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**SUBCOMMISSION ON  
DEVONIAN STRATIGRAPHY**

**NEWSLETTER No. 39**

R.T. BECKER, Editor  
Münster University,  
Germany



# SDS NEWSLETTER 39

## Editorial

The SDS Newsletter is published annually by the International Subcommission on Devonian Stratigraphy of the IUGS Subcommission on Stratigraphy (ICS). It publishes reports and news from its membership, scientific discussions, obituaries of Devonian researchers, original science contributions (SDS Documents), scientific reviews, Minutes of SDS Meetings, SDS reports to ICS, general IUGS information, information on past and future Devonian meetings and research projects, and summaries of new Devonian publications.

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**Please ease the editing by strictly keeping the uniform style of references !**

The Newsletter contributions should be quoted as: "SDS Newsletter, **39**: x-y."

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## CHAIRMAN's Address

Dear SDS Members,

The year 2024 was a special one because of the exchange of the ICS executive and the renewal of all subcommission officers and voting memberships (by new election and/or re-election).

The change was under a rigorous screening from the part of the ICS and IUGS with the focus on the expertise, and (palaeo)geographical and gender balance. It was also necessary to avoid possible overextended terms of some officers and voting members. The SDS has mastered the vote well and, in addition to the SDS officers, we have 15 voting members in total now, including 8 males and 7 females that represent five continents. Allow me to take the opportunity and express my thanks to all the past voting members for their service! I would also like to encourage the new voting members to contribute actively to the SDS matters. Me, as the Chairman, and Nacho VALENZUELA-RÍOS, as the Vice Chairman, were re-elected. Uli JANSEN will kindly continue as the Secretary. We all hope that our new term will be successful in pushing the pending issues forward. The new SDS representation have officially taken their office during the International Geological Congress in Busan in August 2024, where Prof. Elisabetta ERBA of the University of Milan has replaced David HARPER and became our new ICS Chair. During the congress, we held a meeting of the ICS subcommission chairs, where each chair presented the activities of their subcommission and the outlook for the next period.

Besides many other Devonian activities, some of us were busy with the two pending issues that have to be resolved by our subcommission – a redefinition of the basal Emsian GSSP and a redefinition of the Devonian/Carboniferous boundary. A proposal for the redefinition of the Basal Emsian boundary was completed last year and presented both at the IGC and the Joint ISSS

and SDS meeting in Sofia, Bulgaria. The proposal comes from the Prague Synform and is based on biostratigraphy supported by multiple chemo-physical proxies. The SDS still awaits proposals from other areas, including the Spanish Central Pyrenees and/or Morocco. Proposals from any other region, including the Kitab State Geological Reserve in Uzbekistan, are welcome. The formal discussion on the one or several proposals submitted will take place in the next year. The Devonian/Carboniferous Boundary Working Group still continues their work on the definition of multiple criteria that would work in various environments for a safe recognition of the system boundary.

I am writing these lines a few days after my return from the very pleasant SDS meeting in Sofia. Our dear colleague Valeri SACHANSKI and his group organized the Joint ISSS-SDS Meeting “*Timeline of Silurian and Devonian environmental and biotic changes*” that took place on September 12-17. The idea to hold the joint Silurian and Devonian meeting was born somewhat in summer 2023, and it happened to be a good opportunity for both “sister” subcommissions. We had exciting indoor sessions, regular subcommissions business meetings, and two days of fieldtrips to the Palaeozoic of the Svoje Unit and the Iskar Gorge in western Bulgaria.

During the meeting, the SDS grant committee was established and the SDS grant system for early-career Devonian workers was launched. For additional details and information from the SDS meeting in Sofia, please check the minutes in this newsletter.

I wish you a pleasant and inspiring reading of our SDS Newsletter No. 39! Please, keep reporting on all your Devonian-related activities to feed the next issues. The plan for the next SDS meeting is GeoTolosa, Toulouse, France, June 2025. We hope to see many of you there!

*Ladislav SLAVÍK*

(SDS CHAIRMAN, Sept. 2024)

## OBITUARIES

**Charles A. SANDBERG**  
(12.6.1929 - 24.1.2024)

by  
**Gilbert KLAPPER**



**Fig. 1.** Charlie in his later years.

Charles SANDBERG was a world-class leader in the research on Devonian and Mississippian conodont biostratigraphy, taxonomy, paleoecology, paleobiogeography, paleogeography, and paleotectonics. As a number of individuals have observed, Charlie was an incomparable field geologist. He was awarded the U.S. Geological Survey's G. K. GILBERT Fellowship in 1985 (and a rare renewal the following year) during which he carried out research in Belgium and Germany with Roland DREESEN and Willi ZIEGLER, respectively. In 2013, Charlie received the PANDER Society Medal for his many contributions to conodont research.

