Newsletter of Micropalaeontology

vol. 101, March 2020

https://www.tmsoc.org

The Micropalaeontological Society

ISSN: 2398-2098

Registered Charity No.: 284013

Cover image: Dried bryozoan, with its lophophore emerging from the zoecium as it feeds on diatoms and cyanobacteria which accumulated nearby. Bryozoans are small metazoans that live in a calcareous box (zoecium) which they form.
Image by Stephan Borensztajn & Caroline Thaler, Institut de physique du globe de Paris, France (borensztajn@ipgp.fr).

Correspondence: Please send items of news, comments, letters, or articles for publication such as conference reports or meeting announcements to the editor. These should be supplied as plain `.txt` files or as `.doc`/`.docx` documents. Photographs or illustrations to accompany articles are also welcome. Photographs are preferred to be submitted in high resolution as `.jpg` or `.png` files, graphs are preferably provided as `.pdf` files. The editor reserves the right to apply newsletter typographic standard to all contributions and apply minor corrections of grammar and spelling without requesting permission of the authors. Please send all correspondence to the editor: newsletter@tmsoc.org.

Copy date: The *Newsletter of Micropalaeontology* is published by The Micropalaeontological Society twice a year in March and September. The copy dates for each issue are 1 February and 1 August.

Advertising: Please supply your advert as a high resolution `.jpg`, `.png`, or `.pdf` file. We are using a fair-pay system, which means you pay as much as you would like for your advertisement to appear in the newsletter—there are no fixed prices. If you would like to advertise in the *Newsletter of Micropalaeontology*, please inform the editor and the treasurer. Payments can be made via the 'Donations'-tab on `https://www.tmsoc.org/membership/online-membership-payment/` (please use the 'explanation of donation' field to inform the treasurer that this donation is in exchange for an advertisement in the newsletter).

Disclaimer: The views expressed by the authors of any article in the *Newsletter of Micropalaeontology* are their own and do not necessarily represent those of The Micropalaeontological Society.

Taxonomic disclaimer: The *Newsletter of Micropalaeontology* is not deemed to be valid for taxonomical or nomenclatural purposes—see International Codes of Botanical and Zoological Nomenclature.

Copyright © by The Micropalaeontological Society
Published by The Micropalaeontological Society, United Kingdom, https://www.tmsoc.org/
ISSN: 2398-2098

Available at: https://www.tmsoc.org/publications/#tab-newsletter
Mirrored at: https://sites.google.com/view/manuel-f-g-weinkauf/home

'Small Research Grant report' header: Icon-Icons
'Journal of Micropalaeontology article highlights' header: Copernicus Publications
'Micropalaeontology in the news' header: FlatIcon
'Trends in micropalaeontology and biostratigraphy' header: Interesting Runner Evolution Sports Silhouette
'Methods in micropalaeontology' header: Simple Gear Drawing

Typeset in LaTeX with Stix, Carlito, and TXTT

Contributions from

The Micropalaeontological Society

The Grzybowski Foundation

The International Nannoplankton Association

The Newsletter is sponsored by

ROBERTSON
A CGG Company

Editorial

***Manuel F. G. Weinkauf*, Univerzita Karlova (Czech Republic)**

Dear TMS members and reader of the *Newsletter of Micropalaeontology*. In this issue we again present to you the newest developments of The Micropalaeontological Society and current tidings from the world on micropalaeontology. You can look forward to read news from several new TMS committee members, who took over from their predecessors at the AGM in November last year. We also present you a new exciting Trends-article by Mike Simmons, who discusses if biostratigraphers will still be needed in the future, astonishing results on the lifespan and use of nummulites for palaeoenvironmental reconstructions by Peter Stassen, and an entertaining new crossword riddle by Rehemat Bhatia.

However, not everything is coming up roses. The COVID-19 epidemic is ravaging the world, and more and more states instate ever more restricting bans on freedom of movement. No one of us knows how long this situation will prevail. Therefore, as usual, we will announce details about upcoming meetings in the micropalaeontological community. However, *we urge you to check with the conveners and organizers of these meetings in due time to verify whether or not they will actually take place* in the form announced here, or at all.

I wish you a lot of enjoyment going through this newsletter and look forward to your next visit in autumn.

Manuel Weinkauf

Contents

Conference and course announcements

LIVING FORAMS 2020

28 June to 1 July 2020

Bremerhaven, Germany

Venue: Apollo Theatre


11th International Workshop
on Agglutinated Foraminifera
September 24–26 2020
AGH University of Science &
Technology, Kraków, Poland
For information see: www.micropresseurope.eu
IWAF – XI
GRZYBOWSKI FOUNDATION
AGH
micropress europe

News

The Micropalaeontological Society news

Report from the President

***Jenny Pike*, Cardiff University (UK)**

Welcome to the first *Newsletter of Micropalaeontology* of the new decade! New decade, new president! I would like to thank Jim Riding for the fantastic work he has done with the society over the past three years. In particular, I would like to thank Jim for his parting gift—co-convening, together with Mike Simmons (Halliburton and NHM), an excellent Annual Conference and AGM at the British Geological Survey in November 2019, with a thought-provoking symposium on the subject of automation and machine learning in micropalaeontology, followed by a diversity of talks and posters in the open session.

My first few weeks as TMS President have been exciting. I have joined the committee in the middle of an initiative to recognize and celebrate the diversity of micropalaeontologists by naming our as-yet-unnamed awards after excellent micropalaeontologists. The committee asked you, the society members, to nominate micropalaeontologists from currently under-represented groups, that the awards could be named for, and you sent us a number of great suggestions for consideration. We are also looking at ways to improve inclusivity for members who may not be able to travel to TMS Specialist Group meetings or to the Annual Conference and, on this topic, I would like to thank Diana Ochoa, Zeynep Erdem, and their early career colleagues, for their communication and suggestions. Indeed, in the first few weeks of being president, I was delighted to hear from a number of members on various topics around diversity and inclusion and, if you have any thoughts about how the society could evolve into the future, I and the committee would love to hear from you.

For the Geological Society of

America meeting in October 2020 in Montréal, TMS is very pleased to have offered to co-convene a session that has been jointly proposed with the Cushman Foundation in their 70th year (it is unknown at time of writing whether this session has been approved by GSA, but we wish the proposers, Anieke Brombacher and Adriane Lam, every success). Co-proposed sessions such as these are a great way to increase networking between TMS members, and with other like minded micropalaeontologists, who are unable to join the society's main meetings. If you have ideas for micropalaeontologically-focussed sessions as part of larger meetings, I encourage you to contact the committee to discuss what support we can offer.

Finally, I would like you to put the date of the next TMS Annual Conference and AGM into your calendars! This will take place at University College London on 11 & 12 November 2020. This will be the 50th Annual Meeting of the society and other workshops are planned to occur alongside the main meeting, so keep an eye on the website, Facebook, or Twitter for updates. Thank you for your continued support as we move into our next 50 years!

Best wishes

Jenny Pike

Report from the Secretary

***Phillip Jardine*, Universität Münster (Germany)**

The 2019 TMS Annual Conference took place at the British Geological Survey at Keyworth on 13 and 14 November; and was a joint meeting between TMS, SEPM, and the Petroleum Group of the Geological Society. In contrast to the last few years, the opening symposium lasted a full day, and with the theme 'Biostratigraphy: A 21st Century Science' showcased advances in data science, machine learning, and automation in biostratigraphy and micropalaeontology. As ever, the posters and talks on the second day were open-themed and encompassed a diverse range of research from across our discipline. My thanks go to Mike Simmons, Jim Riding, and the BGS staff for organizing this fantastic meeting. The 2020 Annual Conference will take place at Uni-

versity College London on 11 and 12 November, and will mark the 50th anniversary of TMS. We hope to see many of you there to celebrate this momentous occasion!

I would like to thank outgoing committee members Jim Riding (President), Sev Kender (JoM Editor-in-Chief), Janine Pendleton (Webmaster), Tracy Aze (Events Secretary), and Ian Wilkinson (Ostracod Group Chair) for their hard work and contributions to the society. I would also like to welcome new committee members Jenny Pike (President), Francesca Sangiorgi (JoM Editor-in-Chief), Isabel Fenton (Webmaster), Anieke Brombacher (Events Secretary), and Jonathan Holmes (Ostracod Group Chair).

Brady Medal

The 2019 Brady Medal was awarded to Patrick De Deckker at the TMS Annual Conference, in recognition of a hugely successful academic career with substantial contributions to research, teaching, mentoring of research students, service on committees, and journal editorial work. Patrick's research is characterized by a broad application of microfossils, in combination with other proxies, to address questions of palaeoenvironmental and palaeoclimatic change, with expertise in taxonomy, palaeoecology, and geochemistry; most obviously with ostracods but also Foraminifera and other microfossil groups.

The Brady Medal is the society's highest award for scientists who have had a major influence on micropalaeontology by means of a substantial body of excellent research. The medal is named in honour of George Stewardson Brady (1832–1921) and Henry Bowman Brady (1835–1891) in recognition of their outstanding pioneering studies in micropalaeontology and natural history. Nominations for the Brady Medal are accepted by the president or secretary at any time (please see the TMS website for further information).

Alan Higgins Award

The Alan Higgins Award for Applied Micropalaeontology is given to a young scientist, less than 10 years from graduation, in recognition of a significant record of achievement in the field of applied and industrial micropalaeontology, as documented by publications, software, patents, lead-

ership, or educational activities. The award was established with the help of Alan's family and friends, to commemorate his contribution to micropalaeontology and encourage young researchers in the field.

The 2019 Alan Higgins award was given to Abduljamiu Amao, for his work on benthic Foraminifera from the Arabian Gulf, and their uses as bioindicators of pollution and palaeoenvironmental change. Nominations for the 2020 award should be sent to the Secretary by 28 February 2020, using the appropriate form available from the TMS website.

Charles Downie Award

The Charles Downie Award is an annual award made to a member of the society who, in the opinion of the committee, has published the most significant paper in any journal based on their postgraduate research. The 2019 Charles Downie Award (best paper published in 2018) was awarded to Rowan Dejardin for:

Dejardin R, Kender S, Allen CS, Leng MJ, Swann GEA, and Peck VL (2018) ''Live" (stained) benthic foraminiferal living depths, stable isotopes, and taxonomy offshore South Georgia, Southern Ocean: Implications for calcification depths. *Journal of Micropalaeontology* 37 (1): 25–71. doi:10.5194/jm-37-25-2018

Nominations for 2020 (best paper published in 2019) should be sent to the secretary by 28 February 2020.

TMS Student Awards

TMS Student Awards are given to those nominated for their outstanding performance on one of our TMS-approved micropalaeontological courses, and consist of a year's free membership. Last year we made 11 awards to outstanding students: Eleanor Armstrong (Northumbria University), Joshua Beech (Keele University), William Burton (University of Southampton), Jon Gardoqui (Universidad del País Vasco), Janina Groninga (Universität Bremen), Sigrid Huld (Université de Lille), McKenzie Huso (Universiteit Gent/Katholieke Universiteit Leuven), Sian Miller (University of Birmingham), Bianca Rau (Eberhard–Karls Universität Tübingen), Natalie Rea (Cardiff University), and Amy Wrisdale (University of Leicester). Congratulations

to them all.

The TMS Student Award scheme now has 24 approved micropalaeontological courses, and I encourage any TMS members to consider nominating their taught micropalaeontological courses for the scheme to encourage their best students to continue with a micropalaeontological career.

TMS Grants-in-Aid

In 2019 the TMS committee awarded six Grants-in-Aid. These were: Elizabeth Balmer (University of Edinburgh), for nannofossil taxonomy training; J. Emmanuel Bustamante (Durham University), for sampling of modern pollen and diatoms for palaeo-sea level reconstruction; Amy Jones (University of Birmingham), to attend the TMS Foram–Nanno Meeting; Lea Rausch (Universitatea din București) to attend the International Meeting of Early Stage Researchers in Palaeontology; Cemile Solak (Mersin Üniversitesi), to attend the Strati19 conference; and Rebecca Walley (Natural History Museum London) for sampling Triassic–Jurassic microfossils in southwest Wales.

I would encourage all of our student members and early career researchers to consider applying for a Grant-in-Aid. Grants-in-Aid are awarded annually to help members of the society who are students or early career researchers (within 10 years of obtaining their last degree) in their fieldwork, conference attendance, or any other specific activity related to their research which has not been budgeted for. Grants-in-Aid cannot be awarded for miscellaneous expenditure, neither can they be awarded retrospectively. A maximum of £500 can be awarded to each successful applicant. Awardees are expected to write a short report for the newsletter once their grant has been used. Application forms can be downloaded from the website (www.tmsoc.org), or obtained from the secretary. The next deadline is 28 February 2020.

TMS Small Research Grants

Last year we awarded our third Small Research Grant to Martyn Golding for his project ‘Conodont Biostratigraphy and Definition of the Lower–Middle Triassic Boundary in Romania’.

