.00
			12,434.00	2,162.00
			6,344.00	1,718.00
8,598.56		-251.44		
			5,092.00	-434.00
	10,226.25		10,440.00	213.75
	9,770.33		9,789.00	18.67
	4,849.70		4,780.00	-69.70
	11,043.28		10,713.00	-330.28
			175,545.27	22,092.78
128,331.65	90,881.80	9,576.69	656,325.04	64,862.17

Nominations For Council

At the AGM in December 2017, the following vacancies will occur on Council:

- President Elect
- Vice President
- Editor Trustee
- Newsletter Editor
- Book Review editor
- Meetings Coordinator
- Education Officer
- Two Ordinary Members

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.

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 from <**secretary@palass.org**>.

The closing date for nominations is **4th October 2017**. They should be sent to the Secretary: Dr Crispin Little, School of Earth and Environment, University of Leeds, Woodhouse Lane, Leeds LS2 9JT; e-mail: <**secretary@palass.org**>.

Nominations received thus far are as follows:

- President Elect: Prof. C. H. Wellman*
- Vice President: Dr Caroline J. Buttler*
- Editor Trustee: Dr Barry H. Lomax*
- Newsletter Editor: Dr Graeme T. Lloyd*
- Book Review editor: Dr Tom J. Challands (2nd term)*
- Meetings Coordinator: Dr Uwe Balthasar*
- Education Officer: Dr Maria E. McNamara*
- Ordinary Members: Dr Stephen L. Brusatte, Dr Rachel C. M. Warnock

* denotes Council nominations

Council vacancies: 'job descriptions':

President (two-year term)

The President is usually a senior member of the palaeontological community, with wide experience of the Association, its Council and committees. The President represents the Association externally and is responsible for the overall management of Council and its many activities.

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 subcommittees, particularly those tasked with making recommendations for the awards of grants.

Editor Trustee (three-year term)

The Editor Trustees are on the Editorial Board of *Palaeontology* but also serve on the PalAss Council. Their role is: to advise the Editor-in-Chief about policy issues that might arise in the running of the journal; to attend the annual review meeting with the publisher, Wiley; to advise the Editor-in-Chief about the suitability for peer-review of articles submitted to *Palaeontology* and *Papers in Palaeontology*; to select the article to be awarded Best Paper in each journal annually; and to hold a watching brief with respect to the management and well-being of the journals and inform Council of issues arising.

Newsletter Editor (three-year term)

Editing the *Newsletter* is an intense role three times a year with relatively little in between apart from collating some content and attending Council meetings. The main responsibilities are approaching people and commissioning content, ensuring that permission for all reproduced images and content has been sourced, editing all content in the *Palaeontology* style, and reminding contributors of deadlines as necessary.

Book Review Editor (three-year term)

The main duty of the Book Review Editor is to provide a range of new and recently-published scientific book titles for members to review. Books available span all areas of palaeontological and evolutionary research and, as such, it is necessary to establish and maintain contact with a broad range of publishers, search for new titles, and request review copies from publishers. For each *Newsletter*, a list of recently-acquired titles is prepared and, as requests come in from members to review the books, each copy must be sent to the prospective reviewer. Reviews recently received from members must be edited in time for each *Newsletter* deadline. It is often necessary to remind reviewers when their text is required so records must be kept to monitor movement of books and receipt of reviews.

Meetings Coordinator (three-year term)

The Association's Meetings Coordinator ensures the PalAss 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. He/she interacts with the Annual Meeting organizers regarding the topic of the symposium at the Annual Meeting, and with other conveners of PalAss-sponsored symposia to avoid overlaps and enhance the visibility of a wide range of palaeontological topics. The Meetings Coordinator also is responsible for the evaluation of applications to and the administration of the Association's Postgraduate Travel Fund.

Education Officer (three-year term)

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

Ordinary Members (two vacancies, both three-year terms)

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 subcommittees, such as those tasked with reviewing and making decisions upon grant applications.

Awards and Prizes

The Palaeontological Association recognizes excellence in our profession by the award of medals and other prizes. The Association sees its lists of medal 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.

Lapworth Medal

The Lapworth Medal is the most prestigious award made by the Association. It is awarded by Council to a palaeontologist who has made a significant contribution to the science by means of a substantial body of research; it is not normally awarded on the basis of a few good papers. Council will look for some breadth as well as depth in the contributions, as well as evidence that they have made a significant impact, in choosing suitable candidates.

The medal is normally awarded each year. Candidates must be nominated by at least two members of the Association. Nominations should include a single page that summarizes the candidate's career, and further supported by a brief statement from the nominators. A list of ten principal publications should accompany the nomination. Letters of support by others may also be submitted. Council reserves the right not to make an award in any particular year.

The career summary, statements of support and publication list should be submitted in MS Word or PDF format, ideally as a single document if possible. Nominations should be sent by e-mail to <**secretary@palass.org**> by **31st March**.

The Lapworth Medal is presented at the Annual Meeting.

President's Medal

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

The medal is normally awarded each year. The candidate must be nominated by at least two members of the Association. Nominations should include a single page that summarizes the candidate's career, and further supported by a brief statement from the two nominators. A list of ten principal publications should accompany the nomination. Letters of support by others may also be submitted. Council will reserve the right not to make an award in any one year. If a candidate has taken time out from their professional career for family and other purposes, this should be highlighted.

The career summary, statements of support and publication lists should be attached in MS Word or PDF format, ideally as a single document if possible. Nominations should be sent by e-mail to <**secretary@palass.org**> by **31st March**.

The President's Medal is presented at the Annual Meeting.

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.

The candidate must be nominated by at least two members of the Association and the application must be supported by an appropriate academic case, namely a single page of details on the candidate's career, and a brief statement from each of the two nominators. A list of principal publications should accompany the nomination. Letters of support by others may also be submitted. If a candidate has taken time out from their professional career for family and other reasons, this should be highlighted.

The academic case, statements of support and publication list should be attached in MS Word or PDF format, ideally as a single document if possible. Nominations should be sent by e-mail to <**secretary@palass.org**> by **31st March**.

The award will comprise a fund of £1,000, and is presented at the Annual Meeting.

Mary Anning Award

The award is open to all those who are not professionally employed within 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 at least one member of the Association. Nominations should comprise a short statement (up to one page of A4) outlining the candidate's principal achievements,

as well as one or more letters of support. Members putting forward candidates should also be prepared, if requested, to write an illustrated profile in support of their nominee for inclusion in the *Newsletter*.

Nominations should be attached in MS Word or PDF format, ideally as a single document, and should include the full contact details of the candidate. Nominations should be sent by e-mail to <**secretary@palass.org**> by **31st March**.

The award comprises a cash prize of £1,000 plus a framed certificate, and is presented at the Annual Meeting.

Golden Trilobite Award

Golden Trilobite Awards are given at the discretion of Council for high-quality websites that promote the charitable aims of the Association. Nominations for websites should consist of a link to the site and a brief supporting case from a member of the Association. Nominations should be sent by e-mail to <**secretary@palass.org**> by **31st March**.

The award comprises a 'Golden Trilobite banner' and links to the Association's own website. Awards will be announced in the *Newsletter* and on the Association website.

Honorary Life Membership

To be awarded to individuals whom Council deem to have been significant benefactors and/or supporters of the Association. Recipients will receive free membership. Nominations should be sent by e-mail to <**secretary@palass.org**> by **31st March**.

Honorary Life memberships are announced at the Annual Meeting.

Annual Meeting President's Prize

Awarded for the best talk 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 consists of a cash award of £200, and is announced immediately after the oral sessions at the end of the Annual Meeting.

Annual Meeting Council Poster Prize

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 consists of a cash award of £200, and is announced immediately after the oral sessions at the end of the Annual Meeting.

Best Paper Award

Awarded since 2015 for the best papers published in *Palaeontology* and *Papers in Palaeontology* during the calendar year. 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. All eligible papers are automatically considered for this award by the Editor-in-Chief and Editorial Board members, and their decision is announced at the Annual Meeting.

Palaeontological Association Undergraduate Prize Scheme

Undergraduate Prize Scheme

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

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

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

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 (<**www.palass.org**>).

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

The Association is happy to receive applications for grants from the organizers of scientific meetings, workshops and short courses that lie conformably with its charitable purpose, which is to promote research in palaeontology and its allied sciences. Application should be made in good time by the scientific organizer(s) of the meeting using the online application form on the PalAss website (<**www.palass.org/awards-grants/grants/grant-aid**>). Such requests will be considered by Council at the March and the October Council 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. Inquiries 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
- 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. However, in exceptional circumstances, a budget of up to £15,000 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. The award is open to both amateur and professional palaeontologists and the principal applicant must be a member of the Association. Preference will normally be given to candidates who have not previously received a grant.

Proposals must fit with the charitable aims of the Association and 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. Successful applicants must produce a report for the Palaeontological Association *Newsletter*, and any publicity associated with the activity should mention the support of the Association. Full details of application procedures, terms and conditions are available on the Association's website at <**www.palass.org/awards-grants/grants/engagement-grants**>

For more information, please contact the Association's Outreach Officer, Dr Lucy McCobb, Department of Geology, National Museum of Wales, Cathays Park, Cardiff CF10 3NP; e-mail <**outreach@palass.org**>.

The deadline is **1st October** each year. The awards will be announced at the AGM, and funds will normally be available from 1st January.

Small Grants Scheme

The Association offers multiple awards each year, in honour of four donors, to fund palaeontological research, travel and fieldwork; these are integrated together under the Small Grants Scheme. These grants are open to any member of the Association, although preference is given to students, early-career researchers, and members of the Association who are retired.

- **Sylvester-Bradley Awards**: Multiple awards of up to £1,500 each, for palaeontological research.
- **Callomon Award**: An award of up to £1,500 for a project which is normally field-based.
- **Whittington Award**: An award of up to £1,500 for a project which is normally based on museum collections.
- **Stan Wood Award**: An award of up to £1,500 for projects in vertebrate palaeontology, and ideally involving fieldwork and fossil collecting.

There will be one application form and Council will decide on the allocation of the awards based upon the nature of the project made in the application.

Applications should be made through online submission via the appropriate page on the Association's website, and will comprise:

- An account of project aims and objectives and expected outcomes
- A breakdown and justification of the proposed expenditure
- A curriculum vitae
- Two references: one to review the project, and one personal reference for the applicant
- A summary suitable for the non-specialist, which will be published in the *Newsletter* when the award is made

Successful applicants will be required to produce a final project report that will be published in the *Newsletter* and are asked to consider the Association's meetings and publications as media for conveying the research results.

Further details and a full list of terms and conditions for the Small Grants Scheme can be found on the appropriate page of the Association's website. Inquiries may be made by e-mail to the Secretary (<**secretary@palass.org**>). The deadline is **1st November** each year. The awards will be announced at the AGM, and funds will normally be available from 1st January.

Undergraduate Research Bursaries

The Palaeontological Association Undergraduate Research Bursaries are aimed at giving undergraduate students the opportunity to acquire research skills and experience that will significantly transform their academic career. The bursaries will support projects co-designed by students and their supervisor(s) that give students registered for an undergraduate degree their first experience of undertaking a palaeontological research project. The bursaries provide a stipend for the student of £262.50 per week for up to eight weeks. The scheme is not intended to fund students to undertake routine work for the supervisor(s) and the Association expects the supervisor(s) to provide significant personal mentoring of successful student applicants.

Applications should be made by the principal supervisor through online submission via the appropriate page on the Association's website, and will include:

- Details of the principal supervisor making the application, and other members of the supervisory team
- Details and academic track record of the named student
- An account of the project aims, methods and expected outcomes
- A project plan including details of supervision
- Ethics statement
- A referee statement in support of the named student

After completion of the work, successful students are required to produce a short report of the findings suitable for publication in the *Newsletter*. This report should be submitted to <**palass@palass.org**> within eight weeks of the stated end date of the project. Successful candidates are requested to prioritize the Association's meetings and publications as media for conveying the research results.

Further details, including eligibility criteria for supervisors and students, and a full list of terms and conditions for the Undergraduate Research Bursary Scheme, can be found on the appropriate page of the Association's website. Inquiries may be made to the Secretary (<**secretary@palass.org**>).

The deadline is **24th February** each year. Successful applicants will be notified by the middle of May and funds will normally be available from 1st June. A full list of awards will be announced at the AGM.

Research Grants

Awards are made to assist palaeontological research up to a maximum value of £10,000 each, normally in support of single research projects or 'proof of concept' proposals with an aim of supporting future applications to national research funding bodies. Field-based projects are eligible, but the scientific objectives and outcomes of the research must be made clear. Applications for investigator's salary costs will only be considered in exceptional circumstances and if awarded all legal and financial liability will lie with the applicant.

Preference is given to applications for a single purpose (rather than top-ups of other grant applications). The award is open to both amateur and professional palaeontologists, but applicants will normally have a PhD as a minimum qualification and must be members of the Association.

Applications should be made through online submission via the appropriate page on the Association's website, and will comprise:

- A two-page curriculum vitae of the principal researcher
- A two-page 'Case for Support' which addresses the following points:
- Underlying rationale and scientific issues to be addressed
- Specific objectives of the research
- Anticipated achievements and outputs
- Methodology and approach
- Programme and/or plan of research
- How the research fits the charitable aims of the Association
- Proposals for wider dissemination of results including those relating to the wider public understanding of science
- A list of pending and previous applications (with funding bodies and results) for funds to support this or related research
- A breakdown and justification of the proposed expenditure
- A list of suggested referees that may be approached to review the proposal

Successful applicants will be required to produce a final project report that will be published in the *Newsletter* and are asked to consider the Association's meetings and publications as media for conveying the research results.

Further details and a full list of terms and conditions for the Research Grants Scheme can be found on the appropriate page of the Association's website. Inquiries may be made by e-mail to the Secretary (<**secretary@palass.org**>).

The deadline is **1st March** each year.

Funds will normally be available from 1st June, and the awards will be announced at the AGM.

Call for mentors!

Are you interested in raising the profile and increasing the competitiveness and diversity of scientists working in palaeontology and allied fields? The Palaeontological Association is establishing a **mentoring scheme** to assist young palaeontologists at the start of their academic careers. Mentoring is a tool to support the development of an individual, helping him or her make informed choices via the exchange of knowledge and experience. At this stage in the process we are seeking academics in permanent positions, regardless of seniority, to step forward as potential mentors.

Who will you be mentoring?

We have identified priority areas as major career transitions, in the first instance focusing on the postdoc-to-permanent job transition. You will therefore be paired with a postdoc palaeontologist. Other transition points such as late-stage-PhD-to-postdoctoral-position and mid-career-to-senior-leadership-role will be the focus of later mentoring schemes.

What is required?

The Palaeontological Association mentoring scheme will be via direct mentoring. That is, direct contact between the mentor and mentee via email, skype or other forms of communication. Full guidelines on expectations, lines of communication and flexibility (length of the mentorship) will be provided. It is expected that mentors should provide open and honest advice whilst maintaining confidentiality at all times. Frequency of communication should be agreed by both mentor and mentee but should not exceed the programme guidelines in order to ensure that the mentor role is not onerous.

How will the scheme be monitored?

Mentors and mentees will have a point of contact via a member of Council, the Vice-President in the first instance, who will oversee all mentor-mentee pairings and the general running of the scheme.

Who do I contact?

To express interest in acting as a mentor, please e-mail Vice-President Professor Emily Rayfield (<**e.rayfield@bristol.ac.uk**>). To emphasize, we are looking for academics in permanent jobs at *any* level of seniority. Those obtaining permanent jobs in recent years have as valuable experiences to share as more senior academics. Aside from the warm glow of knowing you are making a positive difference to someone else's career, there is much to gain from being a mentor, such as enhanced leadership skills and personal reputation. We hope you can take part and contribute to the continued development and success of the palaeontological sciences in a competitive academic world.

Emily Rayfield
University of Bristol

Diversity in the PalAss

The purpose of the Palaeontological Association is to promote the study of palaeontology and its allied sciences, and the Association is open to any adult with an interest in these subjects regardless of colour, ethnic or national origin, race, gender, disability, age, sexual orientation, religious or other beliefs, marital status or family circumstance.

The Association takes issues of equality and diversity very seriously and is planning to investigate the diversity of its current membership and the wider palaeontological community, by commissioning a survey to gather baseline data on a range of protected[1] and non-protected characteristics such as gender and socio-economic factors. The purpose of this study is to identify under-represented groups, in order to consider how the Association's activities can be tailored to be more inclusive and ultimately to increase diversity in the discipline of palaeontology. Participation in the survey will be voluntary and all data will be anonymized. We hope that as many members as possible will take part to allow us to obtain an accurate reflection of current membership. Further details will follow in autumn 2017.

Fiona Gill
University of Leeds

Maria McNamara
University College Cork

Palaeontology: Printed copies looking for homes

Several runs of print copies of the PalAss journal *Palaeontology* are available for collection, all in the south of England and free to good homes. If you would like them please contact Dr Jo Hellawell at <**executive@palass.org**>.

Jo Hellawell
Executive Officer
The Palaeontological Association

[1] As defined by the Equality and Human Rights Commission; see <**https://www.equalityhumanrights.com/en/equality-act/protected-characteristics**>

The Palaeontological Association at the EGU General Assembly 2017

The EGU General Assembly continues to be the premier geosciences meeting in Europe, attracting thousands of scientists from around the world. The meeting this year (23–28 April 2017 in Vienna) was another great success with 14,496 scientists from 107 countries in attendance, delivering 17,399 presentations, including 4,849 oral, 11,312 poster, and 1,238 PICO presentations. I am happy to report that EGU's Division on Stratigraphy, Sedimentology and Palaeontology (SSP: <**http://www.egu.eu/ssp**>) is in good shape. Palaeontology is identified as an important and successful part of SSP, and there is a continued and strong desire to see greater representation of palaeontology in the division's sessions at the General Assembly.

EGU has a series of awards and medals, both at division and union level. The SSP annual Lamarck Medal rotates between a mid-career sedimentologist, a stratigrapher and a palaeontologist. This year, the medal went to Prof. Paul Wignall (University of Leeds). Dr Yadong Sun (Friedrich-Alexander-Universität Erlangen-Nürnberg), working on stable oxygen isotope signatures of conodonts, received one of EGU's prestigious Arne Richter Awards for early career scientists.

The meeting featured a number of successful sessions involving the Association. The PalAss sponsored a session convened by Dr Duncan Murdock and Prof. Mark Purnell, on *Analytical and Experimental Palaeontology*. The session featured six engaging talks and about three times as many posters. Another highlight in the programme was a full-day session on mass extinctions, co-convened by the Association's Dr David Bond. This included three oral sessions, a large poster session, and was built around the medal lectures of Paul Wignall and Yadong Sun. The medal lectures were a great success, and the room was packed with attendees.

The next General Assembly is scheduled for 8–13 April 2018, in Vienna, Austria. The Association intends to continue its support and to promote palaeontology as a frontier science at this meeting. This involves ensuring that a greater number of quality palaeontology sessions are proposed, filled and run. We are now actively seeking suggestions from the membership for topical sessions that you would like to attend or be willing to convene at the meeting. I would encourage the membership to embrace the alternative presentation forms that work particularly well at this enormous meeting, *i.e.*, to think about proposing poster- and/or PICO presentation-focused sessions. The Association is committing significant funding to support one or more sessions at EGU 2018 through our regular Grants-in-Aid scheme (deadline: 1st September). Funding will be made available to help support the travel and registration costs of convenors, keynote speakers and other poster/oral presenters. Council will make its decision in mid-October and convenors will be informed soon after.

If you have any questions please contact me by e-mail to <**meetings@palass.org**>.

Thijs Vandenbroucke
PalAss Meetings Coordinator – SSP science officer

ASSOCIATION MEETINGS

61st Annual Meeting of the Palaeontological Association
Imperial College, London *17 – 20 December 2017*

The Annual Meeting of the Palaeontological Association will be held at the South Kensington campus of Imperial College London. Dr Mark Sutton is the primary convener, and the email address for all meeting matters is <**annualmeeting2017@palass.org**>.

Please note that the timetable below is provisional – exact timings and speaker-order are subject to change.

Programme

Sunday 17th December: Symposium and reception
The meeting will begin with the Annual Symposium in the afternoon of Sunday 17th December in the Sir Alexander Fleming (SAF) Lecture Theatre at Imperial College. The theme is 'Evolutionary Modelling in Palaeontology':

13.30 – 13.45 Welcome

13.45 – 14.15 Dr Graeme Lloyd (University of Leeds):
Journeys through discrete-character morphospace

14.15 – 14.45 Dr Julia Sigwart (Queen's University Belfast):
Modelling genus-size distributions using simulated taxonomies

14.45 – 15.15 Mr Mark Puttick (University of Bristol):
Using evolutionary models to assess the accuracy of phylogenies estimated with Bayesian, Maximum-Likelihood, and Parsimony methods

15.15 –15.45 Break

15.45 – 16.15 Dr Russell Garwood (University of Manchester), Dr Chris Knight (University of Manchester) and Dr Mark Sutton (Imperial College)
Simulating evolution in space and time

16.15 – 16.45 Dr Natalie Cooper (Natural History Museum, London) and Dr Thomas Guillerme (Imperial College London):
New tools for modelling convergence and disparity in morphological data sets – demonstrated using dinosaur skulls

16.45 – 17.15 Prof. David Polly (Indiana University):
Clade turnover and tectonics: modelling population level processes on palaeontological scales

17.15 – 17.45 Dr Lee Hsiang Liow (University of Oslo):
Modelling biotic interactions using data from the fossil record

18.00 – 20-00 Icebreaker reception in the Queen's Tower Rooms, Imperial College.