Charlie was born on June 12, 1929, and grew up in Boston, Massachusetts. He graduated from the renowned Boston Latin School in 1945 and from Harvard University, graduating *cum laude* with a Bachelor's degree in geology in 1949. He began his professional career with the U.S. Geological Survey in Billings, Montana, in 1950 but that was

interrupted from 1952-1954 when he served in Korea as a 1<sup>st</sup> Lieutenant in the U.S. Army Combat Engineers. Charlie did graduate work at the University of Tennessee (1949-50) and Stanford University (1956), but after service in Korea he returned to the U.S.G.S. in Billings. There he met and married the geologist Dorothy Ann TAYLOR in 1956; they moved the next year and both worked for the Geological Survey at the Denver Federal Center. They were married for over 50 years until Dorothy passed away in 2010. Charlie worked for the Survey for over 40 years until 1994, mainly in the Fuels Branch, when he "retired" at age 65 but he continued full-scale research as an emeritus geologist until quite recently.

Charlie was a titular member of the Subcommission on Devonian Stratigraphy from 1990-2008 and a corresponding member until the time of his passing. He was a member of the Devonian-Carboniferous Boundary Working Group from 1975-1990 and a corresponding member of the Subcommission on Carboniferous Stratigraphy also until January 2024.

I first met Charlie in 1960 at his Denver office, during which time he was a substantial help in suggesting additional localities across the Devonian-Mississippian boundary to collect conodonts in Wyoming and Montana for the dissertation I had started the previous year. We were close friends and colleagues for many years thereafter and, beginning in 2002, talked for almost an hour nearly every Sunday evening.

I like to thank Charlie's daughters, Susan WAJDA and Janet SANDBERG, for providing a number of critical documents on his career, and to James BARRICK and Michael MURPHY for significant comments on an earlier draft. He is also survived by his son William A. SANDBERG and twelve grandchildren and great-grandchildren.

In a formal career summary to the Survey as of 2012, Charlie had published 122 papers and 137 abstracts. Instead of listing all those in that report, he annotated 28 papers he considered

his most important contributions. The references to these are listed in the following to indicate the breadth and depth of his contributions to geology and paleontology.



**Fig. 2.** Charlie SANDBERG in a 1954 photograph shortly after he returned to the U.S. Geological Survey after serving in the Korean War. He is standing at Cottonwood Canyon in the Bighorn Mts., northern Wyoming, which exposes the Ordovician Bighorn Dolomite, the type locality of the Cottonwood Canyon Member (late Famennian to early Mississippian) of the Madison Limestone, as well as the main part of the Madison Limestone (Mississippian) - the upper cliff. Photograph provided by Charlie and probably taken by Professor Curt TEICHERT, because of a photo of the latter from the same spot in the canyon that was recently provided by Charlie's son, Bill SANDBERG.

#### Taxa named after Charlie SANDBERG

*Siphonodella sandbergi* KLAPPER, 1966

*Palmatolepis sandbergi* JI & ZIEGLER, 1993

*Aculeiconchus sandbergi* ZATOŃ, HU, DI PASQUO & MYROW, 2021 (Microconchida)

#### Important publications

**SANDBERG, C. A. & HAMMOND, C. R. (1958).** Devonian system in Williston basin and central

Montana. - American Association of Petroleum Geologists Bulletin, **42** (10): 2293-2334.

**SANDBERG, C. A. (1961).** Widespread Beartooth Butte Formation of Early Devonian age in Montana and Wyoming. - American Association of Petroleum Geologists Bulletin, **45** (8): 1301-1309.

**SANDBERG, C. A. & KLAPPER, G. (1967).** Stratigraphy, age, and paleotectonic significance of the Cottonwood Canyon Member of the Madison Limestone in Wyoming and Montana. - U.S. Geological Survey Bulletin, **1251-B**: 70 pp.

**SANDBERG, C. A., STREEL, M. & SCOTT, R. A. (1972).** Comparison between conodont zonation and spore assemblages at the Devonian-Carboniferous boundary in the western and central United States and in Europe. – Compte rendu 7<sup>th</sup> Congrès International de Stratigraphie et de Géologie du Carbonifère, Krefeld, 1971: 179-203.

**SANDBERG, C. A. (1976).** Conodont biofacies of Late Devonian *Polygnathus styriacus* Zone in western United States. - In: BARNES, C. R. (Ed.), Conodont paleoecology. Geological Association of Canada Special Paper, **15**: 171-186. [in Charlie's annotations, he wrote "this paper may be my most important contribution to conodont research."]