The TMS Small Research Grants comprise a single award of up to

£1500 each year to support micropalaeontological research by members of the society. This grant is aimed to support stand-alone research projects and funds can be used to assist with any costs associated with the work, e.g. analytical costs, visits to museums, fieldwork, etc. This grant is open to any TMS member but if funding relates to a funded Ph.D. or M.Sc. project, then a case must be made as to why funding is required above that already available and a letter of support must be provided by one of your advisors. This award cannot be used to support conference or workshop attendance. The next application deadline is 31 October 2020. Further information, and a summary of previously funded projects, can be found on the TMS website: https://www.tmsoc.org/tms-small-research-grant/.

GSL Online Bookshop benefits for TMS members

TMS members can take advantage of various discounts and offers at the Geological Society Online Bookshop (http://www.geolsoc.org.uk/bookshop):

TMS member discounts: As a TMS member you qualify for 50 % off TMS books, and up to 40 % off other GSL published books (but not books from other publishers). To get these discounts you will need to register with GSL, and then register your affiliation to TMS, which is all explained in the Bookshop FAQs.

Sale Events: These occur several times a year, and sale prices are available to anyone (there are no further discounts for society membership). To receive email notifications about forthcoming sales you can sign up for Bookshop emails at http://www.geolsoc.org.uk/bookshop, by clicking on the yellow 'Subscribe to the Bookshop Newsletter' box on the right hand side of the screen. You will also receive notices of new books published (including any TMS books) and any special promotions.

Committee vacant offices

At the 2020 AGM, the following TMS Committee positions will become available for election:

- Secretary

- Industrial Liaison Officer

Nominations for these positions should be submitted to the secretary by 30 September 2020. Nominees, proposers, and seconders should all be members of the society. Those who consider standing for election are welcome to contact the secretary or president for information on what duties these posts entail.

Report from the Treasurer

***Manuel Vieira*, Shell UK Ltd. (UK)**

Annual audited accounts for the year 2018–2019 are presented in Table 1. Figures for previous years are included (in parentheses) for comparison.

The society continued to support a wide range of financial activities throughout the year, including:

- The image competition and calendar.
- An annual contribution to the societie's Education Fund (which in turn awarded three grants).
- Continuation of the Small Research Grant scheme awarded to Sophie Westacott.
- The award of six Grants-in-Aid and ten student bursaries.
- The Annual General Meeting and the award of the Brady Medal and Higgins and Downie Awards.
- Support of two public engagement events (the Lyme Regis and Yorkshire Fossil Festivals).
- Sponsorship of two external scientific meetings that promote micropalaeontology.

The income has increased relative to 2017–2018. PalyPal subscription increased from £9780 to £10 450, but we also had a substantial increase in miscellaneous income (a generous donation of £6000 from the University of Edinburgh and the Gift Aid refund, which happens every three years). Following the relaunch of the open access *Journal of Micropalaeontology* with Copernicus in this accounting year, we got a positive income of £2226.93.

Table 1: Annual audited accounts for the year 2018–2019.

TMS Statement of accounts for financial year 2018 - 2019 - Audited accounts

INCOME		(2017-18)
BALANCE FROM 2017-2018		
Closing balance in 2017-18 accounts	**34,481.98**	
INCOME DURING YEAR		
Membership subscriptions		
Paid by cheque	90.00	
Paid by direct debit	0.00	
Paid online (Paypal and 'Paypal here' credit cards)	10,405.00	
Paid by bank transfer	20.00	
Total subscription income	**10,515.00**	*(11626)*
Publication-related income		
Calendar Sales	1,484.00	
Spec publications royalties - GSPH	203.99	
Journal & Newsletter advertisements and sponsorship	50.00	
Journal Of Micropalaeontology (Copernicus)	2,226.93	
Total publication-related	**3,964.92**	*(1717)*
AGM 2018 income (Leeds)		
Sponsorship	2,050.00	
AGM registration (incl. dinner)	2,840.00	
	4,890.00	*(7865)*
Miscellaneous Income		
Donations	500.00	
Amazon Clickthrough	69.57	
Univ Edinburgh donation (Forams conference)	6,000.00	
Interest	23.35	
Gift Aid refund	1,976.50	
Total Miscellaneous income	**8,569.42**	*(554)*
TOTAL INCOME DURING YEAR	**27,939.34**	
(Income 2017-2018)	*21763*	
(Income 2016-2017	*20638)*	
(Income 2015-2016	*24585)*	

EXPENDITURE		(2017-18)
Publications		
Journal Of Micropalaeontology (Open Access Fees, Copernicus)	0.00	
Photographic Competition prize	175.00	
Calendar printing & postage	1,551.80	
Total publications	1,726.80	*(9299)*
AGM 2018 Expenditure (Leeds)		
Venue hire, catering & other costs in Leeds	3,103.58	
Speakers' travel and accomodation	619.95	
Total AGM	**3,723.53**	*(9395)*
Meetings, Awards, etc.		
Contribution to Education Trust	1,000.00	
Small Research Grant	1,500.00	
TMS Grants in Aid (6 awards)	2,515.00	
Downie Award 2018	200.00	
Higgins Award 2018	300.00	
Brady Medal (casting & engraving)	360.00	
AGM awardee travel and accomodation	978.75	
Medals UK	673.80	
Public engagement -Yorkshire Fossil Festival	200.00	
GASS 2019	250.00	
NASSET	500.00	
Lyme Regis Fossil Festival	450.00	
Total meetings and awards	**8,927.55**	*(10282)*
Committee expenses		
Committee travel - AGM, Nov 2018	579.31	
Committee travel - March meeting	225.21	
Total committee	**804.52**	*(820)*
Charges & insurance		
Website charges	72.45	
Insurance	308.79	
Bank charges (mostly for foreign payments)	58.00	
Direct debit processing (Pegasus)	0.00	
Online payment fees (PayPal)	546.96	
Total charges	**986.20**	*(1054)*
TOTAL EXPENDITURE	**16,168.60**	
(Expenditure 2017-2018	*30851)*	
(Expenditure 2016-2017	*22632)*	
(Expenditure 2015-2016	*22692)*	

SUMMARY OF FINANCIAL SITUATION	
Opening balance	
Income	
Expenditure	
Closing balance	
This closing balance includes:	
Downie Fund	790.52
Higgins Fund	1055.00

SUMMARY OF FINANCIAL SITUATION		
Opening balance	**34,481.98**	
Income	**27,939.34**	
Expenditure	**16,168.60**	
Closing balance	**46,252.72**	
Change over year	**11770.74**	
	(-£8944 in 2017-18)	
	(-£2,062 in 2016-17)	
	(£1,894 in 2015-16)	

This financial period ran from 6th Nov 2018 to 4th Nov 2019
Prepared by M. Vieira (Treasurer)

Direct debit income was not accounted due to a lost of communication with Pegasus, but we are doing everything possible to ensure this issue is overcome.

Committee expenses are in line with the previous year. Total expenditure is £16 168 (reduced relatively to the previous years, even when adjusted for JOM costs). Change over the year for 2019 records a positive balance of £11 770.

Journal of Micropalaeontology Editor-in-Chief report

***Francesca Sangiorgi*, Universiteit Utrecht (The Netherlands)**

Last November, I became Editor-in-Chief of the *Journal of Micropaleontology*, what an honour! My predecessor, Sev Kender, supported by a committed editorial board, did a great job and achieved excellent results. I hope, I can meet the expectations.

Before writing an update on the state of the journal, I would like to introduce myself to the ones, who do not know me yet. I am Associate Professor in the group 'Marine Palynology and Paleoceanography' at the Department of Earth Sciences, Universiteit Utrecht. I have a background in marine environmental sciences and during my Ph.D., I specialized in marine palynology. I have a broad interest in palaeoclimate and palaeoenvironmental reconstructions, and my main research topics are related to polar, mostly Antarctic, palaeoclimate during the Neogene and to anthropogenically driven environmental changes in coastal areas. If you want to know more about myself, you can check my profile on the university website at https://www.uu.nl/staff/fsangiorgi.

An update on the journal

The journal keeps publishing high quality research papers in the broad field of micropalaeontology, as indicated by the subjects of the most recently published papers (see below), which range from biostratigraphy over palaeoclimate to (palaeo)ecology. The impact factor of 1.500 (2018) combined with the journal's open access model, encouraged by many universities and institutions, shall keep attracting submissions. Our aim is to provide

our discipline with a highly visible, high-quality, and prestigious platform for publication. Submissions in 2019 have remained stable, and the high quality of published papers is maintained by a rigorous and fair peer-review process. Copernicus provides an intuitive platform for our open access research, with article level metrics, paper impact summary statements, and thumbnail images. Copernicus readily supports authors throughout the publication process. The website, which has the entire back content of JOM papers openly accessible, along with all the information needed to submit your work, can be found on the journal website.

Most recent papers

- 'Organic-walled dinoflagellate cyst biostratigraphy of the upper Eocene to lower Oligocene Yazoo formation, US Gulf Coast', Marcelo Augusto De Lira Mota, Guy Harrington, and Tom Dunkley Jones, doi:d10.5194/jm-39-1-2020
- 'Seasonal and interannual variability in population dynamics of planktic foraminifers off Puerto Rico (Caribbean Sea)', Anna Jentzen, Joachim Schönfeld, Agnes K. M. Weiner, Manuel F. G. Weinkauf, Dirk Nürnberg, and Michal Kučera, doi:10.5194/jm-38-231-2019
- 'Latest Oligocene to earliest Pliocene deep-sea benthic Foraminifera from Ocean Drilling Program (ODP) Sites 752, 1168 and 1139, southern Indian Ocean', Dana Ridha, Ian Boomer, and Kirsty M. Edgar, doi:10.5194/jm-38-189-2019
- 'Benthic Foraminifera indicate glacial North Pacific intermediate water and reduced primary productivity over Bowers ridge, Bering Sea, since the mid-Brunhes transition', Sev Kender, Adeyinka Aturamu, Jan Zalasiewicz, Michael A. Kaminski, and Mark Williams, doi:10.5194/jm-38-177-2019

Why publish with the Journal of Micropalaeontology?

It is open access, and several universities and institutions encourage

open access publications and support them financially. The impact factor has increased greatly in the last years. We have fast publication times, and if authors are efficient, papers are online within weeks of acceptance. We publish research articles, and we encourage review papers and (virtual) special issues. The review process is a traditional format, but the online system makes it faster for our editors and reviewers and easier for communication and reviews. There is maximum visibility for your research, with open access publishing and online metrics and supplements. Article processing charges apply, and there are funds available for those TMS members who do not have access to open access funding. TMS members receive reduced page charges (55 € per page) which are some of the lowest of any quality journal. TMS members also receive, in addition to free online access, reduced print subscription. Copernicus offers English copy-editing services included in the article processing charges.

Journal data 2019

Submission–acceptance:	150 d
Acceptance–publication:	29 d
Submissions:	15
Currently under review:	3
Rejection rate:	36 %

The majority of rejections occurs prior to review, due to submission of papers outside the scope of the journal.

Editorial board

- Dr Laia Alegret (benthic Foraminifera)
- Dr Thomas Cronin (ostracods)
- Dr Taniel Danelian (siliceous microfossils)
- Dr Kirsty Edgar (planktonic Foraminifera)
- Dr Sev Kender (benthic Foraminifera)
- Prof. Emanuela Mattioli (nannofossils)
- Dr Luke Mander (palynology)
- Dr Francesca Sangiorgi (palynology)

Report from the Publicity Officer

***Rehemat Bhatia*, University of Bristol (UK)**

Hello! It's Rehemat. You last heard from me during the autumn . . . here's an update of what's been happening since the summer!

Popularity on Twitter and Facebook has steadily been growing, with 125 new followers since September on Twitter and 183 new members on Facebook. Our twitter accounts have multiplied, with new specialist groups being run by the group officers.

We also ran the annual image competition, which was very successful once again. A total of 82 images were submitted this year, from a wide range of individuals (43 people in total). This year we also tried something new to evaluate engagement with the competition, and to identify where we can do better. Having a demographics question on the form helped to identify which groups we engage the most with this initiative. This year, the majority of submission were by Ph.D. students and postdoctoral researchers (60 %). Fewer submissions came in from M.Sc. students, industry professionals, and undergraduates. Publicity strategies that proved most effective were via the TMS membership list, other email mailing lists, and social media. We will aim to reach the groups who engage less next year (strategy to be decided).

The 12 amazing, winning images this year took various artistic forms, from paintings to SEM images, showcasing all groups. The winner this year was undergraduate student Chantal Bussiere from the University of Maine, with a very cool image showing different pollen and spores. Chantal's CT scans are fully open access via her website (see Twitter for the link)!

All 2019/20 calendar winners are listed below:

- Anita Nyerges (Doctoral School of Environmental Sciences, Eötvös Loránd Tudományegyetem, Hungary)
- Fabienne Marret-Davies (University of Liverpool, UK)
- Tristan Biard and Lucie Courcot (Laboratoire

d'oceanologie et des geosciences, France)

- Larry E. Bell (Dallas Paleontological Society, USA)
- Stephan Borensztjan (Institut de physique du globe de Paris, France)
- Caroline Thaler (Institut de physique du globe de Paris, France)
- Katie Harazin (Australian National University, Australia)
- Annekatrin Enge (Vienna, Austria)

Well done to all the winners!