Monday 18th December: Conference, AGM, Annual Address and Dinner
The Conference will commence with a full day of talks and posters. The morning will feature parallel sessions held in the Royal School of Mines building; the afternoon will feature a single session in the Sir Alexander Fleming Lecture Theatre, which will also host the AGM and Annual Address.

The Association AGM will take place before the Annual Address.

The Annual Address will take place at 17.30. This will be given by Professor Mark Purnell (University of Leicester), and will be entitled '101 uses for a dead fish: experimental decay, exceptional preservation, and fossils of soft bodied organisms'.

Following the address there will be a reception and the Annual Dinner at the Millennium Hotel, Gloucester Road – this is approximately 10–15 minutes' walk from Imperial College.

Tuesday 19th December: Conference
A full day of talks in parallel sessions (morning) and joint session (afternoon). Talks, on both days, will be allocated 15 minutes including questions.

Wednesday 20th December: Field trips
Two field trips will be available. One will be a tour of Darwin's Downe House, while the other will be a fossil-collecting trip to the Eocene of the Isle of Sheppey. Prices are yet to be determined, but will be in the region of £50 per head. Places will be limited, and allocated on a first-come first-served basis.

Venue and travel

The conference will take place at the South Kensington campus of Imperial College, adjacent to the Royal Albert Hall, Science Museum, and Natural History Museum. All conference venues except the Annual Dinner are on-campus and within five minutes' walk of each other; the Annual Dinner will take place in the Millennium Hotel, Gloucester Road, which is approximately 10 minutes' walk away.

London has an efficient and relatively cheap public transport system which runs almost 24 hours, 7 days per week; delegates should find no problems using cheaper accommodation options anywhere in London, and travelling to and from Imperial College. Transport timetables and tube maps are available from Transport for London (<**tfl.gov.uk**>), but more conveniently are also available through integrated travel services and apps such as *Google Maps* and *Citymapper*, which maintain live-links to TFL real-time schedules. Taxi transport is also readily available. London Black Cabs can be safely hailed off the street or at stations, but are not always easy to obtain at busy times, and are relatively expensive. Many minicab services also exist, and app-based ones such as *Uber* are generally cheap, reliable and easily available.

The nearest underground (tube) station to the Imperial campus is South Kensington, which is a five-minute walk. Either follow the subway signposted to the museums or walk north up Exhibition Road. Imperial is next to the Science Museum. Gloucester Road tube station is only a little further away. Both stations are on the District, Circle and Piccadilly lines. Many bus routes will take you even closer to campus; there are too many to list here, and you should use the resources mentioned above to determine your optimum routes. The postcode to use for campus for these services is SW7 2AZ – alternatively search for Exhibition Road, Imperial College, or the next-door Science Museum, or Royal Albert Hall.

The London Transport bus and tube network uses an integrated charging system. The simplest way to pay is with a contactless 'Oyster Card'. If you do not have one, you can buy these from any station, which you can top up as required. You can no longer pay by cash on the bus and tube. Your Oyster Card will be charged per single journey (currently £1.50 for any bus journey, £2.40 for any tube journey), with the total cost per day capped at the 'One day travelcard' rate (currently £12). The only exceptions to these charges come if you stray outside the central London travel zones (*e.g.* if you travel by tube from Heathrow). See <**tfl.gov.uk**> for full details.

Getting to London

By Car:

The short version: **Just no**.

The longer version: you are strongly advised not to drive to the Annual Meeting unless you know London well and are able to secure parking. While the Imperial campus lies outside of the congestion charge zone, it can be difficult and slow to drive in to *any* part of Central London. More importantly, parking in South Kensington is difficult to obtain and often ruinously expensive. Some hotels may offer car-parking spaces, but if you wish to drive you are strongly advised to research car-parking options away from campus; you might even find it simpler to park outside London and use public transport to reach the centre.

By Train:

London is easily accessible by train from any part of the UK, although none of the mainline train stations are particularly close to South Kensington – you will need to complete your journey by tube or bus, unless your accommodation is near a station. UK rail travel can be expensive, but booking early will often get the best prices – try for instance <**www.thetrainline.com**>, and consider travelling at an off-peak time.

By Coach:

London is connected by regular coach services to towns and cities across the UK; these are almost always cheaper than trains. For information, see National Express Coaches (<**www.nationalexpress.com**>) and Megabus (<**www.uk.megabus.com**>). Many of these will terminate at Victoria Station, which is only two stops away from South Kensington on the Circle and District tube lines.

By Air:

London is served by several airports, Heathrow, Gatwick and Stansted being the largest. Of these, Heathrow is the most convenient for reaching South Kensington – the Piccadilly tube line runs all the way from the airport to Gloucester Road and South Kensington, and is the cheapest way to reach the centre of London, although the journey can take nearly an hour. Fast trains run from all airports to central London, but you will in all cases need to make a tube or bus journey from their terminus to reach South Kensington. Train/tube travel to/from airports is strongly preferable to taxi travel, which can be slow and expensive.

Registration and booking

Registration, abstract submission and booking (including payment by credit card) commences on **Monday 10th July 2017**. Abstract submission closes at midnight on **Friday 22nd September 2017**; abstracts submitted after this date will not be considered, and registration after this date will incur

an additional administration charge of **£30.00**. The final deadline for registration is **Friday 17th November 2017**. Registrations and bookings will be taken on a strictly first-come-first-served basis. No refunds will be available after the final deadline.

Registration, abstract submission, booking and payment (by credit or debit card) will be through online forms available on the Palaeontological Association website (<**http://www.palass.org/**>). Please note that all these transactions will be in sterling (£:GBP). Accommodation must be booked separately (see below). Early registration is **£90.00** for ordinary and retired members; **£65.00** for students; and **£125.00** for non-members. Registration provides the icebreaker reception on Sunday evening, the full registration package, and tea/coffee/biscuits from Sunday through to Tuesday. Note that lunches are not included. Delegates can either purchase lunch from various food outlets on or near campus, or can order packed lunches when registering. Prices for the latter have yet to be finalized, but will be in the £4–£6 range.

The Annual Dinner costs **£50** (**£35** for student delegates). It will be held at the Millennium Hotel, Gloucester Road, which is a ten minute walk from campus. The evening will begin with a drinks reception followed by a three course meal. Seats at the Annual Dinner will be capped at 200 as this is the maximum the venue can hold; these seats will be allocated on a first-come first-served basis.

Oral presentations

All speakers (apart from the Symposium speakers) will be allocated 15 minutes. You should therefore prepare a 12 minute talk to allow time for questions and switching between presenters. We will have a number of parallel sessions in adjacent theatres so timing will be especially important. All the lecture theatres have a two-screen setup, but these will be set to 'mirror' mode – double-screen presentations will not be possible. Presentations should be in PowerPoint or PDF format, and should be brought on a USB-stick for loading on to computers before the start of each session (in liaison with the session chair). Imperial College is Windows-based, so Mac presentations may cause problems, particularly if animations are included. If you are using a Mac please make sure your presentation is PC compatible before you leave your institution.

If we are oversubscribed with oral presentations, you may be offered the opportunity to present your work as a poster presentation instead. Preference will normally go to those in the early stages of their career.

Poster presentations

Poster boards will accommodate an A0-sized poster presented in **portrait** format. The boards will not be suitable for posters of this size in landscape format. Materials to fix the poster to the boards will be available at the meeting. Posters will be displayed for one day (either Monday or Tuesday). Posters will be in a different location in the morning and afternoon, to ensure they are in proximity to the lecture theatres in use. Poster presenters can (a) bring two copies of their poster, one for each location, (b) move their poster during the lunch-break, or (c) request that conference assistants move the poster for them.

Accommodation

Delegates are responsible for booking their own accommodation. The Annual Meeting section of the Palaeontological Association website (<**www.palass.org**>) provides extensive information and suggestions for accommodation, which are summarized briefly here.

London transport is efficient, relatively cheap, and runs almost 24 hours a day – delegates on a restricted budget should thus consider accommodation away from the expensive South Kensington area. Those with no such constraints should consider the Millennium Gloucester Hotel, which is hosting the Annual Dinner. Rooms here will cost £144 / night, with double-occupancy rooms costing £156 / night. Breakfast is included.

Cheap accommodation can be found through AirBnB <**www.airbnb.co.uk**> or in the form of hostels (try *e.g.* <**www.hostelworld.com**>, or the Youth Hostel Association (<**www.yha.org.uk**>). Many hotels and 'Bed and Breakfast' establishments will provide viable accommodation – these vary widely in standards, prices and distances. The Palaeontological Association website (<**www.palass.org**>) provides some suggestions, although we stress that these suggestions are not recommendations. Alternatively, search for yourself using online resources such as <**www.booking.com**>, <**www.trivago.co.uk>** or <**www.tripadvisor.co.uk**>.

Travel grants to student members

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. For the 2017 meeting, grants of up to £100 will be available to student presenters who are travelling from outside London. 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 presentation is accepted, and before 1st December 2017. Entitle the e-mail "Travel Grant Request". No awards can be made to those who have not followed this procedure.

London

London is one of Europe's foremost tourist destinations (see *e.g.* <**www.visitlondon.com**>). Major attractions within a few minutes of the Imperial campus include the Natural History Museum, the Science Museum, the V&A Museum, and the Royal Albert Hall, but a full list of all London has to offer would fill several newsletters! London also boasts a very large number of excellent restaurants, pubs and bars; a guide to those near campus will be provided in your registration pack.

We look forward to seeing you in December!

The Geological Society
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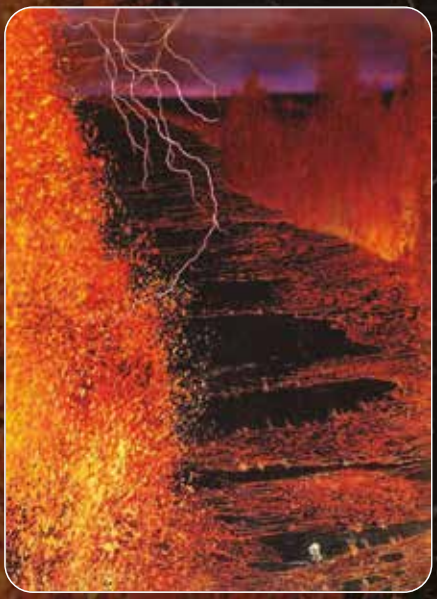
Event Partners

Lyell Meeting 2018

Mass extinctions: understanding the world's worst crises



7 March 2018

The Geological Society, Burlington House

The study of mass extinctions is one of the most interdisciplinary research areas within Earth and environmental sciences. Recent, major advances have come from a broad spectrum of fields, including atmospheric modelling, high-precision age dating, volcanology, geochemistry, stratigraphy and palaeontology. The 2018 Lyell Meeting aims to highlight these achievements and showcases the improved understanding we now have of the great environmental catastrophes of the past. The Meeting aims to encompass the full spectrum of crises seen in the Phanerozoic fossil record.

The 2018 Lyell Meeting provides a platform to assess the current stratigraphic and geochemical records of environmental change during mass extinction events and the role of atmospheric climate modelling in understanding the causes of the crises. The goal is to evaluate the relative importance of environmental changes in major episodes of species extinctions, and to further explore the mechanisms that link these proximal kill mechanisms to the ultimate drivers, such as large igneous province eruptions and meteorite impacts. This will be a rare opportunity to hear research developments happening in diverse disciplines applied to all mass extinction events.

Convenors:

Paul Wignall (University of Leeds, UK)
Dave Bond (University of Hull, UK)

Keynote Speakers:

Prof Mike Benton (University of Bristol)
Dr Sofie Lindström (Geological Survey of Denmark and Greenland)

Further information:

For further information about the conference please contact:
Naomi Newbold, Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 0207 434 9944
E: naomi.newbold@geolsoc.org.uk
Web: www.geolsoc.org.uk/lyell18
Follow this event on Twitter #lyell18

Call for Abstracts:

We invite oral and poster abstract submissions for the meeting, and these should be sent in a Word document to naomi.newbold@geolsoc.org.uk by 1 December 2017. Abstracts should be approximately 250 words and include a title and acknowledgement of authors and their affiliations.

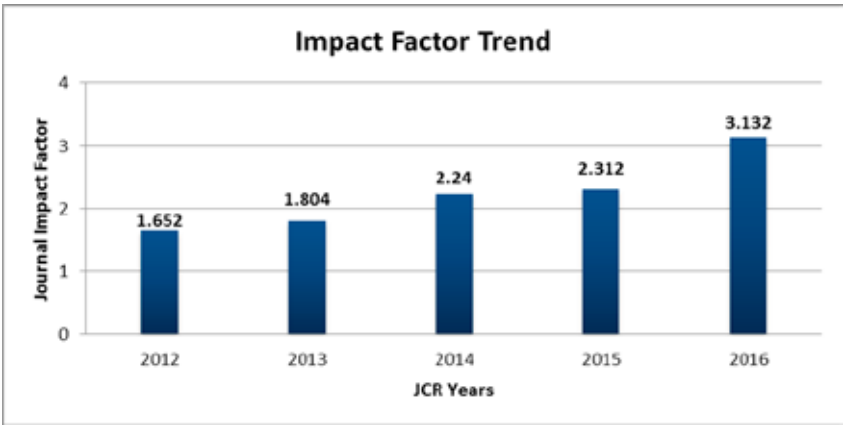
news

Palaeontology *and* Papers in Palaeontology *have impact!*

In 2014, the Association took the decision to change its publishing model and to produce two sister journals, *Palaeontology* and *Papers in Palaeontology*. The rationale behind this was that, by having two journals with clearly differentiated remits, we could develop *Palaeontology* as a world-class journal that reported trend-setting, innovative and timely hypothesis-driven research while maintaining the Association's founding principle of publishing high-quality, descriptive taxonomic work that forms the bedrock of our science in *Papers in Palaeontology*.

I'm pleased to be able to report that the strategy seems to be working. Thomson Reuters recently released the latest Journal Impact Factors and *Palaeontology* has steadily risen through the ranks from 12/49 for Palaeontology in 2013 to stand now at 2/53, with an impact factor of 3.1. Only *Paleoceanography* has a higher citation score in this category. Furthermore, *Papers in Palaeontology*, now in its third year, has for the first time been scored and has a highly respectable impact factor of 2.4, ranked at 6/53 in the Palaeontology category.

Palaeontology is now leading its field in publishing science that shapes and directs the research agenda, while the success of *Papers in Palaeontology* demonstrates that high-quality taxonomic research, when set in context and with its wider implications clearly spelt out, remains a vital and scientifically appreciated contribution. This is excellent news for the Association and for the scientific activities it supports. The Association depends upon the success of its journals to generate income that is used for promoting the subject in many different ways, and having a high impact factor ensures that our journals continue to be seen as essential purchases by libraries around the world.



I would like to take this opportunity to thank all the authors who have submitted their papers to our journals, and to all our referees who put so much time and effort into ensuring that the science we publish is of top quality. I would also like to pay tribute to the work of the Editorial Board, the subject-based scientific editors, and to our Publications Officer Sally Thomas for their dedication and efficiency in steering papers through the system.

Andrew B. Smith
Editor in chief

InCites™ Journal Citation Reports® THOMSON REUTERS

Rank	Full Journal Title	Total Cites	Journal Impact Factor	Average Journal Impact Factor Percentile
1	PALEOCEANOGRAPHY	7,165	3.254	89.246
2	PALAEONTOLOGY	4,005	3.132	97.170
3	JOURNAL OF SYSTEMATIC PALAEONTOLOGY	987	2.963	78.371
4	PALEOBIOLOGY	3,712	2.886	76.422
5	PALAEOGEOGRAPHY PALAEOCLIMATOLOGY PALAEOECOLOGY	20,600	2.578	75.957
6	PAPERS IN PALAEONTOLOGY	55	2.412	89.623
7	LETHAIA	2,179	2.281	87.736
8	JOURNAL OF VERTEBRATE PALEONTOLOGY	5,054	2.114	85.849
9	CRETACEOUS RESEARCH	3,539	2.015	79.747
10	PALAIOS	3,216	1.983	77.74

PalAss at the Palace

In *Newsletter* 94 it was reported that our past President Professor Jane Francis had been recognized in the UK Queen's New Year's Honours List and appointed Dame Commander of the Most Distinguished Order of Saint Michael and Saint George (DCMG) for her services to UK polar science and diplomacy. Jane's principal research interests lie in the palaeobotany of the Antarctic, and she has undertaken more than 16 expeditions to polar regions.

Our current President Professor Paul Smith has also been recognized, being awarded a Polar Medal for outstanding achievement and service to the UK in the field of polar research. Paul has spent his career working at the opposite end of the globe to Jane, in the high Arctic, in particular in the Cambrian and Ordovician of Greenland and Svalbard.

Both attended an Investiture at Buckingham Palace in May to receive their awards and accompanying medals from the Duke of Cambridge.

Jo Hellawell
Executive Officer

Photo courtesy of Paul Smith

news

PalAss news round-up, June 2017

This news round-up usually focuses solely on media coverage of articles published in our journals, but before I do that, I'd like to switch my focus slightly.

As many of our members will be all too aware, the last few years have not generally been kind to the UK museums sector, and palaeontology and geology seem to have been very badly hit by cuts. Personally, as a palaeontologist whose first field-trip was to Wren's Nest, I was particularly depressed by the Dudley Metropolitan Borough Council's decision to close the town's Museum and Art Gallery at the end of 2016 (<**https://www.expressandstar.com/entertainment/2016/12/23/dudley-museum-shuts-as-council-cuts-bite/**>). The global importance of Dudley's rocks and fossils has been acknowledged somewhat with the announcement that at least some of them will go on display in a recently built (and vastly less characterful) archives building, but it's hardly a promising sign for the long-term future of natural sciences in the Black Country.

It was heartening, therefore, to see better news elsewhere in the West Midlands, as Birmingham's famous Tiny Geology Centre (© The Grauniad: <**https://www.theguardian.com/culture/2017/apr/27/tiny-geology-centre-lapworth-vies-tate-modern-museum-year**>) – better known to the rest of us as the Lapworth Museum of Geology – was nominated for the 2017 Art Fund Museum of the Year: <**https://www.artfund.org/what-to-see/museums-and-galleries/lapworth-museum-of-geology**>. After decades of being overlooked by the University of Birmingham's movers and shakers, in 2014 the Museum finally got the investment it deserved. It reopened in the summer of 2016, and the refurbishment is tremendous: the Lapworth retaining its Edwardian charm whilst adding some splendid new galleries and interactive displays.

By the time this newsletter is published, we'll know if the Lapworth has been successful, but at this juncture I am hopeful that at least one of the judges will vote favourably, given that she claims to love rock: BBC Radio 2 DJ Jo Whiley. And even if the Lapworth doesn't win Museum of the Year, we know that, with 4.5 billion of them, it will always be museum of the years. Congratulations to Jon Clatworthy, Jane Harris, Richard Butler and all the Birmingham team on this thoroughly deserved nomination.

Congratulations also to the Rotunda Geology Group in Scarborough, whose splendid outreach and engagement activities of recent years – including the Association-supported Yorkshire Fossil Festival (newsletters *passim*) – have helped the town's William Smith Museum of Geology secure the R. H. Worth Prize of the Geological Society: <**https://www.geolsoc.org.uk/About/Awards-Grants-and-Bursaries/Society-Awards/RH-Worth-Prize**>. There were other palaeontological successes, as our recent Hodson Award-winner, Dr Susie Maidment (Brighton), claimed the Lyell Fund, and Dr Russell Garwood (Manchester; 2009 President's Prize-winner) the Wollaston Fund.

Now, on to the more traditional news coverage, and getting up at the crack of dawn for a Scottish milk round. Yes, a new discovery from the Jurassic of Skye, described by Elsa Panciroli and colleagues in *Papers in Palaeontology* (<**http://onlinelibrary.wiley.com/doi/10.1002/spp2.1079/full**>), turned out to be a jaw of the early mammal *Wareolestes rex* with unerupted molars and premolars.

"Jurassic animal on Skye 'fed milk to young'," headlined the BBC, suggesting that Wareolestes would have 'secreted milk on to a bare patch of skin for their young to lap up' (<**http://www.bbc.co.uk/news/uk-scotland-highlands-islands-39791226**>). *The Guardian*, meanwhile, preferred to

declare *W. rex* "the first 'King' of Scotland" (<**https://www.theguardian.com/science/2017/may/04/new-fossil-mammal-was-the-first-king-of-scotland-wareolestes-rex**>), although they did at least admit that it 'probably fed its young on milk.' In an ever-so-slightly more localized focus, *The Scotsman* went for the fossil being 'the first evidence of Scottish mammals producing milk' (<**http://www.scotsman.com/news/environment/skye-fossil-shows-first-evidence-of-scottish-mammals-producing-milk-1-4437483**>), whilst also stating that 'they predate many of the Chinese examples'. I presume this is 'predate' as in 'occur earlier', rather than 'predate' as in 'eating other organisms', otherwise this is a bold new interpretation of very early mammalian ecology.

Talking of bold new interpretations, last year, two studies published in *Nature* in quick succession argued that everyone's favourite Illinoisan oddball, *Tullimonstrum gregarium*, was a vertebrate. In late February, however, an article was published in *Palaeontology* that called for more robust evidence for these interpretations (<**http://onlinelibrary.wiley.com/doi/10.1111/pala.12282/full**>). News outlets which had, in 2016, declared a palaeontological mystery resolved suddenly had to declare it unresolved again.

