

COMMISSION INTERNATIONALE DE MICROFLORE DU PALÉOZOÏQUE

Thanks to all members who contributed to this newsletter!

Cover photo: 3D model of palynomorph deposition.

Credit: Filipe Barreira (LNEG)

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CIMP

CIMP is an international federation of palynologists focused in Palaeozoic palynology, and membership is open to all individuals involved in this field of expertise. The commission aims to advance knowledge in Paleozoic palynology and related subjects by the promotion of international co-operation and meetings between scientists of all regions and countries.

To this end the CIMP arranges symposia and working groups which deal with various stratigraphical and taxonomic problems in Palaeozoic palynology. For more information on membership and activities, please see:

<https://cimp.weebly.com/>

PRESIDENT'S LETTER

Dear CIMP fellows,

just one year ago I wrote a letter full of ideas and expectations for the coming year 2020, hoping that the just starting COVID-19 global pandemic will be over soon and we could meet at one or other conference later this year. We all know this didn't work and we had to learn to live with many limitations in business and private life. Conferences were canceled or changed to virtual and we didn't meet anywhere. Field work, research collaborations and many projects were prevented by travel and work restrictions. Particularly if you collaborate with industry it was a very tough year, because industry turned down a lot of exploration activities due to these restrictions and the collapse of the oil price.

I hope all of you got well through these challenging times, healthy and safe, and



Hartmut Jäger
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had a good start into the new year 2021. Much more than before, people were desperately waiting for the end of the old and the start of the new year. Until now it doesn't feel really different. We are still surrounded by lockdowns and restrictions in life and work. But we can see the light at the end of the tunnel. Medical research has done an unbelievable great job and vaccinations have started in many countries already. Better times are coming.

So, what are the expectations for 2021? Will we meet again at conferences later this year? It doesn't look like it at the moment. The IPC/IOPC in Prague was just postponed to 2024 and the EPPC in Stockholm next year is still organized as virtual meeting. What about research collaborations, field work and projects? I hope we will be able to bring this back to life step by step. But it might not be the same this year as it was before. So still we will be limited in our activities. Let's make the best out of it. It could be the time to get the stuff out of the shelf, that was never finished, because there was always something more urgent or important to do. I guess every one of you has such things on the shelf. I already started to get some old stuff under the microscope.

Also, CIMP won't be busy as usual. No conferences and sessions have to be organized this year. But CIMP has some old stuff on the shelf too, waiting to be done. One thing is our homepage. It is on the agenda for some years already and now we should take the time to get it updated in a modern format. I want to encourage all of you to get involved with your ideas and comments. Take some time to visit our homepage (<https://cimp.weebly.com/>) and check it out carefully. What should be kept, what should be changed, what could be deleted? What are you missing, what should be improved? What about the design and organization of the homepage? You all see many homepages, so let's get

the best out of all for our own. Your comments are highly appreciated. Please send it to our general secretary Gilda Lopes (cimp.palynology@gmail.com).

Another issue is the CIMP group on Facebook - CIMP - The Power of Palaeozoic Palynology.

We have got quite a number of new members interested in our field of research, not only Palaeozoic palynologists. It would be great to make this group a vital and valuable communication platform for Palaeozoic palynology. It is the perfect tool to exchange ideas, get support from the experienced fellows in your specific field of interest, discuss questions, exchange pictures and all sorts of materials including papers and to develop new collaborations. Last but not least, let's take the chance to show all the non-Palaeozoic palynologists in the group the impressive and wonderful world of Palaeozoic palynology and its huge research potential in earth science. Your active participation within the group is highly appreciated. Help us to make this group to the central platform for actual and all-time communication about Palaeozoic palynology.

Although we are not back to normal and still have to live with certain limitations this year, I want to strongly encourage you to make the best out of it. Look out for new possibilities, enter the door that opens and take every chance you get. I'm sure there will be a lot of interesting research in Palaeozoic palynology, also this year. And I'm looking forward to hear about it later. Stay healthy and safe.

Best wishes

Hartmut Jäger



Gilda Lopes
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GENERAL SECRETARY'S LETTER

Dear CIMP Members,

The 2021 CIMP Newsletter is now out! I hope this small treasure can bring you a great reading time back at your place!

I want to acknowledge all the members that took their time to write a small contribution. In 2022, if you don't have time to write something up, please just send us a list of the papers published throughout the year. This small gesture will help us all!

In the present newsletter, this year a quite smaller newsletter, you will find important information about the member's activities throughout this last rough year, among other issues.

I would also like to acknowledge Filipe Barreira (LNEG's designer) for all his support with the newsletter layout.

Best regards,
Gilda Lopes

CIMP NEWSLETTER GUIDELINES

The CIMP Newsletter is released once a year by the Commission Internationale de Microflore du Paléozoïque, and welcomes contributions from both members and non-members. You are invited to submit items related to CIMP members' fields of study that might include technical notes, meeting reports and reviews, book reviews, and other news related to Paleozoic palynology. Articles are preferred in Microsoft Word or plain text formats, and high resolution photos and other illustrations are welcomed.

All contributions should be sent by email to the Newsletter Editor, Gilda Lopes, at:

cimp.palynology@gmail.com

CIMP SUBSCRIPTION RATES

CIMP has an annual subscription regime. We encourage you to check your annual status and make your payment!

Subscriptions are set at:

Professionals

10€ per year (+ 0.50€ of charge whatever for how many years you pay your fees)

Students and retired members:

FREE

Information on methods of payment can be found at: <http://cimp.weebly.com/membership.html>.

It is easy, but why pay? Simple - you can help CIMP members (mainly students) to participate in meetings and conferences. You also may help in offsetting the costs of organizing social events during meetings, and participate in discussions between CIMP members. Your annual CIMP member dues also provide the fees for the CIMP subscription to IFPS (International Federation of Palynological Societies).

Thank you!

IN MEMORIAM...

RANDALL PENNEY (1951-2019)

By Graham Booth and Gordon Forbes

EDUCATION AND CAREER

Randall Alexander Penney was born in December 1951 and grew up in Blackrock, County Dublin, Ireland. He was the eldest son of Norman and May Penney. He completed a BA Honours degree in Natural Sciences at Trinity College Dublin in 1976 and an MS at Toronto University in 1979. It was this latter degree, which was gained through the study of palynomorphs from Quaternary lake sediments of Ontario, that was to set Randall on his palynological career path.

His first employment was as Laboratory Manager and Research Assistant at TCD's Applied Geology Unit. He was responsible for organising the laboratories and supported the palynological scientific work programme, which was designed to establish the palynostratigraphy of petroleum exploration wells drilled in Irish waters.

In 1988 he moved to Gearhart Geo Consultants (subsequently Halliburton Reservoir Description Services) in Aberdeen, where he was employed as a Senior Geoscientist. He was involved in the palynological study of exploration and development wells drilled on UK and Norwegian continental shelf. His work programme also included well sections from West Africa and the Middle East, which enabled him to diversify his palynological skills. It was during the early 90s, via a Halliburton RDS contract, that Randall first spent time working in the offices of Petroleum Development Oman LLC (PDO). Following the takeover and closure of the Halliburton office in early 1994, Randall became an independent consultant. Trading in Aberdeen as 'Under



Photo: Randall Penney.

The Microscope Stratigraphic Consultants Ltd' the majority of his work continued to come from PDO.