During February, we will also be running #iamamicropalaeontologist again, so watch the mailing list, Facebook, and Twitter for more info.

Officers of the Society

Dr Jenny Pike
President
School of Earth and Ocean Sciences
Cardiff University
Main Building
Park Place
Cardiff CF10 3AT
United Kingdom
president@tmsoc.org

Dr Phillip Jardine
Secretary
Institute of Geol. and Palaeontol.
Universität Münster
Heissenbergstraße 2
48149 Münster
Germany
secretary@tmsoc.org

Dr Manuel Vieira
Treasurer
Shell UK Ltd.
1 Altens Farm Road
Nigg
Aberdeen AB12 3FY
United Kingdom
treasurer@tmsoc.org

Dr Francesca Sangiorgi
Journal Editor
Earth Sciences
Universiteit Utrecht
Vening Meineszgebouw A
Princetonlaan 8a
3584 CB Utrecht
The Netherlands
editor@tmsoc.org

Dr Anieke Brombacher
Events Secretary
National Oceanography Centre
University of Southampton
University Road
Southampton SO17 1BJ
United Kingdom
events@tmsoc.org

Dr Matt Wakefield
Industrial Liason Officer
ilo@tmsoc.org

Dr Rehemat Bhatia
Publicity Officer
School of Earth Sciences
University of Bristol
Queens Road
Bristol BS8 1RJ
United Kingdom
publicity@tmsoc.org

Dr Matthew Pound
Membership Secretary
Department of Geography
Northumbria University
Ellison Building
Newcastle upon Tyne NE1 8ST
United Kingdom
membership@tmsoc.org

Dr Manuel Weinkauf
Newsletter Editor
Faculty of Sciences
Univerzita Karlova
Albertov 2038/6
128 00 Praha 2
Czech Republic
newsletter@tmsoc.org

Dr Isabel Fenton
Webmaster
Department of Earth Sciences
University of Oxford
South Parks Road
Oxford OX1 3AN
United Kingdom
webmaster@tmsoc.org

Dr Jeremy Young
Archivist
Earth Sciences
University College London
Gower Street
London WC1E 6BT
United Kingdom
jeremy.young@ucl.ac.uk

Dr Peter Osterloff
Special Publications Editor
Shell UK Ltd.
1 Altens Farm Road
Nigg
Aberdeen AB12 3FY
United Kingdom
peter.osterloff@shell.com

Dr Fabienne Marret-Davies
Special Publications Editor
Department of Geography
University of Liverpool
Roxby Building
Liverpool L69 7ZT
United Kingdom
f.marret@liverpool.ac.uk

Prof. Dr Martin Langer
Foraminifera Group Chair
Bereich Mikropaläontologie
Steinmann-Institut
Nussallee 8
53115 Bonn
Germany
martin.langer@uni-bonn.de

Dr Lyndsey Fox
Foraminifera Group Secretary
Dpt. of Geogr., Geol. and Environ.
Kingston University
River House
53-57 High Street
Kingston upon Thames
Surrey KT1 1LQ
United Kingdom
L.Fox@kingston.ac.uk

Dr Sarah Alvarez (née O'Dea)
Nannofossil Group Chair
University of Gibraltar
Europa Point Campus
Gibraltar GX11 1AA
British Overseas Territory
sarah.alvarez@unigib.edu.gi

Amy Jones
Nannofossil Group Secretary
School of Geogr./Earth/Environ. Sci.
University of Birmingham
Aston Webb Building
Edgbaston
Birmingham B15 2TT
United Kingdom
APJ527@bham.ac.uk

Prof. Dr Jonathan Holmes
Ostracod Group Chair
Department of Geography
University College London
Pearson Building
Gower Street
London WC1E 6BT
United Kingdom
j.holmes@ucl.ac.uk

Joanna Tindall
Ostracod Group Secretary
Department of Geography
University College London
Pearson Building
Gower Street
London WC1E 6BT
United Kingdom
joanna.tindall.15@ucl.ac.uk

Dr Manuel Vieira
Palynology Group Chair
Shell UK Ltd.
1 Altens Farm Road
Nigg
Aberdeen AB12 3FY
United Kingdom
Manuel.Vieira@shell.com

Dr Matthew Pound
Palynology Group Secretary
Department of Geography
Northumbria University
Ellison Building
Newcastle upon Tyne NE1 8ST
United Kingdom
matthew.pound@northumbria.ac.uk

Dr Marco Chiari
Silicofossil Group Chair
Ist. di Geoscienze e Georisorse
Univ. degli Studi Firenze
via G. la Pira 4
50121 Firenze
Italy
mchiari@geo.unifi.it

James Williams
Silicofossil Group Secretary
School of Earth & Ocean Sciences
Cardiff University
Park Place
Cardiff CF10 3AT
United Kingdom
williamsja8@cardiff.ac.uk

Exchange between the Cushman Foundation for Foraminiferal Research and The Micropalaeontological Society

Original letter from Brian Huber[1], sent on 31 October 2019

Dear Journal of Micropalaeontology Editor,

a member of the Cushman Foundation, who is also a member of The Micropaleontological Society, alerted me to the report from Editor-in-Chief Sev Kender (v. 100, September 2019 Newsletter of Micropalaeontology) stating 'The June publication of Impact Factors saw the Journal of Micropalaeontology (JoM) move ahead of some of our competitors, such as the Journal of Foraminiferal Research, with a jump to 1.500 and the highest we have ever had'. I applaud the JoM's increased impact factor, but I hope the TMS membership agrees that JoM is not in competition with the Journal of Foraminiferal Research, as we all benefit if both journals succeed. With the transition to open access publication and competition from journ-

[1]Then president of the Cushman Foundation for Foraminiferal Research.

als printed by for-profit corporations, the future sustainability of society journals is uncertain. I suggest that rather than consider the JoM and JFR as competitors, we seek opportunities to co-sponsor symposia and jointly publish review papers that would be of interest to our respective memberships, as well as the broader research community. I hope that you agree, and that we can begin a discussion how the CF–TMS relationship (and micropalaeontology) can prosper in the future.

Brian Huber
President
The Cushman Foundation for Foraminiferal Research

Joint response letter from Jenny Pike[2] and Laurel Collins[3], sent on 17 March 2020

On behalf of TMS and the Cushman Foundation for Foraminiferal Research, we thank Brian Huber for his thought-provoking comments reflecting upon Sev Kender's last newsletter report about the Journal of Micropalaeontology (v. 100, September 2019). Since TMS received Brian's letter, the new presidents of both TMS and the Cushman Foundation have had fruitful discussions about future collaborations and society members have submitted a co-proposal for a session at the 2020 Geological Society of America meeting, on the occasion of the 70th anniversary of the Cushman Foundation. With many members in common, we hope that this collaboration will grow to the benefit of both societies in the future.

Jenny Pike and Laurel Collins
Presidents
The Micropalaeontological Society and
the Cushman Foundation for Foraminiferal Research

[2]Current president of The Micropalaeontological Society.
[3]Current president of the Cushman Foundation for Foraminiferal Research.

Specialist group reports

Ostracod Group report

***Joanna Tindall*, University College London (UK)**

Field meeting September 2019 across East Anglia

The ostracod group saw a good turnout for our September field meeting led by Dave Horne and his enthusiastic team which included Alan Lord, Anna March, Kadri Sohar, and Andrew Smelling. We began the first day at Marks Tey, where Dave introduced the sites importance to MIS 11 research and Anna gave us some insights from her Ph.D. research, which she successfully defended in November! After a good pub lunch we moved onto our next site, Little Cornard, which Kadri Sohar and Andrew Snelling led. Similar to Marks Tey, this clay pit was used for brick making, but has left a 'cliff' of calcareous sediments filled with ostracods, again thought to be of MIS 11 in age.

The second day started at Stutton Ness, led by Dave Horne, Alan Lord, and Andrew Smelling, which was a fluvial deposit of the Stour Estuary. Ostracods have recently been found in the deposits by the team and some exciting preliminary results are coming out of the MIS 7 site. The final stop was Tollesbury salt marsh, a site of Special Scientific Interest looked after by Natural England and Essex Wildlife Trust. Michaela Radl completed her Ph.D. in 2017, and Tollesbury salt marsh was one of her field sites, which has produced an assemblage which includes rare British species. One particular rare British species, *Terrestricythere elisabethae*, however, has sparked some debate on whether these species are truly rare or instead overlooked and understudied by ostracodologists in the past?

Figure 1: Some of the group at Tollesbury salt marsh. Photo by Alan Lord.

Figure 2: The attendees at Marks Tey. Photo: Joanna Tindall.

A good group gathered for an interesting weekend of ostracod fun in the (mostly!) sunshine! We hope to organize the next field meeting in Spring 2020—details to follow so keep an eye on your inboxes!

New chair

Professor Jonathan Holmes at University College London took over the role as group chair at the AGM in November 2019.

Silicofossil Group report

***Marco Chiari[a] and Špela Goričan[b]*; [a]Università degli Studi Firenze (Italy), [b]Paleontološki inštitut Ivana Rakovca (Slovenia)**

The next 16th InterRad (The International Association of Radiolarists) will be held in September 2020 in Ljubljana, Slovenia. The conference will take place in the halls of the Znanstvenoraziskovalni center Slovenske akademije znanosti in umetnosti (ZRC SAZU; https://

www.zrc-sazu.si/en/node) and the Slovenska akademija znanosti in umetnosti (SAZU; http://www.sazu.si/en/about-sasa) in the centre of Ljubljana. The first circular can be downloaded at https://interrad2020.zrc-sazu.si/ During the meeting, four excursions (pre–mid–post-conference) are being organized.

Excursion A (pre-conference)—Mesozoic tectonostratigraphy of the Eastern Alps (Northern Calcareous Alps, Austria): A radiolarian perspective

Prepared by: Hans-Jürgen Gawlick (Leoben), Sigrid Missoni (Leoben), Hisashi Suzuki (Kyoto), Špela Goričan (Ljubljana), and Luis O'Dogherty (Cadiz).

The topic of the field trip will be the Mesozoic geodynamic evolution of the western Tethys with two oceanic domains: The Neo-Tethys realm and the Alpine–Atlantic realm. The field trip will focus on deep-water, radiolarian-bearing sedimentary rocks during this geodynamic history in different basins: Rift-basins, shelf areas, oceanic domains, trench-like basins, and foreland basins. The geodynamically triggered interplay between carbonate production, siliciclastic/volcanic input, and deposition of siliceous rocks/radiolarites in combination with the asynchrony of basin formation allows, in specific times, the calibration of radiolarians with e.g. ammonoids, conodonts, and calpionellids beside other organisms.

Excursion B1 (mid-conference)—Kras, the classical karst area in SW Slovenia

Prepared by: Karst Research Institute ZRC SAZU.

This excursion will be devoted to the area of classical karst, where we will visit the Škocjan caves, a UNESCO world heritage site famous for its spectacular underground canyon and inspiring history of exploration. The second part of the excursion will focus to the karst hydrology and geomorphology of the Ljubljanica catchment area.

Excursion B2 (mid-conference)—Geology of the Bohinj area, Julian Alps, NW Slovenia

Prepared by: The Ivan Rakovec Institute of Paleontology ZRC SAZU.

Figure 3: The venue for the 16th InterRad meeting Slovenia.

The field-trip area lies in a beautiful landscape of the Triglav National Park. In the morning, we will take the cable car to Vogel, to observe the overall nappe structure of the Julian Alps. In the afternoon, we will visit Upper Jurassic to Lower Cretaceous deposits (Biancone limestone and flysch) of the Pokljuka nappe.

Excursion C (post-conference)—Mesozoic basins of the southern Dinarides, Montenegro

Prepared by: Špela Goričan (Ljubljana), Martin Đaković (Podgorica), Peter Baumgartner (Lausanne), Duje Kukoč (Zagreb), Nevenka Djerić (Belgrade), Tim Cifer (Ljubljana), Aleksander Horvat (Ljubljana), Hans-Jürgen Gawlick (Leoben), and Sigrid Missoni (Leoben).

This excursion will show a cross-section through the Dinarides from the most external zones in coastal Montenegro to the ophiolitic mélanges near the border with Serbia. We will examine the complete Middle Triassic to end-Cretaceous succession of the most external Budva basin and the Triassic to Lower Cretaceous succession of a more internal Lim basin. On the way, we will cross hundreds-of-meters thick successions of platform limestones locally including a Middle

Triassic radiolarite unit. Allochthonous Middle Triassic cherts associated with volcanics and Middle Jurassic cherts associated with ophiolitic mélange will be also visited.

The InterRad Association promotes all aspects of radiolarian research including taxonomy, ecology, biogeography, biochronology, and evolution along with applications in stratigraphy and tectonics. The meetings are held regularly every three years and are aimed to gather radiolarian specialists of different research fields who present current research and exchange new ideas to advance the understanding of fossil and living radiolarians. The community is not restricted to geologists and biologists, but is open to other scientists who integrate radiolarians in a wide range of disciplines, such as mathematics, physics, and space engineering. Artists inspired by the fascinating complexity of radiolarian skeletons are also most welcome.