One such medium, *The Sun* newspaper, picked up the controversy, and announced that the study's lead author, Lauren Sallan, had told them that 'the last thing the Tully Monster could be is a fish' (<**https://www.thesun.co.uk/news/2909526/tully-monster-which-had-eyes-on-stalks-and-alien-style-tooth-tongue-leaves-scientists-baffled/**>). Putting aside the accuracy of any quote it publishes, the tabloid was left to suggest instead to its readers that *Tullimonstrum* was simply an 'alien-like animal'. However, since we don't have any idea what aliens look like, this is an utterly hopeless description, and the Tully Monster is more likely to be a fish than an alien. However, I will not muddy the waters any further by publishing this radical claim as a reply in *Palaeontology*.

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

Perhaps unsurprisingly, more detailed and informative quotes from Lauren and her colleagues were provided in other outlets, such as the *International Business Times*, which told us that *Tullimonstrum* was a weird creature but not a fish (<**http://www.ibtimes.co.uk/mysterious-tully-monster-was-weird-creature-not-fish-1607543**>). The *Daily Mail* was so utterly nonplussed, though, that it could only stick its proboscis out and offer the headline-question, "The weirdest animal that ever lived?"

(<**http://www.dailymail.co.uk/sciencetech/article-4241904/Mystery-ancient-Tully-Monster-far-solved.html**>). Answers on a postcard to PalAss Towers, please.

Finally, just in time for the Tour de (Palaeozoique de) France, a study in *Palaeontology* by Hugh Trenchard and colleagues (<**http://onlinelibrary.wiley.com/doi/10.1111/pala.12301/full**>) offered up the exciting possibility of trilobikes. The possible phenomenon of trilobites moving in migratory lines, raised by Blazejowski *et al.* last year and highlighted in these pages a couple of issues ago (<**http://onlinelibrary.wiley.com/doi/10.1111/pala.12252/full**>) was explored further. The conclusion was that trilobite queues could have led to drag reduction, much like a peloton of cyclists. Susannah Lydon wrote a fine review in the *Guardian*'s 'Lost Worlds' column (<**https://www.theguardian.com/science/2017/may/24/what-do-the-tour-de-france-and-fossils-have-in-common**>), wondering if synchronized swimming ammonites were the next Olympian palaeontological discovery. Sadly I can't find a copy, but I recall an old cartoon in the Geological Society of London's *Geoscientist* magazine, showing *Cruziana* trace fossils being produced by unicycling arthropods. Perhaps they were actually on to something.

Liam Herringshaw
<**publicity@palass.org**>
@fossiliam

British Science Festival

The British Science Festival is Europe's longest-standing national event which connects people with scientists, engineers, technologists and social scientists. Tens of thousands of people come together to celebrate the latest developments in science and to engage in open discussion about issues that affect our culture and society. In previous years it has taken place in York, Liverpool, Guildford, Aberdeen, Newcastle, Birmingham, Bradford and most recently in Swansea in 2016. The British Science Festival 2017 will be co-hosted by the University of Brighton and the University of Sussex, taking place from 5th to 9th September.

This year Dr Susannah Maidment, palaeontologist and lecturer at the University of Brighton, is one of the local organizers, and together with Prof. Paul Barrett of the Natural History Museum, London will be hosting a viewing of *Jurassic Park*, with a discussion of the film's scientific accuracy. Susannah and Paul were awarded the PalAss Hodson Award and President's Medal for 2016, respectively.

Joe Keating, winner of the President's Prize for best talk at the 2016 Annual Meeting will be giving a talk entitled "Your 500-million-year family tree".

Jo Hellawell
Executive Officer

What will the post-Anthropocene world be like?

I write just days after Donald Trump pulled the USA out of the Paris Climate Agreement, whilst we in the UK are in the latter stages of a General Election campaign in which climate change has barely been on the agenda. We face an uncertain future in many ways, and beyond the White House there is widespread concern that Earth has entered into a new, human-induced mass extinction that will characterize the "Anthropocene" (Barnosky *et al.*, 2011) (likely soon to be considered for ratification by the International Commission on Stratigraphy).

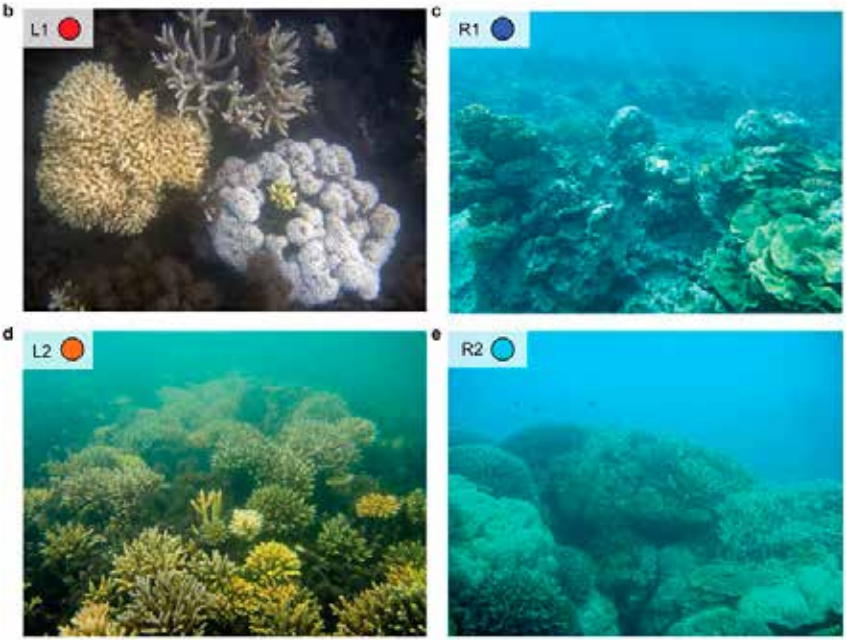
Earth is again facing the stresses implicated in its past mass extinctions, including marine anoxia, ocean acidification, warming, ozone loss and increased UV-B radiation, hypercapnia, acid rain, atmospheric oxygen depletion, and toxic metal poisoning, as well as unprecedented threats in habitat destruction and pollution. Most Earth and environmental scientists see these as "bad things" but the future of life on Earth is far from clear. Some think that a mass extinction is avoidable[1] – let's hope they're right.

A new open-access paper in *Scientific Reports* by Emma Camp (Camp *et al.*, 2017) of the University of Technology Sydney highlights that our understanding of biotic response to change is far from complete. Coral reefs are considered one of the ecosystems most vulnerable to climate change and other anthropogenic impacts, with predictions that 60% of the world's coral reef area will be lost by 2030 (Hughes *et al.*, 2003), or worse, reefs will suffer near-total destruction – with precedent in the geological past (Pandolfi & Kiessling, 2014). However, Camp *et al.*'s paper on "Reef-building corals thrive within hot-acidified and deoxygenated waters" offers some hope. Camp *et al.* conducted three field visits to a semi-enclosed lagoon system in New Caledonia (how dreadful that must have been!) and identified diverse coral communities growing in exceptionally hot, acidic and oxygen-poor waters. The 20 coral species observed calcifying in the lagoon have supposedly altered their metabolism and physiology to tolerate their extreme living conditions. Amazingly, the nasty cocktail of the lagoon exceeds in nastiness even the nastiest IPCC predictions for future oceans (Stocker, 2014), leading to the hope that some corals will be able to adapt and thrive. These so-called 'Super Corals' are suggested to be central to proactive management options aimed at upgrading reef resilience. I'm not so sure about that, but the study highlights the incredible resilience of even some of the most vulnerable taxonomic groups.

Given Earth's current extraordinary rate of change, one wonders what proportion of corals (or any other taxa, for that matter), will be able to adapt, survive, or even flourish in the post-"Anthropocene" world. If 50% of species cannot, we do indeed face a mass extinction (using Jack Sepkoski's definition). Predicting the future of life is a great challenge, but palaeontology and experimental (geo)biology must sit at the forefront of our response to change, as recently noted by Tony Barnosky (Barnosky *et al.*, 2017). Palaeontologists have a key role to play in understanding and mitigating climate change because we, above all, understand how such scenarios have manifest in the geological past. If funding agencies want to know what the societal impact of palaeontology is, then they need look no further.

David Bond
University of Hull

[1] See <**www.scientificamerican.com/article/fact-or-fiction-the-sixth-mass-extinction-can-be-stopped/**> for an accessible write-up on how a mass extinction might be avoided.



Typical benthic scenes from Camp et al.*'s (2017) lagoon sites L1 (b) and L2 (d), the exposed reference reef site R1 (c), and sheltered reference site R2 (e). From Camp* et al. *(2017). Used under the Creative Commons Attribution 4.0 International License:* <**http://creativecommons.org/licenses/by/4.0/**>.

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Mary Anning Award presentation

Dugald Ross is a remarkable guy. For decades he has collected dinosaurs and other fossils on the Isle of Skye in Scotland, taking time out from his busy life as a builder and a crofter. A self-taught fossil hunter, he has published numerous academic papers and is Scottish Natural Heritage's point man for safeguarding fossil sites on Skye. As a teenager he even started his own fossil museum, the Staffin Museum, by rebuilding the ruins of a one-room schoolhouse and filling it with bones, teeth, ammonites and other specimens from across the island. For these and his many other contributions to palaeontology, the Palaeontological Association awarded Dugald (or Dugie, as he is usually called) the Mary Anning Award in 2016. Unfortunately, Dugie was unable to make the long journey from Skye to Lyon, so I accepted the award for him at the Annual Dinner. However, to make sure his big achievement was properly celebrated, I made a presentation to him with my fellow PalAlba Group palaeontologists Tom Challands and Neil Clark when we were on Skye for fieldwork in May 2017.

On a beautiful sunny evening about 20 of us gathered at Dugie's house, near his museum. Dugie's family cooked up a fantastic Hebridean feast of boiled prawns, nettle soup and various puddings. We brought the Guinness, the champagne, and most importantly, the bottle of Talisker. I tried to imitate Paul Smith's style as best I could, formally presenting Dugie his certificate while waxing effusively about his pivotal role in putting Skye on the map for vertebrate palaeontologists, before Tom and Neil both said a few words. It was great that his family was able to meet many of the scientists Dugie has worked with and the students he is now helping to train in the field. And we were regaled by his stories of growing up in a Gaelic speaking household on Skye, of the time he found his first archaeological artifacts as a teenager, of how his father encouraged his obsession with Hebridean history (and prehistory), and of the many fossils that he knows are still out there, just waiting to be collected.

Stephen Brusatte
University of Edinburgh

The award ceremony in Staffin. From left to right: Steve Brusatte, Dugie Ross, Neil Clark and Tom Challands. Photo courtesy of S. Brusatte.

New ichthyosaur at The Etches Collection

The Etches Collection Museum of Jurassic Marine Life in the village of Kimmeridge, in Dorset, UK, has recently received by way of donation an incredible 6-metre-long ichthyosaur fossil specimen which was discovered almost ten years ago. The fossil came to us semi prepared from the top surface (the surface which was exposed when it was found) and has spent the last three months in our workshop being re-prepped from the underside by Steve Etches. Preparing the specimen from the underside has enabled us to reveal a much better level of preservation than was seen before. This specimen represents one of the most complete ichthyosaurs to have come from the Kimmeridge Clay and has some unique features, possibly new to science. This is the first stage of preparation and the whole animal will be air abraded and mounted; once complete it will eventually be an integral part of our display here at the exhibition. Visitors can see the specimen currently under preparation in our workshop.

The Etches Collection is open every day, 10am – 5pm; for more information please see our website, at <**www.theetchescollection.org**>.

Carla Crook
The Etches Collection

Pliosaurus! Face to face with a Jurassic beast

Bristol Museum & Art Gallery, UK, has a new family exhibition focusing on our spectacular 8-metre-long fossil *Pliosaurus carpenteri* – aka Doris – the holotype and only known specimen of its species and a rare example of a relatively complete pliosaur. Using an imaginative approach, we will be taking visitors on a journey that 'brings it back to life' and engages them with the science behind its story. The exhibition is supported by a PalAss Engagement Grant and is open to all from 17 June 2017 to 7 January 2018, with a 'pay what you think' entrance fee. We will be promoting the exhibition on social media using the hashtag #DeadlyDoris.

Isla Gladstone
Bristol Museum & Art Gallery

news

From our Correspondents

Legends of Rock

James Parkinson: a legacy to medicine and more

Plaque at 1 Hoxton Square erected by the London Hospital (now the Royal London Hospital) to commemorate its famous alumnus. Image courtesy of 'Parkinson's Life': read more about the man behind the shaking palsy at <**http://parkinsonslife.eu/james-parkinson-the-man-behind-the-shaking-palsy/**>.

James William Keys Parkinson was born in Shoreditch, London, in 1755. Medicine was his first passion, having trained initially with his father, and he published a great deal of medical texts during his career. He soon succeeded his father in running the family medical practice at 1 Hoxton Square. Many of his medical works were influential, discussing public health and welfare, and providing some of the earliest descriptions in English of afflictions like gout, appendicitis, and 'Shaking Palsy'. This latter was the first comprehensive description of the disease's symptoms and possible causes, and it was thus renamed Parkinson's Disease almost fifty years after his death by Charcot. Parkinson had a very successful medical career, being elected a fellow of the Medical Society of London in 1787, and is known to this day for his role in understanding Parkinson's Disease. However, during life he was well known for his contributions to fields outside of medicine, not least contemporary politics, in which he called for radical social reform and universal suffrage, often under the pseudonym Old Hubert.

In the late 18th century, Parkinson began indulging an interest in collecting and illustrating fossil organisms. His key contribution to palaeontology was *Organic Remains of a Former World*, published during the early 19th century. Over three volumes, this contained his observations regarding fossils, accompanied by a number of beautiful plates hand drawn by him, and many coloured by his daughter. In *Organic Remains,* he discussed the history of palaeontology, preservation of organic fuels, fossil plants, fossil animals, and creationist theory. His works included incredibly extensive descriptions and classification of many groups. He figured a number of fossil echinoderms, molluscs, insects, reptiles, and mammals, describing in detail the morphology of these groups, and noting close similarities in some groups, like starfish, to modern counterparts. He also explained why certain groups, such as insects, are less likely to be preserved in the fossil record, and recognized the use of fossils in stratigraphy.

Rather than taxonomy, much of *Organic Remains* is dedicated to description and figuring of individual fossil specimens, their preservation, and referral to previous descriptions or modern comparisons. He published a subsequent book, *Outline of Oryctology*, which provided a shorter and more general overview of palaeontology. Parkinson firmly believed in the principle of catastrophism, which posits that the modern Earth has been shaped by large-scale cataclysmic events. In particular, like most scientists of the day, he believed in the Great Flood and that God controlled creation and extinction. However, he struggled to reconcile this with the concept of geological time. He did not believe that all of creation could have been accomplished in six days, so argued in his works that each day must therefore have lasted for much longer periods of time.

Images of pages from Organic Remains *courtesy of the Wellcome Trust (*<**wellcomeimages.org**>*), provided under a CC-BY Attribution 4.0 International licence.*

He received great renown during his life for his geological work, and *Organic Remains* proved a very popular publication. Indeed, Parkinson was part of the group that founded the Geological Society of London in 1807. He was also awarded the first Royal College of Surgeons' Gold Medal for his palaeontological work, accompanied by what would be considered the highest praise for any scientist: "The fruits of your exertions are distinguished by the stamp of simplicity and truth. They express the most laudable zeal in the pursuit and promulgation of knowledge, for the benefit of mankind."

James Parkinson died shortly after this, in 1824, leaving behind a lasting legacy, and both fossil taxa and a disease named after him. He is traditionally remembered by his ground-breaking description of the 'Shaking Palsy', but perhaps now a few more people will think of his prolific contribution to palaeontology, his so-called "favourite science".

Harriet Drage
University of Oxford

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Behind the Scenes at the Museum

Natural History at the National Museum of Ireland

The Natural History branch of the National Museum of Ireland was built in 1856 as an expansion to Leinster House (home of the Royal Dublin Society) to house the zoological and geological specimens that were collected throughout the 19th century. It opened its doors to the public in 1857, but it wasn't transferred to the state until 1877, where it became part of the Museum of Science & Art, Dublin and combined with collections from the Royal Irish Academy and Trinity College Dublin. Following the foundation of the Free State in 1922, the Museum has faced a great number of developments and restoration projects including a new entrance from Merrion Street (though some of the larger specimens still face the previous entrance), as well as gaining a large number of UK fossils from the Geological Survey of Ireland and the reinstatement of the grand stone staircase in 2010, three years after structural issues temporarily closed the building.

The Museum is currently running a seven-year digitization project to document every specimen (dating back to the Precambrian) in the collections, helping to streamline and preserve the museum catalogue as the collections grow and change. According to curator Matthew Parkes, the toughest curation battle is currently pyrite decay, which can strike even if environmental conditions for the collections are controlled extremely closely. The solution, he suggests, is to identify susceptible specimens and quarantine them in separate microenvironments.

The Natural History building opened in 1857 to house the Royal Dublin Society's growing collections, which had expanded markedly since the late eighteenth century.

The building is a 'cabinet-style' museum designed to showcase a wide-ranging and comprehensive zoological collection, and has changed little in over a century. Often described as a 'museum of a museum', its 10,000 exhibits provide a glimpse of the natural world that has delighted generations of visitors for 160 years.

Of the collections on display, most of the specimens are zoological and archaeological, including what is perhaps the best collection of Giant Irish Deer (*Megaceros hibernicus*) in the world, a clear public favourite. After all, these giants stand at the entrance of the Irish Room of the Museum and certainly provide a lasting first impression for any budding naturalists who might be visiting the Museum for the first time. Another favourite specimen is a *Rhomaleosaurus cramptoni*, an original plesiosaur fossil from the Jurassic of Yorkshire found in 1848, the replica of which is the centrepiece to the London Natural History Museum's palaeontological gallery. Although the *R. cramptoni* specimen used to stand in the Fossil Hall of the Natural History Museum in Dublin, this building was sadly demolished in 1962 to make way for a restaurant and bar for the Dáil (the Irish Parliament), so *R. cramptoni* was consigned to storage and awaits some much needed TLC.

The demolition of Fossil Hall is also one of the reasons that most of the extensive geological collection remains hidden from the public, with only 22 window cases dedicated to Irish fossils and minerals in the Museum. However, discussions are in progress to develop an Earth Sciences Museum on the National Museum's site at Collins Barracks, a stone's throw west of Dublin city centre. With such an expansion, the hidden gems of the collections may once again be shown to the public, some for the first time in over a century.

One of the most pressing issues faced by the Museum is keeping younger generations engaged in natural history. Accordingly, the Museum offers a range of activities to capture the imaginations of youngsters, such as onsite handling sessions, tours and workshops. The Museum also hosts exhibits at major science exhibitions in the Republic and engages in offsite outreach with schools and the general public. With these activities and two new outdoor "rock gardens" in development, Matthew hopes that the public and younger generations will find inspiration to find out more about the beautiful specimens kept in the National Museum, and perhaps even pursue a career in natural history to keep the collections (and our knowledge about

them) growing. To supplement this further, Matthew provides opportunities for students and universities to collaborate with the Museum, to encourage students and early-career researchers to contribute to the collections through fieldwork, and preserve collections from across the country that are at risk of being lost altogether. Thanks to the effort being made to preserve the collections and show the public what the natural world has to offer, the Natural History branch of the National Museum of Ireland continues to be an exciting and inspiring place to visit for all ages.

Claire Dobson
University of Oxford

The giant Irish deer skeletons at the entrance of the Museum are some of the most famous and distinctive animals on display here. One of the skeletons has an antler span of 3.5 metres.

General admission to the National Museum of Ireland is free. The Museum is open all year round from 10am to 5pm Tuesday to Saturday and 2pm to 5pm on Sundays; closed on Mondays.

National Museum of Ireland – Natural History, Merrion Street, Dublin 2

Web: <**http://www.museum.ie/Natural-History**>

You can take a virtual tour of the galleries at <**http://www.museum.ie/Natural-History/Exhibitions/Current-Exhibitions/3D-Virtual-Visit-Natural-History**>.

Brewing up taphonomy

When a group of faux-Mohawk Indians, aka the local chapter of the Sons of Liberty, clambered aboard the good ships *Dartmouth*, *Eleanor* and *Beaver* of the East India Company in Boston Harbour on a May night in 1773, and consigned 342 chests of tea into the harbour waters, they had little inkling of the consequences. It led to the Intolerable Acts[1] of an outraged British government, which, duly not tolerated, became the American Revolution. The rest is, of course, history. It might even have become palaeontology too, had those fervent patriots been a touch more patient, and waited until the offending merchandise could be shipped across as teabags.

The thought struck me not just because the symbolism of the event continues to live on among some of the more turbulent stretches of modern political waters, but because these humble objects are just one nice example among many that are worth musing on for their own chances of geological eternity. Here, the scale of the 'many' itself gives pause for thought. A little while ago, among those poor souls becoming ever more deeply ensnared in this notion of how the human component is adding its own two pennyworth to a hitherto largely inoffensive and tolerably well-regulated planet, a simple question emerged. Just how big and various is the human enterprise?

A back-of-a-beermat answer to the 'how big' part of the question came to thirty trillion tons[2], or roughly 50 kilos per square metre of the Earth's surface. On average, therefore, we're shin-deep in the stuff we use or have used and discarded. As to the 'how various' bit, well, the beermat proved too delicate and precise a measuring tool for this knotty question, so it was replaced by the analytical equivalent of the kind of canvas upon which Jackson Pollock used to conjure up his more effervescent creations. 'Perhaps of the order a billion or so' was the figure plucked from the general direction of the ether. That is, humans have maybe constructed around a billion different types of pens, pencils, toothbrushes, paperclips, plates, books[3], carpets, napkin rings, nails, grommets, metronomes, bottles, bottle-tops, small devices for the removal of stones from horses' hooves, shin-pads and mobile phones[4]. And, for the purposes of this essay, tea bags.