This was the precursor to the twenty-two years, which Randall then spent in Oman (1995 - 2016) working mostly through sponsors but employed almost exclusively by PDO. During this period, he made a very significant contribution to updating the palynostratigraphy, particularly of the Haushi Group sediments, and undertook many complex regional reviews for the exploration and development teams, which assisted the understanding of source rock and reservoir distribution. This was partly achieved through upgrading the Haushi palynological biozonation scheme, which involved painstaking evaluation of many hundreds of palynological preparations. He was much respected by the exploration and development teams, who keenly sought his views on the stratigraphy of their wells. Many successful wells, both E & D, owed a debt to Randall's quality work.

Those who had the opportunity to work with Randall will know that any day spent with him in the office was always a good

day, and one that would invariably bring a smile to your face. He could be a frustrating colleague to work with, but such was his nature that it was impossible to be annoyed with him for any length of time.

Randall left Oman in December 2016 for Gawler in South Australia for planned semi-retirement and to be closer to family members. There he resurrected his consultancy name 'Under The Microscope Stratigraphic Consultants Pty Ltd'. Tragically, within little more than a year he was beset by serious health problems from which he never recovered. He died peacefully on March 15th, 2019.

During his career Randall authored or co-authored fifteen palynological publications.

ASTRONOMY, ART, MUSIC AND MORE

To only describe Randall's career would be to describe but half the man. He was a true polymath with wide ranging knowledge and interests. Astronomy, classical music, botany/gardening, financial/precious metals markets were but a few of the topics that Randall could, and would, talk about at length and with authority. Many of us benefitted from his garden parties, excellent cooking skills, overall hospitality and generosity.

He showed early promise as an artist but pursued this as a hobby rather than with any career intent. He was passionate about music; he played the piano and with his memorable bass voice was a prominent and supportive member of the Muscat Singers. He regularly travelled from Muscat to Dubai to take part in orchestral and choral concerts, and after the opening of the Royal Opera House in Muscat in 2011 he rarely missed a performance during the concert season.

Perhaps Randall's greatest contribution to ex-patriate life in Muscat was his monthly astronomy camping trips into the beautiful interior of Oman. He was the proposer and a founding member in 1996 of the Ras Al Hamra Astronomical Society and was its chief astronomer and chairman for many years. These trips were very popular weekend family outings, involving a convoy of twenty or more 4WD vehicles, which Randall would lead to selected remote sites. In the evening he would entertain the group with his encyclopaedic knowledge of the starlit skies and demonstrate astronomical events using his famous military-grade laser pointer and large, carefully conveyed telescopes, with the assistance of a team of willing and loyal helpers.

Those fortunate enough to have known Randall will never forget his energy, passion and generous unwavering spirit. He was such an endearing man and we have all lost a good friend. We offer our sincere condolences to his brothers Russell, David and Gordon and to his sister Jenny and all other family members.

NEW MEMBERS

One new member registered in the past year and we already have one registration this January. On behalf of CIMP, I would like to welcome all of you!


Juan Emilio Di Nardo

Universidad Nacional del Sur, Bahía Blanca, Argentina

Position: Student

Location: Bahía Blanca

Interests: Carboniferous and Permian acritarchs and miospores.



I got a degree in Geology from the Universidad Nacional del Sur, Bahía Blanca, Argentine. Currently, I am working on my PhD thesis under the supervision of Drs. Mercedes di Pasquo and Marcelo Martínez. The project mainly focuses on the palynological analysis of core samples from the Upper Paleozoic sequences of the Claromecó Basin in the onshore area. I'm very excited to be part of the CIMP community and I wish to share the results of my research project with you soon.

Olle Hints

Department of Geology, TalTech
Estonia

Position: Professional

Location: Tallinn


Interests: Ordovician to Devonian
chitinozoans and scolecodonts.

NEWS FROM THE MEMBERSHIP

ALEXANDER C. BALL

University of Sheffield & Natural History Museum
London, UK

PhD 'The Late Silurian – Early Devonian adaptive radiation of vascular plants'



Like most as Lockdown 1.0 began, promises of extensive fieldwork and far-flung conferences quickly evaporated. I instead found myself packing my microscope, England Finder, and a none-too small collection of slides into a hastily pilfered cardboard box on a drizzly Sheffield day.

Nonetheless, I began working through JB Richardson's material from the latest Pridoli-earliest Lochkovian of the Anglo-

Welsh Basin. These assemblages from the earliest Lochkovian '*Apiculiretusispora* sp. E' biozone (and possible preceding and proceeding Pridoli/ earliest Lochkovian biozones) are beginning to be characterised and are proving to be pleasantly surprising. Whilst being dominated by smooth spores, sprinkled amongst these in far lower proportions are a diverse range of cryptospores and trilete spores, betraying a surprisingly diverse palynoflora from this time. Work on the MN biozone (Early – Late Lochkovian) continues, too, and alongside the lower biozones, seems to have a plethora of novel species to offer alongside previously described forms. I am especially looking forward to crystallising these and, for those from pre-MN assemblages, seeing how useful they are for discerning the enigmatic Latest Silurian/ Earliest Devonian biostratigraphy of the basin.

The parent plants of some of these spores have also been under scrutiny. Notably, two species of *Emphanisporites* have been found in sporangia from the lower MN biozone of the M50. I am collaborating with Willy Taylor at Wisconsin-eau Claire to investigate their ultrastructure through TEM and shed some light on their phylogenetic relationships, alongside exploring their possible palaeoecologies - this work will be submitted for review early next year. The 'sporangial arm' of my research is proving to be exciting - many sporangia, holding a variety of *in situ* species, have been uncovered and many more wait to be picked. In line with this, several level 3 projects at the University of Sheffield have been organised around this material, hopefully bringing to light further interesting specimens.

In other publication news, Charles Wellman and I have co-authored a Geol. Soc. Special publication review on Devonian phytodebris, comprising

mysterious banded tubes and fragments of cuticle from the M.50 and Rhynie Chert. We review the range of techniques used to investigate them and deliberate their mysterious affinities. This paper will be available 'online first' soon early in the new year.

When lockdown relaxed a little, I had a crack at some limited fieldwork around Shropshire - but I mostly found myself staring blankly at lots of red mudstone. As with my taxonomy, the onus was on earliest Lochkovian – Pridoli exposure, of which there is little. In the Welsh Borders, the succession is poorly exposed and the prospects of a palynomorph bearing horizon are particularly grim – exposure is typically found in steep sided streams choked with fallen trees and jealously guarded by brambles – but some samples were retrieved, nonetheless. Samples from these brief excursions are currently bubbling away in the labs and will hopefully add a number of horizons to the Pridoli of the basin. Having bought myself a new pair of wellies, I hope to attack the narrow streams of the Welsh Borders in due course.

2021 promises to be a busy year of more logging, (hopefully) collecting and further publishing.

AMALIA SPINA

Department of Physics and Geology, UniPG
Italy

I continue to work on long term projects on the Palaeozoic palynostratigraphy of Iran and on upper Palaeozoic of Italy. Last year, in January, before the lockdown, within the Erasmus Traineeship program, I participated in a fieldtrip to Southern Turkey in order to collect samples from the Devonian-Carboniferous transition. I'm also still working on thermal maturity of organic

matter with Geoff Clayton, Paulo Fernandes and Zelia Pereira. Results of these lines of research have already been published or presented in congresses.