Nanno News—updates from the TMS Nannofossil Group and the INA

***Sarah Alvarez[a], Amy Jones[b], and Jeremy Young[c]*; [a]University of Gibraltar (BOT), [b]University of Birmingham (UK), [c]University College London (UK)**

Recent meetings

TMS Annual Conference, Keyworth, Nottingham, UK—November 2019

The TMS Annual Conference took place at the British Geological Survey, Keyworth, Nottingham on 13 and 14 November 2019, convened by Jim Riding and Mike Simmons. The Conference was a great success and the Nanno Group was represented by attendees from industry, academia, and across a broad spectrum of career stages. The first day featured a symposium on 'Biostratigraphy: A 21st Century Science', convened by TMS, with the support of SEPM, the Petroleum Exploration Society of Great Britain, and the Petroleum Group of the Geological Society. We heard great nannofossil-focussed talks from Nicolas Barbarin and Jeremy Young and enjoyed discussing the excellent posters from Nanno Group-members, including

students and early career researchers. Those who braved the rain and nearby flooding were rewarded with plenty of insightful discussion, some fantastic conference talks and posters, and a very enjoyable conference dinner. It was fantastic to see so many nannofossil workers at the event, with numbers up on previous years.

Upcoming meetings

Foram & Nanno Group Spring Meeting—back in 2021

After much discussion, it has been decided that the regular TMS Foram & Nanno Group Spring Meeting will take a short break this year. We will, however, be organizing several other events during 2020, and will be back for the joint group meeting during spring 2021.

INASSET 2020

The third INA Summer School on Evolution and Taxonomy will be held in Lyon, from 5–11 July, covering Caenozoic nannofossils. The school is hosted by Emanuela Mattioi and co-organized by her and Giuliana Villa with an expert set of lecturers including Claudia Agnini, David Watkins, Giuliana Villa, Jorijntje Henderiks, Eric de Kaenel, and Luc Beaufort. It is intended that in the future, these summer schools will take place every other year, alternating with the INA conferences. So there will not be a summer school in 2021, as there will be an INA conference then, hosted by Luc Beaufort. Registration for the summer school will be opening shortly, on the INA website.

TMS Annual Meeting, UCL—November 2020

The TMS Annual Conference will take place at University College London during November 2020. Further details will be announced closer to the event, and we are hoping for a strong Nanno Group-contingent, following on from last year's success.

Workshops

We are delighted to announce that we will be hosting a Nanno Group Workshop alongside the TMS Annual Conference at University College London later this year. We are also planning to hold another 'Cocco-Catch-Up Day' in the interim, with

the aim of providing an informal opportunity for nannoplankton workers to share their progress, interests, and frustrations(!) and to help promote future collaborations. These events have proved highly productive in the past, and we are sure that this year will be no exception. Watch this space, the website, and our Facebook and Twitter feeds for further details! As always, we aim to ensure that workshops represent Nanno Group-members' interests, so please do not hesitate to contact a Nanno Group committee member if you have any suggestions/requests for any workshop themes.

@TMS_Nanno

Our Twitter feed is a great way to keep up with the latest happenings in the nannofossil world. We have been active since May 2019, and are gradually building up our followers. We are currently at 77, so let's see if we can make it to 100 by the TMS Annual Meeting! This is a great forum to share details of conference sessions, recent papers, viva celebrations, upcoming workshops, puzzling taxonomy, and more; so we hope to see you online soon!

A new morphology-based search system for Nannotax

One of the good things about coccolithophores is that their taxonomy is rather well-developed and well-supported. Biologists and palaeontologists use essentially the same classification and it is supported both by morphological characters and by molecular genetics. So, this classification naturally forms the basis of the Nannotax website. Indeed the website structure is built around the concept of browsing through the taxonomy. This does have the disadvantage that the website can be difficult to use if you do not understand the taxonomic system already. To make this worse, the key characters which underpin coccolith taxonomy are based on coccolith ultrastructure/biomineralization patterns. These provide robust criteria for classification, but are not always easy to see on single coccoliths. Indeed, to definitively work out the structure and affinities of a coccolith, you need data from both the scanning electron microscope (SEM) and light microscope (LM; especially crystallographic data from cross-polarized light images), but that is a bit disconcerting if you just want to identify

a single image. Moreover, superficially similar coccoliths often end up in different taxonomic groups. The ultimate solution to this problem for nannofossil specialists is either to learn the taxonomy and the basis for it, or to learn all the species so that they do not need to worry about classification at all. Naturally, on a taxonomic website we want to help people to learn the taxonomy and to identify species without having encyclopedic knowledge. The normal ways of doing this are to develop some kind of table of characters or key. This has proven difficult for coccoliths because of their morphological diversity and lack of homology (for the same reason no one has managed to do a cladistic study of coccolithophores). As an alternative, in 2017, we adopted a more flexible system developing a large set of morphological tags to describe coccoliths and other nannofossils and an 'advanced search' interface with dropdown menus to search them. I described this system in the October 2017 *Newsletter of Micropalaeontology*, and I was really rather pleased with it; unfortunately though, no one else was.

The system had nearly 200 tags grouped into 12 dropdown menus, and so perhaps unsurprisingly proved a bit daunting. It also proved a challenge to maintain and we never extended it to the Mesozoic. So, finally I decided to try and make a much simpler system—ruthlessly reducing the number of tags in use from 200 to 40, so that the battery of menus could be replaced by a friendly grid of pictorial buttons. In addition, the default output has been changed from just producing one image to a row of seven images. The number seven was simply chosen because it filled the screen neatly, but one key advantage of having multiple images is that SEM and LM images are shown, and for modern taxa both complete coccospheres and individual coccoliths. This makes it much more likely that specimens similar to the users will be shown. This system does not allow mechanistic identification of species, but it does allow users to search across the diversity of coccoliths and nannofossil for species which match simple sets of criteria—and by combining morphology, size, and geological age, one can normally reduce the number of possible identifications to a limited set.

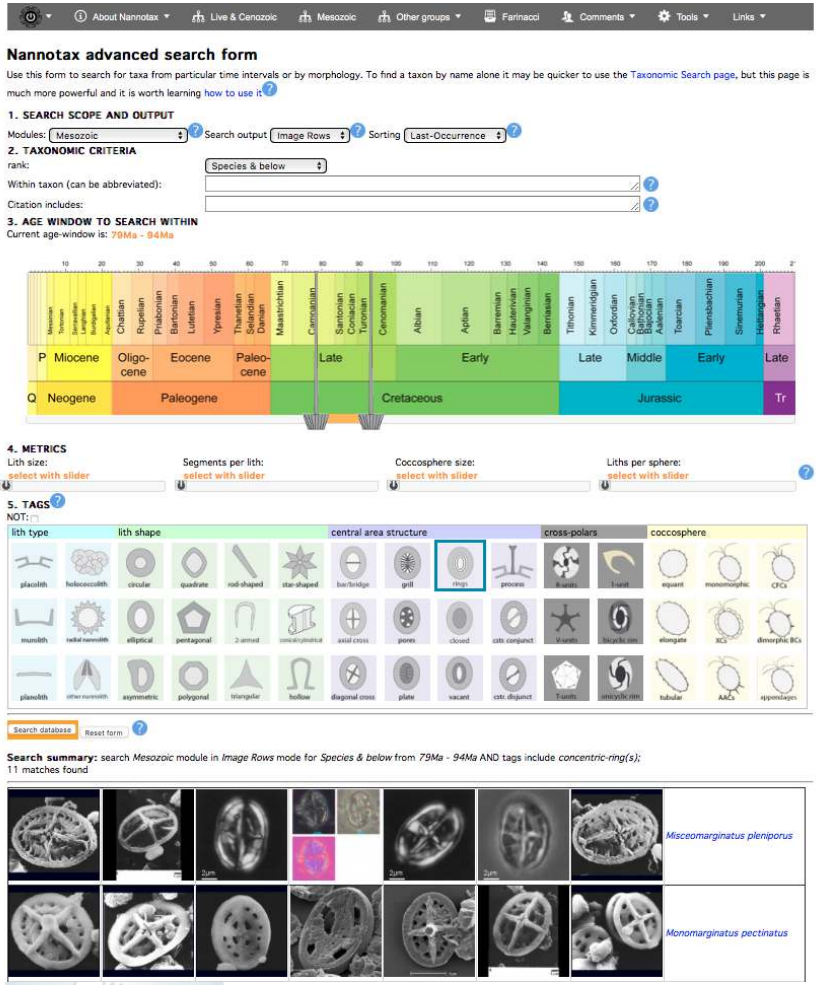


Figure 4: The new advanced search form on Nannotax.

Finally, this simplified tagging set was easy enough to code for me to be able to apply it to the Mesozoic nannofossils. So, now it is possible to search Mesozoic or Caenozoic, or both combined. Adding the tags did, however, require working systematically through the entire set of *c.*1000 Mesozoic taxa. Actually, the most time-consuming part of this was adding size data, since that frequently required measuring individual images. Whilst doing so, I reread the text of virtually every page and corrected numerous typos and other errors. Moreover, in several places this lead to quite drastic revision or reorganization of the coverage. For example, the numerous (*c.*30) *Zeugrhabdotus*-species are now organized by size and rim appearance (unicyclic vs. bicyclic) into a set of sub-categories which at least provide a comprehensible guide to current usage.

So the overhaul of the Mesozoic combined with development of the Advanced Search adds up to a significant change and feedback would, as ever, be very useful.

Grzybowski Foundation news (gf.tmsoc.org)

***Mike Kaminski*, King Fahd University of Petroleum & Minerals (Saudi Arabia)**

During the Autumn of 2019, the Grzybowski Foundation supported a number of activities. In October, the 20th Czech–Slovak–Polish palaeontological conference, was held at the Uniwersytet Warszawski field training facility in Chęciny, Poland. This new facility is the showcase geological training centre of the Uniwersytet Warszawski, and was constructed with support by an infrastructure grant from the European Community. Located in an abandoned quarry in the Holy Cross mountains, the centre is a short walk away from Chęciny castle, and boasts lecture rooms, sedimentology and magnetostratigraphy laboratories, residential areas, and a beautiful auditorium that is built into the Devonian limestone outcrop. The meeting, held over a three-day period, consisted of lectures and poster sessions, and a one-day field excur-

Figure 5: The Geological Training Center of the Uniwersytet Warszawski in Chęciny, Poland.

sion to view the upper Palaeozoic limestones in the Chęciny area. A handsome abstract volume containing 43 abstracts was produced by Anna Żylińska and her group at the Uniwersytet Warszawski. The abstract volume is published on open access, and can be downloaded from the Grzybowski Foundation website. The GF sponsored the micropalaeontological session as well as the conference dinner at the meeting, which turned out to be a very pleasant event with excellent Polish delicacies.

At the European Micropaleontological Reference Centre, Lucyna Bobrek has been busy compiling new chapters for the Ellis & Messina Catalogue of Foraminifera. This is an activity that the Foundation will support in the new year as well—this semester, I am moving my 10-year old iMac computer (which still works perfectly well!) to the EMRC, and we hope to employ a summer student for the task of scanning and editing images for the catalogue. We are happy to assist the good people at Micropaleontology Press by contributing chapters to the E&M catalogues.

Grzybowski Foundation Special Publication no. 24 is now published, and will be made available for purchase through the GF website. GF members and libraries will receive their copies in due course. The new

publication is an updated and enlarged English-language version of Wilfried Rönnfeld's book *Foraminifera – a Catalog of Typical Forms* (The previous edition of the book was published in German). The new edition, which is now 159 pages in length, will no doubt serve as a useful text for students who are new to the subject of Foraminifera. The book provides an introduction to the study of Foraminifera; discussing analytical methods, the history of foraminiferal studies, and their application to biostratigraphy. The systematic part will serve as a handy lab manual that can be used in conjunction with a type collection to learn the common foraminiferal genera. The book has been thoroughly reviewed by subject experts, and is much expanded compared with the previous German edition. We will use the book as a textbook at the ISF course in Urbino.

Speaking of which, the 13th International School on Foraminifera will be held at the Università degli Studi di Urbino 'Carlo Bo' in June, and we are encouraging potential participants to apply as early as possible in order to reserve a place. The ISF course has received sponsorship this year from the EGU, and full tuition scholarships will be made available to self-funded students from the European Community who have no institutional support. Micropaleontology Press (New York) has also provided a tuition scholarship that is open to any applicant (although the lucky recipient will likely be asked to consider submitting a paper to *Micropaleontology*). The application form for the course can be found on the ISF website.