**SANDBERG, C. A. & POOLE, F. G. (1977).** Conodont biostratigraphy and depositional complexes of Upper Devonian cratonic-platform and continental-shelf rocks in the Western United States. - In: MURPHY, M. A., BERRY, W. B. N. & SANDBERG, C. A. (Eds.), Western North America; Devonian. California University, Riverside, Campus Museum Contribution, **4**: 144-182.

**SANDBERG, C. A., ZIEGLER, W., LEUTERITZ, K. & BRILL, S. M. (1978).** Phylogeny, speciation, and zonation of *Siphonodella* (Conodonts, Upper Devonian and Lower Carboniferous). - Newsletters on Stratigraphy, **7** (2): 102-120.

**SANDBERG, C. A. & ZIEGLER, W. (1979).** Taxonomy and biofacies of important conodonts of Late Devonian *styriacus*-Zone, United States and Germany. - Geologica et Palaeontologica, **13**: 173-212.

**GUTSCHICK, R. C. & SANDBERG, C. A. (1983).** Mississippian continental margins of the

- conterminous United States. - In: The shelfbreak; critical interface on continental margins, Society of Economic Paleontologists and Mineralogists Special Publication, **33**: 79-96.
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- SANDBERG, C. A. & GUTSCHICK, R. C.** (1984). Distribution, microfauna, and source-rock potential of Mississippian Delle Phosphatic Member of Woodman Formation and equivalents, Utah and adjacent States. - In: WOODWARD, J., MEISSNER, F. F. & CLAYTON, J. L. (Eds.), Hydrocarbon source rocks of the Greater Rocky Mountain region. Denver, Colorado, Rocky Mountain Association of Geologists: 35-178.
- SANDBERG, C. A. & DREESEN, R.** (1984). Late Devonian icriodontid biofacies models and alternate shallow-water conodont zonation. - In: CLARK, D. L. (Ed.), Conodont biofacies and provincialism. Geological Society of America Special Paper, **196**: 143-178.
- JOHNSON, J. G., KLAPPER, G. & **SANDBERG, C. A.** (1985). Devonian eustatic fluctuations in Euramerica. - Geological Society of America Bulletin, **96** (5): 567-587.
- VON BITTER, P. H., **SANDBERG, C. A.** & ORCHARD, M. J. (1986). Phylogeny, speciation, and palaeoecology of the Early Carboniferous (Mississippian) conodont genus *Mestognathus*. - Royal Ontario Museum Life Sciences Contributions, **143**: 115 pp.
- SANDBERG, C. A.**, ZIEGLER, W., DREESEN, R. & BUTLER, J. L. (1988). Late Frasnian mass extinction; conodont event stratigraphy, global changes, and possible causes. - In: ZIEGLER, W. (Ed.), 1<sup>st</sup> International Senckenberg Conference and 5<sup>th</sup> European Conodont Symposium (ECOS V), Contribution 1. Courier Forschungsinstitut Senckenberg, **102**: 263-307.
- ZIEGLER, W. & SANDBERG, C. A.** (1990). The Late Devonian standard conodont zonation. - Courier Forschungsinstitut Senckenberg, **121**: 115 pp.
- SANDBERG, C. A.**, ZIEGLER, W., DREESEN, R. & BUTLER, J. L. (1992). Conodont biochronology, biofacies, taxonomy, and event stratigraphy around middle Frasnian Lion Mudmound (F2h), Frasnes, Belgium. - Courier Forschungsinstitut Senckenberg, **150**: 87 pp.
- CHARPENTIER, R. R. & **SANDBERG, C. A.** (1992). A Devonian/Carboniferous conodont database-Documentation and user's manual. - U.S. Geological Survey Open-File Report, **92** (273A & B): 61 pp., 2 computer 3.5-in. floppy disks.
- ZIEGLER, W. & SANDBERG, C. A.** (1994). Conodont phylogenetic zone concept. - Newsletters on Stratigraphy, **30**: 105-123.
- WARME, J. E. & **SANDBERG, C. A.** (1995). The catastrophic Alamo breccia of southern Nevada; Record of a Late Devonian extraterrestrial impact: - Courier Forschungsinstitut Senckenberg, **188**: 31-57.
- ZIEGLER, W. & **SANDBERG, C. A.** (1996). Reflexions on Frasnian and Famennian Stage boundary decisions as a guide to future deliberations. - Newsletters on Stratigraphy, **33**: 157-180.
- SANDBERG, C. A.** (1997). Mississippian. - McGRAW-Hill Encyclopedia of Science & Technology, 8<sup>th</sup> edition, **11**: 317-322.
- SANDBERG, C. A.**, POOLE, F. G. & MORROW, J. R. (2001). Construction and destruction of crinoidal mudmounds on Mississippian Antler forebulge, east of Eureka, Nevada. - Nevada Petroleum Society 2001 Summer Field Trip, Structure and Stratigraphy of the Eureka, Nevada Area: 23-50.
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- MORROW, J. R., **SANDBERG, C. A.**, HARRIS, A. G. (2005). Late Devonian Alamo Impact, southern Nevada, USA: Evidence of size, marine site, and widespread effects. - In: KENKMANN, T., HÖRZ,