Publications:

SPINA A., CIRILLI S., SORCI A., CLAYTON G., GENNARI V., GHORBANI M., GHORBANI M., OVISSI M., RETTORI G. & RETTORI R. 2020. Palynology of the Permian succession from the Ajabshir area (Azerbaijan, Central Iran): a preliminary report. *Geopersia* 10 (1), 211-225.

SPINA A., CIRILLI S., GHORBANI M., RETTORI R., SORCI A. & SERVAIS T. 2020. Middle-late Cambrian acritarchs of the Zagros Basin (southwestern Iran). *Palynology*.

SORCI A., CIRILLI S., CLAYTON G., CORRADO S., HINTS O., GOODHUE R., SCHITO A., VECOLI M. & SPINA A. 2020. Optical analyses for thermal maturity assessment of Upper Ordovician (Katian-Hirnantian) rocks from southern Estonia. *Marine and Petroleum Geology* 120.

MOLLI, G., BROGI, A., CAGGIANELLI, A., CAPEZZUOLI, E., LIOTTA, D., SPINA, A. & ZIBRA, I. 2020. Late Palaeozoic tectonics in Central Mediterranean: a reappraisal. *Swiss Journal of Geosciences* 113(1), 1-32.

CHARLIE WELLMAN

University of Sheffield
Sheffield, UK

In 2020 I undertook fieldwork in the Ordovician of the Cape Supergroup of South Africa and the Scottish 'Lower Old Red Sandstone' prior to the cessation of activities. A new 3-year NERC-funded Standard Research Grant has commenced studying the Devonian sequences of

Northern Spain. I hope to soon advertise a 2.5-year postdoc position working on the acritarchs and chitinozoans of these sequences.

Publications:

ASKEW, A. J. & WELLMAN, C. H. 2020. Reconstructing the terrestrial flora and marine plankton of the Middle Devonian of Spain: implications for biotic interchange and palaeogeography. *Journal of the Geological Society* 177, 315-324.

BONACORSI, N. K., GENSEL, P. G., HUEBER, F. M., WELLMAN, C. H. LESLIE, A. B. 2020. A novel reproductive strategy in an Early Devonian plant. *Current Biology* 30, 371-392.

GIBSON, M. E., TAYLOR, W. A. & WELLMAN, C. H. 2020. Wall ultrastructure of the Permian pollen grain *Lueckisporites virkkiae* Potonie et Klaus 1954 emend. Clark 1965: evidence for botanical affinity. *Review of Palaeobotany and Palynology* 275, 104169.

NAVIDI-IZAD, N., HASHEMI, H., CASCALES-MINANA, B., REGNIER, S., WELLMAN, C. H. & SERVAIS, T. 2020. Colonial palynomorphs from the Upper Ordovician on north-eastern Iran: 'thalli', coenobial Chlorophyceae (Hydrodictyaceae) or cyanobacteria? *Palynology* 44, 575-585.

STEIN, W. E., BERRY, C. M., MORRIS, J. L., VANALLER HERNICK, L., MANNOLINI, F., VER STRAETEN, C., LANDING, E., MARSHALL, J. E. A., WELLMAN, C. H., BEERLING, D. J. & LEAKE, J. R. 2020. Mid-Devonian *Archaeopteris* roots signal revolutionary change in earliest fossil forests. *Current Biology* 30, 421-431.

STROTHER, P. K., TAYLOR, W. A., VAN DE SCHOOTBRUGGE, B., LEANDER, B. S. & WELLMAN, C. H. 2020. Pellicle

ultrastructure demonstrates that *Moyeria* is a fossil euglenid. *Palynology* 44, 461-471.

CLAUDIA RUBINSTEIN AND VICTORIA GARCÍA MURO

IANIGLA-CCT-CONICET
Mendoza, Argentina

We continue to be involved in projects related to marine and terrestrial palynomorphs (organic-walled microphytoplankton, chitinozoans, cryptospores and trilete spores) from the Early to Middle Paleozoic of Argentina, and lately more concentrated on other basins from South America.

We have recently published the palynomorph assemblage recorded in the Devonian deposits of Bolivia, in collaboration with Pluspetrol S.A. The research is mainly focused on taxonomy, biostratigraphy, paleogeography and paleoenvironments.

Claudia Rubinstein is working on Ordovician acritarchs and miospores from Colombia, in collaboration with Ecopetrol. Comprehensive palynological study of Lower Ordovician rocks were carried out for the first time in Colombia. Collaboration still continues with promising data.

Together with Philippe Steemans (Liège) in collaboration with Brazilian geologists, we worked on the terrestrial palynomorphs from Alto Garças Sub-basin, Brazil. Palynomorphs are very diverse and exceptionally well preserved. We give new insights into the Brazilian biostratigraphy, as well as a geochemical analysis and its palaeoenvironmental implications. The marine palynomorphs will be study as soon as we can go back to the microscope!

Claudia Rubinstein worked on Ordovician acritarchs and miospores from Baltica (Sweden), in collaboration with Vivi Vajda (Stockholm). Given the recognition of the worldwide oldest so far recorded trilete spores, in the lowermost Upper Ordovician (Sandbian) strata in Sweden, a new perspective of radiation of vascular plants is accomplished.

Claudia supervises two PhD students. Sonia Camina, who is working on her PhD since 2018, on Devonian chitinozoans from Argentina and Bolivia. Guillermo Pierobon, started his PhD on 2020, and will analyze early Paleozoic marine and terrestrial palynomorph diversity from Argentina.

Publications and abstracts:

CAMINA, S.C., GARCÍA MURO, V.J. & RUBINSTEIN, C.V. 2020. New insights into Middle Devonian chitinozoans from Bolivia. The Palaeontological Association. Virtual Annual Meeting.

CAMINA, S.C. & RUBINSTEIN, C.V. 2020. Nuevos registros de quitinozoos de la Formación Los Monos, Cuenca Subandina, Bolivia. 1° Reunión Virtual de Comunicaciones de la Asociación Paleontológica Argentina.

GARCÍA MURO, V. J., RUBINSTEIN, C. V., PEREIRA, E., BERGAMASCHI, S., MAULLER, P. M. & STEEMANS, P. 2020. Early Devonian miospores and organic geochemistry from the Alto Garças Sub-basin (Paraná Basin), Brazil: Biostratigraphic, paleogeographical and paleoenvironmental implications. Review of Palaeobotany and Palynology 274, 104150.

GARCÍA MURO, V.J. & RUBINSTEIN, C.V. 2020. Evolución de la diversidad de palinomorfos marinos y terrestres desde el Ordovícico Tardío al Devónico Temprano en la Precordillera. 1° Reunión Virtual de Comunicaciones de la Asociación Paleontológica Argentina.

GARCÍA MURO, V.J., RUBINSTEIN, C.V., CAMINA, S.C., VERGANI, G. & PEREIRA, M. 2020. Palynology and organic geochemistry of an early to Middle Devonian succession from TCB X-1001–Tacobo borehole, sub-Andean basin, southern Bolivia. Journal of South American Earth Sciences, 102912.

RUBINSTEIN, C.V. & VAJDA, V. 2019. Baltica cradle of early land plants? Oldest record of trilete spores and diverse cryptospore assemblages; evidence from Ordovician successions of Sweden. GFF 141(3), 181-190.