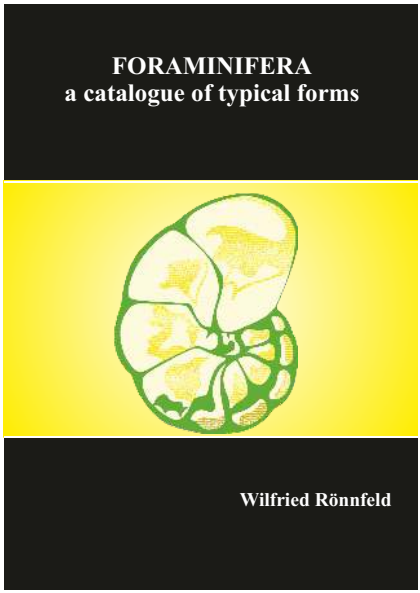


Figure 6: Cover of the new Grzybowski Foundation Special Publication.

The 11th International Workshop

on Agglutinated Foraminifera, will take place at Micropress Europe and the Akademia Górniczo–Hutnicza im. Stanisława Staszica in Kraków, Poland, on 24–26 September 2020. The IWAF-11 is timed to commemorate the 100th birthday of Prof. Stan Geroch, who trained the current generation of micropalaeontologists in Kraków. The call for abstracts is now out—if you are interested in submitting an abstract to the meeting, the deadline is 1 April. We will publish the abstract volume as a GF Special Publication, and this will be made available to download from the GF website. The GF will sponsor travel grants to students and retired scientists who wish to attend the meeting. Please write to me directly if you would like to apply for a travel grant. The International Committee on Foraminiferal Classification will also meet during the IWAF. To register for the IWAF-11, please send an email to Sławek Bębenek (s.bebenek@agh.edu.sa).

Thanks to the generosity of the O'Neill family, we are able to offer another 'Brian J. O'Neill Memorial Scholarship for Research in Stratigraphic Micropaleontology' grant this year. Last year's grant was awarded to Eric Wolfgring of the Universität Wien, to support his research on the Cretaceous DWAF faunas recovered from the recent IODP Expedition 369 to the Great Australian bight. Please contact me for further information about the grant.

Other future activities include 'Sausage Night' at the Universität Wien, which will be held in conjunction with an open palaeontology session at the EGU meeting in May. This year, our micropalaeontology session at EGU has been merged into the open session on palaeontology, and we will inform presenters and participants at the session. Hope to see you there!

TMS Small Research Grants

TMS offers a single grant of up to £1500 each year to support micropalaeontological research by students or researchers of the Society. This grant is aimed to support stand-alone research projects, and funds can be used to assist with any costs associated with the work, e.g. analytical costs, visits

to museums, fieldwork, etc. This grant is open to any TMS member but if funding relates to a funded Ph.D. or Master's project, then a case must be made as to why funding is required above that already available and a letter of support must be provided by one of your advisors. This award cannot be used to support conference or workshop attendance (please see Grants-in-Aid).

List of past recipients

Year	Name	Affiliation/Title
2019	Martyn Golding	Geological Survey of Canada & University of British Columbia (Canada) 'Conodont Biostratigraphy and Definition of the Lower–Middle Triassic Boundary in Romania'
2018	Sophie Westacott	Yale University (USA) 'Macroevolutionary Trends in Silica Use by Palaeozoic Radiolarians'
2017	Peter Stassen	Katholieke Universiteit Leuven (Belgium) 'Eocene Nummulites: High-Resolution Archives of Early Eocene Greenhouse Conditions'

Small Research Grant report

Eocene nummulites: High-resolution archives of early Eocene greenhouse conditions

***Peter Stassen*[1,2]**

[1]Deptartment of Earth and Environmental Sciences, Katholieke Universiteit Leuven, Kasteelpark Arenberg 1, 3001 Leuven, Belgium, [2]Museum of Natural Sciences, Koninklijk Belgisch Instituut voor Natuurwetenschappen/Institut royal des Sciences naturelles de Belgique, Rue Vautier 29, 1000 Bruxelles, Belgium; *e-mail:* Peter.Stassen@kuleuven.be

Geological history has proven that Earth's biosphere as a whole is a robust system, capable of restoring from climate changes, acting on various time scales. In this scope, the enigmatic biogeographic distribution of Eocene nummulites in NW Europe has caught our attention as such deep-time biotic data can understand how Earth's biosphere operates under past greenhouse conditions. Currently, nummulites are an underutilized source of palaeoclimate data despite their great potential as high-resolution geochemical proxy archives of marine environments in nearshore conditions. Recently, a new palaeotemperature proxy, based on the geochemical composition of their calcareous tests, has been proposed (Evans et al. 2018). Through the TMS small research grant, we explored this proxy-application by qualitative micro-X-ray fluorescence (microXRF) mapping, quantitative element analyses (inductively coupled plasma optical emission spectrometry (ICP-OES) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS)), and stable isotope analyses (isotope-ratio mass spectrometry (IRMS)). This was done in close collaboration with the AMGC Department at the Vrije Universiteit Brussel (Dr Niels De Winter and Prof. Phillippe Claeys); and is part of the ongoing Ph.D.

study of Lise Martens (Katholieke Universiteit Leuven) to reconstruct the early Eocene climate evolution in the North Sea basin.

During the early Palaeogene, climatic conditions evolved from the relatively cool, but largely ice-free, early Palaeocene to the early Eocene hothouse, with global mean surface temperatures much higher compared to today and subtropical conditions reaching as far north as the North Sea basin (Evans et al. 2018). These early Eocene conditions reflect background greenhouse conditions with atmospheric CO_2 levels up to four times the pre-industrial levels (Hollis et al. 2019) and a weak latitudinal temperature gradient. Considerable progress has been made in linking this Eocene climate evolution with general circulation climate models. However, the so-called 'equable' climate problem during the early Eocene climatic optimum (EECO) remains puzzling. The related latitudinal movement of climate belts thus remains poorly constrained, and climate model simulations typically struggle to replicate mid- and high-latitude proxy-derived temperature estimates. An important climate parameter could be added to these modelling studies to enable more realistic reconstructions of past surface conditions, if temperature seasonality could be reconstructed with a high fidelity for these deep time successions. Gradually shifting Eocene climate conditions might have also played a crucial role in the speciation and dispersal capacities of marine organisms as the poleward expansion of the (sub)tropical belt had a profound effect on mid-latitude hydrology and seasonal temperature ranges.

Marine calcareous (micro)fossils can be used to compare such temperature-related biotic changes as they usually occur in high abundances and, aside from species-specific stable isotope data, measurements of trace elements in foraminiferal tests can provide detailed environmental data. Eocene otoliths from Belgium were previously used to reconstruct mean annual temperatures and seasonal patterns by analysing incremental growth patterns (Vanhove et al. 2011, Vanhove et al. 2012). Yet, these palaeotemperature estimates from the $\delta^{18}O$ records are considerably hampered by proxy calibration, including intra-taxon offsets, and uncertainties in

sea water chemistry. These uncertainties are even higher in a marginal setting, when periodic changes in the hydrological cycle are probable; e.g. potential freshwater influences of coastal waters due to increased continental runoff (Vanhove et al. 2012). Nummulites, on the other hand, are unicellular marine organisms with a well-constrained relationship between shell geochemistry and ambient water conditions (Evans et al. 2013, Evans et al. 2018). As an example, the Mg/Ca ratio of the calcareous test of nummulites is a largely salinity-independent temperature proxy. Combining these data with the traditional δ^{18}O-proxy can deliver estimates of sea water composition. As these organisms have a presumed life span of several years, their tests also have the potential to reveal seasonal ranges in temperature and precipitation, which can otherwise not be obtained directly in marginal marine environments.

The North Sea basin is a highly sensitive recorder of regional climatic and oceanographic changes in a mid-latitudinal setting, due to its relatively isolated character and position on the continental margin. The Ypresian is fairly continuously represented within the Belgian deposits of the North Sea basin, and these deposits are rich in marine microfossils, indicative of continuous marine conditions with occasional connections to the Atlantic Ocean. Thus, providing ample research opportunities to study biotic responses to environmental changes in coastal waters during the gradual warming towards the EECO. A related sequence of early Eocene nummulite biozones is recognized in this basin (Baccaert 2017), and these larger benthic Foraminifera occur in monospecific assemblages. Nummulites occur in high abundances in the fine sands of the Mons-en-Pévèle sands (i.e. pre-EECO to basal EECO assemblage of *Nummulites involutus*), representing the nearshore equivalent of the classical Ypresian clays. During the EECO peak warming, *Nummulites aquitanicus* appears suddenly within the Egem sands. Their dispersals into the North Sea basin are probably climatically controlled by pulses of northward migrations during warmer conditions and species-specific environmental thresholds (e.g. varying salinity and non-survival during too cold winter temperatures).

Well-preserved nummulites will thus offer a snapshot of environmental variability on a regional scale, which complement Eocene long-term climate reconstructions. Our research provides additional palaeotemperature reconstructions in nearshore marine conditions using the Mg/Ca incorporation in nummulite test-geochemistry. Prior to the generation of the geochemical palaeoclimate proxy data, we established a methodological approach to reduce bias in our reconstructions (unpublished Katholieke Universiteit Leuven M.Sc. thesis; Martens 2018). This includes the relationship between the geochemistry (measured by ICP-OES) and (1) preservation, (2) cleaning techniques, (3) test size, and (4) potential seasonal bias by comparison with LA-ICP-MS data. The detailed methodological study is based on major and minor element concentrations recorded in complete and crushed specimens, measured by ICP-OES. Prior to analysis, all foraminiferal tests were cleaned to remove clay and other detrital material by rinsing with ethanol, ultrasonication, and repeatedly pipetting off the supernatant.

Microscopic and scanning electron microscopy (SEM) observations of variable preservation states indicate that increasing taphonomic alteration (i.e. partial dissolution and recrystallization) results in a continuum of decreasing Sr/Ca and Mg/Ca values (Fig. 7). Caution is thus needed during the selection of specimens, and obtained results should be assessed critically as taphonomic alteration can render unrealistically low palaeotemperatures (specimens with Mg/Ca and Sr/Ca values below 50 mmol mol^{-1} and 1.5–1.75 mmol mol^{-1}, respectively). Well-preserved specimens without taphonomic bias were used to evaluate the effect of different cleaning techniques and if the geochemistry of individual specimens is coupled to the test size. The conventional cleaning protocol for Foraminifera enables the removal of elements (Al, Fe, Mn, . . .), which are associated with sedimentary and diagenetic contaminations. Our results indicate that these elements can be effectively removed without considerable effect on the Mg/Ca ratio of the nummulite test. This implies that Mg-contamination by sedimentary and diagenetic coatings is insignific-

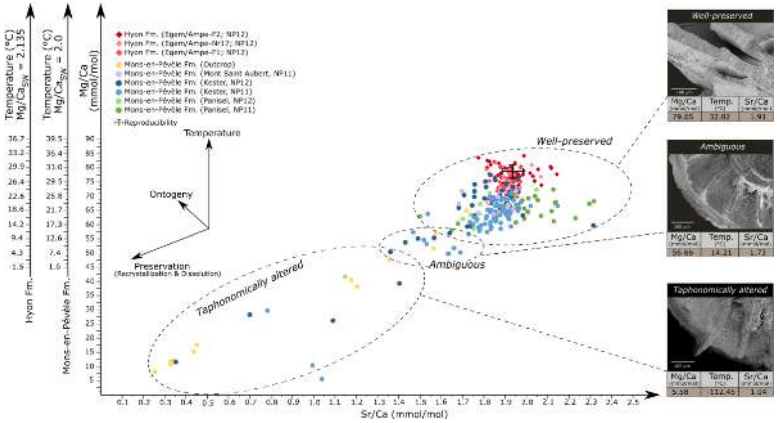


Figure 7: Effect of different preservation states of early Eocene nummulites on the relationship between Sr/Ca (mmol mol^{-1}) and Mg/Ca (mmol mol^{-1}), with equivalent palaeotemperatures (°C) following Evans et al. (2018). The three preservation classes are exemplified by scanning electron microscopy images (Martens et al. 2019).

ant and therefore does not directly influence the proxy use to reconstruct mean annual temperatures.

Nummulites from the Egem sands are best preserved and their relation between test size and geochemistry indicates that smaller tests (radius <3.5 mm) display a larger variability in Mg/Ca values (between 70 and 85 mmol mol^{-1}), while larger tests mostly cover the upper range (>75–80 mmol mol^{-1}). Patterns in the Sr/Ca record indicate that largest specimens have relatively lower values, which may respond to ontogenetic (periodic) changes in growth rate. Newly generated data indicate that this observed variability in Mg/Ca and Sr/Ca might reflect seasonal effects as it corresponds to the internal variability recorded within large individuals. Thus, ontogenetic effects may cause bias towards higher palaeotemperatures (largest individuals) as the lifespan of these nummulites might be relatively limited (see below) and must be taken into account.

To assess the seasonal aspects of test accretion, high-resolution elemental-Ca profiles along the growth direction (LA-ICP-MS

measurements along the marginal cord section) were generated from a selection of nummulites (Egem sands, EECO). Prior to laser ablation, the preservation state (diagenesis, infilling, coating, . . .) was assessed critically by microscopy, and preliminary interpretations of chamber accretion rates were also made. Elemental abundance maps of polished equatorial sections were obtained using an energy-dispersive microXRF scanner. This non-destructive technique creates semi-quantitative element abundance maps and allows for a rapid assessment of the preservation state of the internal and external features of nummulites. These microXRF-maps indicate the overall absence of detrital particles and the presence of an occasional thin coating by Fe- and Mn-hydroxides on the interior chamber walls, but no alteration of the test wall was observed. Individual LA-ICP-MS measurements were inspected for diagenetic alteration or contamination by detrital material using the same thresholds as used for microXRF data. Based on these observations, and confirmation by SEM-imaging, we consider that the elemental data from these tests are derived from non-altered pristine calcite.