F. P. & DEUTSCH, A. (Eds.), Large meteorite impacts III. Geological Society of America, Special Paper, **384**: 259-280.

MORROW, J. R., SANDBERG, C. A., MALKOWSKI, K. & JOACHIMSKI, M. M. (2009). Carbon isotope chemostratigraphy and precise dating of middle Frasnian (lower Upper Devonian) Alamo Breccia, Nevada, USA. - Palaeogeography, Palaeoclimatology, Palaeoecology, **282**: 105-118.

MYROW, P. M., STRAUSS, J. V., CREVELING, J. R., SICARD, K. R., RIPPERDAN, R., SANDBERG, C. A. & HARTENFELS, S. (2011). A carbon isotopic and sedimentological record of the latest Devonian (Famennian) from the Western U.S. and Germany. - Palaeogeography, Palaeoclimatology, Palaeoecology, **306**: 147-159.

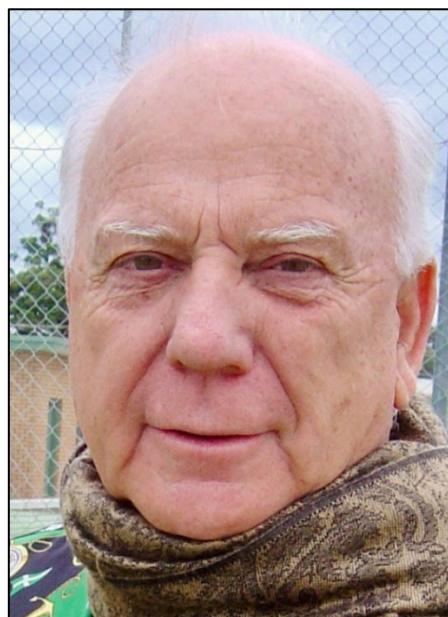
To bring Charlie's contributions as up-to-date as possible, ResearchGate [see <https://www.researchgate.net/profile/Charles-Sandberg/research>] lists 148 entries, papers and abstracts. Two important ones after 2012 are the following:

POOLE, F. G. & SANDBERG, C. A. (2015). Unusual Central Nevada Geologic Terranes produced by Late Devonian Antler Orogeny and Alamo Impact. - Geological Society of America, Special Paper, **517**: 104 pp.

STOCK, C. W. & SANDBERG, C. A. (2019). Latest Devonian (Famennian, *expansa* Zone) conodonts and sponge-microbe symbionts in Pinyon Peak Limestone, Star Range, southwestern Utah, lead to reevaluation of global Dasberg Event. - Palaeogeography, Palaeoclimatology, Palaeoecology, **534**: 14 p.

**John A. TALENT**  
(18.10.1932 - 27.3.2024)

by  
**Andrew J. SIMPSON**



**Fig. 1.** Portrait of John A. TALENT.

John Alfred TALENT was born in 1932 in Ascot Vale, Victoria. He was educated at the University of Melbourne, where he completed a Bachelor of Science with major subjects in geology, chemistry and mathematics in 1952; a Master of Science in 1954; a Doctor of Philosophy in 1959, and a Bachelor of Arts in 1966, with major subjects in French and Fine Arts, with a minor in Arabic.

He started as a geologist and senior geologist with the Victorian Department of Mines and covered extensive areas of the state undertaking geological fieldwork. He had a great enjoyment of this work and with the help of his chainman, known as 'Red Ned', they would stretch the technical capabilities of Department vehicles well beyond normal boundaries. This allowed them to explore vast and difficult to access areas of the Victorian high country, a part of the world of which he was particularly fond. He honed his field skills in stratigraphy and biostratigraphy, mainly using brachiopods in these early years. He was a keen observer of the field relationships of different strata and developed the capacity to

identify inter-relationships and complexities that others had overlooked in the establishment of existing ‘layer cake’ paradigms.

But the borders of Victoria were not enough to contain his curiosity. In 1961 and 1962, he was a Research Associate of the Institut royal des Sciences naturelles de Belgique, Brussels, under a Commonwealth Scientific and Industrial Research Organisation (CSIRO) post-doctoral fellowship. In 1967 he was a Visiting Associate Professor at the Division of Geological Sciences, California Institute of Technology (Caltech), Pasadena. At the end of 1967, he took on an appointment as UNESCO Professor in the University of Dacca in East Pakistan (now Bangladesh), where he was involved in field and laboratory postgraduate teaching. These early forays outside of Australia shaped his internationally oriented professional life in many ways.