RUBINSTEIN, C.V., VARGAS, M.C., DE LA PARRA, F., HUGHES, G.M. & SOLANO, C. C. 2019. Lower Ordovician (late Tremadocian?-Floian) palynomorphs from the Llanos Basin, Colombia: Biostratigraphic and paleogeographic significance. Review of Palaeobotany and Palynology 268, 43-54.

RUBINSTEIN, C.V., VARGAS, M.C., DE LA PARRA, F. & HUGHES, G.M. 2020. Biostratigraphy and paleogeography of Middle-Late Ordovician palynomorphs from the Llanos Basin, Colombia. Review of Palaeobotany and Palynology. In press.

VEIZAGA SAAVEDRA, J.G., POIRÉ, D.G., VERGANI, G.D., SALFITY, J.A., RUBINSTEIN, C.V., & PÉREZ LEYTON, M. Paleoenvironment and age of Los Monos Formation (Devonian), Tarija Basin, Argentina and Bolivia. Latin American Journal of Sedimentology and Basin Analysis 28 (1). In press.

<http://ppct.caicyt.gov.ar/index.php/lajsba/article/view/18188/45454575770782>

DUNCAN MCLEAN & DAVID BODMAN

MB Stratigraphy Limited
UK

From last year: "2019 proved to be a very good year for research activities at MB Stratigraphy Limited with plenty of good-quality fieldwork, always in good weather!" However, 2020 proved to be a

very bad year for research activities at MB Stratigraphy Limited with no good-quality fieldwork, despite the exceptionally good weather! During 2020 the UK government restrictions on movement due to the Covid-19 pandemic effectively prevented any fieldwork. We had to concentrate on rocks that we already had.

Analysis of material from the miospore-bearing levels in the Stephanian of the Oxfordshire Coalfield has been completed. This fills the last data gap in our ongoing pan-Carboniferous study and means that work on the biozonation of the Carboniferous of the British Isles can be finalised.

A paper describing the nature of coals in platform carbonate sequences at the Asbian-Brigantian boundary, Cefn Mawr, North Wales has been submitted by Peter del Strother (PhD, University of Manchester). It contains a small amount of miospore data.

Jon Tod (University of Birmingham) completed a study of miospores from the early Langsettian at Burntshaw Quarry northwest of Sheffield, and received his Masters degree! Plans are afoot to eventually publish his data as part of a larger study. However, we need to get back into the quarry to sample the highest part of the section first. Hopefully this can be done in spring or summer 2021.

Stephen Ingrams (University of Birmingham, now at University of Aberdeen) published preliminary results from the Mississippian of Northumberland. More of that to follow.

Publications:

McLEAN, D., BOOTH, M., BODMAN, D.J. & McLEAN, F.D. 2020. Carboniferous records

of the Zoophycos group of trace fossils from England, Wales, the Isle of Man and the North Sea. *Proceedings of the Yorkshire Geological Society* 63, 135-145. DOI: 10.1144/pygs2019-007

BOOTH, M.G., UNDERHILL, J.R., GARDINER, A. & McLEAN, D. 2020. Sedimentary and tectonic controls on Lower Carboniferous (Visean) mixed carbonate-siliciclastic deposition in NE England and the Southern North Sea: implications for reservoir architecture. *Petroleum Geoscience* 26, 204-231. DOI: 10.1144/petgeo2019-101

INGRAMS, S., McLEAN, D., BODMAN, D.J. & BOOTH, M.G. 2020. Asbian to Brigantian (Mississippian) miospores from Northumberland: preliminary results. *Review of Palaeobotany and Palynology* 276, 104-206.

DOI: 10.1016/j.revpalbo.2020.104206

McLEAN, D., RIDING, J.B. & WELLMAN, C.H. 2020. Professor Bernard Owens (1938-2019). *Review of Palaeobotany and Palynology*.

DOI: 10.1016/j.revpalbo.2020.104184

RIDING, J.B., McLEAN, D. & WELLMAN, C.H. 2020. Bernard Owens (1938-2019). *Palynology*.

DOI: 10.1080/01916122.2020.1739252.

GIL MACHADO

Chronosurveys Lda.

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During 2020 I spent most of the time with several commercial projects from around the World, not restricted to palynology or the Paleozoic. During 2019 and 2020, together with colleagues from the

University of Évora and Lisbon I supervised final graduate projects on Carboniferous and Devonian metasediments of a complex basin in SW Portugal. The work included not only palynology, but also ichnology, sedimentology, structural geology and other topics. Hopefully the results will be published this year. I also refined a palynological processing technique for evaporites and associated sediments, which was already used in a commercial project. A short paper on this topic and a couple of other articles were published during 2020.

Publications:

MACHADO, G. 2020. Salt Biostratigraphy in Oil and Gas Exploration: An Untapped Source of Data? *GeoExPro*. 17 (1)

LUDMAN, A., MACHADO, G., FERNANDES, P. 2020. Palynological dating of low-grade metamorphosed rocks: Applications to Early Paleozoic rocks of the Central Maine/Aroostook-Matapedia Basin and Fredericton Trough (Northern Appalachians) in eastern and east-central Maine, USA, *American Journal of Science*, 320 (3), 280-312. DOI: 10.2475/03.2020.03

MACHADO, G., MOREIRA, N., SILVÉRIO, G. 2020. Devonian sedimentation in the SW boundary of the Ossa-Morena zone: State of art and paleogeography, *Comunicações Geológicas*, 107 (1), 43-47.

MACHADO, G., SLAVIK, L., MOREIRA, N., FONSECA, P.E. 2020. Prasinophyte bloom and putative fungi abundance near the Kacak event (Middle Devonian) from the Odivelas Limestone, Southwest Iberia, *Palaeobiodiversity and Palaeoenvironments*.

DOI: 10.1007/s12549-019-00415-1

GILDA LOPES

CIMA, Universidade do Algarve
Faro, Portugal

I continue to work in the Mozambique Permian/Triassic project with Paulo Fernandes, Zélia Pereira, Márcia Mendes, and other colleagues, and I am also working with very interesting material from Angola. And finally I got the Devonian material from Bjornoya, Svalbard Archipelago out this January. Enjoy the readings!!

Publications:

LOPES, G., PEREIRA, Z., FERNANDES, P. MARQUES, J., MENDES, M. & GÖTZ A.E. 2021, (in press). Permian stratigraphy and palynology of the Lower Karoo Group in Mozambique – a 2020 perspective. *Newsletters on Stratigraphy*. DOI: 10.1127/nos/2021/0618.

LOPES, G., MANGERUD, G., CLAYTON, G. & VIGRAN, J.O. 2021. Palynostratigraphic reassessment of the Late Devonian of Bjørnøya, Svalbard. *Review of Palaeobotany and Palynology* 286. DOI: <https://doi.org/10.1016/j.revpalbo.2020.104376>

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SANT'ANNA, L.G., TASSINARI, C.C.G. & LEMOS DE SOUSA, M. J. 2020. New palynostratigraphic data of the Irati (Assistência Member) and the Corumbataí formations, Paraná Basin, Brazil, and correlation with other South American basins. *Journal of South American Earth Sciences* 102. DOI: <https://doi.org/10.1016/j.jsames.2020.102631>

HARTMUT JÄGER

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Business-wise 2020 was a total disaster. It was the worst year of my career. As I said before, industry turned down a lot of research activities and so all plans for last year were blown away. I was developing new collaborations in China, particularly (Palaeozoic) shale research, which were the first to get canceled, followed by the crash of all other projects planned for 2020. Although it took quite some time and energy to manage this crisis somehow, there was time to go through the stuff that piled up on the shelves during the last years.