Destructive sampling of the growth increments by microdrilling of the marginal cord allows an additional reconstruction of intra-annual changes in ambient river water geochemistry (δ^{18}O-proxy). Based on this multi-proxy approach, snapshots of Eocene seasonal environmental changes are reconstructed using the variability in Mg/Ca (palaeotemperature), Sr/Ca (preservation and variations in growth rate), and δ^{18}O (sea water composition and palaeotemperatures); as demonstrated in Figure 8. The resulting incremental analyses revealed >10 °C mean annual range of temperatures, with peak summer temperatures exceeding 30 °C and mean annual temperatures of up to 28–30 °C during the EECO. This is in accordance to the previous mean annual temperature estimate of 27.5 °C and seasonal range of 9.5 °C, which were based on otolith δ^{18}O compositions of non-migratory species (Vanhove et al. 2011). Intra-annual variability of δ^{18}O in nummulites is relatively low, and further research is needed to verify the effect of periodic freshwater influences on the coastal fauna

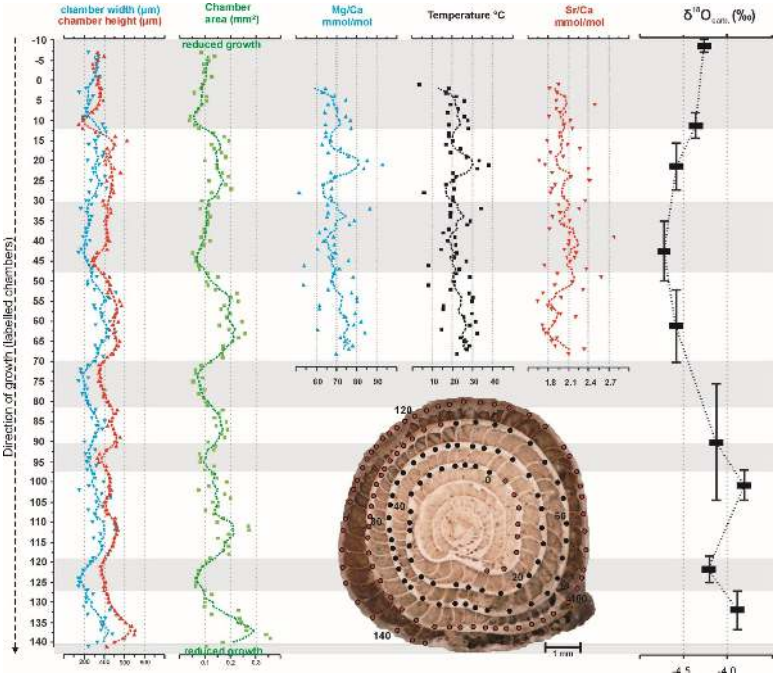


Figure 8: Chamber parameters of a microsphere from the Egem sand (early Eocene climatic optimum interval) and laser ablation inductively coupled plasma mass spectrometry-geochemical data of Sr/Ca (mmol mol^{-1}) and Mg/Ca (mmol mol^{-1}), with equivalent palaeotemperatures (°C) following Evans et al. (2018), coupled to stable isotope data. Grey areas reflect zones with reduced increase in chamber area.

from the studied site (see Vanhove et al. 2012).

Aside from the observed methodological caveats, the studied early Eocene nummulites from the Mons-en-Pévèle and Egem sands recorded a regional rise in mean annual temperatures of ±5–7 °C over 3 Myrs (pre-EECO: 21–23 °C; towards EECO: 28–30 °C). This is in accordance with other proxy data of climate variability in mid-latitude marginal basins (Evans et al. 2018, Hollis et al. 2019). The most surprising outcome of our research is the limited lifespan of the studied large specimens, often

less than 1.5 to 2 years as indicated by the stable isotope data. This contrasts previous assumptions of a relatively long lifespan (>2–3 years) based on the cyclic deviations in chamber addition patterns during the ontogeny of nummulites from Belgium (Baccaert 2017). Nevertheless, nummulites are thus applicable as a proxy for high-resolution estimates of palaeoclimate variations in nearshore marine environments of the North Sea basin. Future research directions include the incorporation of data from other localities and time frames (including TEX_{86}, clumped isotopes, . . .), and growth modelling to fully confine seasonal variations recorded in the nummulites species of NW Europe. The full integration of geochemical and biotic data will define the downfall of one species and the rise of another on a NW European scale. Thus linking nummulites' biogeographic distribution and habitat association during the Eocene climate development.

References

Baccaert J (2017) First records of *Nummulites involutus* Schaub in the early Eocene of Belgium: A taxonomic-ecological approach. *Memoirs of the Geological Survey of Belgium* 63: 1–45.

Evans D, Müller W, Oron S, and Renema W (2013) Eocene seasonality and seawater alkaline earth reconstruction using shallow-dwelling large benthic Foraminifera. *Earth and Planetary Science Letters* 381: 104–15. doi:10.1016/j.epsl.2013.08.035.

Evans D, Sagoo N, Renema W, Cotton LJ, Müller W, Todd JA, Saraswati PK, Stassen P, Ziegler M, Pearson PN, Valdes PJ, and Affek HP (2018) Eocene greenhouse climate revealed by coupled clumped isotope-Mg/Ca thermometry. *Proceedings of the National Academy of Sciences of the United Staes of America* 115 (6): 1174–9. doi:10.1073/pnas.1714744115.

Hollis ChJ, Dunkley Jones T, Anagnostou E, Bijl PK, Cramwinckel MJ, Cui Y, Dickens GR, Edgar KM, Eley Y, Evans D, Foster GL, Frieling J, Inglis GN, Kennedy EM, Kozdon R, Lauretano V, Lear CH, Littler K, Lourens L, Meckler AN, Naafs BDA, Pälike H, Pancost RD, Pearson PN, Röhl U, Royer DL, Salzmann U, Schubert BA, Seebeck H, Sluijs A, Speijer RP, Stassen P, Tierney J, Tripati A, Wade B, Westerhold Th, Witkowski C, Zachos JC, Zhang YG, Huber M, and Lunt DJ (2019) The DeepMIP contribution to PMIP4: Methodologies for selection, compilation and analysis of latest Paleocene and early Eocene climate proxy data, incorporating version 0.1 of the DeepMIP database. *Geoscientific Model Development* 12 (7): 3149–206. doi:10.5194/gmd-12-3149-2019.

Martens L (2018) 'Geochemistry of Nummulites as Proxy for Eocene Climate Change in the Southern North Sea Basin'. M.Sc. thesis. Leuven: Katholieke Universiteit Leuven. 158 pp.

Martens L, Stassen P, Steurbaut E, and Speijer RP (2019) Geochemistry of nummulites as a proxy for early Eocene paleotemperature evolution in the southern North Sea basin. *Geologica Belgica* 22 (1–2): 93–4. https://popups.uliege.be/1374-8505/index.php?id=6218.

Vanhove D, Stassen P, Speijer RP, Claeys Ph, and Steurbaut E (2012) Intra- and inter-taxon stable O and C isotope variability of fossil fish otoliths: An early Eocene test case. *Austrian Journal of Earth Sciences* 105 (1): 200–7.

Vanhove D, Stassen P, Speijer RP, and Steurbaut E (2011) Assessing paleotemperature and seasonality during the early Eocene climatic optimum (EECO) in the Belgian basin by means of fish otolith stable O and C isotopes. *Geologica Belgica* 14 (3–4): 143–58. https://popups.uliege.be/1374-8505/index.php?id=3345.

Who needs biostratigraphers? Career options through the energy transition

***Mike Simmons*[1]**

[1]Halliburton, Abingdon, UK

The University of Birmingham recently announced that it is ceasing the M.Sc. programme in 'Applied and Petroleum Micropalaeontology', thereby ending the long tradition in the UK of taught postgraduate training in the various microfossil disciplines. The reason for closure is simple—not enough students applying to study. Should this be of concern? Do we still need applied micropalaeontologists/biostratigraphers? Why are students apparently not interested in studying applied micropalaeontology? Is it because of negative perceptions associated with the petroleum industry, and/or because of perceptions that the industry is rapidly coming to the end of its days?

Concerns about the impact on the environment and of the use of the products of the petroleum industry are doubtlessly turning some would-be students away from industry-related studies. This has affected geology student numbers in general. Some geoscience-departments have witnessed undergraduate numbers decrease by ~35 %, whilst some vocational higher degrees are seeing even more catastrophic declines. Many British universities are declaring a climate emergency and are encouraging geoscience-departments to disassociate from the oil and gas industry. At the same time, oversupply of oil and gas in a time of economic slow-down has led to a lowering of the oil price and in turn a very significant downturn in the investment oil companies are making in exploration and production. Consequently, the industry has seen a huge reduction in workforce, biostratigraphers included. When this downturn is coupled with pressures from environmentalists, it can

seem that the petroleum industry is a sunset industry. But is this true? We are doubtlessly in a time of energy transition—what does that mean for the world of applied biostratigraphy?

In order to begin this analysis, we need assessment of society's appetite for energy and how this will be supplied. Access to affordable energy is essential for economic growth and social development (Lloyd 2017), and the meeting of UNESCO's sustainable development goals. The current global population is 7.8 billion, with UN projections suggesting that this will most likely rise to 9.8 billion by 2050 and 11 billion by 2100 (https://population.un.org/wpp2019/). Without very substantial changes in the efficiency of energy usage, a growing global population inevitably consumes more energy, especially as every nation seeks economic growth to ensure the prosperity and well-being of their citizens. Approximately 940 million people (13 % of the world population) do not currently have access to electricity. And 3 billion (40 % of the world population) do not have access to clean fuels for cooking. This comes at a high health cost for indoor air pollution (https://ourworldindata.org/energy-access). Therefore, because of population growth and economic growth, global annual energy demand is set to rise from current levels by around 50 % by 2050 (www.eia.gov/ieo, Fig. 9).

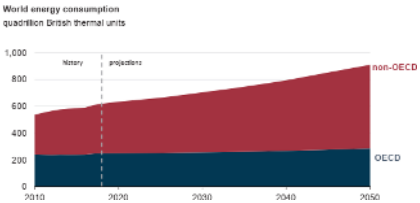


Figure 9: Projection of global energy consumption to 2050 (U.S. Energy Information Administration 2019). A rise of ~50 % is predicted, mostly from developing nations.

How will this rising demand for energy be sourced if we are not otherwise simply to deny energy to large numbers of people, most likely those from developing nations? Doubtlessly, renewable sources will form an increasing proportion of the energy mix, as electrification of heating and transportation promotes their greater use, especially as the price of their supply falls. The Energy Information Administration (EIA) projects that by 2050, renewables will be the single most important source of energy (U.S. Energy Information Administration 2019,

Fig. 10). However, because of rising energy demand, almost all energy sources see rises in demand, such that by 2050 global energy will be supplied by almost equal proportions of oil, gas, and renewables; and a smaller proportion of coal, plus nuclear. The EIA projections can be compared with those of other organisations (e.g. BP p.l.c. 2019, McKinsey & Company 2019), but although there are differences in detail, none predict a significant collapse in the demand for gas and oil, with these forming part of a balanced energy supply alongside renewables.

Why does the energy mix continue to be diverse over coming decades? Discussion of all technological reasons why renewables cannot quickly and totally replace hydrocarbons as an energy source are beyond the scope of this brief article (see MacKay 2009, for a comprehensive discussion). However, key issues relate to energy density (e.g. to power an aircraft engine, or industrial machinery), geopolitics, and the capital intensity of the energy system. Our infrastructure is dominated by machines and buildings that are relatively long lived. Cars tend to last at least 10 years before being scrapped; power stations can operate for 30 years or more. This acts as a brake on the pace at which new sources of energy can grow.

So put simply, oil and gas will be part of the energy mix for several decades to come. But this does not mean business as usual. Geoscientists, including biostratigraphers, need to contribute to increasing the efficiency, and hence reducing the carbon footprint, in obtaining these resources. In other words, getting the geology right. Because of its relevance to correlation and palaeoenvironmental interpretation, biostratigraphy has always been at the heart of this. Biostratigraphers have key roles to play in everything from regional geology studies high-grading areas for exploration through to rigsite work, steering well trajectories so that production is optimized. Fewer dry wells and fewer poorly producing wells lead to a reduced carbon footprint. In addition, conventional exploration can be much more efficient than unconventional exploration—a driver in the recent increased number of wells being drilled in frontier basins around the world—all requiring biostratigraphic support.