In 1969, John moved to Sydney, when he secured a position at the then newly established Macquarie University. The new university, located on the suburban fringe of the city, was the third for Sydney but it was a time of growing opportunities for access to higher education and it was ambitious, outwardly focused, and expansive. An acid leaching facility was designed by John and installed soon after he joined the staff. It enabled a constant stream of limestone samples, mostly Palaeozoic, from many projects around Australia, and further afield, to be continuously processed over many years. These samples supplied the raw material for numerous collaborative projects with a host of other scientists. They also supported the work of a buoyant postgraduate school of trainee researchers. The acid room, as it was known to many, was in the basement of the building that housed the palaeontology and other geoscience laboratories. It was designed based on what John had seen at his good friend Art BOUCOT, built in a car park at Caltech. It was fundamentally important as both a teaching and research tool. It could process a vast abundance of Australian silicified faunas from the Cambrian through to the Mississippian. It

meant that undergraduate students would get access to real material to sort and classify and from that build a range of palaeontological data and inferences. Direct engagement with the raw material of the science, either in the field or in the laboratory, underpinned the teaching philosophy in the palaeontology lab at the new university.

The acid leaching facility also enabled an upscaling of conodont investigations. Whereas much previous work, mainly driven by the reconnaissance imperatives of state geological surveys to establish broad-scale chronological relationships, was based on spot sampling or limited sections, the thick sequences of Australian Palaeozoic carbonates could now be interrogated bed-by-bed enabling a much finer detailed resolution of chronological intervals and boundaries.

The acid room was treating material from outside of Australia at an early stage. John’s international profile was shaped in the 1960s and 1970s when he advanced interests in the geology, palaeontology and palaeobiogeography of the Himalaya, Karakoram and Hindu Kush as the leader of the initial International Geological Correlation Program, Project IGCP-1. This project fed his curiosity about the biogeography and palaeobiogeography in relation to the relative positions and motions of crustal blocks in the Asia-Australia hemisphere, especially for the latest Silurian-Mississippian interval.

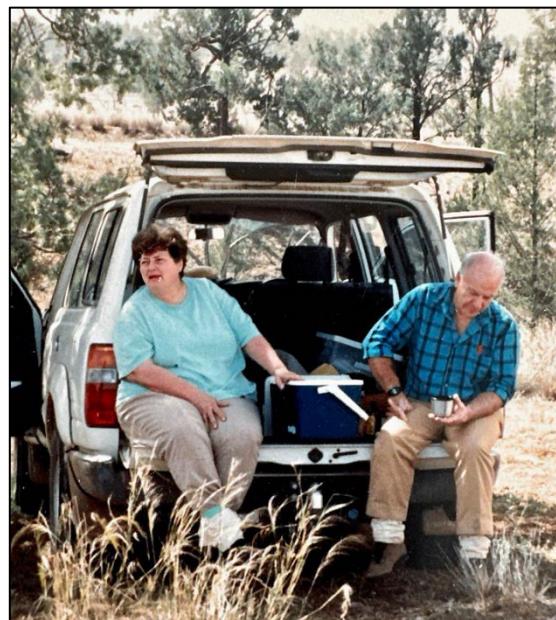
More significant, however, was John’s long professional relationship with the redoubtable Ruth MAWSON, who John has paid tribute to in this newsletter a few years ago (No. 34, 2019). Ruth, one of John’s early Ph.D. students, developed her conodont taxonomy skills during her investigations on the latest Silurian to early Devonian Buchan and Bindi areas of eastern Victoria. Her careful taxonomic work fed data for John’s encyclopedic knowledge of the middle Palaeozoic interval and in combination; the two became a profound scientific force through the agency of their own university research centre, MUCEP

(Macquarie University Centre for Ecostratigraphy and Palaeobiology). It took them on many grand adventures in Australia and around the world. At the height of their powers, when I was one of many undergraduate students studying palaeontology in the early 1980s, there was a map at the entrance of the palaeontology laboratory that showed details of sections from around the world then under investigation, with a more detailed close-up of Australian sections. Each one had a list of collaborators and fossils groups being investigated. It was a massive, global, collective enterprise.