Due to the request of some colleagues, actually doing research in the Carboniferous in the Harz Mts., I went back to the old samples from the Harz Mts. out of my PhD. Many of the samples have high amounts of recycled spores from the late Devonian. During my PhD I didn't study the recycled spores in detail, but now I did. I started to combine this with the results from the Devonian-Carboniferous boundary interval in Rügen Island. My own samples, but also other material. During that time, Rügen was part of the shallow marine carbonate shelf south of Laurussia with a strong hiatus at the D/C boundary. The samples studied in

the Harz Mountains are in sediments derived from the Laurussian shelf. Thus, the recycled uppermost Devonian spores in the samples from the Harz Mts. could be used to fill in the Devonian part of the hiatus observed in Rügen Island. Together it gives a good overview of the palynology at the D/C boundary interval in northeastern Germany and the real depositional hiatus of the end Devonian regression. Additionally I got samples from the D/C boundary in the Rhenish Massif, located in the distal shelf. These are well samples, that I processed several years ago, waiting on my shelf to be worked on one day. Other palaeontological data suggest, that this well section continues across the D/C boundary without an hiatus. Now I started to study the palynology of the Upper Devonian to Lower Carboniferous interval in this well. This will be compared to the data from Belgium on the one side and from Rügen Island on the other side. It will improve the knowledge about the palynology of the D/C boundary in Germany, but also the dynamics of the development and erosion of the proximal shelf in Rügen Island, controlled by the final stage of the Variscan orogeny.

Beside this I started to work on unfinished papers. After I have finished my chapters in a new textbook on Source rock analysis and development (methods and case studies) and the paper on climatic changes in the early Cretaceous of the Southern hemisphere (Chile, Antarctica) it's time to finish the papers on (upper) Palaeozoic palynology, that are waiting on the shelf.

JACQUES VERNIERS


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I am still partly active at the Ghent University, working on a summary article on the Silurian lithostratigraphic units of Belgium, where the chitinozoans are of much help. I'm also working to get the PhD thesis of Jan Mortier published (2014).

JOHN MARSHALL

University of Southampton
Southampton, UK



What is there to say about 2020. Following lockdown in March I was usefully self-isolating with a microscope, slides and a hastily assembled literature mountain. However, I am also Programme Leader for the Geology degrees in Southampton. So, from March to now and then far into 2021 I will be reorganising a degree whilst it is being taught. This includes all the postponed fieldwork. So, I have been to Dorset and the local Jurassic coast quite a lot, taking an intense interest in things I thought I would never look at again. It's also become apparent that many of my colleagues have never looked at local rocks or British stratigraphy either working entirely abroad or on drill core. Still, I did manage one day on the spore-free Devonian at Portishead. At the moment we can't travel to Wales, never mind Scotland.



The highlight of 2020 was getting the D-C boundary spore malformation paper published in *Science Advances*. This was based on a section from Greenland where we managed to locate the boundary in marginal lake sediments that had a diverse assemblage of spores. The boundary section was anomalous as it exactly coincided with a deep, wide stratified and long lived (~5-10 kyr) lake that represented a very active monsoon (i.e. a warming) and the collapse of the final cycle of the latest Famennian glaciation. In

this respect it's the palaeoclimatic mirror image of this glacial cooling. The spore assemblage from the D-C boundary lake included forms with spines that showed the characteristic malformation that occurs when UV-B radiation has damaged the DNA and exactly coincident with the terrestrial mass extinction at the end of the Devonian. Most spore types (e.g., all bifurcate tipped spores) go extinct without malformation which is shown by a group of survivors that are nearly all malformed in some way. Such malformation has been reported before by Maurice Streepl and others but always in a much lower proportion and below the D-C boundary. Such malformation is interpreted as the loss or thinning of the ozone layer and in the case of the Frasnian-Famennian, end Permian and end Triassic mass extinctions was coincident with a Large Igneous Province and accompanied by a Hg/TOC anomaly. Other groups have looked for the Hg/TOC anomaly or LIP at the D-C boundary and failed to find any convincing evidence. We measured Hg/TOC from our Greenland sections and also failed to find any anomaly. So, we advanced an ozone thinning mechanism based on modelling and measurement data from the USA Mid Continent where increased heat in the system increases transport of naturally produced methyl halogens into the stratosphere.

Fairly swiftly after our paper was published the astronomers got involved and reinterpreted (Field et al 2020) the terrestrial mass extinction (plus every other Late Devonian Event) as the result of supernova explosions. This is where a cosmic ray blast from a collapsing star strips off the ozone layer enabling the kill mechanism. Astronomers have always advanced this hypothesis but it has never found traction in the geological community. However, we now have a mechanism and the analytical tools to test

it since the cosmic ray blast is followed by a dust cloud that will include unique radionuclides formed in the supernova explosion.

Other activities in 2020 were publication of a more detailed account of the Greenland D-C boundary sections and particularly a discussion of the spore groups that did, and did not become extinct at boundary. This includes an argument for placing the D-C boundary GSSP section at the largely terrestrial mass extinction level (not to be confused with the earlier latest Devonian Hangenberg mass extinction level that mostly affected marine groups like ammonoids and conodonts).

GTS 2020 was also published (online but not yet in print) at the end of 2020 and as Chair of SDS I was an author on the revised Devonian chapter. This includes a new revised geochronology and importantly the beginnings of a coherent timescale based on orbital cycles.

Finally, our paper on the *Archaeopteris/Wattieza* Cairo forest from the Mid Devonian of New York State (Stein et al., 2019) published last year was featured in the *Guinness Book of World Records* for 2021 as the oldest fossilised forest.

Publications:

MARSHALL, J.E.A., LAKIN, J., TROTH, I. & WALLACE-JOHNSON, S.M. 2020. UV-B radiation was the Devonian-Carboniferous terrestrial extinction kill mechanism. *Science Advances* 6, eaba0768. DOI: 10.1126/SCIADV.ABA0768.

MARSHALL, J.E.A. 2020. A terrestrial Devonian-Carboniferous boundary section in East Greenland. *Palaeobiodiversity and Palaeoenvironments*. DOI.ORG/10.1007/s12549-020-00448-x

BECKER, R.T., MARSHALL, J.E.A. & DA SILVA, A.C. 2020. The Devonian Period. In Gradstein, F.M., Ogg, J.G., Schmitz, M.D. & Ogg, G.M. (eds) *Geologic Time Scale 2020*, 2, 733-810.

STEIN, W.E., BERRY, C.M., MORRIS, J.L., Hernick, L.V., MANNOLINI, F., VER STRAETEN, C., LANDING, E., MARSHALL, J.E.A., WELLMAN, C.H., BEERLING, D.J. & LEAKE, J.R. 2019. Mid-Devonian *Archaeopteris* roots signal revolutionary change in earliest fossil forests. *CURRENT BIOLOGY* 30, 1-11.

Cited reference

FIELDS, B.D. et al. 2020. Supernova triggers for End-Devonian extinctions. *PNAS* 117, 21008-21010.