The interesting thing about this number is that, with almost any range of error bars that one wishes to add, it is much bigger than the number of biological species living today, much much bigger than the number of named fossil species and much much *much* bigger than the number of trace fossil species that have been recognized. And as these objects might be considered artefacts in archaeological terms, animal-made constructions biologically, and trace fossils to a palaeontologist, this is where our speculations might lead us in the general direction of taphonomy. A tea-bag, now, might represent only one amid a billion possibilities – but just how fossilizeable is it?

[1] One regrets that our present Parliamentary authorities have lost this fine sense of poetry.

[2] The gory details are in Zalasiewicz, J., Williams, M., Waters, C.N. *et alii.* 2017, Scale and diversity of the physical technosphere. *Anthropocene Review*, vol. **4** (**1**), pp. 9–22.

[3] This is the one object that anchors the whole exercise. Thanks to some assiduous and doubtless now exhausted Google employee, the number of published book titles (not just books) in the world in August 2010 was 129,864,880.

[4] These days, mobile phones are an automatic addition to any list of this kind. They have clearly become the Archetypal Contemporary Thing.

The devil, as ever, lies in the detail, and we might start with maximum simplicity. There is the tea, and there is the bag. We will omit, for now, and so as not to start a lifetime's endeavour, consideration of a possible additional string and paper tag, to be placed outside the rim of the cup[5], and studiously ignore those metallized plastic bags the teabags are packed into, and the cardboard carton that that is in turn placed within, and the plastic wrap which surrounds that, and… The horizon of tea-bag-related objects to be studiously ignored soon has us reaching the lower slopes of that billion-strong mountain of things. But let us keep focus.

The leaves are those of the tea plant, *Camellia sinensis*, an evergreen shrub. The name is appropriately quirky. It was none other than Carl Linnaeus who concocted *Camellia*, not after the well-known desert quadruped but after the Reverend Georg Kamel, Brno-born[6] in 1606, and variously and in part concurrently a pharmacist, apothecary, physician and Jesuit missionary in the Phillipines.

Kamel became a notable scholar of the natural history of the Phillippines, and a practical one too, setting up a botanical garden to help supply the local pharmacy and giving free treatment to the local people. His wide range of correspondents included the naturalist John Ray and the apothecary James Petiver. These, prominent members of the Royal Society, helped publish his works – following a little initial misfortune in having the first shipment of manuscripts being stolen by pirates – in that august body's *Philosophical Transactions*. The studies included '*A description of some coralls* [sic]*, and other curious submarines*', the splendidly utilitarian '*Phillipine shells, minerals and fossils*' that encompassed not just a description of such as *Nautilus* and *Murex*, but the advice that '*Lapis Frigidus* de Cananor' was 'Laudant contra Febres et Diarrheas', while '*Phillipine Monsters and Snakes: De monstris, quasi monstris et monstrosis; item de serpentibus etc.*' at my quick glance seems to deserve instant translation from its scholarly Latin into Hollywood blockbuster script. However, Kamel did not study the tea plant (Linnaeus was just being generally appreciative), nor was *Camellia* what Linnaeus thought of as a tea plant – which he had assigned to the genus *Thea*. It was only later that all *Thea* species were included into *Camellia*, which nevertheless stayed within the family Theaceae. It's nice to be reminded that the dark arts of taxonomy rarely fail to disappoint those properly appreciative of the most Byzantine of plotlines.

Be that as it may, *Camellia* is a plant native to East and Southeast Asia and the Indian Subcontinent. The legend that, more than four millennia ago, some of its leaves blew into, to be steeped within, the cauldron of Shennong (variously regarded as Chinese deity and/or mythical sage ruler, to whom has also been ascribed the invention of the ploughshare, hoe, irrigation, well-digging, acupuncture and the Chinese lunisolar calendar) and so made the first-ever brew-up is a lovely but improbable story. However, the earliest evidence of tea leaves as destined for teapot is still respectably old in human terms, from the second century BC, preserved in the mausoleum of the Emperor Han of Jing, whose regal life was quite as Byzantine as, and even more melodramatic than, the taxonomic history of *Camellia*. The earliest record of *Camellia* itself then goes back quite a bit before even the times of the multi-talented Shennong, with the recent discovery of *Camellia nanningensis* in late Oligocene strata of south China, a record that makes this genus yet more ancient than molecular dating had suggested[7]. Now, these fossils, and most

[5] Or, in my case, to invariably fall inside the cup and have to be fished, damply, out.

[6] Now, there's a finely anagrammatical coincidence.

[7] Huang, L-L, Jin, J-H, Quan, C & Oskolski, A.A. 2016. *Camellia nanningensis sp. nov.: the earliest fossil wood record of the genus Camellia (Theaceae) from East Asia. Journal of Plant Research* **129**, 823–831.

of the few other records of the Theaceae, seem to be by recognition of the characters of the fossil wood, and not by preservation of the leaves. Indeed, the only Theaceae fossil leaf that I have so far come across in my – be warned – highly dilettante background research, belongs to another genus of the family, *Stewartia submonodelpha*, from the Pliocene of Japan[8].

The tea plant thus is an impressively long-lived, but minor and rarely fossilized, element of Asian plant communities. Once the cup of tea was invented, *Camellia* became global. From Asia, cultivation of the plant has been spread as far as the Near East, Africa, the Americas, Tasmania, New Zealand – and even Vancouver Island and Scotland. And the leaves travel yet farther, to wherever humans have a wish, or need, to brew up. It is a most popular invasive species. But the tea leaves for the ordinary teapot, industrially dried, finely fragmented, are unlikely to become among the most distinctive of future fossils, despite their bulk, at now more than 5 million tons grown and distributed annually.

Then the teabag arrived.

The teabag dates back conceptually to the Chinese Tang dynasty of the 7th to 9th centuries AD, in terms of Western patents to the early 20th century, and in terms of mass production from about the mid-20th century. The UK took to this new device a little later than the USA – in my own childhood of the 1960s the custom of a spoon of tea for each person and one for the pot was still standard. But now teabags account for 96% of British tea drinking, a quiet revolution that might have the longest-reaching of consequences, for the teabag, unlike the unadorned leaf, has serious fossil potential.

A range of materials has been used for teabags, especially at the posher end of the market – nylon, silk and suchlike. But the ordinary teabag on the standard supermarket shelf is mostly made of bleached fibres of the abacá plant, *Musa textilis*, also called Manila hemp, a relative of the banana. It is native to the Phillipines, so was likely known to (and perhaps even studied by) Georg Kamel, as it had long been cultivated and harvested by native people for textile production. It was described and named, though, by Luis Née, a member of the Spanish Malaspina Expedition, in 1801.

Née's publications were one of the few results to emerge reasonably quickly from that expedition, a breathtaking five-year global circumnavigation which was no less impressive than that of Captain Cook's which had preceded it – or that of the *Beagle*, which was to follow. Alas, its impressively competent and honest leader, Alessandro Malaspina, made the mistake of taking part in an attempt to depose the corrupt and powerful Prime Minister, Godoy, on his return to Spain. The attempt failed, Malaspina was imprisoned, and the results of the expedition were only published in full between 1982 and 2005. Perhaps we should be thankful, for the general progress of our science, that neither Darwin nor Captain Fitzroy were similarly politically adventurous.

The abacá had been first discovered by Europeans as Magellan made landfall in the Phillipines in 1521, and by the time Luis Née was making his botanical studies, the properties of this silky, strong and durable fibre had begun a growing trade, mostly for rope, hammocks, canvas and fishing nets (it was resistant to salt water) – and hats. This use has now diminished, but abacá

[8] Tanai, T. 1976. The revision of the Pliocene Mogi flora. *Journal of the Faculty of Science, Hokkaido University. Series 4, Geology and Mineralogy* **17**(**2**), 277–346. Alas, the *Stewartia* leaves were unfigured.

remains in large demand – its production still employs one-and-a-half-million people in the Phillipines, and earns the country over a hundred million dollars annually. Demand exceeds supply (though the latter is threatened by the viruses that such monocultures encourage) but this time for fibres for tough, durable paper, for banknotes – and for teabags.

With all of these qualities, does *Musa textilis* have a fossil record? Well, not obviously as a species[9], but the genus *Musa* has a sparse fossil record, just sufficient to establish its origin by the Early Eocene and perhaps the Paleocene or even late Cretaceous of the Americas, while a likely relative, *Musopsis*, subsisted in the Arctic, then enjoying greenhouse warmth[10]. So, again, it seems to be a rarity, which turns up now and again, of interest to the specialist rather than for everyday biostratigraphy. The modern plant, though, as reconstituted to form an assemblage with the tea leaves, has an advantage. Reinforcement is now provided.

To help heat-seal those two sheets of paper together around the gram or two of tea leaves that make the soothing cuppa, around 20 percent of polypropylene or polyethylene terephthalate (PET) fibres are typically added to the mix. The resulting blend is notably indigestible to the average microbe, making manufacturers shy away from labelling such teabags as biodegradable. Quite how indigestible has been shown via the racking up of an impressive amount of taphonomic evidence in a beautifully serendipitous experiment carried out for quite different reasons.

'Simplify me when I'm dead' wrote Keith Douglas and, while this advice has not always been heeded by those who admire his (indeed, deceptively simple) poems, it rings true enough for the carbon cycle. Stratigraphers, now, tend to mull over the significance of wiggles in those blessedly one-dimensional carbon isotope profiles. But those looking at the mechanics of the process today have the whole intricate business to contend with, in real time and at various scales, on land and in the sea. On land a key question is how quickly organic matter is decomposed, releasing carbon dioxide and methane to the air, in soils and wetlands, and how quickly different types of organic matter break down. To do this, they used just to painstakingly construct 'litter bags' – home-made permeable bags containing organic stuff that's first weighed, then buried for a few months in different kinds of soil, dug out, then dried and weighed again. It's effective – but is a bit of a faff, and there are problems of inter-laboratory consistency.

And then came the teabag – a wonderfully prefabricated, uncomplicated *de facto* litter bag of (for any brand) standard weight and composition. Just take a handful of those and bury them in different soils, dig them out a few months later, and the loss of the organic matter – *i.e.* the tea leaves – through microbial breakdown is measured. The soil carbon community now has a growing number of tea bag enthusiasts, at the Smithsonian Institute and elsewhere, branching out into citizen science projects such as the marvellous Tea Bag Index of Utrecht University, where members of the public are encouraged to bury tea bags in their back gardens and report on what happens[11].

It's a lovely development in Earth System science. As a palaeontologist, though, I'm struck by the unspoken corollary. The tea is expected to decay away, the rate depending on flavour (Rooibos

[9] Note that the observations above about dilettantism still apply.

[10] Boyd, A. 1992. *Musopsis* n. gen.: A banana-like leaf genus from the early Tertiary of eastern North Greenland. *American Journal of Botany* **79**, 1359–1367.

[11] <**http://sercblog.si.edu/?p=6372**>

rots down more slowly than does green tea, for instance) – but the teabag is now empirically trusted to stay recalcitrant over several months in the microbe-laden ground to hold the whole experiment together. Quite how much longer it can resist the bugs is an intriguing question. Perhaps this cheerful bandwagon can be joined for some longer-term experiments, as the emergent community of teabag taphonomists joins the fray.

There's no shortage of material to work with. The number of teabags brewed and discarded each year just in the UK now exceeds 55 billion[12], or about a thousand per person per year; averaged over the land area, that's about one tea bag per four square metres per year. So averaged, it would provide the most magnificent soil carbon experiment of all time but, alas for such a vision, most post-brew discards go straight into the bin and then into those many growing lagerstätten of teabags (and much else) – our landfill sites – where the taphonomic patterns are likely to have their very own intricacies.

Teabags are just one in a billion, with a brief past but, just perhaps, a long future. The trappings of tea in this way perhaps symbolize another kind of growing revolution, one quite different from that initiated in Boston Harbour and still echoing today. It might even take us to another kind of planet. Let us hope we can still peacefully enjoy it, mug of tea – of course – in hand.

Jan Zalasiewicz
University of Leicester

Dinosaurs of China: Ground Shakers to Feathered Flyers

Spectacular fossil discoveries in China over the last 20 years have drastically changed our understanding of dinosaur appearance, evolution and behaviour. Although many dinosaurs were large and scaly, this view has become part of a more diverse picture. Many dinosaurs were tiny, some had feathers, and certain feathered flyers evolved into birds. A world exclusive exhibition of 26 dinosaur skeletons and real fossils from China, coming to Nottingham in 2017, will provide visitors with the opportunity to see the fossil evidence with their own eyes.

Why Nottingham?

Dinosaurs of China has been developed and curated over several years by Dr Wang Qi, Assistant Professor of Architecture in the Department of Architecture and Built Environment at the University of Nottingham, and myself as Curator of Natural Sciences at the Nottingham Natural History Museum, Wollaton Hall. Dr Wang Qi first developed links with the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP) in China in 2011, through his research on spatial exhibition narrative as a means to enhance visitor experience. This connection, together with Wang Qi's passion to bring an exhibition of Chinese feathered dinosaurs to Nottingham, got the project off to a flying start.

[12] <**http://www.dailymail.co.uk/sciencetech/article-2353193/The-new-enemy-planet-As-new-Bank-England-chiefs-wife-attacks-humble-tea-bags-really-doing-untold-damage.html**>

I began working closely with Wang Qi when it was agreed that the exhibition would be co-hosted by Wollaton Hall and Nottingham Lakeside Arts. I've outlined the palaeontological highlights and history of the Nottingham Natural History Museum in a previous PalAss newsletter (number 88). The Museum's 750,000 specimens include many taxidermy birds and fossil reptiles, so Wollaton Hall is a fitting venue for the main *Dinosaurs of China* exhibition, which tells the story of how dinosaurs evolved into birds.

The University of Nottingham's Lakeside Arts delivers an annual programme of exhibitions and events across the visual, performing and participatory arts. This is why the theme of the *Dinosaurs of China* exhibition at Lakeside is on the science of bringing dinosaurs to life in palaeo-art, a story heavily impacted by the discovery of feathered dinosaurs in China.

Where are the dinosaurs coming from?

Most of the specimens in the *Dinosaurs of China* exhibition are on loan from IVPP, including two real holotype specimens. An additional star of the exhibition (*Gigantoraptor*) is on loan from the Longhao Institute of Geology and Paleontology in Inner Mongolia. This will be the first time many of these specimens have been displayed outside of Asia. The exhibition contains nine mounted dinosaur skeletons (casts), eight real fossils including feathered dinosaurs and birds, and nine detailed fossil replicas. The dinosaurs were packed in crates in China and transported together across the globe in a single shipping container. Technicians from the IVPP were sent to meet and unpack the crates upon their arrival at Wollaton Hall, and to erect the skeletons and install the fossils. Fabricators and printers were contracted in the UK to build and install the exhibition cases and graphics, and the curators worked closely with a freelance designer to plan the exhibition. The exhibition was made possible with funding from Arts Council England, the University of Nottingham, and several sponsors.

What is the exhibition about?

Designing a large dinosaur exhibition inside an Elizabethan Mansion dating to 1588 was a particular challenge. However, we were able to devise a route through the complicated building to interpret the dinosaurs in three key linear narratives: evolution, discovery, and stratigraphy. These stories are told in parallel across four separate galleries in the Museum. The key theme of dinosaur evolution begins with a focus on scaly 'ground shakers' in the spectacular central Great Hall, and comes to an end with 'feathered flyers' on the balcony overlooking (and being overlooked by) their giant ancestors. The exhibits are also ordered to mirror the timeline of palaeontological discovery in China over the decades. For example, the exhibition begins with the very first dinosaur studied and mounted by Chinese palaeontologists and ends with a new dinosaur named in 2015. These first two narratives are supported by an in-built trail of 20 facts distributed across the exhibition, which encourage visitors to collect the evidence that connects dinosaurs and birds. This takes the form of comparative anatomy of bones, observing behaviour in the fossil record, and the "smoking gun" – dinosaurs with feathers preserved.

Lastly, a stratigraphic narrative threads its way through the galleries. This starts in the Great Hall which presents dinosaurs mostly from the Jurassic Period, while later sections focus on dinosaurs (including birds) from the Cretaceous Period.

Not all of the dinosaurs are behind barriers. A huge sauropod femur is on open display to be handled and to measure one's height against, while a 'Dino Explorer Zone' will provide a range of dinosaur-themed activities and handling objects.

At Nottingham Lakeside Arts the exhibition is about palaeo-art. In particular, it explores how the depiction of prehistoric life in paintings, sculptures and movies has changed over the decades to reflect the palaeontology of its time. This is why one of the two Chinese dinosaur skeletons on display at Lakeside Arts is a star of *Jurassic Park*.

Which dinosaurs of China?

Here are a few of the dinosaurs you can expect to see…

Ground shakers

The long-necked plant-eating *Mamenchisaurus* was a true ground shaker. At 23 metres long from head to tail, its skeleton was too large to fit inside the Museum in a typical four-legged walking pose. Therefore, it was specially constructed in a dramatic rearing posture to fit inside the building. At 13.5 metres high it is the tallest dinosaur skeleton ever displayed in the UK, higher than three double-decker buses. Although *Mamenchisaurus* was scaly, many dinosaurs had plumage…

Feathered dinosaurs

Bones and eggs become fossils relatively easily because they are hard. Soft parts like skin and muscles are preserved only under special conditions. In Liaoning Province in north-eastern China during the Cretaceous Period, *ca*.125 million years ago, volcanic activity preserved an entire ecosystem (the Jehol biota) in fine ash. The description of the first feathered dinosaur from these deposits in 1996, *Sinosauropteryx,* began a revolution in dinosaur studies. The *Sinosauropteryx* fossil in the exhibition preserves the remains of soft tissues and the consensus is that these are the remains of downy feathers. It may have used these for thermoregulation or display.

Four-winged flyer

In addition to 'fuzzy' dinosaurs, some of the species from Liaoning have definitive bird-like feathers. The stunning *Microraptor gui* fossil in the exhibition is the holotype of its species, named in 2003. It has claws on its hands and feet, a long bony tail, and teeth, all dinosaur characteristics. However, the fossil also has long feathers on its arms, legs and tail, so *Microraptor* had four wings and was capable of gliding. As a member of the Dromaeosauridae or 'raptor' family, it is a close relative of the famous *Velociraptor*.

Largest bird-like dinosaur in the world

Gigantoraptor is from the Late Cretaceous of Inner Mongolia, northern China, and was about as tall as a giraffe. Described in 2007, this is the first time it has been displayed outside of Asia. *Gigantoraptor* had a relatively short tail, long neck, long arms and legs, and was covered with bird-like feathers. Only the bones of *Gigantoraptor* are known, but bird-like feathers are preserved in other oviraptorosaurs. A real feathered fossil of *Caudipteryx* – the holotype specimen of *C. dongi* – reinforces this message in the exhibition. *Gigantoraptor* was too heavy to fly and may have used its feathers for courtship displays.

The Exhibition

Dinosaurs of China: Ground Shakers to Feathered Flyers runs from 1 July to 29 October 2017. The main exhibition is hosted by the Nottingham Natural History Museum at Wollaton Hall, while a complementary exhibition about palaeo-art is based at Nottingham Lakeside Arts on the University of Nottingham campus. For details visit <**www.dinosaursofchina.co.uk**>.

Adam S. Smith
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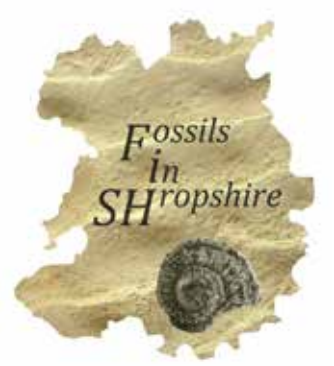
Fossils in Shropshire

Ludlow Museum Resource Centre looks after Shropshire's geological, biological and historical museum collections. It shares a building with the town's library and is not far from the site of the famous Ludlow Bone Bed. The town museum was founded in 1833 by the Ludlow Natural History Society whose members were inspired by Murchison – who came to the area when working on the then-named Silurian System. The Friends of Ludlow Museum support both the Resource Centre and the museum in town through fundraising and voluntary work, and in 2015 the Friends secured a substantial grant to digitize the geology collections with particular focus on their exceptional fossils.



The *Fossils in Shropshire*, or FiSH, project is being run in association with the Natural History Museum. It aims to digitize and catalogue the most important objects from the Shropshire collections. Specimens of particular interest are being selected for high-resolution photography and 3D imaging suitable for research. The goal of this work is to improve access and awareness of the collections amongst both the general public and the academic community.

The collection contains many interesting and important specimens including type material and samples from the Ludlow Bone Bed, which is no longer visible in the field. There is a significant amount of material from the type localities for both the Ludlow and Wenlock epochs of the Silurian; the collection of cephalopods from those epochs is second only to that at the Natural History Museum. The Shropshire collections also include the famous Shropshire Mammoth, as featured on Channel 4's *Walking Through Time*, and a collection of mammalian fossils from the Siwalik Hills of India.