One of their earliest ventures in Australia was the organisation of a meeting of the Subcommission on Devonian Stratigraphy in 1976. This included a 10-day field excursion by plane and jeep to the main Devonian sequences of the Lachlan Fold Belt from eastern Victoria to the Broken River region in north Queensland. John believed that in any branch of palaeontology good taxonomy underpins and facilitates everything else. He was intuitively supportive of Ruth's approach to conodont taxonomy, where the identification and naming of new taxa should only be done where it adds to our understanding of the biological relationships within a broader group. We should be able to clearly identify the origin of new clades and assess ancestral-descendant relationships within the stratigraphic record.

Using conodont data allowed increased precision in discrimination of stage, series and zonal boundaries in the c. 100-million-year interval in eastern Australia's Early Silurian to earliest Carboniferous. Australia has elegantly exposed highly fossiliferous mid-Palaeozoic carbonate sequences but, for most of these, little precision was previously available regarding stratigraphic alignments. Precision in time-correlation of such sequences enabled clarification of the pattern of marine transgression and regression for this interval, and disentangling this from the overprint of tectonic data. Results from the MUCEP group began to show that diastrophic events in the

mid Palaeozoic of eastern Australia were diachronous.



**Fig. 2.** Ruth MAWSON and John TALENT in the Broken River area, ca. 1997 (photo supplied by Glenn BROCK).

In 1995, John and Ruth organised the First Australian Conodont Symposium (AUSCOS-I) and conjoined Symposium in honour of Art BOUCOT. As with many of their conference undertakings, there were attendant excursions in south-eastern Australia, northern Queensland, and a post-conference workshop on reef dynamics at Heron Island. John funded a group of eight palaeontologists from the Soviet Academy of Science in Novosibirsk and from Tashkentgeologiya in Uzbekistan himself. He dipped into his own pocket frequently to support students and/or colleagues from poorer nations to enable their participation. As a student, I was on the receiving end of this generosity. He also supported his own students to visit Novosibirsk; seven postgraduates were given a one-month induction into the geology of the Altai Mountains of SW Siberia in July 1991. John was a frequent visitor to the Soviet Union as a guest of the USSR Academy of Sciences from the very early 1980s, something that obviously puzzled the CIA operatives on staff at the university.

His USSR links were another quest for taxonomic consistency that is essential for biogeographic analysis and for making improvements in stratigraphic alignments. This involved the generic and specific status of all latest Silurian (Pridoli) to Middle Devonian (Givetian) brachiopod taxa from the Asia–Australia hemisphere – from the eastern part of the Russian Platform and the west flank of the Urals to New Zealand – which were documented with the late R. T. GRATSIANOVA of the Russian Academy of Sciences, and the results published in 2002. The database amassed can be subjected to a time-slice by time-slice computer analysis against the framework of 45 or so crustal blocks discriminated for the Asia–Australia hemisphere. The massive project had support from the USSR Academy of Sciences and from the Australia–USSR Scientific Exchange Agreement.

Another organisational initiative from MUCEP was the Australasian Palaeontological Convention (APC-2000) held with the Third International Symposium on the Silurian System (MCCOY Symposium), plus the conjoined Second Australasian Conodont Symposium (AUSCOS-II) and the associated 8<sup>th</sup> International meeting of UNESCO's International Geological Correlation Program Project 421. An IGCP lens is another way of viewing John's long career in stratigraphic research; bookending a time period of over 30 years, starting with IGCP-1 (1970–1975) through to IGCP-421 (R. FEIST & J. A. TALENT, joint-organisers); both programs ran officially for six years, the latter resulting in an estimated 1.650 publications by various scientific colleagues (J. A. TALENT pers. com. 2010). IGCP 421 had meetings and field trips in Moderna and Bologna, Morocco, Peshawar (including pre-sessional excursions to Chitral, Gilgit, Hunza valley and Kashi - Xinjiang), Isfahan, and Orange (Australia).

A couple of years later, John became the first Chairman of the International Palaeontological Association and hosted their first Congress at Macquarie University. In total

there were 424 participants, about 400 of them were from outside Australia. There were 24 pre and post conference excursions and a swarm of symposia and workshops including one for high-school teachers, an art exhibition in the University's Art Gallery (*Palaeographia*), a reception where guests nibbled their way through Australian flora and fauna, and the production of a special wine bottled for the congress (*Palaeo Pinot*). The related field trip to Broken River involved a fleet of 4-wheel drive vehicles and 64 participants. John and Ruth could organise anything! The extraordinary logistical abilities of the MUCEP team included organising a wedding on one of these Broken River field trips, complete with the transport of food, drink and celebrant into the very remote Jack Hills Gorge.

As can be seen from any listing of John TALENT's publications, his work has focused on stratigraphy and tectonics, transgression-regression patterns and 'event' stratigraphy through the analysis of mostly conodont and brachiopod biostratigraphy and how this impacts our understanding of global life crises, especially for the Asia–Australia hemisphere and the Silurian, Devonian and Early Carboniferous periods. This accumulation of a considerable body of stratigraphic knowledge also brought significant tangential achievements in related fields.