JOHN BACKHOUSE

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The following publication has been published recently in digital format and can be downloaded from the website of the Department of Mines, Industry Regulation and Safety:

<https://dmpbookshop.eruditetechnologies.com.au/product/mid-carboniferous-lower-permian-palynology-and-stratigraphy-canning-basin-western-australia.do>

The Report incorporates palynological (30 wells) and stratigraphic (90 wells) revisions for the north of the basin with illustrations including 33 plates of palynomorphs and seven correlation plates of petroleum wells. The following summary is from the abstract:

The ages of the late Viséan to ?early Moscovian *Grandispora maculosa*,

Spelaetriletes ybertii and *Diatomozonotriletes birkheadensis* Zones (in ascending order) are poorly constrained and the definition of the uppermost of these zones is notably imprecise. Of the three spore-pollen zones within the overlying late Kasimovian? – Asselian (*Vallatisporites arcuatus*, *Microbaculispora tentula* and *Pseudoreticulatispora confluens*, in ascending order), the *V. arcuatus* Zone is newly established and the *M. tentula* Zone incorporates the former *Deusilites tenuistriatus* Zone. The age of these zones is loosely constrained by overlying Sakmarian faunas and a provisional mid-Asselian zircon ash bed date from the Bonaparte Basin. Most taxa are discussed but no taxonomic revisions are proposed with possible new taxa left in open nomenclature. Correlations of the zonation with most other former parts of Gondwana are hindered by provinciality.

A mid-Pennsylvanian (?Moscovian–Kasimovian) hiatus seemingly corresponds to the zenith of ice development across the State and preceded an overall phase of deglacial sedimentation. There are no unequivocal glacial features below this break. Along the southeastern margin of the main depocentre of the basin, thicker glacial deposits appear to have filled areas between local salt-generated highs that directed Early Permian paleovalleys northwards into the that depocentre.

Publications:

BACKHOUSE, J. & MORY, A.J. 2020. Mid-Carboniferous – Lower Permian palynology and stratigraphy, Canning Basin, Western Australia: Geological Survey of Western Australia Report 207.

MARTHA GIBSON

CIMP Student Representative

University of Sheffield
Department of Animal and Plant Sciences
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I am thrilled to say that this year I passed my Ph.D. entitled '*Palaeoecology and Palaeoenvironments of the Late Permian Zechstein Sea and its Hinterlands*' supervised by Prof. Charles Wellman (University of Sheffield) and Tristan Pottas and Asher Haynes (Anglo American Plc) at the University of Sheffield, U.K.

The primary aim of my research was to undertake the first high-resolution palynological analysis of the entire evaporite-dominated Zechstein Group using borehole material from northeast England. The Zechstein flora appears to have persisted up to the Permian-Triassic boundary instead of disappearing during the early Changhsingian (Gibson & Wellman; in review), adding to the evidence of no land plant mass extinctions at the end of the Permian.

This was enabled by developing a new technique for evaporite palynology with the aid of David Bodman of MBStratigraphy (Gibson & Bodman; in review). Exceptionally well-preserved bisaccate pollen grains were recovered from a variety of evaporite lithologies, primarily argillaceous (dirty) halite, highlighting the preservation potential and scientific value of the Zechstein evaporites. I am currently seeking post-doctoral positions in palynology or palynology-related fields and am excited to further apply my evaporite palynology method. So please get in touch if you have any evaporites to study!

Finally, as the current CIMP Student Representative I would like to point students seeking support and engagement in the palynological community in the direction of the 'Palynology platform' and 'AASP | The Palynological Society - EARLY CAREER' Facebook groups, and the

'Palynology Short Talks' series (<https://palynology.org/palynology-short-talks/>).

These will be excellent ways to continue to stay connected in 2021.

Publications:

GIBSON, M.E., WELLMAN, C.H. & TAYLOR, W. 2020. Wall ultrastructure and development in the Permian pollen grain *Lueckisporites virkkiae* Potonié and Klaus 1954 emend. Clarke 1965: evidence for botanical affinities. Review of Palaeobotany and Palynology 275, 104169.

GIBSON, M.E. & WELLMAN, C.H. The use of spore-pollen assemblages to reconstruct vegetation changes in the late Permian Zechstein deposits of northeast England. Accepted pending minor revisions.

GIBSON, M.E. & BODMAN, D.B. Evaporite Palynology: a case study on the Late Permian Zechstein Sea. Accepted pending minor revisions.

GIBSON, M.E. & WELLMAN, C.W. Zechstein forests thrived up to the Permian-Triassic mass extinction event. In prep.

GIBSON, M.E. Exceptional preservation of possible endobiotic fungus inside late Permian pollen grains from the British Zechstein Group. In prep.

NAVID NAVIDI-IZAD

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I received my PhD in Paleontology and Stratigraphy at Kharazmi University, Tehran, Iran in 2020. I continue my research on biostratigraphy and paleobiogeography of the late Cambrian and Ordovician organic-walled marine

microphytoplankton of northern Iran. This year I published some papers with my colleagues on the revision of the Middle – Upper Ordovician acritarch genus *Orthosphaeridium*, the revision of the Upper Cambrian – Lower Ordovician acritarch genus *Vulcanisphaera*, and the description of the Upper Ordovician colonial palynomorphs. Also the first evidence of Ordovician sediments in northwestern Algeria by recording the Upper Ordovician acritarchs in the Traras Mountains was published. Additionally, I continue my collaborations for the revision of some important acritarch taxa.

PHILIPPE STEEMANS & MAURICE STREEL

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Liège, Belgium

During confinement we have tried to update former researches on the Upper Devonian palynology resulting in three contributions, two on the Frasnian and the third one on the latest Famennian and the Devonian–Carboniferous Boundary in Europe.

The first contribution: Updating Frasnian miospore zonation from the Boulonnais (Northern France) and comparison with new data from the Upper Palaeozoic cover on the Brabant Massif (Western Belgium) by M. Streel, F. Boulvain, M. Duser, S. Loboziak, P. Steemans will be online at the end of November and will be published in *Geologica Belgica*, 24/1-2 (2021).

The second-one concerns the palynology and geochemistry of the Frasnian transgression in the Parnaíba Basin (Brazil) by P. Steemans, E. Pereira, A. Le Hérisse, Y. Grahn, M. Streel, M. Brito, S. Bergamaschi and R. Rodrigues and will be online in *Review of Palaeobotany and Palynology*, 284 (2021).

The third one is to be found in the Newsletter on Devonian Stratigraphy (SDS) 35, 29-45 and reviews quantitative palynological data available across the DCB in Western to Central Europe.

Additionally, Philippe published two papers on South America. The first one is: Garcia-Muro, V., Rubinstein, C., Pereira, E., Bergamashi, S., Mauller Mendlowicz, P., & Steemans, P. (2020). Early Devonian miospores and organic geochemistry from the Alto Garças Sub-basin (Paraná Basin), Brazil: Biostratigraphic, paleogeographical and paleoenvironmental implications.

Review of Palaeobotany and Palynology, 274, 1-18. The second one has a special sentimental value as it was written in collaboration with our friend and colleague that disappeared too early: Gerrienne, P., Araújo-Júnior, H. D., Bergamaschi, S., Milagres, I., Martins, G. D. O., Pereira, E., Rodrigues, M. A., Rodrigues Francisco, V., & Steemans, P. (2020). Earliest Evidence of Land Plants in Brazil. In R., Iannuzzi, R., Rößler, & Kunzmann, Brazilian Paleofloras (pp. 1-39). Springer.