So far the entire collections have been surveyed to produce a database of their contents. The county collections were merged only recently so it was important to produce a complete and consistent record. Photography equipment is in place and high-resolution, vertically-stacked

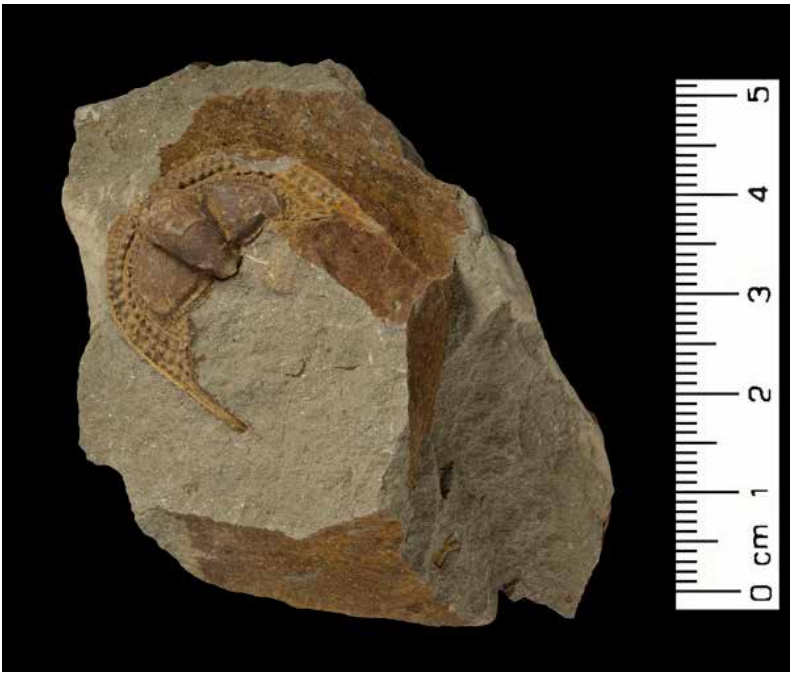
and 3D images are being produced. At the time of writing the first batch of images and records have just been made live on the Natural History Museum's Data Portal (<**http://dx.doi.org/10.5519/0015223**>).

The eventual aim is to have all the digitized material hosted on both the Natural History Museum's portal and Shropshire's own collections database, which is due for an overhaul in the near future. The type specimens will also be hosted through the GB3D programme run by the British Geological Survey. As well as this improved digital access, the project aims to have a series of exhibitions and events showcasing the collections and research on the local geology.

The project is currently looking for more volunteers, particularly those who could help with image processing.

To get in touch or to find out more about the project go to <**http://fishproject2020.wixsite.com/news**> or e-mail <**enquiries.fossilsinshropshire@gmail.com**>.

Gregory Phillpots
FiSH volunteer, Shropshire Museum



>>***Future*** Meetings of Other Bodies

6th International Conference on Trilobites and their Relatives
Tallinn, Estonia *7 – 10 July 2017*

We are pleased to invite all specialists on trilobites and related arthropods to attend the 6th International Conference on Trilobites and their Relatives. The goal of the Conference is to present and discuss recent progress in studies on all aspects of trilobites and their relatives (*e.g.* morphology, evolution, phylogeny, ecology, geography). We will have two full days of scientific sessions, and accompanying persons are invited to enjoy a parallel programme regarding the history and culture of Estonia. The pre- and post-conference field trips will examine trilobite-bearing rocks from the lower Cambrian to upper Silurian.

Please see the conference website for details: <**http://trilobite-conference.com/**>.

International Workshop on Konservat-Lagerstätten
University College Cork, Ireland *15 – 16 July 2017*

Konservat-Lagerstätten are widely recognized as essential archives of palaeobiological information. Research in the field is accelerating rapidly and becoming increasingly multidisciplinary, with the integration of new methodological approaches, new fossil discoveries, and refinement of current methods. This workshop will explore frontier research on Konservat-Lagerstätten and will bring together experts in imaging, chemical analysis, organismal palaeobiology, sedimentological analysis and experimental taphonomy. The intended audience is a mixture of professional researchers, postdoctoral researchers, and PhD and MSc students in palaeontology. Contributions are welcome on any aspect of the palaeobiology, taphonomy, and sedimentological context of Konservat-Lagerstätten, including palaeoecology, geochemistry, morphology, evolution, taphonomic experiments, stratigraphy, sedimentology and new fossil discoveries. There is a fantastic line-up of invited speakers for both days of the meeting, with an exciting social programme.

Please see the website for more details: <**http://lagerstaetten.ucc.ie**>.

DINO11: 11th International Conference on Modern and Fossil Dinoflagellates
EPOC Laboratory, Bordeaux University, France *17 – 21 July 2017*

The scientific programme will be devoted to the latest developments in studies of living and fossil dinoflagellates, which are one of the most important groups of planktonic and benthic marine microalgae, and, as such, of interest in both biology and geology. In keeping with the tradition of this conference series, the programme of this meeting (held only every 3–5 years) will consist of oral presentations based on talks and posters selected from the submitted abstracts, supplemented by a small number of invited and keynote talks. Please see the website for more details: <**http://www.laplf.org/dino11/calquedino11.htm**>.

15th Annual Meeting of the European Association of Vertebrate Palaeontologists (EAVP)
Ludwig-Maximilians-Universität München, Germany *1 – 3 August 2017*

The EAVP annual international meetings promote an interchange of research in all subfields of vertebrate palaeontology in a European location. A major focus is the fostering of international collaboration, paying great attention to the encouragement and assistance of students to become part of projects and develop into future vertebrate palaeontologists. The 15th annual meeting of the EAVP will be held in Munich, Germany, at the Palaeontological Museum hosted by the GeoBio-Center of the Ludwig-Maximilians-Universität München. Pre-meeting workshops as well as a two-day field trip will frame the event. Munich provides a unique conference environment due to over 200 years of research on vertebrate palaeontology at the Ludwig-Maximilians-Universität München and the Bavarian State Collections of Natural History.

Please find further information at <**www.lmu.de/eavp2017**>.

7th International Meeting on Mesozoic Fishes
Mahasarakham University, Thailand *1 – 7 August 2017*

The Palaeontological Research and Education Centre in cooperation with the Faculty of Science of the Mahasarakham University (Thailand), the University Claude Bernard Lyon1 (France), and the Natural History Museum of Geneva (Switzerland) are pleased to announce and host the 7th International Meeting on Mesozoic Fishes. The Meeting will reflect progress in Mesozoic fish research during the 24 years since the first meeting in 1993. The Meeting will include discussions of old and new methodologies and will showcase novel information regarding the evolution, diversification and palaeobiogeography of fishes during the Mesozoic. A three-day field-trip is planned to several fish localities of the Khorat plateau in the Isan region in the north-eastern part of Thailand, and will include a visit to the Siridhorn Palaeontological Museum.

Please see the website for more details: <**https://immf7.msu.ac.th/**>.

77th Society of Vertebrate Paleontology Annual Meeting (SVP)
Calgary Telus Convention Centre, Canada *23 – 26 August 2017*

Each year, vertebrate palaeontologists, preparators, writers, artists and enthusiasts convene to share the latest research, attend workshops and field-trips, and meet new fossil fans as well as old friends. It's the world's foremost forum on vertebrate palaeontology, usually referred to simply as 'SVP'. The 77th Annual Meeting of the Society of Vertebrate Paleontology will be held in Calgary, Alberta, Canada.

Visit <**www.vertpaleo.org**> for up-to-date meeting information.

International Workshop on Evolution of Cambrian Arthropods
Xi'an, China *1 – 6 September 2017*

Cambrian Burgess Shale-type fossil Lagerstätten are renowned for providing the best evidence of the Cambrian explosion and have provided major contributions to our knowledge of early arthropods. Indeed, much excellent work on the evolution of Cambrian arthropods has been produced by colleagues in the last decade. This workshop will be focused on recent rapid advances in our understanding of the taxonomy, ontogeny and phylogeny of Cambrian arthropods, and will hopefully prompt us to extend coverage even more widely to encompass additional topics. A post-conference field excursion to the Chengjiang Lagerstätte, as well as the Precambrian–Cambrian boundary at Meishucun, Jinning, Yunnan is under consideration, depending on the number of interested participants.

Contact the organizers for more information: Dr Dongjing Fu, e-mail <**djfu@nwu.edu.cn**>.

The Old Red: Hugh Miller's Geological Legacy
Victoria Hall, Cromarty, UK *9 – 10 September 2017*

The Friends of Hugh Miller are organizing a 'legacy' conference aimed at the international geological and palaeontological community, and all who have a general interest in Hugh Miller, fossils and the natural world. A keynote speaker will be John Long, Strategic Professor in Palaeontology, from Flinders University, Australia. The scientific programme includes a three-day field-trip to the north of Scotland Jurassic beds, with special permission to explore the famous fish fossil locality in Caithness. Numbers are limited so please book early.

For further information and booking form please see the website:
<**http://www.thefriendsofhughmiller.org.uk/index.asp?pageid=661915**>.

65th Annual Symposium of Vertebrate Palaeontology and Comparative Anatomy & 26th Symposium of Palaeontological Preparation and Conservation with the Geological Curators' Group (SVPCA and SPPC/GCG)
University of Birmingham, UK *12 – 15 September 2017*

SVPCA is a meeting for current research in vertebrate palaeontology and comparative vertebrate anatomy, and has been held annually in the UK, Ireland or France since 1953. The meeting is held in conjunction with SPPC, a forum for discussion of fossil preparation, conservation and related topics co-organized with the Geological Curator's Group. The 2017 SVPCA and SPPC meetings will be held at the University of Birmingham, in collaboration with the Lapworth Museum of Geology (shortlisted Art Fund Museum of the Year 2017). The meetings will take place from Tuesday 12th to Thursday 14th September, with a field-trip on Friday 15th. This will be the first time in its 65-year history that SVPCA has come to Birmingham, and the organizers look forward to welcoming you.

Please see the website for details: <**https://svpca2017.com/**>.

8th International Meeting on Taphonomy and Fossilization (Taphos2017)
University of Vienna, Austria *14 – 17 September 2017*

Every few years Taphos brings together palaeontologists, archaeologists, biologists and sedimentologists as well as other researchers interested in all of aspects of taphonomy, the study of decay and fossilization of organisms. Previous Taphos meetings have been held in Madrid 1990, Zaragoza 1995, Valencia 2002, Barcelona 2005, Granada 2008, Tübingen 2011 and Ferrara 2014. The upcoming Conference will take place at the University of Vienna (Geocenter, UZA II building). Vienna is the capital of Austria and located in the heart of Europe. It can easily be reached from almost all parts of the world and is famous for its culture and friendly atmosphere. Contributions to all aspects of taphonomy from across the tree of life are welcome and may include biostratinomy, fossil diagenesis, taphofacies, exceptional preservation and fossil Lagerstätten, taphonomy and sequence stratigraphy, microbial taphonomy, archaeology, historical ecology and conservation palaeobiology. Please see the website for more details: <**https://taphos2017.univie.ac.at/home/**>.

First workshop on Actualistic Taphonomy in South America (TAAS)
Universidad de la República, Uruguay *9 – 11 October 2017*

A key to understanding the taphonomy of ancient deposits is the observation of present physical-chemical and biological processes concerning potential future fossils. The workshop is intended for palaeontologists, sedimentologists, archaeologists and other researchers interested in these fossiliferous deposit-forming processes. The First Workshop on Actualistic Taphonomy in South America will be held in Montevideo. The proposed format is that of a workshop *sensu stricto*, *i.e.* a small meeting of a group of researchers with a common interest. Presentations and abstracts may cover any aspect concerning actualistic taphonomy in South America and can be in Spanish, Portuguese or English. Registration is now open.

Please see the website for more information: <**https://wtaas2017.wixsite.com/taas/home**>.

Lyell Meeting 2018: Mass extinctions – understanding the world's worst crises
Burlington House, London, UK *7 March 2018*

The 2018 Lyell Meeting aims to highlight advances in understanding the great environmental catastrophes of the Phanerozoic using atmospheric modelling, high-precision age dating, volcanology, geochemistry, stratigraphy and palaeontology. The meeting provides a platform to assess the current stratigraphic and geochemical records of environmental change during mass extinction events and the role of atmospheric climate modelling in understanding the causes of the crises. The goal is to evaluate the relative importance of environmental changes in major episodes of species extinctions, and to further explore the mechanisms that link these proximal kill mechanisms to the ultimate drivers, such as large igneous province eruptions and meteorite impacts. Keynote Speakers: Prof Mike Benton (University of Bristol); Dr Sofie Lindström (Geological Survey of Denmark and Greenland). Conveners: Paul Wignall (University of Leeds, UK), David Bond

(University of Hull, UK). Oral and poster abstract submissions should be sent in a Word document to Naomi Newbold by 1st December 2017. For further information please contact Naomi Newbold (e-mail <**naomi.newbold@geolsoc.org.uk**>) or see <**https://www.geolsoc.org.uk/lyell18**>.

5th International Palaeontological Congress (IPC5)
Paris, France *9 – 13 July 2018*

The IPC is organized every four years under the auspices of the International Palaeontological Association (<**www.ipa-assoc.org**>). After Sydney (Australia) in 2002, Beijing (China) in 2006, London (UK) in 2010 and Mendoza (Argentina) in 2014, it will convene in Paris (France). On behalf of the Organizing Committee, we are particularly pleased to invite you to France for "the Fossil week", the fifth edition of the International Palaeontological Congress. This event is a unique opportunity for our community to present its new results and discuss all aspects of our discipline. Field-trips are planned before and after the Congress throughout France, Belgium and Italy. They will give you the opportunity to discover our palaeontological, geological and gastronomic heritage. The organizers hope to welcome many of you in France in 2018. Travel grants will be available to student members of PalAss; with information on <**www.palass.org**> in due course.

Registration opens on 1st September 2017. See the website: <**https://ipc5.sciencesconf.org/**>.

10th European Palaeobotany & Palynology Conference (EPPC)
University College Dublin, Ireland *12 – 17 August 2018*

The organization committee would like to extend a warm welcome and invite you to Dublin in August 2018 to attend the 10th EPPC. The disciplines of palaeobotany and palynology are integrative and multidisciplinary by nature. As a community we are constantly seeking new tools and techniques to answer both long-standing and new questions. Palaeobotanists and palynologists demonstrate a strong history of partnership with disciplines that are outside our core biological and geological fields of research, such as with chemistry, physics, maths and computer science. Our community have been early adopters of state-of-the-art technology in visualization, experimentation and chemical analyses to name but a few.

The theme for EPPC 2018 is 'A Multidisciplinary Science', and seeks to highlight multi- and inter-disciplinarity in palaeobotanical and palynological research, past, present and future. We aim to showcase disciplinary diversity in palaeobotanical and palynological research through themed and open sessions, via demonstrations of new technology platforms in a dedicated exhibition space and during post-conference field excursions. See the website for more details: <**http://eppc2018.ie/**>.

Please help us to help you! Send announcements of forthcoming meetings to <**newsletter@palass.org**>.

Meeting REPORTS

European Geosciences Union (EGU) General Assembly 2017
Vienna, Austria *23 – 28 April 2017*

Palaeontology does not always come to mind when musing on the larger, multi-disciplinary conferences, but this has changed over the past couple of years, at least for the Annual Meeting of the European Geosciences Union – in large part thanks to the efforts of the Palaeontological Association. This year's EGU meeting delighted fossil enthusiasts during the early part of the week-long meeting with three fascinating palaeontological sessions, one of which, "Experimental and Analytical Palaeontology", was sponsored by the PalAss.

EGU's palaeontology theme kicked off on Monday afternoon with "Integration of geological and biological processes using fossils to understand the evolution of terrestrial and marine ecosystems." The opening talk by **Michal Kowalewski** set the tone for the session, with the application of some heavily analytical biostratigraphical techniques to assess the biological and stratigraphic determinants of fossil abundance in Late Quaternary deposits from Italy. The session also featured interesting talks from **Silvia Danise** and **Adam Tomasovych** on Jurassic marine palaeoecology and the use of biostratigraphic mixing to detect the periodicity of hypoxic events in the Adriatic Sea, respectively. The talks segment of this session was followed immediately by the accompanying poster session, which was the subject of a very unfortunate timetable clash with the talks for the PalAss-sponsored session on "Experimental and Analytical Palaeontology", depriving both sessions of potential audience members and the latter of some potentially excellent palaeontological posters (and beer)!

Despite this, the session on "Experimental and Analytical Palaeontology" was very well attended. All speakers were asked probing questions, and all gave clear and insightful answers – a model for a successful session!

The session featured three palaeobotany talks, all co-authored by **Barry Lomax** of the University of Nottingham. The first, presented by Dr Lomax, reported the results of plant growth experiments investigating links between genome size and ecophysiology, and the ability of plants to acclimatize to varying CO_2 conditions. Next, Dr **Wesley Fraser** presented the potential of a recently-developed spore- and pollen chemistry-based proxy for UV irradiance to inform on orbital precessional cycles over the past *c.* 100ka in sediments from a Ghanaian lake. Finally, Dr **Fiona Gill** took a slightly different tack, presenting experimental data using potential sauropodian food plants, suggesting that the energy budget of large herbivorous dinosaurs was independent of atmospheric CO_2.

Delegates were also treated to two talks on experimental and analytical taphonomy. **Thomas Clements**, the only PhD student to give an oral presentation at this session, presented an analysis of the mode of preservation of various morphological characters in different taxa from the Mazon Creek biota in order to constrain the taphonomic biases operating over this crucially important fossil deposit. Dr **Maria McNamara** gave a typically fascinating presentation on work from her Fossil Colour group, demonstrating the importance of differentiating integumentary from

non-integumentary melanosomes in interpreting the colour of fossil vertebrates, and consequently on palaeobiological inferences based on colour patterning. Finally, Dr **Alex Dunhill** presented an analysis of the relative impact of environmental and biological factors on survivorship during the Late Triassic mass extinction and demonstrated that reef organisms, and highly motile or non-motile organisms, were least likely to survive.

Immediately following the talks, we moved downstairs to a diverse and truly international poster session, with presentations on various topics that included ocean anoxia in the Hirnantian, pterosaur diets, Indian archosauriforms and the evolution of conodonts. The session then reconvened informally at a local restaurant, where scientific discussion continued over some excellent Austrian beer.

On Tuesday, EGU attendees were treated to a full day on disasters and crises, with a session on "Mass Extinctions, Volcanism, Impacts, and Catastrophic Environmental Changes: Observations and Processes", convened by **Thierry Adatte** and colleagues. The session opened with an account of widespread Proterozoic glaciation by **Hugh Rice** before we travelled forwards through time for an excellent summary of the link between Large Igneous Province (LIP) eruptions and mass extinction in the Middle Permian with **David Bond**. This was followed by several talks about volcanic-induced crises during the Permian and Jurassic before we were indulged by two of this year's EGU medal winners: Dr **Yadong Sun** (who received the Arne Richter Award for Outstanding Early Career Scientist) and Prof. **Paul Wignall** (who received the Jean Baptiste Lamarck Medal). Yadong Sun talked about climatic change and global warming across the End Permian mass extinction before Paul Wignall provided a wonderful summary of the causes, dynamics and effects of the Pangaean extinctions. After lunch there was a plethora of interesting talks, from mercury anomalies to ecosystem collapses, culminating with the "Great Debate on Great Extinctions", which pitted advocates of volcanic-induced catastrophe mechanisms against those favouring extra-terrestrial impactors. By all accounts, the "impactors" somewhat surprisingly came out on top courtesy of Prof. Wignall's excellent display of devil's advocacy (as, in reality, he is firmly in the volcanic camp). The day concluded with an excellent poster session followed by a mass extinction-themed dinner where we did our best to cause a mass extinction of Austrian pigs (judging by the popularity of the rib dish).

It was a rare treat to see such a diversity of talks in a single session; at such large conferences there are usually frustrating clashes. The PalAss has committed to continuing its support for palaeontological sessions at EGU and all we now require is a higher level of session participation and conference attendance, especially by postgraduate students. EGU is a fantastic meeting that has the potential to become a key European palaeobiological meeting, much as GSA has become in the USA. The presence of palaeontologists from so many fields brings together diverse perspectives and makes for excellent questions and discussion, as each brought unique perspectives. We therefore urge all able PalAss members to attend the conference next year and to encourage their students to attend and submit abstracts. Financial support has been provided by the PalAss to presenters at the PalAss-sponsored sessions, both this year and in 2016. Only by greater participation can we make "palaeontology at EGU" a success. Hopefully future EGUs will be attended by more graduate students – something in which this large conference lags behind our well-loved Association annual meetings.

Alex Dunhill
University of Leeds

Charlotte Kenchington
Memorial University of Newfoundland

Lyme Regis Fossil Festival 2017
Lyme Regis *28 – 30 April 2017*

Marquees, banners flapping in the wind and an Iguanodon Restaurant? Signs that the Fossil Festival had descended upon Lyme Regis. Once again this picturesque town, steeped in palaeontological history, became home to museums, collectors, societies, and passionate palaeontologists of all ages.

The intent to enthuse was certainly evident in all of the stalls throughout the town, encouraging people not only to explore palaeontology but also to wander through Lyme Regis. The Festival wasn't confined only to stalls, however, as guided walks along the famous fossil-filled coastline were touted along with 'meet the engineer' walks.

The Hub was home to The Natural History Museum and The Micropalaeontological Society. The NHM had a wide variety of activities ranging from a desktop SEM to an exciting game of extinction Kerplunk! The Micropalaeontological Society allowed people to pick their own foraminifera and mount them on a slide, which they could then take home and display proudly.