John was involved in a quest for isotopic signatures for these events in association with colleagues Anita ANDREW and Dave WHITFORD in the Division of Petroleum Research, CSIRO, publishing early results in the 1990s recognising the Lau and Ireviken events in Silurian sequences of the Lachlan Fold Belt. Ten events were investigated in Australian sequences; nine were shown to have distinctive isotopic patterns for O, C and Sr. Confirmatory sequences in Western Europe and Australia were sampled and have shown similar isotopic patterns. Apart from this pioneering work with isotopic signatures, MUCEP also used the Colour Alteration Index (after being given a set of reference specimens

by Anita Harris) and illite crystallinity for lower grade metamorphic regional studies.

Beyond conodonts, the biggest impact John had was on the many students who passed through the MUCEP laboratory. In many universities, palaeontology was taught as an adjunct to stratigraphy, with little if any links to modern biology. At Macquarie, John strove to develop a more relevant, interdisciplinary pitch, confronting the whole gamut of things palaeobiologic, including palaeoecology and palaeobiogeography. His courses, all delivered with Ruth MAWSON, were made relevant to a student clientele not only from earth sciences but from biological sciences, chemistry and the arts (principally archaeology). The method of teaching was derived from his experience as a UNESCO professor, by generating courses for internal as well as distance teaching.

The main foci of the teaching programs were to engender an appreciation of our historical-biological debt to other creatures from which humankind evolved; and to engender an understanding of ecosphere/biosphere evolution. At the same time, it nurtured in students a capacity for operating inventively on their own, evaluating ideas, sifting reason from assertion and, thereby, producing graduates capable of solving problems not only for the geologist but for the biologist, environmentalist, biogeographer and archaeologist as well. The main impact of this was pouring into the education system more than 1.500 graduates with substantial exposure to modern evolutionary palaeontology. As a former student, I can attest to the success of this approach to teaching. Huge numbers, dwarfing the rest of the Earth Science student clientele, flocked to the programs; it was the most exciting place to be on campus! Over their careers John and Ruth had at least 34 successful doctoral students, many B.Sc., M.Sc. and M.App.Sci. candidates. Over their long careers at Macquarie, they team-taught large classes in palaeontology, coral reef dynamics, and museology. Wherever possible, there was a significant field component.

They also left a physical legacy on campus. They developed the area adjacent to the Earth Sciences buildings as an evolutionary garden by working with colleagues in Biological Sciences and with the support and encouragement of the university architect and engineer. The courtyard was divided into two sections, the gardens on the north and west were planted with Laurasian species, e.g. Pecan Nut, Magnolia, Dawn Redwood, Camellias and Swamp Cypress. The gardens on the eastern and southern sides were planted with Gondwanan species, e.g. Norfolk Island Pine, Macadamia, Illawarra Flame Tree, Queensland Firewheel Tree, and a Wollemi Pine. The sandstone pathway through the central area was called ‘WALLACE’s Line’ in reference to the boundary between the two provinces. The funding needed for landscaping and plant purchases were largely raised by staff and students. Fellow undergraduate students and I sizzled many sausages in pursuit of project finances. Large geologic specimens including Devonian limestones full of fossils, Permian tree trunks from Queensland coal mines and monolithic sandstone cores from Warragamba Dam were installed in the courtyard. The garden was named after Jim ROSE, Macquarie’s foundation geography professor and Head of the School of Earth Sciences at the time. Although the Earth Science Garden is no longer used for teaching and research as frequently as it once was, it is still a peaceful oasis on campus emblematic of the university’s now relinquished educational agenda.

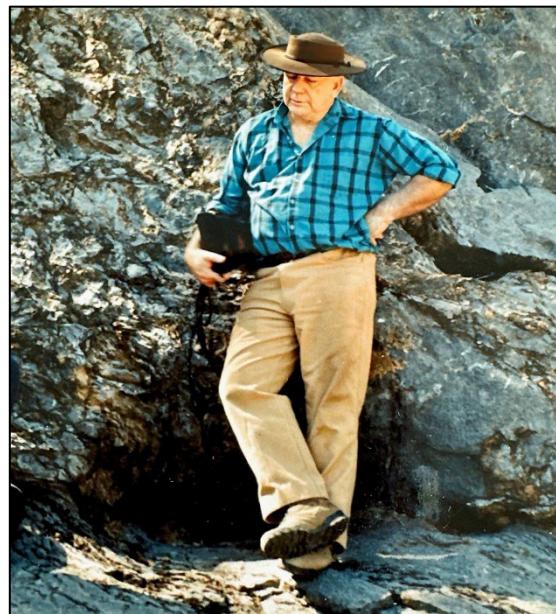
It is probably for one event that John TALENT will be most clearly remembered, especially beyond the world of palaeontology, and that is the denunciation of the notorious scientific fraudster V. J. GUPTA. In April 1989, ‘the case of the peripatetic fossils’ lit up the pages of *Nature* with claim and counterclaim. Conodonts also played a significant role here thanks to the well-known North Evans Limestone at Amsdell Creek, New York, a site with a distinctive conodont fauna that was widely distributed among conodont workers