A third paper concerns the geology and geothermal energy of the western part of Belgium: Licour, L., Goderniaux, P., Dupont, N., Hennebert, M., Swennen, R., Steemans, P., Boulvain, F., Peticlerc, E., Rorive, A., & Baele, J.M. (2020). Stratigraphical reinterpretation of Devonian strata underlying the Mons Basin based on cuttings from the Saint-Ghislain borehole, Hainaut, Belgium. *Geologica Belgica*, 23(1-2).

Philippe is also involved in research on the northern Lower/Middle Devonian of Spain with C. Wellman and in another region of Spain with B. Cascales. Again, with Borja and, posthumously, with Philippe Gerrienne, on the famous Rhynie Chert. We have also begun a review of a borehole close to Qatif, in the Lochkovian of Saudi Arabia, with Pierre Breuer and

Charlie Wellman, while Maurice concentrates also on the peat-bogs of the Hautes-Fagnes, NE Belgium.

REED WICANDER

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During 2020 I was planning to spend four months (January – May) again with Geoff Playford as I have done for the past five years. Unfortunately, Covid-19 interrupted that trip and I had to leave at the end of March on the last flight from Brisbane to Los Angeles. None-the-less, Geoff and I finished our paper on the palynoflora of the Lower Devonian Ross Formation, Tennessee and submitted our manuscript for publication in December. After review, we hope this study will be published in 2021.

We will be following up this study with an examination of the chitinozoans, scolecodonts, and miospores from the same material as our paper on the palynoflora. In this way, we will have described the entire palynomorph assemblage of this formation.

It was a disappointment that all palynologic meetings had to be cancelled for 2020, and I suspect the same will be the case in 2021. However, I am hopeful that meetings will be able to take place in 2022 and look forward to seeing everyone again at that time.

G. SUSANA DE LA PUENTE

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I continue to focus on chitinozoan and Paleozoic geological studies. I am a scientific researcher for CONICET of Argentina, and a Professor in the Geology Department at the Universidad Nacional del Comahue in Neuquén, Argentina.

Publications:

DE LA PUENTE, G.S., PARIS, F. & VACCARI, N.E., 2020. Latest Ordovician–earliest Silurian chitinozoans from the Puna region, northwestern Argentina (Western Gondwana). *Bulletin of Geosciences* 95(4), 391-418.

'The Azolla Story: A message from the future'

By Jonathan and Alexandra Bujak

A miracle plant worshipped in the East. A Superorganism with unique abilities. The Third Event since life originated on our planet.

Published as an ebook, 31 December 2020.

Available as an ebook from Amazon (free with Kindle Unlimited until 31 March 2021).

Kindle Discount Deal: The ebook is also available for a discount on amazon.com and amazon.co.uk between Friday 5 February and 11 February 2021:

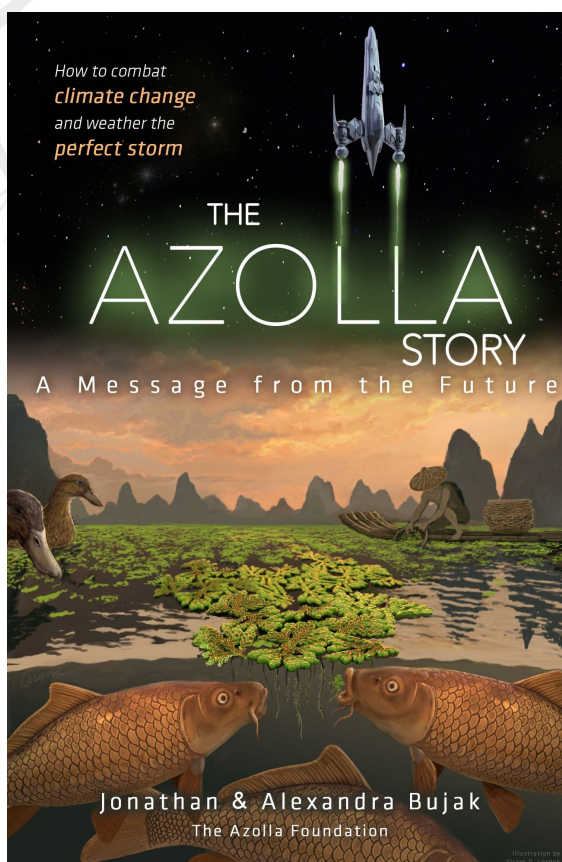
- Beginning 5 February at 4pm: \$1.99 and £1.99
- Beginning 7 February at 12 am: \$2.99 and £2.99
- Beginning 8 February at 8am: \$3.99 and £3.99
- Beginning 9 February at 4pm: \$4.99 and £4.99 until midnight 11 February.

The book will then revert to its usual price of \$9.99 and £9.99.

For more details on the book see:

<http://theazollastory.com/about-the-azolla-story/> or contact

jonathanbujak@outlook.com



Cover: The book cover was designed by paleo-artist Victor Leshyk (weblink: home.victorleshyk.com).

This is the story of a wonder plant called azolla that can help us at this crucial moment in our human journey.

Written by Dr. Jonathan Bujak, a palaeontologist with more than forty years' experience in the Arctic and his environmental scientist daughter, Alexandra, *The Azolla Story* takes the reader on an amazing journey through time and space, ending with a message

written a hundred years from now in a world of incredible opportunities.

THE PAST

It begins with the 2004 Arctic Coring Expedition (ACEX) that discovered the Arctic Azolla Event (link: <http://theazollafoundation.org/azolla/the-arctic-azolla-event-2/>) featured in National Geographic (May 2005), Nature (1 June 2006) and the New York Times (November 2004). Forty-nine million years ago azolla repeatedly covered large areas of the Arctic Ocean and drew down enormous quantities of the greenhouse gas carbon dioxide (CO₂), ending the world's greenhouse climate and moving it towards today's icehouse with its succession of ice ages.

Combining the latest data on biology and genetics with geology and palaeontology, The Azolla Story describes the timing and location of a Whole Genome Duplication event that led to the third major evolutionary jump since life began on our planet. The result was azolla – the only plant with a co-evolving nitrogen-fixing cyanobacterial symbiont that was formally designated as a Superorganism by University of Lisbon's Francisco Carrapiço in 2010 – a unique plant that can help us overcome the multiple threats of the Perfect Storm we face today: shortages of land, fresh water, food and energy, plus man-made climate change as our population grows by more than a million every three days.

FROM DEEP TIME TO OUR TIME

The story then transports us from Deep Time to Our Time as we see how azolla was first cultivated in rice paddies 6900 years ago in China, doubling rice productivity without the need for chemical fertilizers and pesticides. We see how

Buddhist monks spread the knowledge of azolla's use as a biofertilizer and livestock feed in India and the Far East, and how it was brought back to France at the end of the eighteenth century by a naturalist and his remarkable assistant. Jeanne Baret disguised herself as a man so that she could go on Louis-Antoine de Bougainville's circumnavigation of the globe – the first women to travel around the world. The plants brought back to France would be formally named 'azolla' by the French naturalist Jean-Baptiste Lamarck in 1783.

The stage was now set for the next part of our journey as we move from the Past into the Present.

THE PRESENT

The Present shows us the many ways in which azolla can help us weather today's Perfect Storm. The story takes us to different parts of the world, including India where azolla is revered as a wonder plant, transforming the lives of smallholder farmers for less than one US dollar (80 rupees) a year, and then to Ecuador where it can save the country more than a billion dollars a year and protect the country's precious ecosystems.