The Oxford Museum of Natural History showcased some stunning fossils from their collections and hyena artefacts associated with Reverend William Buckland. The Reverend also cropped up elsewhere during the Festival, *e.g.* eating his way through the animal kingdom in Emerald Ant's street theatre production, *i.e.*, the *Iguanodon* Restaurant (Figure 1). This is based on the famous New Year's Eve dinner that took place in an incomplete *Iguanodon* model destined for Crystal Palace Park. The production began with Lyme Regis' local heroine Mary Anning and saw the colourful characters of Gideon Mantell, Georges Cuvier, Reverend William Buckland and the marvellously depicted, villainous, Sir Richard Owen making life-changing discoveries. It was an utterly delightful educational performance that children and adults alike enjoyed immensely.

Figure 1. The Iguanodon Restaurant by Emerald Ant

This year the Festival also saw an enlightening crowd-funded exhibition by Trowelblazers and photographer Leonora Saunders called "*Raising Horizons: 200 years of Trowelblazing Women*". This exhibition featured 14 modern female geoscientists and archaeologists, photographed not as themselves but as their historic counterparts, accompanied by biographies on all of the women's research (see the item on 'Raising Horizons' in *Newsletter* **94**). This allowed the audience to contemplate the exciting yet complicated history of women in science and of modern-day role models.

These day-time activities were supplemented by a series of interesting evening talks by speakers such as **Dean Lomax** on the dinosaurs and ichthyosaurs of Britain and Dr **Huw Griffiths** and **Hilary Blagborough** of The British Antarctic Survey on the forces that shaped the evolution of Antarctica.

The Palaeontological Association's stand was located in a vibrant marquee, where visitors were greeted by the toothy grin of Dinosaur Isle's raptor replica and the RSPB. The Friday was dedicated to local schools; the children faced the prospect of becoming a fossil themselves by playing a fossilization game (created by The National Museum Wales), in which the ultimate goal is to transform from a Jurassic marine beast to a fossil in a museum (Figure 2). However, as many frustrated children discovered, becoming a fossil was not easy, and many faced the perils of being eaten, melted by metamorphism or broken by the collector! After all the drama of the fossilization game, the children could make their own fossil mould or footprint by pressing real fossils or plastic dinosaur feet into salt dough, with clear favourites being ammonites and *Baryonyx* feet. The PalAss volunteer army (Lucy McCobb, Caroline Buttler, Jake Morton, Jordan Bestwick, Jed Atkinson, Jo Hellawell and I) fielded questions on diverse topics.

Figure 2. Caroline Buttler from The National Museum of Wales playing the fossilisation game with local school children.

Saturday and Sunday saw the addition of the exceptionally talented palaeoartist James McKay, who delighted everyone present by painting various creations and chimeras of different animals (including visitors' personalized etymology). For some visitors, James painted their favourite prehistoric creature from the UK.

This was my first time volunteering for the PalAss and at the Lyme Regis Fossil Festival. It was an incredibly enjoyable experience and I found myself absorbing lots of new information along with the visiting public!

Emily Roberts
University of Portsmouth

Progressive Palaeontology 2017
University of Leicester, Leicester, UK *1 – 3 June 2017*

The New Walk Museum and University of Leicester Geology department provided a perfect setting for the Conference that was an overwhelming success and thoroughly enjoyed by all attendees.

The Conference kicked off with two useful workshops. Firstly, the statistics of hypothesis testing in palaeontology were introduced by Prof. **Mark Purnell** and Dr **Duncan Murdock**. For those unfamiliar with statistics, the workshop provided a perfect introduction and useful overview of the subject. The statistics were followed by an informative guide to the peer review process led by Dr **Sally Thomas** and Prof. **Sarah Gabbott**. This workshop has been reviewed as "fantastic" with attendees commenting on how useful they found the advice on navigating journal submissions and peer reviews.

Most delegates had arrived in Leicester by the evening and the weather had turned hot. Very hot. Luckily the evening ice breaker was next and turned out to be one of the best in recent years. The very professional bar was well stocked with a wide selection of real ale, and, most importantly

Photo: Tom Fletcher.

(considering the weather) chilled wine, lager and soft drinks. The New Walk Museum and Art Gallery played host to the event, providing an excellent atmosphere for delegates to meet whilst perusing the fossils on display. Fittingly, the fossil gallery contains the only portrait of Sir David Attenborough (an inspiration to us all), his 90th birthday portrait.

The Department of Geology hosted the oral and poster presentations the following day. This year, the audience consisted of 97 delegates, including delegates from Belgium, Germany, the Republic of Ireland, Russia, Hungary and Australia. Also present was a representative of the 1851 Fellowship (Russell Garwood) and members of Palaeocast. Palaeocast were kind enough to live-stream the Conference and will make the talks available on their website in the near future (<**http://www.palaeocast.com**>).

The day consisted of four sessions; each session consisted of a series of 'full' 12-minute talks followed by a series of lightning talks. The topics were wide-ranging, spanning the Cambrian to the modern day and included topics such as palaeoecology, taphonomy, phylogeny, biomechanics and extinction events. The prize-winning talks this year came from **Virginia Harvey** (Investigating species identity and chronological frameworks using mass spectrometry on ancient collagen (full talk)) and **Killian Eichanseer** (Fickle oceans – the influence of temperature and Mg/Ca ratio on marine calcifers (lightning talk)). A special mention has to go to **Dave Marshall** who presented a very memorable talk on eurypterids with hand-drawn slides!

Tea, coffee and a wide array of light bites provided the perfect accompaniment for the poster session, which took place alongside lunch and throughout the afternoon break. Again, the posters represented a variety of interesting topics. This year, the best poster was awarded to **Emily Brown** for her poster "Quantifying the completeness of the bat (Mammalia: Chiroptera) fossil record between the Eocene and Miocene".

Prof. Mark Williams leading the field-trip. Photo: Aqqid Saparin.

The meal and auction rounded off Friday perfectly. After filling up on tasty Indian food from Everest Dine, the auction commenced under the authoritative, but hilarious gavel of **Thomas Clements** (University of Leicester) and **Andrew Jones** (University of Birmingham). The auction items this year included several professional 3D prints, books, items from co-chair Jordan Bestwick's personal dinosaur collection, and a star item of a 3D printed Tiktaalik. All proceeds from the auction – £821 this year! – will go towards next year's ProgPal travel grants.

Very early on Saturday morning, delegates headed out to Ludlow for the field-trip "A Silurian Saunter". Led by Leicester's Prof. **Mark Williams**, the trip allowed delegates to take in many localities within the Ludlow anticline, including the famous Ludlow Bone Bed. The delegates had the chance to collect shelly fauna and graptolites.

On behalf of all the delegates who attended this year's ProgPal, I'd like to thank Leicester's committee for its hard work. The Conference was a great experience; I had a fantastic time and learned an awful lot. We are very much looking forward to hosting the conference in Manchester next year and hope to maintain the high standard set by Leicester. ProgPal 2017 will be a hard act to follow!

Elspeth Wallace
University of Manchester

——OBITUARY——
Arthur J. ('Art') Boucot 1924 – 2017

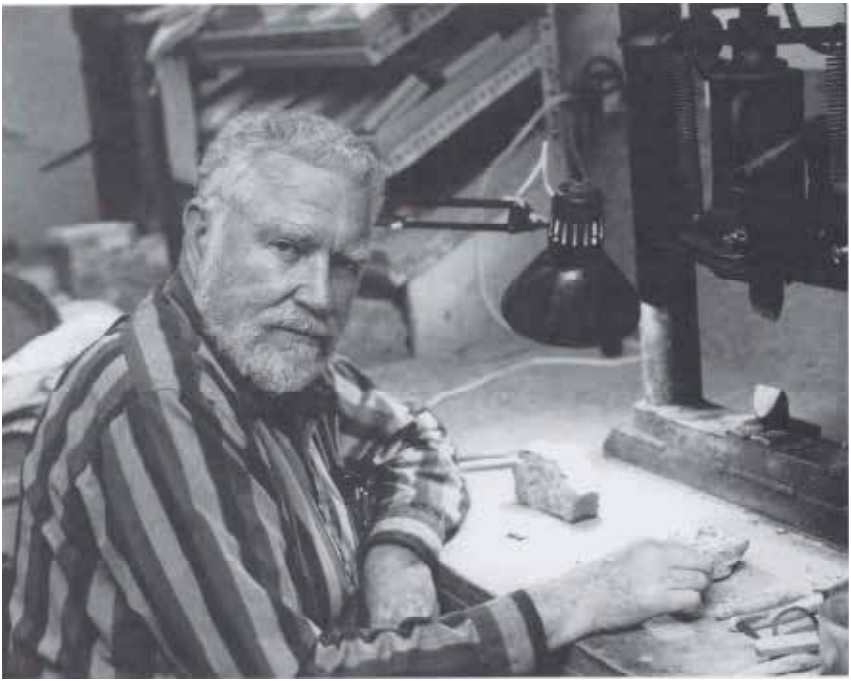
The death of Art Boucot whilst undergoing an operation for congestive heart failure has robbed the palaeontological community of one of its most dynamic and colourful characters. At the age of 93 he remained an indefatigable researcher.

Art Boucot grew up in Philadelphia and showed early interest in minerals and fossils; he enrolled for evening classes in geology at the age of 11. He entered the University of Pennsylvania to read chemical engineering in 1941, but withdrew in the first year and joined RCA as a crystal finisher. In 1943 he was drafted into the US army, but soon transferred to the US Army Air Forces. Art became Lead Navigator with the 8th Air Force and flew 46 sorties in B-24 bombers over Germany between 1943 and VE Day; he was awarded a Distinguished Flying Cross for his service.

In 1945 Art began a mineralogy degree at Harvard, but became rapidly disenchanted with it and was introduced to palaeontology and stratigraphy by Preston Cloud. He graduated in 1948 and obtained his Masters in 1949, then embarked on a PhD on the Devonian Moose River region of Maine and before this was finished joined the United States Geological Survey. During his Survey years (1951–56) Art came under the influence of both G.A. Cooper (which cemented his interest in brachiopods) and also the Palaeozoic gastropod specialist J. Brookes Knight. His PhD was completed in 1953. In 1956–57 he was awarded a Guggenheim Scholarship for work on the Silurian and Devonian of Western Europe; there followed a grant that took him to the Soviet Union. This period was instrumental in the beginning of Art's widening approach to his subject and during this time he amassed enormous collections.

His professional academic career began in 1957 at the Massachusetts Institute of Technology. Then followed a period at Caltech in Pasadena, California; there he employed as his research assistant Jess Johnson who had been partially paralysed by polio and needed a mechanical respirator. He and Jess and his collections moved to the University of Pennsylvania in 1968, which proved an unsatisfactory move, so in 1969 a further step took them to Oregon State University at Corvallis; there Art held the post of Distinguished Professor of Zoology and Geology until his death.

Art's initial publications were on Silurian–Devonian brachiopods, their taxonomy and biostratigraphy (*e.g.* his paper on Eospiriferidae in *Palaeontology* in 1963) and dozens of taxonomic papers were published in the 1960s and 70s. Joint publications with Jess Johnston alone exceeded 50. His interests became wider and embraced biogeography, palaeoecology and broad evolutionary studies, with such book titles as *Evolution and extinction rate controls* (1975) which dealt with the biogeography of Silurian and Devonian brachiopods, or *Principles of benthic marine paleoecology* (1981). He was author and editor of many major compilations and demonstrated that he could get his co-contributors to get work to him on time. The Silurian Correlation charts (co-edited with W.B.N. Berry) involved some 23 other contributors, whilst *Evolutionary paleobiology of behavior and coevolution* (1990) involved 29 other authors. *Historical biogeography, plate tectonics and the changing environment* edited by Art with Jane Gray (1979) involved 45 contributors, but even this pales into insignificance bedside the over 70 contributors of *Paleocommunities: A case*



Art with his rock splitter (from Dutro 2000). Reproduced with kind permission of the Paleontological Society.

study from the Silurian and Lower Devonian that Art co-edited with Jim Lawson (1999); in this volume Art propounded some far-reaching principles, such as showing that wide geographical range confers some protection against extinction, or that there is an inverse relationship between rates of evolution and abundance. His last major work was *Phanerozoic paleoclimate: an atlas of lithologic indicators of climate* (2013) co-authored with Chen Xu and Chris Scotese; this matched continental positions to the lithologies and Art's encyclopaedic knowledge of biogeography came into its own.

One of the notable widenings of Art's interests arose directly from his move to Corvallis, for amongst his colleagues there was the palaeobotanist Jane Gray. Their collaboration helped demonstrate that embryophytes existed as early as the Middle Ordovician, an early phase of terrestrial plant evolution that had been hitherto under-appreciated. They demonstrated similarities of the spores with those of bryophytes and reconstructed the ecophysiology and life strategies of the earliest terrestrial plants.

My first knowledge of Art was when former Swansea colleague Vic Walmsley spent a sabbatical year in 1962–63 at Pasadena with Art (one of more than 20 postdoc workers to profit from such contact). He came back not only with a re-invigorated interest in Silurian 'dalmanellid' brachiopods, but equipped with techniques of collection and preparation that Art had pioneered or developed. These practices are now firmly established in the palaeontologist's armoury. First amongst them was the technique of bulk collection that led to the coining of the verb 'to boucotize', as Art considered a minimum of a ton to a ton-and-a-half an adequate sample. Second was to prepare that material: (if necessary) by de-calcifying it in acetic acid, washing and drying it, then breaking up the rock, for

which purpose Art had designed a hydraulic rock-splitter equipped with opposing chisel jaws whose crushing movement split the rock around the fossils. Lastly, after manual preparation to remove superfluous matrix, came latex casting of internal and external moulds (usually dyed to aid in subsequent photography). A rock splitter was soon made and installed in the Swansea department and later played a significant part in my own recovery of many new genera and species of a plethora of fossils from a boucotized quarry in the Early Arenig of South Wales. Thus I profited enormously from adopting Art's techniques of collection and preparation. Later, when I came to know Art personally, I was able to tell him what a difference his influence had made to my own researches.

Art was truly a larger-than-life figure and a veritable human dynamo, who regularly worked more than 14 hours per day on his research; this resulted in a tally of over 500 published works (my colleague Mike Bassett was astounded to find that after leaving the lab to go home to the Boucot household for dinner he was expected to return to the lab for several more hours of work in the evening). Art was supported for much of his life by his wife Barbara ('Bobbie') with whom he had two sons and two daughters. He was devastated by Bobbie's death after 63 years of marriage in 2011. Over the past few years he had a new partner, his colleague Kathy Nichols, who is a specialist on the Triassic, with whom he was writing a new book.

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Sylvester-Bradley REPORT

Diversity and ecology of Radiodonta of the Great Basin, USA

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Introduction

Our knowledge of radiodontans, a diverse group of pelagic predators, has increased greatly over the last decade. A number of new species and localities have been recovered and new feeding modes identified, in addition to advances in descriptive techniques (*e.g.* Daley *et al*. 2009; Caron *et al*. 2010; Daley and Budd 2010; Cong *et al*. 2014, 2016; Van Roy *et al*. 2015). Radiodontan body elements, some belonging to *Hurdia*, some to *Peytoia* and some unassigned, have been reported from the Spence Shale Member of the Langston Formation, the Wheeler Formation and the Marjum Formation of the Great Basin, Utah, USA (Robison and Richards 1981; Conway Morris and Robison 1982, 1988; Briggs and Robison 1984; Briggs *et al*. 2008; Daley *et al*. 2013). More recently, *Anomalocaris* was reported from the younger Weeks Formation, Utah (Lerosey-Aubril *et al*. 2014).

This project sought to identify new specimens and re-describe known radiodontans from the Great Basin, Utah, in light of advances in the field over the last decade. The project results include a redescription of the putative lobopodian *Aysheaia prolata* as a frontal appendage of the radiodontan *Stanleycaris* (Pates *et al.*, accepted), a synopsis of the evidence for hurdiids from the Great Basin (Pates *et al.*, accepted) and description of two new species of the durophagous radiodontan *Caryosyntrips* from the Great Basin, based on frontal appendage morphology (Pates and Daley, accepted).

Aysheaia prolata reinterpreted as *Stanleycaris* sp.

Aysheaia prolata, known from a single specimen held at the University of Kansas, was originally described as the only lobopodian from the Wheeler Formation of the Great Basin, Utah (Robison 1985). Re-examination of this fossil (Figure 1A) revealed previously overlooked features that are not consistent with the lobopodian interpretation, including segmental boundaries between putative lobopods and curved terminal spines on the putative anterior end. Eleven podomeres were identified and the putative lobopods reinterpreted as long recurved spines with auxiliary spines on the ventral surface, and robust spines on the dorsal surface. These characters allowed identification of this specimen as a frontal appendage of the radiodontan *Stanleycaris*, the first of this genus to be reported outside of the Stephen Formation, British Columbia, Canada (Cambrian Series 3, Stage 5). Conversely *Aysheaia* is now a monotypic genus endemic to the Burgess Shale, and *Acinocrinus stichus* is the only lobopodian known from the Great Basin, Utah.

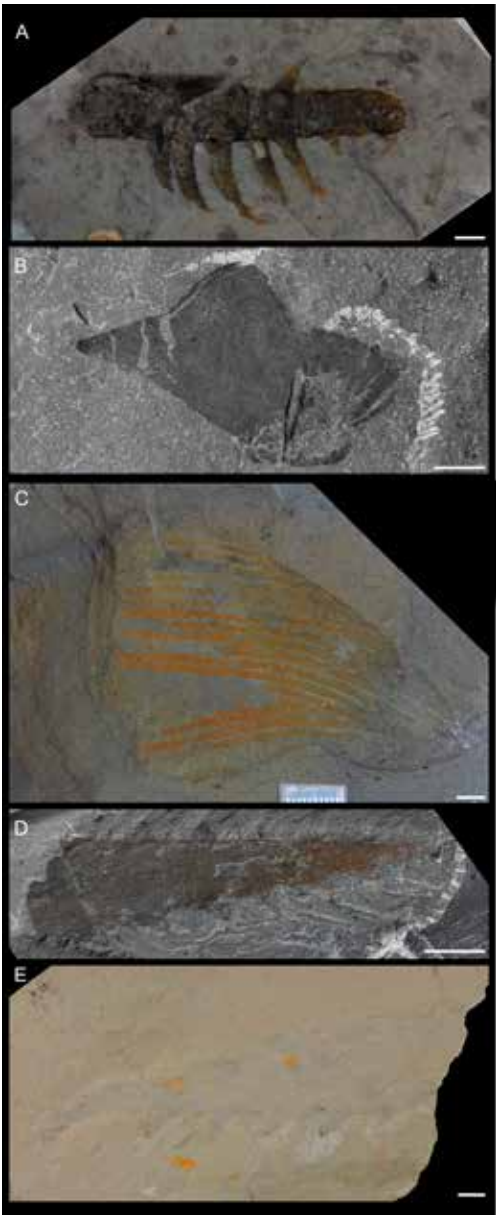

Figure 1. A. Stanleycaris *sp. frontal appendage, Wheeler Formation; B.* Hurdia victoria *H-element, Spence Shale; C.* Hurdia *sp. flap, Spence Shale; D.* Caryosyntrips durus *frontal appendage, Wheeler Formation; E.* Caryosyntrips *cf.* camurus *frontal appendage, Valdemiedes Formation. Scale bars are 5 mm.*

Hurdiids from the Great Basin

New specimens of *Hurdia* were identified from the Spence Shale Member, Langston Formation. These represent mouthparts (oral cones), cephalic carapace H-elements (Figure 1B), frontal appendages and an isolated swimming flap (Figure 1C). The shape of the H-elements allowed *Hurdia victoria* to be identified from the Spence Shale for the first time (Figure 1B). *Hurdia* was also reported from the Wheeler Formation, but is not yet known from the Marjum Formation. A new *Peytoia* oral cone was identified from the Marjum Formation, and its presence was confirmed in the Wheeler Formation. However, it is no longer known from the Spence Shale as specimens previously identified as partial *Peytoia* appendages were reinterpreted in this study as endopods of a *Sidneyia*-like taxon.

Caryosyntrips from the Great Basin, USA and Spain

New specimens of *Caryosyntrips* frontal appendages were identified from the Great Basin, Utah, and the putative lobopodian *Mureropodia apae* from the Valdemiedes Formation (Cambrian Series 2, Stage 4), Spain, was redescribed as a *Caryosyntrips* frontal appendage. These specimens, alongside known *Caryosyntrips* frontal appendages from the Burgess Shale, allowed three species of the genus to be distinguished based on the arrangement and size of dorsal and ventral spines. *C. camurus* has only large ventral spines, *C. serratus* has large ventral spines and a row of small dorsal spines, and *C. durus* has large ventral and dorsal spines, with a small row of dorsal spines (Figure 1 D). The new specimens increase the temporal range for the genus (Cambrian Series 2, Stage 4 to Series 3, Drumian) and the geographic range to a new palaeocontinent, Gondwana.

Conclusions

This project described two new species of *Caryosyntrips*, alongside the first radiodontan, *Caryosyntrips* cf. *camurus,* from Spain (Figure 1 E). It also increased the known diversity of radiodontans in the Great Basin, Utah, identifying *Caryosyntrips, Hurdia victoria,* and *Stanleycaris* for the first time, and confirming the presence of *Peytoia* and *Hurdia* (see Table 1). Future work will include re-examination of radiodontans from the Cambrian Series 2, Stage 4, Kinzers Formation, Pennsylvania, based on material examined in the course of this project at Franklin and Marshall College, the Smithsonian National Museum of Natural History and the Yale Peabody Museum.