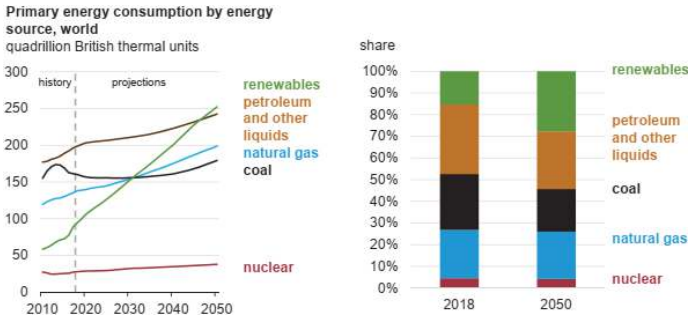


Figure 10: Projected primary supply source to 2050. By 2050, renewables will have become the most important energy source, but other energy sources remain an important and significant part of the energy mix (U.S. Energy Information Administration 2019)

Carbon capture and sequestration (CCS) is entering prime time and will only grow in importance (Stephenson 2018, Ringrose 2020). Secure storage will require geoscientists who can locate and model suitable subsurface repositories for CO_2, and model the behaviour of CO_2 injected into those repositories. Since such work requires a detailed understanding of the subsurface, it seems likely that biostratigraphy will play its part in developing subsurface models and assisting in injector well placement and trajectory control. It is very likely the CO_2 injector wells will require biosteering in the same way that some production wells currently do.

As oil and gas companies transition into energy companies, many will increase their investment in wind farm technology. Determining the appropriate location for wind farms requires an analysis of numerous factors, but the geotechnical suitability of their installation locations is a key concern. For example, in the North Sea, the considerable variability in the nature of sediments resulting from Quaternary glaciations is a key challenge. On the Dogger Bank, technical challenges associated with a buried landscape of glacial and fluvial channels and thrusted moraine complexes must be overcome (Cotterill et al. 2017). Detailed biostratigraphic correlation is likely to support such geotechnical endeavours.

In conclusion, the energy trans-

ition does not mean the end for biostratigraphers working in the energy sector. Traditional work will continue alongside a host of emerging roles. We need a new generation of biostratigraphers and we need to be able to educate and train them. In the absence of taught courses, that means those biostratigraphers with experience getting involved in training project-based research students and undergraduates. The digital revolution will help. Data science is accelerating the pace that routine tasks are executed and is providing new scientific insights, thereby transforming all resource industries, contributing to improved efficiency and associated environmental benefits (reduced emissions and overall operational footprint). The future applied biostratigrapher needs to be technology and data science literate, with an underpinning of sound geoscience knowledge, and to be ready to adapt.

References

BP p.l.c. (2019) *BP Energy Outlook, 2019 Edition*. 73 pp. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2019.pdf.

Cotterill C, Phillips E, James L, Forsberg C.-F, and Tjelta TI (2017) How understanding past landscapes might inform present-day site investigations: A case study from Dogger Bank, southern central North Sea. *Near Surface Geophysics* 15 (4): 403–14. doi:10.3997/1873-0604.2017032.

Lloyd PhJ (2017) The role of energy in development. *Journal of Energy in Southern Africa* 28 (1): 54–62. doi:10.17159/2413-3051/2017/v28i1a1498.

MacKay DJC (2009) *Sustainable Energy – Without the Hot Air*. Without the Hot Air Series no. ii. (Cambridge: UIT). 366 pp.

McKinsey & Company (2019) *Global Energy Perspective 2019: The Global Energy Perspective Reference Case Provides our View on How the Energy Transition Will Unfold*. https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2019.

Ringrose Ph (2020) *How to Store CO_2 Underground: Insights from Early-Mover CCS Projects*. SpringerBriefs in Earth Sciences. (Cham: Springer-Verlag). 129 pp. doi:10.1007/978-3-030-33113-9.

Stephenson M (2018) *Energy and Climate Change: An Introduction to Geological Controls, Interventions and Mitigations*. (Amsterdam, Oxford, and Cambridge: Elsevier). 206 pp.

U.S. Energy Information Administration (2019) *International Energy Outlook 2019, with Projections to 2050*. 85 pp. https://www.eia.gov/outlooks/ieo/.

Reports

TMS Grant-in-Aid reports

Nannofossil taxonomy training with Professor Isabella Raffi

***Elizabeth Balmer*, University of Edinburgh (UK)**

Firstly, I would like to say a huge thank you to the Micropalaeontological Society for awarding me a Grant-in-Aid during 2019. I used this Grant-in-Aid to support my trip to Pescara in Italy, where I spent three weeks working under Professor Isabella Raffi's supervision as she shared her knowledge and expertise in nannofossil taxonomy. This training was very much key to my Ph.D. research.

I am a 2nd-year Ph.D. student at the University of Edinburgh, researching the sedimentary development of the latest Cretaceous to Neogene of west Cyprus. My research is multidisciplinary and combines fieldwork, sedimentology, structural analyses, and biostratigraphy using nannofossils and Foraminifera. Understanding and identifying the different nannofossil taxa allows me to date my rocks, place the development into a timeframe, and thus unravel the evolution of western Cyprus.

The three-week trip to Pescara was fantastic from both a geological perspective and because, as a Scot, I was able to experience Italian life for three weeks—sunshine, copious amounts of coffee, ice cream, and of course Italian **pizza**—some photo highlights of these are shown in Figure 11!

When starting out on my nannofossil training, as a sedimentary geologist, my knowledge of nannofossils was quite limited; however, over the three weeks I spent with Isabella, I learned a huge amount. We covered the main taxa of the Miocene, Pliocene, and Pleistocene. Figure 11 shows some of the main Miocene taxa, highly abundant is the *Discoaster* genus.

It was a truly eye opening and exciting experience, from learning how to make smear slides from

Figure 11: Some impressions from the nannofossil taxonomy training in Pescara

my field samples, to then being able to identify the main species in the sample and ultimately give the sample a calcareous nannofossil zone and age range! Using nannofossils for biostratigraphy is such a great and powerful technique. Towards the end of the trip, I was able to date some of my Ph.D. fieldwork samples and found some unexpected older ages that were previously thought to be younger.

I would like to say a massive thank you to Isabella Raffia and her Ph.D. student Amalia Notaro, and all the other postgraduate students and staff that I met at Università degli Studi 'Gabriele d'Annunzio'—Pescara for

being so welcoming, friendly, and helpful. A special thanks for the coffee breaks by the ingenious 'coffee cupboard' invention, a photo of which is shown in Figure 11. The view from the university campus in Chieti was spectacular (Fig. 11). Therefore, my fellow Ph.D. student and I decided to take the opportunity to explore the geology of the local Abruzzo Apennines.

We took a day trip to the Gran Sasso e Monti della Laga National Park, with two highlights being watching semi-wild horses galloping through the valley below Gran Sasso and taking a walk up to Rocca Calascio (Fig. 11). The wilderness and geology of the surrounding area were truly breath-taking and I recommend a visit if you have never been to this part of Italy!

For now, I will continue to be amazed by the power of the nannofossils found in my samples and the ability for them to give me an age range for the stratigraphy for different areas of western Cyprus. Maybe in the future, I will have an opportunity to pass on the knowledge I have learned from the expert Isabella Raffi and also learn more about the older Palaeogene taxa myself.

Looking for the stratigraphic evidence of pre(historical) earthquakes along the Pacific coast of Mexico

***J. Emmanuel Bustamante-Fernandez*, Durham University (UK)**

The Grant-in-Aid covered partially my second field season from Durham, UK, to the Pacific coast of Mexico, designed to find the stratigraphic evidence of (pre)historical earthquakes which occurred in the southern region of the Jalisco subduction zone (JSZ). In October 2019, I visited for the second time of my Ph.D. project the coastal wetland known as 'Esteros Potrero Grande' in the state of Colima. In this site, I investigated the stratigraphic architecture of this wetland in order to find evidence of abrupt sedimentary changes potentially associated to coastal subsidence/uplift driven by tectonic strain release during big earthquakes. Seven boreholes were logged in the field along 270 m of a shore-normal transect 500 m inland from the actual coastline. Core

(a) *Coastal wetland 'Estero Potrero Grande' (19° 9′ 55.55″ N, 104° 31′ 54.44″ W)*

(b) *Coring site (19° 9′ 4.15″ N, 104° 34′ 10.76″ W)*

(c) *Stratigraphic evidence of silty units (grey layers) intercalated with organic rich layers (brown).*

Figure 12: Field trip to 'Esteros Potrero Grande'.

logging based on the main components of the stratigraphic column was used to map the local stratigraphy. One sediment core of 5 m length, that best represents the stratigraphic sequences, was brought to Durham University to investigate the assemblages of fossil diatoms.

Additionally, in the field we examined intertidal environments across the wetland to identify the best sites to collect surfaces sediments and characterize the modern distribution of intertidal diatoms. Understanding the modern distribution of diatoms across the intertidal zone is important as they are used as analogues to quantify the magnitude of coastal subsidence or uplift archived in the fossil record. A

third field season will be carried out in May–June 2020 to collect surface sediments of intertidal environments to calibrate the fossil record and understand the mechanisms of this subduction zone over centennial to millennial timescales.