Thanks to the Azolla Foundation [link here: <http://theazollafoundation.org/>], set up by Alexandra and Jonathan Bujak, thousands of smallholder farmers around the world have been shown how to sustainably farm with azolla. In Sierra Leone, azolla's use as a biofertilizer in rice paddies provides the country's Ebola Orphans with food and money to build their schools, while also preventing deforestation of the region.

The Azolla Story then takes us into space to see how azolla can be used in closed-loop life support systems (CLLS), providing food, recycled oxygen and purified water that are essential in space travel and on

other worlds.

Back on Earth, the Azolla Biosystem, which is described in the book, grows azolla anywhere on our own world. The highly flexible, modular biosystem sequesters CO₂ for Carbon Capture and Storage (CCS) or converts the greenhouse gas into a local source of renewable food, livestock feed, biofertilizer, biofuel and high-value pharmaceuticals.

But azolla can do more. Azolla Hubs that house the Biosystem increase urban agriculture in the world's growing megacities, connecting their inhabitants with nature through living, green arteries – a connection that is essential for our health as individuals and societies.

THE FUTURE

The last part of the book transports us to the shore of the Arctic Ocean a hundred years from now. As we stand there remembering the events of the past century, we record our message and view a world that is bright with optimism. It is a future that we can all have with azolla's help – a unique plant, a Superorganism and an ally on our remarkable human journey.

THE IMPORTANCE OF GEOLOGY

The Azolla Story illustrates the relevance of geology to today's world. It shows us how we can use our knowledge of the past to solve the multiple problems that we now face and how we can turn a problem into a solution. To quote from the book:

'It shows us the value of working with nature and its roots that go far back into the mists of Deep Time – time that is measured in billions of years – an unfathomable chasm compared to our own brief time as humans.

We really are the new kids on the block,

but we are also beginning an incredible journey of exploration and discovery, providing we survive the next few years and weather a Perfect Storm that threatens us all. We can do that with azolla's help – a friend and ally at this crucial time in our human journey.

All we have to do is say yes, let's do it together.'

Join us on that journey as you read The Azolla Story.' (link here to <http://theazollastory.com/>).

With an extensive Glossary of scientific terms and more than 600 citations linked to their web pages, The Azolla Story is written for both the specialist and the non-scientist. Its aim: to make people aware of a unique Superorganism and how it can help us overcome the Perfect Storm that threatens us all.

References:

Carrapiço, F. "Azolla as a Superorganism. Its Implication in Symbiotic Studies." Cellular Origin, Life in Extreme Habitats and Astrobiology Symbioses and Stress, 2010, pp. 225–241., doi:10.1007/978-90-481-9449-0_11. Web link:

https://www.researchgate.net/publication/226143146_Azolla_as_a_Superorganism_Its_Implication_in_Symbiotic_Studies

UPCOMING MEETINGS AND COURSES

XV INTERNATIONAL PALYNOLOGICAL CONGRESS & XI INTERNATIONAL ORGANIZATION OF PALAEOBOTANY CONFERENCE

PRAGUE, CZECH REPUBLIC

POSTPONED TO MAY 25TH–31ST, 2024

Dear colleagues,

Unfortunately, we need to advise you that we are cancelling the XVth International Palynological Congress/XIth International Organization of Palaeobotany Conference 200 Years of Palaeobotany event, which was due to be held in Prague, May 1st–7th, 2021. Reviewing the various levels of Coronavirus infections and processes implemented by various European countries, we simply do not believe that the situation will have improved enough to allow for travel and for a physical meeting that can safeguard all attendees. Attendees' safety is our priority, and we have therefore made the decision to move the event to May 25th–31st, 2024.

The date has also been chosen on the basis of the decision by our parent organizations (IFPS and IOP), and the fact that the on-line European Palaeobotany and Palynology Conference in Stockholm will take place in 2022. These conferences are held biannually, and alternate between the European and World events. Our current World one we have cancelled altogether, the next European one will be in 2022, and our next World conference will be in 2024.

CONFERENCE FEES

In the coming weeks, information will be made available to those of you who desire a refund of your conference fees. However, it will be very welcome if you leave your conference fees with us. If you leave your already paid fees with us, we will hold your reservation at today's price – if the fees increase (due to a rise in prices by 2024), yours will remain unchanged. You can also change the name of the payee, and leave your pre-paid reservation to be used by a colleague, again, at today's price - just let us know.

Thank you for staying with us!

Organizing Committee

53RD AASP-THE PALYNOLOGICAL SOCIETY ANNUAL MEETING

MANIZALES, COLOMBIA

POSTPONED TO 2022

The AASP Annual Meeting 2021 to take place in Manizales, Colombia, was postponed to 2022.

APPLIED BIOSTRATIGRAPHY COURSE**ONLINE COURSE****29TH OF MARCH TO 10TH OF MAY 2020**

The course runs for 5 weeks (corresponding to a 5-days course) with tutorials, videos, exercises with real data and other resources. A tutor will be available throughout the course to clarify any doubts. Participants can enrol from anywhere in the World as there are no schedule restrictions and can follow the course at their own pace. The course covers a wide audience, including Exploration and development Geologists, Geoscience final year undergraduate, Master and PhD students, Seismic Interpreters, Sedimentologists and also academic staff that want to know more about the industrial applications of biostratigraphy.

Details can be found here:

<https://ingeoexpert.com/en/courses-online/applied-biostratigraphy-course/>

Course contents:

Week 1**Stratigraphy and an Introduction to Micropaleontology**

- The Laws of Stratigraphy
- Age Dating Methods for Sediments and Igneous Rocks
- The Stratigraphical Column and Chronostratigraphy
- The Different Microfossil Groups and Preparation Techniques
- Organic Microfossils (Palynomorphs) including Acritarchs, Chitinozoans, Dinoflagellates, Pollen and Spores
- Inorganic Microfossils including Microforaminifera and Ostracoda

Week 2**Biostratigraphy**

- Microfossil evolution through the Stratigraphical Column
- Building stratigraphical range charts
- First downhole occurrence, last downhole occurrence, fossil assemblages
- Numerical methods, abundance increases and maxima
- Index fossils
- Stratigraphical type sections and the relation between Biostratigraphy and Chronostratigraphy

Week 3**Biostratigraphical Correlations and Correlation Techniques**

- Pitfalls using biostratigraphical data, downhole caving, reworking, contamination
- Definition of biozones

- Integration of sedimentological and petrographical data
- The integration of geochemical information
- Identification of unconformities / hiatus in the sequences

Week 4

Biostratigraphy, Paleoenvironments and Sequence Stratigraphy

- Using Micropalaeontology for palaeoenvironmental interpretation
- Marine microfossils vs. non-marine microfossils
- Preservation of microfossil groups and different lithologies
- Definition of water depth from the different fossil groups
- The identification of sequence boundaries using biostratigraphical Data
- Using biostratigraphical data to identify condensed sequences and maximum flooding surfaces
- Using biostratigraphical data to identify low stand System and high stand system tracts

Week 5

Play Definition using Play Based Exploration Techniques

- Hydrocarbon Play definition
- Integrated Biostratigraphy and its use in Play based exploration techniques
- The deltaic to marine Cretaceous Alagamar Play in Potiguar Basin, Equatorial Marginal of Brazil
- The Cenozoic deep-water turbidites and associated salt play, Lower Congo Basin, Angola
- The Early Silurian Hot shales of the Arabian plate, source rock characterization