Table 1. Radiodonta from the Great Basin, Utah, USA

	Spence Shale	**Wheler Formation**	**Marjum Formation**	**Weeks Formation**
	Stage 5	Drumian	Drumian	Guzhangian
Anomalocaris sp.	Y	Y		Y
Caryosyntrips camurus	Y			
Caryosyntrips durus		Y		
Caryosyntrips serratus		Y		
Hurdia victoria	Y			
Hurdia sp.	Y	Y		
Peytoia nathorsti		Y	Y	
Stanleycaris sp.		Y		
References	Conway Morris and Robison 1988; Briggs *et al*. 2008; Daley *et al*. 2013; **This study.**	Robison and Richards 1981; Conway Morris and Robison 1988; Briggs *et al*. 2008; **This study.**	Briggs and Robison 1984; **This study.**	Lerosey-Aubril *et al*. 2014.

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I would like to thank the Palaeontological Association for the Sylvester-Bradley Award (PA-SB201503) that allowed me to visit the museum collections. I would also like to thank all those who facilitated my visits to collections: Susan Butts and Jessica Utrup (Yale Peabody Museum); Roger Thomas (Franklin and Marshall College); Mark Florence (Smithsonian National Museum of Natural History); and Bruce Lieberman (University of Kansas Natural History Museum). Samuel Zamora facilitated the visit to the Museo de Ciencias Naturales de la Universidad de Zaragoza and provided photographs of *Caroysyntrips* cf. *camurus*.

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Stan Wood REPORTS

Biomolecule preservation through time: mapping bone degradation in fossil Proboscideans from different depositional environments

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The study of ancient biomolecules (*e.g.*, DNA, protein, amino acids) is a relatively new sub-field of palaeontology, which has grown as new analytical techniques have been developed and incorporated into the study of molecular scale preservation. Over the last few decades, various studies (*e.g.* Briggs *et al.* 2000; Buckley *et al.* 2011; Collins *et al.* 2002; Keenan 2016; Demarchi *et al.* 2016) have demonstrated that some fossils contain complex biomolecules that have persisted in the rock record (*e.g.* see Table 1). The preservation of ancient nucleic acids has received the most attention because DNA and RNA contain so much biological information otherwise inaccessible from extinct animals. However, nucleic acids do not preserve on long timescales and recent research in vertebrates has turned to the preservation of collagen and other proteins, which may preserve on much longer time scales. Studying the proteins and amino acids preserved in fossils can potentially answer compelling questions about *in vivo* changes in cells, the phylogenetic relationships between animals (Cleland *et al.* 2015) and the adaptation of specific traits (*e.g.* amino acids indicative of adaptations for cold climates; Campbell *et al.* 2010). Palaeoproteomics, the study of ancient proteins on long timescales, is complicated by the degree of degradation, differentiating between *in vivo* and diagenetic modifications, and identifying external sources of organic contamination. Therefore, understanding protein preservation on short time scales is important for interpreting organic preservation in vertebrates in deep time.

Table 1. Presence of biomolecules in the fossil record. Adapted from Briggs and Summons 2014.

Biomolecule	Organism	Archaeological record	Cenozoic record <66 Ma	Mesozoic-Palaeozoic record 66-541 Ma
Nucleic acids (i.e. DNA/RNA)	All organisms	10^5-10^6 year	None sequenced	Reported in Cretaceous dinosaur bone (fragmented)
Proteins	All organisms	10^3-10^6 year	Present	Reported in Carboniferous scorpion (310 Ma) and Silurian eurypterid (417 Ma)
Lipids	All organisms	Present	Present	Present

Proboscideans (elephants, mammoths, mastodons, Figure 1) have a well-documented fossil record and have been the subject of numerous studies on organic fossil preservation (*e.g.* Poinar *et al.* 2006; Asada 2007; Cappellini *et al.* 2011; Lynch *et al.* 2015). Mammoths lived tens to hundreds of thousands of years ago and therefore fall into a time period that will likely preserve a great deal of organic information. They are also found in a variety of burial environments, allowing the preservation potential of proteins to be examined in different conditions. I analyzed organic preservation in mammoth fossils from different burial environments (*i.e.* natural asphalt, a sinkhole, a stream deposit and permafrost) and compared the data with that found in modern elephant bones. I also did thermal maturation experiments to replicate the degradation of proteins in modern elephant bones and compared the result to what is found in the fossils. The goal of my project is to understand the degradation of proteins in mammoth fossils from different burial environments (Figure 2) and to develop a series of analytical techniques that will be useful in deep time studies.

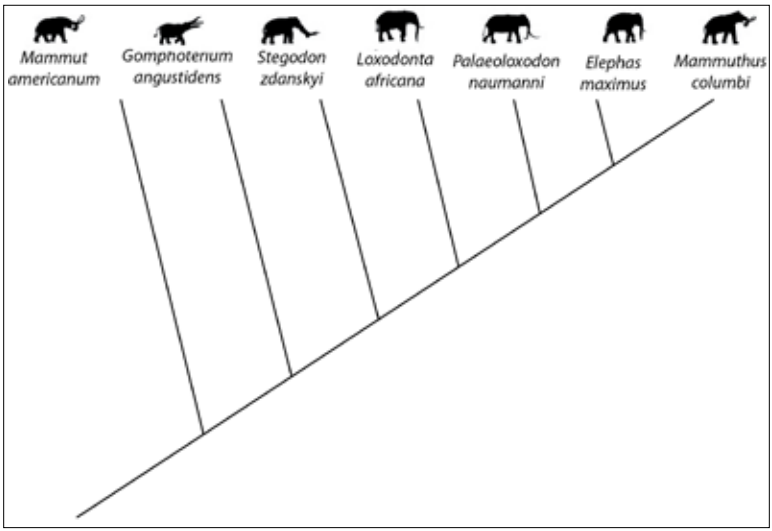

Figure 1. Proboscidean phylogeny based on hyoid characters. Adapted from Shoshani and Marchant 2001.

A Stan Wood Award (PA-SW201501) from the PalAss funded the time-of-flight secondary ion mass spectrometry (TOF-SIMS) analyses. TOF-SIMS is a minimally destructive mass spectrometric technique that analyzes the surface of a sample. It is particularly interesting in fossil studies because it maps the spatial distribution of the molecules in the bone, allowing the identification of areas that may have higher preservation potential than others. I compared the mammoth fossils, the modern elephant bone and the experimentally-matured elephant bone and identified two different types of preservation. The permafrost sample is the most similar chemically to the lower temperature (100°C) experiments, whereas the sinkhole and stream deposits were the most similar to the higher temperature experiments (200°C), suggesting that the latter has undergone more degradation.

I combined the TOF-SIMS analyses, which detected amino acids indicative of proteins, with additional analyses to get a broader taphonomic view of the preservation of the bones. Lipid

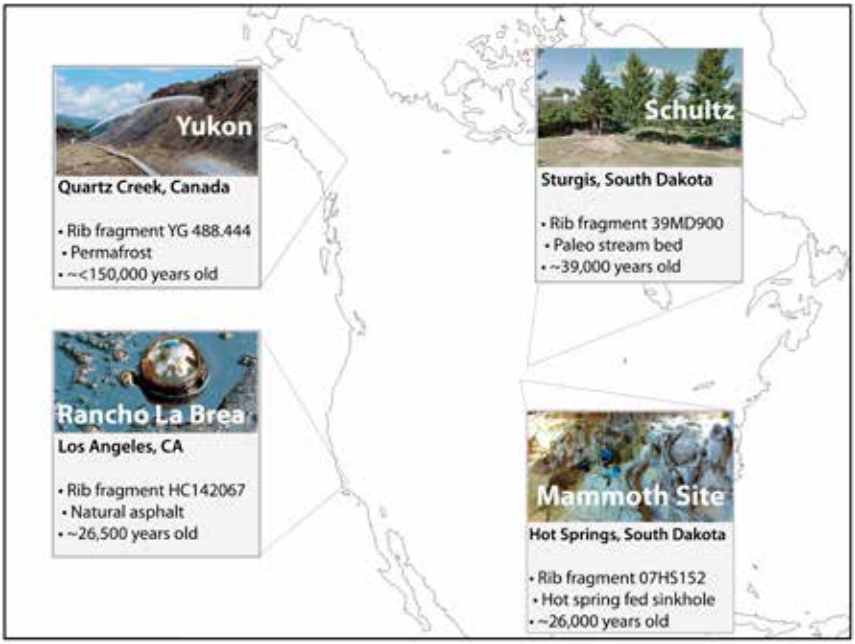

Figure 2. Map showing the different burial environments and ages of mammoth fossils being examined in this study.

analyses revealed that there is no lipid contribution from bacteria, confirming that the organic material is original to the mammoths. I also performed Raman mass spectroscopy to analyse the amount of degradation that has occurred to the bones and compared that to the level of organic preservation. With the support of this award, I was able to corroborate biomolecule preservation with bone degradation and burial environment - an important step for examining organic preservation in terrestrial vertebrates in deep time.

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A comprehensive anatomical, taxonomic, and phylogenetic analysis of Teleosauridae, and a look into macroevolutionary trends

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Introduction

Crocodylomorpha is an ancient group that includes all living crocodylians and fossil relatives. They first appeared in the fossil record approximately 230 million years ago and achieved high morphological and species diversity during the Mesozoic and early Cenozoic. One of the major Mesozoic crocodylomorph radiations involved the thalattosuchians; these flourished in the Jurassic and Early Cretaceous and represent the pinnacle of marine specialisation within Crocodylomorpha (Young *et al.* 2014). Thalattosuchians evolved a wide range of feeding and marine adaptations, transitioning from coastal and gavial-like to pelagic and orca-like (Wilberg 2015). One peculiar, yet poorly studied, family within Thalattosuchia are the teleosaurids. They lived from the Early Jurassic to the Early Cretaceous (~182–125 Ma) (Fanti *et al.* 2016) and are the sister group to the wholly marine, well-studied Metriorhynchoidea (Young *et al.* 2014). Teleosaurids were semi-marine and mostly long-snouted with a superficial resemblance to modern gharials (Young *et al.* 2014;

Johnson *et al.* 2015). They were morphofunctionally diverse, with some species exhibiting generalist features while others were more specialist (*e.g.* piscivorous, durophagous; Hua and Buffetaut 1997). Teleosaurids greatly varied in size, from 3 metres to over 7 metres in length. They inhabited shallow open-shelf marine environments, as well as lagoonal, brackish and freshwater ecosystems (Vignaud 1995); they attained a near-global distribution, were the first crocodylomorphs to cross ocean barriers, and evolved many specialized feeding ecomorphologies (*e.g.* chelonophagy).

Teleosaurid fossils have been known for over 200 years (the first teleosaurid specimen was published on in 1758) and are represented by approximately 20 species. However, they are still severely understudied and little understood. There is a wealth of teleosaurid specimens found in Germany, most notably *Steneosaurus bollensis* and *Machimosaurus* species (*e.g.* Figure 1). Many of the most complete and best-preserved teleosaurid specimens in the world come from the Posidonia Shale near Holzmaden.

Figure 1. Machimosaurus *cf.* hugii *tooth LMH 16401.*

Museum data collection

I spent a month in Germany collecting valuable data from seven institutions: Landesmuseum in Hannover (LHM); Naturmuseum Senckenberg in Frankfurt (SMF); Staatliches Naturhistorisches Museum in Braunschweig (SMHM); Staatliches Museum für Naturkunde in Stuttgart (SMNS); Staatliches Museum für Mineralogie in Dresden (MMG); the Faculty of Geoscience and Geography at the University of Göttingen (GZG); and the Paläontologische Sammlung at the University of Tübingen (GPIT).

During my time at these institutions I examined a total of approx. 124 specimens. These included articulated and unarticulated skull, mandible and postcranial material, as well as multiple isolated teeth. Many of these specimens are either undescribed or understudied. The most common species that I examined was *Steneosaurus bollensis*, which was an extremely abundant taxon during the Toarcian, especially in what is now Germany (see Figures 2 and 3). Other distinct taxa I came across were: *Machimosaurus hugii*; *M. buffetauti*; *Steneosaurus edwardsi*; and the enigmatic *Teleosaurus laconosae*, in addition to unidentified *Steneosaurus* (*Mystriosaurus*), *Teleosaurus*, or *Machimosaurus* sp. Two of the most important specimens I examined were the holotypes of *Steneosaurus bollensis* (MMG BwJ 595, discovered around 1718), and *Machimosaurus buffetauti* (SMNS 91415; see Young *et al.* 2014). There are also several undescribed specimens in the smaller

museums (*e.g.* Braunshweig) that will be invaluable for my future phylogenetic analysis and will be the focus of future papers.

Figure 2. Steneosaurus bollensis *MMG BwJ 689.*

Figure 3. Steneosaurus bollensis *SMNS 51555 near complete specimen. Black hangers are* c. *6 cm.*

Future work

I am currently building my morphological dataset, and I have prepared visits to Padova (Italy), Tunis (Tunisia) and Beijing (China) to examine teleosaurid holotypes as well as additional and undescribed material. Once I have collected all of my anatomical data, I will begin my phylogenetic analysis

using both parsimony ([1] unweighted and [2] weighted) and Bayesian ([3] equal character rates and [4] varying rates) methods. I currently have 18 teleosaurid taxa and 384 characters in the matrix (provided by my co-supervisor), and will be adding at least 13 additional teleosaurid taxa and 30 morphological characters. Once I have completed my phylogenetic analysis, I will begin examining teleosaurid macroevolutionary trends through time via likelihood modelling. I will specifically be focusing on teleosaurid increase(s) in body size and biogeographical distribution through time.

Acknowledgements

I would like to thank the Palaeontological Association for awarding me the Stan Wood Award (PA-SW201601), without which the travel and data collection could not have been possible. I would also like to thank R. Schoch and E. Maxwell (SMNS), M. Wilmsen (MMG), R. Brocke (SMF), A. Richter (LMH), A. Gehler (GZG), I. Werneburg (GPIT) and R. Kasma (SMHM) for assistance and support throughout my visits. Finally, I thank my supervisors Dr Stephen Brusatte and Dr Mark Young for their continued support and guidance.

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The Late Triassic amphibian and reptilian fauna of the Jameson Land Basin (East Greenland) and its comparison with coeval European faunas

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Introduction

The Late Triassic rocks of the Fleming Fjord Formation that crop out at the Jameson Land Basin in East Greenland are the richest rocks in Greenland in terms of fossil vertebrates, including fish, amphibian, turtle, phytosaur, aetosaur, pterosaur, sauropodomorph, theropod and early mammal remains such as bones, teeth and coprolites (*e.g.* Jenkins *et al.* 1994, 1997, 2001, 2008; Clemmensen *et al.* 1998; Gatesy *et al.* 1999; Milàn *et al.* 2012; Mateus *et al.* 2014; Hansen *et al.* 2016; Marzola *et al.* 2016). Many of these taxa are known from very well-preserved and nearly complete material. However, with the exception of the monographical studies on *Eudimorphodon cromptonellus* (Jenkins *et al.* 2001) and *Gerrothorax pulcherrimus* (Jenkins *et al.* 2008), few detailed reports of other taxa have been produced and without anatomical description and phylogenetic analysis.

The aims of my PhD project are to (1) describe the anatomy and osteology of the Late Triassic amphibian and reptilian fauna of the Fleming Fjord Formation, with particular focus on the amphibian *Cyclotosaurus*, the Testudines, the phytosaurs and the sauropodomorph material collected by the early 1990s US-Danish and the 2012 and 2016 Danish expeditions; (2) qualitatively reassess the taxonomy of the previously-described amphibian and reptilian taxa using cladistic approaches; assess the palaeoecological, palaeogeographic, palaeoenvironmental, palaeoclimate and chronological implications of the Fleming Fjord faunal assemblage; and (3) compare the Late Triassic fauna from Jameson Land to the coeval faunas from Europe and North America, in order to create a global and uniform palaeoenvironmental and chronological study of the vertebrate land fauna of the Late Triassic.

In order to achieve these aims, it was necessary to compare the Greenlandic specimens with other material. The Stan Wood Award (PA-SW201502) generously funded travel and accommodation costs to visit Late Triassic collections at the Staatliches Museum für Naturkunde Stuttgart (SMNS) and the Geologisches-Paläontologisches Institut at the University of Tübingen (GPIT-RE) in Germany. These collections have more than 90 specimens of interest, but of particular importance and relevance are the holotypes of the testudine *Proterochersys robusta* (SMNS 17757), the temnospondyls *Cyclotosaurus posthumus* (SMNS 12988) and *Eocyclotosaurus lehmani* (SMNS 51562), and the sauropodomorph *Plateosaurus quenstedti* (GPIT-RE-0386). The Stan Wood Award also enabled the purchase of a DSLR camera and lens.

Preliminary results

During the first 18 months of my PhD, I examined over 550 specimens in 17 institutes in Denmark, Germany, Poland and the USA. These extensive museum visits plus fieldwork in Greenland were the

basis of two manuscripts in review (Marzola *et al.* in review) and two presentations (at the XIV EAVP Annual Meeting and the 60th Annual Meeting of the Palaeontological Association).

A focused study on the skull of the temnospondyl *Cyclotosaurus* briefly reported in Jenkins *et al.* (1994) led us to describe and name *Cyclotyosaurus naraserluki*, a new species from Greenland based on the presence of three autapomorphies and a unique combination of characters within the genus *Cyclotosaurus* (Marzola *et al.* 2017; Figure 1 herein). A wider view of the fossil record of tetrapods from Greenland allowed us to identify some crucial aspects of the evolution of Greenland tetrapods and their preservation. Their record ranges from the Late Devonian to the Cenozoic and includes 28 different taxa: five Late Devonian stem-tetrapods; four Early Triassic amphibians; two stereospondyl amphibians, six reptiles and four synapsids from the Late Triassic; one Early Jurassic plesiosaur; two plesiosaurs and one ichthyosaur from the Late Jurassic; one Cenozoic aves. The most fossiliferous periods are the Late Devonian with five unique species recorded, and the Late Triassic with 14 (Marzola *et al.* in review), see Figure 1.

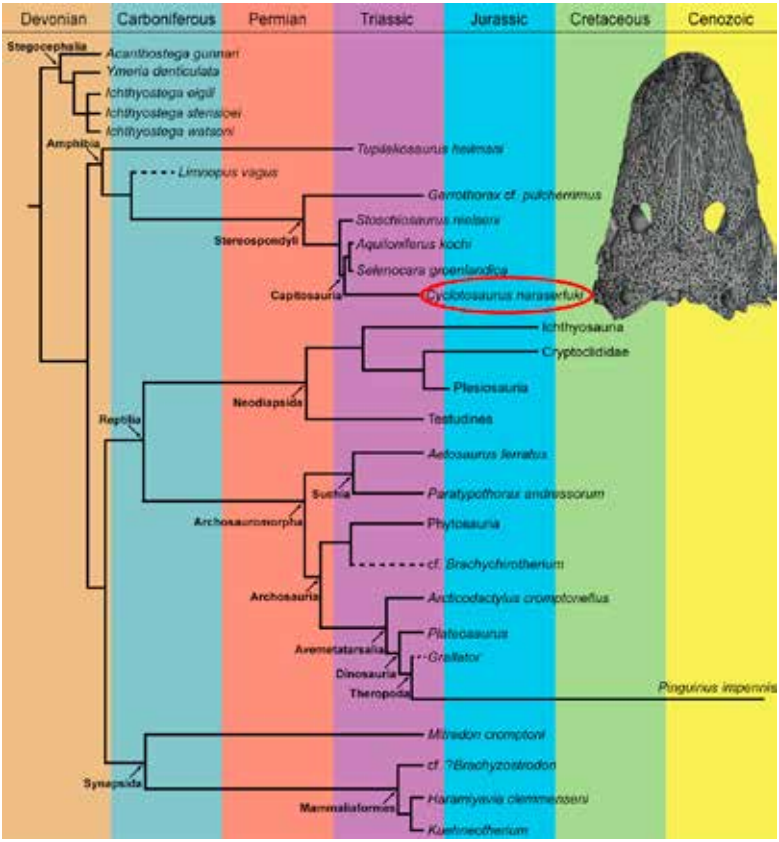

Figure 1. Time calibrated phylogenetic cladogram of the main fossil tetrapods of Greenland. Dashed lines represent ichnotaxa. Cyclotosaurus naraserluki *is circled in red and the dorsal view of the skull MGUH.VP 9522 is shown (from Marzola* et al. *2017; artwork of.* C. naraserluki *skull by Ana Luz of the Museu da Lourinhã).*

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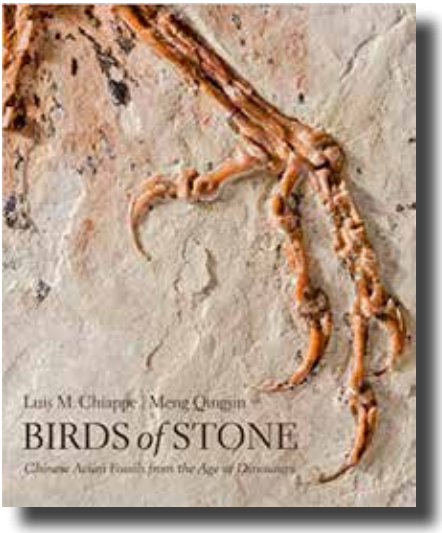
Book Reviews

Birds of Stone: Chinese Avian Fossils from the Age of Dinosaurs

Luis M. Chiappe and Meng Qingjin 2016. 294 pp. Johns Hopkins University Press, Baltimore. £63.00, ISBN 1421420244.