Fun with micropalaeontology

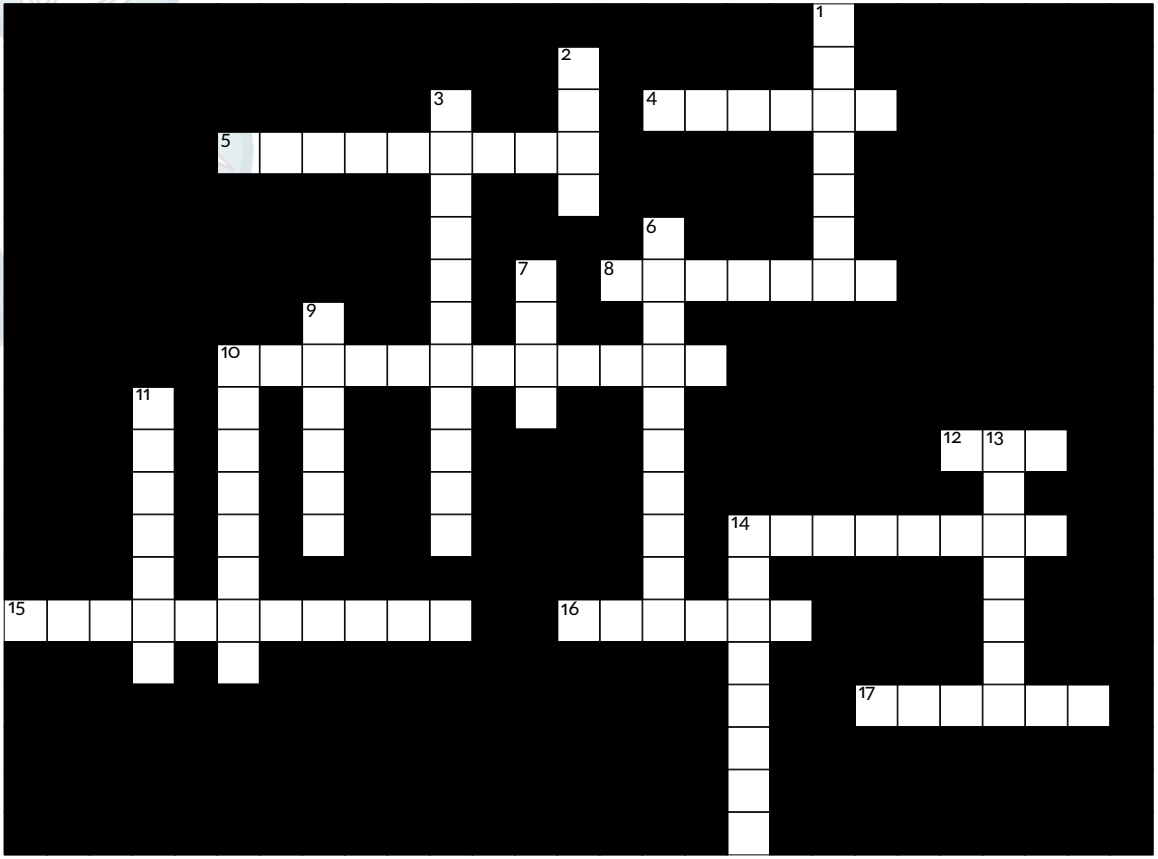
TMS Newsletter crossword no. 4

***Rehemat Bhatia*, University of Bristol (UK)**

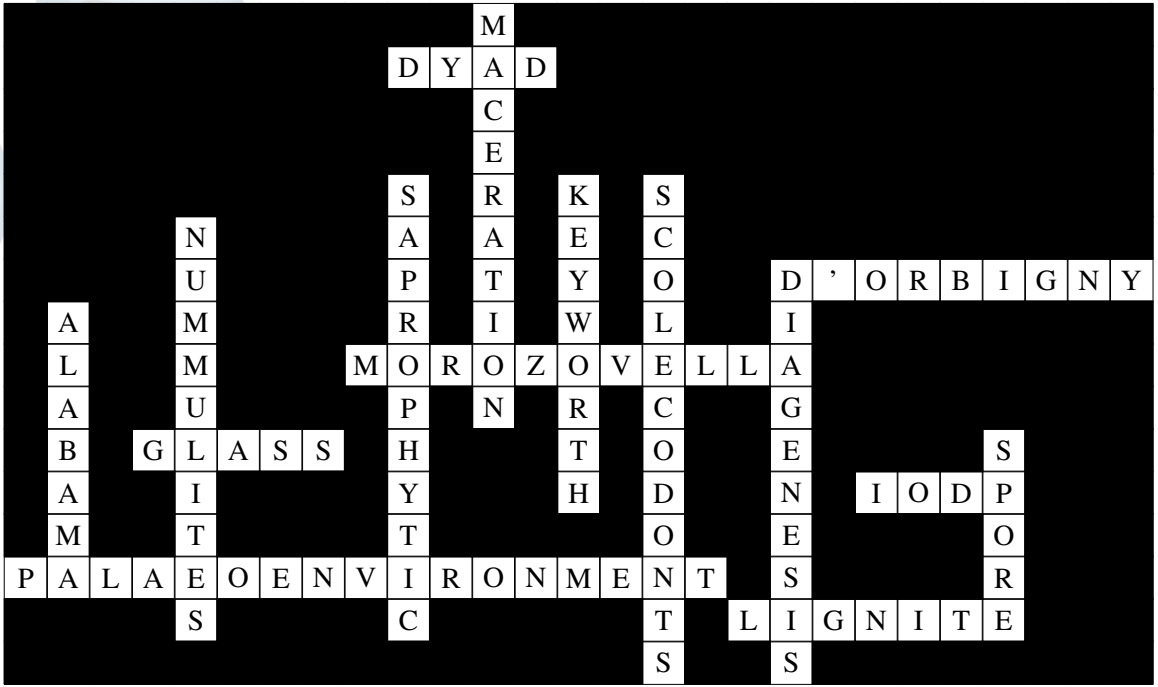
We have decided to include a micropalaeontologically themed puzzle in each version of the TMS Newsletter! There are clues to entice those in all specialist groups.

Across 4 One of the TMS awards (part 2). 5 The surname of a Russian Foraminifera-micropalaeontologist, who had a thermocline dwelling foraminiferal genus named after her. 8 Microfossils which are used in dynamite. 10 A group of zooplankton with skeletons made from calcium carbonate. 12 The 2020 AGM is being held at . . . 14 Silica secreting flagellate that dines on diatoms. 15 Microfossil associated with Palaeozoic cherts. 16 There is an IODP core repository here. 17 Something you will find inside a torch in a mass spectrometer that is hotter than the surface of the sun.

Down 1 This element helps to identify the location of the K/Pg extinction event in rocks. 2 This prevents diagenesis. 3 Genus containing the largest centric diatom. 6 You use this to look at your microfossils. 7 If you drop this on your calcitic microfossils, they will disappear. 9 You can go here in the summer to learn about Foraminifera and/or palaeoclimatology. A renaissance town in Italy. 10 Name of the silicified cell wall of a diatom. 11 Circular group of diatoms. 13 One of the TMS awards (part 1). 14 You find these inside atoms, orbiting the nucleus.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

Solution of the TMS Newsletter crossword no. 3 (vol. 100, autumn 2019).



Appendix

Excerpt from the first circular of 'InterRad XVI, Ljubljana, September 2020'[1]

***ZRC SAZU[a] and SAZU[a]*; [a]Slovenska akademija znanosti in umetnosti (Slovenia)**

Dear Colleagues, we are pleased to invite you to the 16th meeting of InterRad, the International Association of Radiolarists, which will be held in September 2020 at ZRC SAZU, Ljubljana, Slovenia.

InterRad promotes all aspects of radiolarian research including taxonomy, ecology, biogeography, biochronology, and evolution along with applications in stratigraphy and tectonics. The meetings are held regularly every three years and are aimed to gather radiolarian specialists of different research fields who present current research and exchange new ideas to advance the understanding of fossil and living radiolarians. The community is not restricted to geologists and biologists but is open to other scientists who integrate radiolarians in a wide range of disciplines, such as mathematics, physics, and space engineering. Artists inspired by the fascinating complexity of radiolarian skeletons are also most welcome.

In addition to scientific sessions, several excursions will be organized. The pre- and post-conference excursions will focus on the stratigraphy and geodynamic evolution of the Northern Calcareous Alps in Austria and the Dinarides in Montenegro, respectively. The mid-conference excursions will visit Kras (the classical karst area) and the Julian Alps in Slovenia.

We are looking forward to seeing you in Ljubljana.

On behalf of the Organizing Committee

Špela Goričan, president of InterRad

[1]This is an excerpt from the full first circular. For a full circular and more information, please check https://interrad2020.zrc-sazu.si/.

Excerpt from the second circular of 'IWAF-11: 11th International Workshop on Agglutinated Foraminifera, September 24–26th, 2020, Kraków, Poland'[2]

***Mike Kaminski*, King Fahd University of Petroleum & Minerals (Saudi Arabia)**

The Micropress Europe and AGH University of Sciences & Technology cordially invite you to participate in the 11th International Workshop on Agglutinated Foraminifera held in Kraków, Poland, on September 24–26th, 2020.

The IWAF-11 is open for anybody interested in agglutinated foraminifers both fossil and modern. The workshop should be of interest to both academic and industrial participants. Following the tradition of the IWAF meetings, it will be specifically open to young researchers and students. We aim to provide a scientifically stimulating and socially enjoyable forum to meet and discuss results related to agglutinated Foraminifera.

Conference venue

The workshop will be held in the offices of Micropress Europe and in the facilities of the AGH University of Science & Technology in the center of Kraków (Mickiewicza Ave. 30). The Main Building of AGH is centrally located within walking distance of the old town and the major tourist hotels near the river and castle. The European Micropalaeontological Reference Centre at Micropress Europe now houses one of the world's largest collections of agglutinated Foraminifera, and these will be made accessible for viewing.

Conference schedule

The IWAF-11 will consist of two days of technical sessions, followed by a one-day workshop on the base foraminiferal collections housed in

[2]This is an excerpt from the full second circular. For a full circular and more information, please contact kaminski@kfupm.edu.sa.

the European Foraminiferal Reference Centre.

25th September	
8.00–10.00	Registration
10.00	IWAF-11 opening
10.20–18.00	Oral and poster sessions
19.00	Conference dinner
26th September	
10.00–17.00	Oral and poster sessions
27th September	
10.00–17.00	Workshop on the base foraminiferal collections housed in the European Foraminiferal Reference Centre

[

Scientific program]Scientific program and conference materials **English will be the official language of the conference.** Participants are invited to present their contributions in oral or poster form connected with the agglutinated Foraminifera topic.

Oral presentations

All speakers will be allocated 15 minutes for the presentation +5 minutes for discussion. Data projector and notebook will be available.

[3]Indexed by the ISI data base.

Posters

Size format up to 1 m width and 1.5 m tall. Poster exhibition will be placed nearby the lecture room.

Abstracts

Abstracts of all presentations will be published in an abstract book as Grzybowski Foundation Special Publication. We also invite you to send an 'extended abstract' of up to two pages length. After the conference, there is a possibility of printing contributions as papers in the journal *Micropaleontology*[3].

Important dates

April 1, 2020: Deadline for early registration.
April 1, 2020: Deadline abstracts submitting.
May 30, 2020: Deadline for early payment.
June 30, 2020: Third circular.
August 30, 2020: Deadline for registration.

To register, please send an e-mail to Sławomir Bębenek at sbebenek@agh.edu.pl.

Payment

The registration fee (Table 4) covers the abstract volume, coffee breaks, and conference dinner.

Early payment is only possible via bank transfer.

Bank transfer details:

Name: Micropaleontological Foundation Micro-Press Europe

Address: al. Mickiewicza 30, paw. A0, 30-059 Kraków

VAT ID number: PL6772380282

Bank: BNP Paribas Bank Polska S.A.; ul. Kasprzaka 10/16, 01-211 Warszawa

Account no./IBAN: PL91 1750 0012 0000 0000 2841 0832

SWIFT: RCBWPLPW

Payment after April 1, 2020 via bank transfer or cash on site.

If invoices are needed, please provide invoice details just before payment.

[

Instructions for authors]Instructions for authors of abstracts Please prepare extended abstracts in English. The page limit is two pages including tables or pictures, `.doc` or `.rtf` text format, MS Word, 11 point font size, 1.5 line spacing. Before submitting, ensure yourself that your tables (`.xls`) and pictures (`.cdr`, `.tif`, `.jpg`) in final scale are still readable, with respect to font size, etc. Avoid unnecessary use of colors and grayscale in your charts. Submit your texts with indicated placement of tables/figures together with separate table and figure files by email to Sławomir Bębenek (sbebenek@agh.edu.pl), before April 1, 2020. Abstracts received after this deadline may not be accepted with respect to typesetting and printing deadlines.

There is no limit to the number of abstracts you may submit.

[

Accommodation]Accommodation and board in Kraków. The participants should book by themselves.

Organizing institutions

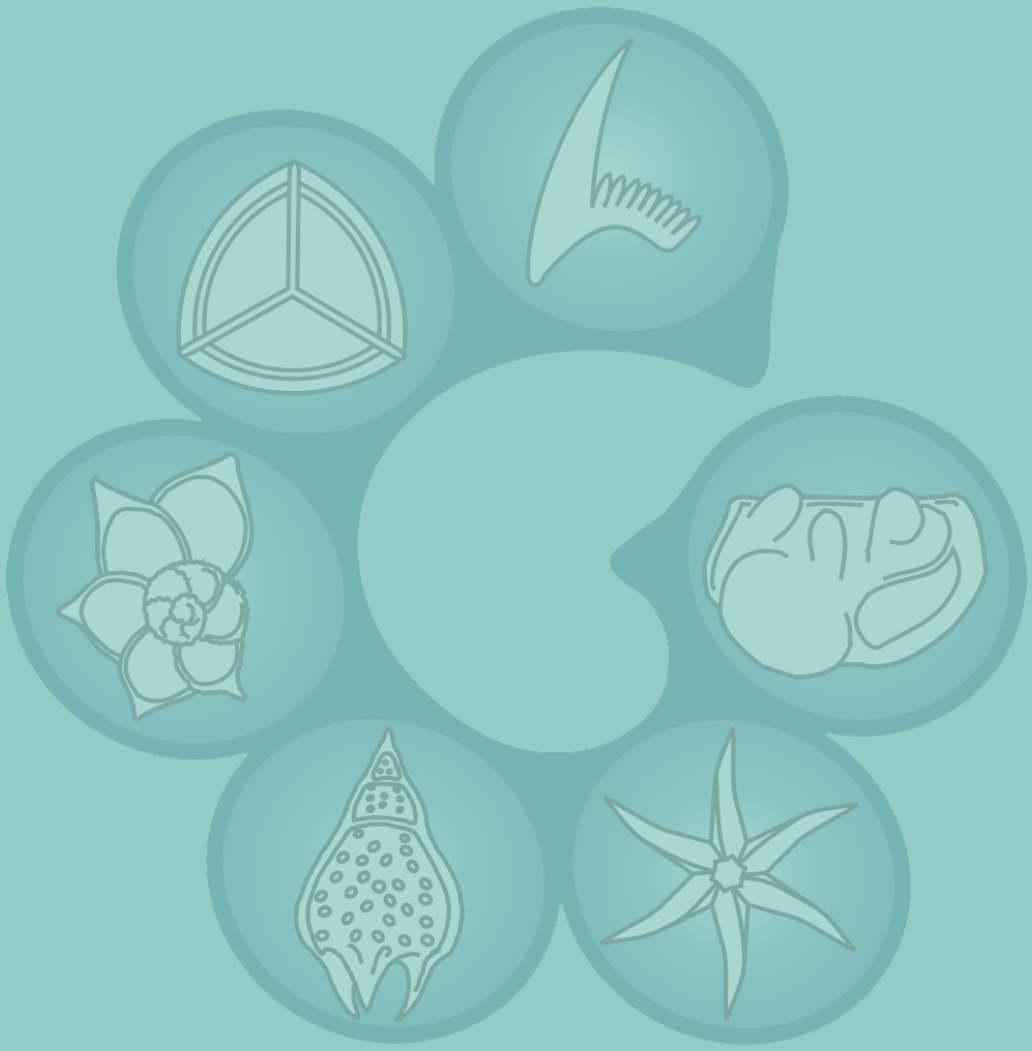
- Micropress Europe
- Faculty of Geology, Geophysics and Environmental Protection AGH
- Grzybowski Foundation

Table 4: IWAF-11 registration fees.

	Professionals	**Students**
Before April 1, 2020	100 €	70 €
After April 1, 2020	130 €	90 €

Organizing committee

- Michael A. Kaminski
- Sławomir Bębenek
- Anna Waśkowska
- Justyna Kowal-Kasprzyk
- Jarosław Tyszka
- Kamil Fekete
- Weronika Baliniak



© The Micropalaeontological Society
ISSN: 2398-2098
Registered Charity No.: 284013