With its large format and stunning colour photographs of exquisitely preserved fossil birds, complete with bones, teeth, feathers and sometimes gut contents and ovarian follicles, *Birds of Stone* at first sight may look like another nice coffee-table book extolling the beauty of fossils. In fact, it is much more. Luis Chiappe, of the Los Angeles County Museum of Natural History, and Meng Qingjin, of Beijing Natural History Museum, have joined forces to offer the reader an engaging description of what certainly ranks among the major palaeontological discoveries of the last quarter-century, *viz.* the remarkable fossil avifauna from the Early Cretaceous 'Jehol Biota' of north-eastern China.

As the authors point out, until the 1990s the Cretaceous fossil record of birds amounted to a handful of taxa, mainly from the later part of the period, and was generally so scanty that it could easily be assumed that avian diversity had remained low during the 85 million years or so separating *Archaeopteryx* from the Early Tertiary adaptive radiation of modern birds. Thanks to the efforts of Chinese palaeontologists (and the local farmers and other collectors who have dug up many of the fossils), our image of bird life in the Early Cretaceous has changed thoroughly. It has become clear that some 130–120 million years ago, birds had already undergone a major radiation and were playing important roles in ecosystems. *Birds of Stone* documents this revolution in avian palaeontology through a description of the main fossil taxa discovered during the last 25 years in the Lower Cretaceous rocks of Liaoning and adjoining provinces, where incredibly well-preserved fossils of all kinds of animals and plants have been preserved in fine-grained lacustrine deposits.

The first part of the book is a description of the remarkable array of bird taxa discovered in the Lower Cretaceous Formations of north-eastern China. They include animals such as *Jeholornis*, with a long bony tail, that are reminiscent of *Archaeopteryx* – albeit more advanced in some respects. Among short-tailed species, sapeornithids and confuciusornithids are still rather basal, especially in their flight apparatus. Enantiornithines are more advanced in this respect and constitute the most species-rich group of birds from the Jehol Biota. Basal ornithuromorphs, members of the large group that also includes extant birds, are also present, and represented by several taxa. The Jehol avian assemblage thus encompasses a wide variety of birds that exhibit quite different levels of

evolutionary development. The ecological adaptations of the birds are equally varied: while some taxa had a foot anatomy that enabled them to perch in trees, others apparently spent much of their time on the ground, sometimes in near-shore environments. Further, feeding behaviours must have been diverse, based on the shapes of the jaws and on stomach contents. Although the adaptations of these Early Cretaceous birds often parallel those of modern birds, the Jehol avifauna would probably have looked unfamiliar to a modern ornithologist: many of these birds still had toothed jaws, and the authors point out that some of the feather types that covered their bodies are now 'extinct', having no counterparts in extant forms.

The second part of the book examines the origin and early evolution of birds. Again, the study of fossils from the Jehol Biota has resulted in enormous advances in our understanding of these questions, notably with the discovery of the famous feathered dinosaurs. While the origin of birds among maniraptoran dinosaurs is no longer in doubt, the way in which four-winged maniraptorans evolved into early birds capable of flapping flight is still a matter of discussion. The authors delve into the question of feather evolution at some length, but tell us relatively little about how they see the morphofunctional transition from non-avian dinosaurs to birds and about the vexing question of the origin of flight. The authors do insist that many of the anatomical prerequistes of avian flight actually appeared in their flightless dinosaurian forerunners. They then provide the reader with a summary of what is currently known about the Jehol aviary, in what may appear as a repetition of the first section of the book. The final section is about the environment, flora and fauna of the Jehol Biota and might have been better placed in an introductory position at the beginning of the book.

The drawings that illustrate the book typically show skeletons with a simple body outline or are simplified phylogenetic diagrams. Unlike most books already published on the Jehol avifauna, *Birds of Stone* does not include life restorations of extinct forms (apart from a single reconstruction of the four-winged dinosaur *Changyuraptor*). Apparently the authors have decided to let the fossils speak for themselves. The photographic illustrations are indeed truly remarkable and display the anatomy of the Jehol birds in exquisite detail. The captions, however, are very brief and the photos are not annotated; thus a fairly good knowledge of avian anatomy is needed if one wishes to really understand what is shown, beyond merely marvelling at the beautiful preservation of the specimens. This raises the question of what kind of readership the book is really aimed at. It is written in non-technical language and is therefore accessible to a wide range of readers interested in avian evolution. Experts on fossil birds may find it a useful summary of what is currently known about the avifauna from the Jehol Biota, all the more so that a reasonably extensive bibliography is provided. This is not, however, a technical treatise or a handbook on the topic. It lacks, for instance, a systematic list of Jehol birds in table form that would have enhanced its value as a reference work. Nevertheless, *Birds of Stone* is an attractive and well-documented introduction to the marvellous fossil birds from the Jehol Biota and their implications for our understanding of the early stages of avian evolution.

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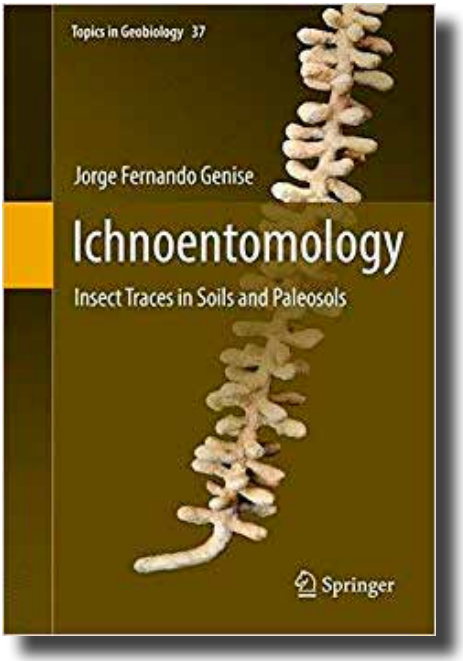
Ichnoentomology: Insect Traces in Soils and Paleosols. Topics in Geobiology 37

Jorge Fernando Genise 2017. xxviii+695 pp. Springer, Switzerland. Hardcover US$179.00, ISBN 978-3-319-28208-7.



Here is a cautionary tale for nascent book reviewers. When the book review editor of the *Newsletter* offered me *Ichnoentomology*, I jumped at the chance. It was only when I received the book in the post that I realized what a large mouthful I had bitten off – almost 700 pages and weighing 1.24 kg! But this is me just being whimsical. I wanted to read *Ichnoentomology* and a commitment to review it made sure that I did so, rather than have it collect dust on my monumental pile of books to be read 'when I have more spare time' (never?).

I congratulate Jorge Genise on *Ichnoentomology*, a magnificent achievement. It consists of 22 chapters, an appendix of records of insect trace fossils in palaeosols, an unusually detailed reference list (73 pp.) and, bizarrely, no index. Illustrations are good and particularly plentiful; most photographs are in colour. My only criticism is of some diagrams that are reproduced too small, making them difficult to read (*e.g.*, fig. 22.9). The principal focus of the several chapters are the traces of insects in soils and palaeosols (and elsewhere), as indicated by the title, but the spoor of other soil organisms are also discussed in some detail where appropriate – earthworms, crustaceans, vertebrates and roots. It is an informed approach that emphasizes similarities and differences between insect and non-insect traces. This makes *Ichnoentomology* a comprehensive reference for anyone with an interest in terrestrial ichnology, not just insects. The only major omission is vertebrate trackways and these already have a broad literature; recent recommended contributions include Martin (2014) and Pérez-Lorente (2015). But *Ichnoentomology* stands on its own as a comprehensive reference for terrestrial invertebrate ichnology.

If I have a major complaint (two, actually) about *Ichnoentomology*, it is that Springer appears to have treated Jorge Genise rather poorly. First, the paper on which this book is printed is so thin that it is easy to see 'ghosts' of subheadings in bold and figures through the reverse sides of pages. The e-book version is US$40 cheaper than the hardcover edition and I am tempted to suggest that a hard copy printed from this might be preferable. Secondly, copy editing has been poor. Genise is not a native English speaker and would surely have expected stringent copy editing before publication. Instead, the text is littered with spelling errors and poor sentence structures that should have been eliminated before publication. And why did the publisher not insist on an index? This is a poor advertisement for Springer's author services.

I am pleased to discover that Genise and I differ in our philosophy of ichnotaxonomy a little less than I had anticipated. I disagree with the notion of ichnofamilies, but, then again, I also regret that we are saddled with the concepts of ichnogenus and ichnospecies. Much of the problem with ichnotaxonomy is due to the mistaken desire of too many authors to make an ichnospecies a biological entity. It is not; it is a sedimentary structure. It is true that the more complex a trace fossil, the greater the probability that it is only made by a limited group of organisms and the better the likelihood that its producing organism can be identified. And many of Genise's insect traces are truly complex, as is demonstrated beautifully by the graphic restorations in Chapters 5 and 6. I believe it necessary, however, to separate the description of the physical (the form of the trace fossils) and the biological (interpretation of the producer), which can be absolutely certain only on the rare occasions when the producer is preserved *in situ*. Without such rigour, interpretations of trace fossils of all kinds develop into 'just so' stories. The boundary between physical and biological does blur in places in *Ichnoentomology*.

Regardless, Jorge Genise has written what will be the standard reference in this field for many, many years to come. I have read it from cover to cover, which few will do, but as a 'dipper', where a chapter or part thereof sheds light on the systematics, genesis or relationships of a trace, *Ichnoentomology* will find wide and continuing use anywhere where insects live or lived in the soil. I recommend this volume to all ichnologists and libraries – put a copy on your shelf. A new standard reference is here.

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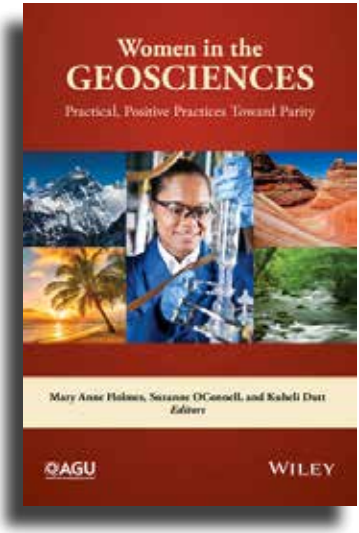
Women in the Geosciences: Practical, Positive Practices Toward Parity

Mary Anne Holmes, Suzanne OConnell and Kuheli Dutt (*eds*) 2015. 171pp. Wiley. Paperback £64.50, E-book £58.99, ISBN 978-1119067856.

Does gender parity matter? The introduction to this book begins with this provocative question and swiftly moves on to cite numerous studies indicating that greater diversity in teams and workforces leads to improved outcomes, for business, research and students. Despite this, the geoscience workforce in the USA is less diverse and contains a lower proportion of women than the average of all other science or mathematics fields, much less the general population. The purpose of this volume is to investigate reasons for this lack of gender parity and evaluate strategies to address the issue.

The first three brief chapters set the scene, providing an overview of gender data for geoscience students and faculty in the USA and a conceptual framework to address the issue of gender parity. Chapter 1, drawing on data from the National Science Foundation (NSF), shows an upward trajectory



over the past several decades for the number of women awarded both Batchelor's degrees and graduate degrees, peaking at around 40%. The proportion of women progressing to postdoctoral positions closely matches those receiving a PhD, but at subsequent career stages, the proportion of women falls sharply. These data indicate that the low proportion of women faculty is not a "pipeline" issue that will be remedied by larger numbers of female students being recruited, but instead indicate a disproportionate loss of women at the point of recruitment to a tenure-track position. This is reflected in the title of Chapter 2, "We are the 20%", this being the average percentage of female faculty in the top 106 earth science departments in the US. Chapter 3 outlines a framework for considering the cause of this gender disparity, identifying potential barriers at the individual, interactional and institutional level.

The remainder of the volume is devoted to reporting strategies for addressing the issue of gender parity. Many of the reported initiatives have arisen from the NSF's ADVANCE programme, which aims to increase the number of female faculty members in science, technology and engineering in the US. The majority of ADVANCE funding has gone towards addressing institutional barriers to recruitment and retention of female STEM faculty. Chapter 5 provides an overview of such strategies, including analysis, tracking and monitoring of recruitment, tenure, promotion and work/life policies; professional development and mentoring, coaching and networking opportunities to improve retention; small grants to facilitate research or scholarship, particularly after career or life transitions, and leadership development. An example of the application of these strategies to bring about institutional change is given in Chapter 6, while Chapters 7 and 8 describe specific targets for policy change, namely dual-career hiring and breastfeeding.

The remaining chapters focus on transactional and individual strategies, covering topics such as implicit assumption and how to reduce its impact (Chapter 9), strategies for hiring diverse faculty (Chapter 10), the benefits of targeted mentoring (Chapters 11 and 12), and networking programmes (Chapters 13 and 14), and finally advice on developing a successful writing practice (Chapter 15).

The book is based on US data and examples, but the issues outlined and the strategies described are also relevant to the geoscience community elsewhere in the world. Palaeontology lies within the geosciences, although it may also be considered part of biosciences, so many of the issues explored in this book are likely to affect Association members. The Association is currently planning action designed to increase diversity among the membership and in palaeontology in general, as reported on page 36 of this Newsletter. For other organizations or individuals concerned about gender parity in the geosciences, this publication is an extremely useful source of data and ideas for strategies for change.

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Amber palaeobiology: research trends and perspectives for the 21st century

David Penney 2016. Siri Scientific Press. Paperback £20.00, ISBN 978-0992997977.

This slim A5 paperback book is a personalized, selected review of amber research and the author's views of future research directions. The author has two decades of research experience working with amber arthropod fossils so you can expect a strong entomological theme to unite and thread through this book. This is certainly a good starting point considering the high proportion of amber-preserved arthropods when compared to other groups preserved in amber. The book neatly draws together this diverse research area and introduces the key researchers themselves.

The book has been organized into eight chapters. The first, 'Palaeodiversity and new amber deposits', outlines succinctly the recently discovered amber deposits (such as in Australia and India), details the best studied (Burmese, Baltic and Dominican) and the lesser studied (Canadian, Mexican and Fushun) deposits and their key entomological contents known to date. The second chapter, 'Microbes in amber', is shorter and highlights the microworld (algae, bacteria, fungi and protozoans) that is not usually preserved elsewhere in the fossil record. These fossils originate from both terrestrial and marine-coastal realms, highlighting the diversity of the microbial world in amber that is gradually becoming better known.

The third chapter, 'New imaging techniques', covers photomicroscopy, confocal laser scanning, computer tomography, synchrotron scanning and computer-generated images. The rise of virtual palaeontology and digital reconstructions in palaeontology has been very useful in understanding the external morphology of fossils in amber (they can be obscured by bubbles or cracks), and how they are preserved, and whether internal organs have been preserved. Not all ambers are translucent and many can darken with age, so new imaging techniques have greatly improved our access to these hidden amber fossils. A balanced review of any potential issues with each of the techniques (*e.g.* autofluoresence with confocal laser scanning, reversible amber darkening after synchrotron scanning) is also given. The fourth chapter, 'Palaeotaxonomy,' is a brief summary of the potential pitfalls and traps of describing fossil (entomological) taxa, applicable to those preserved in amber or via other modes, and other taxa.

Chapter five, 'Palaeoecology', is the longest in the book and is, I believe, the area that the author really wishes to emphasize as it has the most extensive technical and methodological focus and critically evaluates certain palaeoecological studies that use amber-hosted fossils. Various concepts such as quantifying a representative sample, high- and low-taxonomic resolution palaeoecology, syninclusions (more than one fossil in an amber piece), and combining amber and non-amber fossil datasets are examined. Several important concepts are introduced and explained, many should

be familiar to palaeoecologists, but also with some analyses illustrated to give the reader a feel for 'real' datasets, and potential issues with the sampling and these analyses. The shorter sixth chapter, 'Palaeo/biogeography', reflects the fact that many deposits have not had the majority of their fossils studied in depth yet, particularly of course the more recently discovered deposits. Thus, primary taxonomic data are lacking and limiting this research area (except for the Baltic and perhaps some other deposits), highlighting the ample opportunities for future work with amber fossils!

The seventh chapter, 'Subfossils in copal', (copal is a subfossil resin, not an amber) is a relatively short summary of work using this subfossil resin as a proxy for amber studies. Finally, the 'Conclusions' chapter neatly summarizes this selective, personal, but on the whole balanced review of amber research in the 21st century to date.

It should be borne in mind that this book clearly states that it is a personal view, and given its small size, it is not attempting to be an authority on all things amber-related, but does point the reader in the direction of further literature. I would therefore say that it could be a helpful introduction to the diverse research area of amber palaeontology and the value of amber fossils, for palaeo- and amber-enthusiasts, but it does not serve as a general introduction to amber and amber fossils. This self-published book tries to be unbiased in its critique of the various fields of study, and I think it is indeed fair and well balanced. I consider this contribution to be well illustrated and clearly written for both the enthusiast and the researcher, and may even help to convince neontologists to consider amber fossils in their work. The book generally avoids the hard sell on the use of amber fossils. It is a concise summary emphasizing the value of amber preserved fossils, albeit with personal pleas for more work to be dedicated to this area.

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University of Göttingen

Books available to review

The following books are available to review. Please contact the Book Review Editor, Tom Challands (e-mail <**bookreview@palass.org**>), if you are interested in reviewing any of these.

- *The White River Badlands: Geology and Palaeontology*, by Rachel C. Benton, Dennis O. Terry Jr., Emmett Evanoff and H. Gregory McDonald.
- *Acrocanthosaurus inside and out*, by Kenneth Carpenter.
- *Dinosaur Tracks: The next steps*, by Peter L. Falkingham, Daniel Marty and Annette Richter.
- *Trilobiten aus dem Unter-Karbon des Katalonischen Küstengebirges (NE-Spanien)*, by Josef Gandl, Enric Ferrer, Josep Magrans, Javier Sanz López.
- *The sauropod dinosaurs*, by Mark Hallet and Matthew J. Weddel.
- *Phylogenomic data acquisition: Principles and approaches*, by W. Bryan Jennings.
- *Dinosaurs: The textbook*. (6th Edition), by Spencer G. Lucas.
- *The Princeton Field Guide to Prehistoric animals*, by Donald R. Prothero.
- *Integrated Molecular Evolution*, by Scott. O. Rogers.
- *Die fossilen Brachiopoden der Schweiz* (2nd Edition), by Heinz Sulser.
- *The Cambrian Fossils of Chengjiang, China: The Flowering of Early Animal Life* (2nd Edition), by Hou Xian-Guang, David Siveter, Derek Siveter, Richard Aldridge, Cong Pei-Yun, Sarah Gabbott, Xiaoya Ma, Mark Purnell, Mark Williams.

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Careering off course!

Inspirational palaeontologists

Susan Butts
Collections Manager Invertebrate Paleontology
Peabody Museum of Natural History, Yale University

Following undergraduate and doctoral studies at Hobart and William Smith Colleges, and the University of Idaho, Susan Butts completed a postdoc with Derek Briggs at Yale University. Since 2004 she has been the Collections Manager of Invertebrate Paleontology at Yale's Peabody Museum of Natural History. Her research interests focus on taphonomy (silicification), and Permian–Carboniferous brachiopod communities and diversity. She has been heavily involved with initiatives to digitize museum collections (PaleoNiches, Fossil Insect Collaborative, and Cretaceous World TCNs) and data sharing (ePANDDA – Enhancing Paleontological and Neontological Data Discovery API).

How did you first become interested in palaeontology?

Completely by accident! I grew up in New England on metamorphic rocks and I went to a small liberal arts college for political science, planning to be a diplomat. I took an introductory geology course and changed my undergraduate field of study that term. I was interested in hydrogeology and did a senior thesis on non-marine stromatolites in a waterfall in upstate New York, but I spent more time at the outcrop collecting Devonian brachiopods.

Which aspect of your job do you enjoy the most?
The fact that it varies so much – both from day to day and how the job has evolved over time. Depending on what grants I have, I may be focusing on different taxa or geologic ages in the collections, looking at storage conditions, or collaborating on large-scale digitization and informatics projects. Being at Yale is great because there are great faculty and many interesting visitors. There are always new graduate students and postdocs with different interests and ways to use the collection. I get to be involved with a huge range of research topics by connecting researchers with specimens from the Yale collections.

What do you see as the role of museum collections and collections managers in the future?
The job of collections manager has changed pretty significantly, even in the last ten years, as collections become more connected through digitization. The job requires a lot of innovation to overcome barriers, including better digitization protocols to process large numbers of specimens efficiently, development and commitment to data standards, and informatics initiatives to facilitate data sharing. Many collections managers are part scientist, part informatics specialist, and part charming host (one of my favourite parts).

What is some of the most interesting work to come out of your collections recently?
The fauna of the Ordovician Fezouata Lagerstätte of Morocco is pretty hard to beat!

How does your work interact with the general public?
The collections and public sides of the natural history museum are fairly distinct at the Yale, but I do public events and tours. I'm also involved in a couple of collaborative projects to develop educational tools to help K-12 students do collections research, based on digitized museum collections. My colleagues and I do a lot of lobbying (on public tours, "VIP" tours, through our database tools, while travelling, *etc*.) for the importance of collections and collections-based research. I also get to work on the Museum's public exhibits.

What advice would you give to someone wishing to pursue a museum-based career?
Collections manager jobs at bigger institutions generally require a doctoral degree. The job varies a lot from institution to institution, so make sure you have a good sense of what percentage of time you can devote to personal research. There is typically some sacrifice of your personal research (not always), but far more opportunities to collaborate and be part of a much broader range of scientific research. There is a lot of social interaction. If you love palaeo, but not enough to devote every waking minute of your life to it, and if you like collaborating and supporting other scientists in research, and if you realize the important resource that museum collections are, it is probably a good job for you.

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