and palaeontology laboratories globally. Suddenly this fauna was turning up at different stratigraphic horizons in different parts of the Himalayas and had been used to ascribe a range of different ages. Investigations of GUPTA's voluminous scientific output consisting of over 400 papers in 25 years, revealed more curious characteristics apart from palaeobiogeographically bizarre biota. There was evidence of recycling specimens to a few localities, hooking illustrations out of other publications, and extremely vague or deliberately misleading locality data. Many came out to support TALENT's claims, others came out to attack him and defend GUPTA, especially one serial co-author who dismissed GUPTA's 'errors' as a little bit of sloppy field and laboratory work. John found himself in high demand from the media while at the centre of this scientific storm. The 1991 Australian Broadcasting Corporation film '*The Professor's New Clothes*' that covered the fraud is still used today in classes on ethical practice in science.

A great testament to John's broad biostratigraphic interests was his late-career work in producing a UNESCO/International Year of Planet Earth volume: *Earth and Life: Global Biodiversity, Extinction Intervals and Biogeographic Perturbations through Time* (35 chapters; about 65 authors, 1.100 pp., 2012). It is a remarkable achievement resulting from a lifetime of curiosity about fossils and strata, which was all produced from Ruth and John's private home in the Sydney suburb of Castle Hill. They simply moved research operations to there after retirement from Macquarie University. There were still many on-going projects when poor health associated with advanced age caught up with them.

Probably more than any other Australian scientist, John TALENT has been responsible for globalising the study of Australian Palaeozoic stratigraphy and biostratigraphy. More or less from the beginning on, he was a Member of the International Devonian Subcommission, organizing for SDS excursion to Bindi and Buchans (Victoria), Wellington

(New South Wales), Brudekin and Broken River (Queensland) in conjunction with the 25<sup>th</sup> International Congress in Sydney, where one of the early SDS Business Meeting took place. John served as a Titular Member until the end of 2004 but continued as an active CM afterwards.



**Fig. 3.** John in the field (Broken River area; photo supplied by Glenn BROCK).

John was always happiest in the field and loved nothing more than 'shooting the breeze' around a campfire after a long day out and about looking at fossils. He was also fond of swinging a billy of tea around his head in a helicopter motion to impress, or terrify, non-Australian visitors, who hadn't seen the trick before. He was a great raconteur and could have a crowd in stitches telling tales about the places he'd been and the people he'd met. I was fortunate enough to hear many of them around the fire at Broken River. Between stories, he'd say to nobody in particular, "It's a full life!"

John died peacefully in Sydney on the 27<sup>th</sup> of March 2024. He is survived by his daughter Nadia. In the last months of his life, because of poor health, he didn't keep in touch with his extensive international network of friends. But he spoke about many of them frequently.

Palaeontology, and in fact the Earth Sciences, are no longer offered at Macquarie

University. The neoliberal transformation of higher education in Australia over recent decades has seen the abandonment of this scientific discipline by many tertiary institutions. The former specialised earth science laboratories are now general-purpose classrooms. The acid room is destined for decommissioning soon. There is now only one active conodont worker in Australia. MUCEP was very much a phenomenon of its time. John's passion and enthusiasm will be greatly missed by the community of palaeontologists and his many friends and colleagues around the world.

Full life? Certainly was!

#### Taxa named in honor of John TALENT

- Talenticeras talenti* ERBEN, 1965 (Ammonoidea)  
*Talentella* JOHNSON, 1990 (Brachiopoda)  
*Linguipolygnathus talenti* BARDASHEV, WEDDIGE & ZIEGLER, 2002 (Conodonta)  
*Doseyosteus talenti* YOUNG, 2004 (Arthrodira)  
*Icriodus talenti* ASHOURI, 2006 (Conodonta)

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## Hans-Georg MITTMEYER (1930 – 2023)

by  
**Ulrich JANSEN**



**Fig. 1.** Hans-Georg MITTMEYER (by courtesy of his sister, Ingeborg KRÜGER, 2018).

Hans-Georg MITTMEYER worked for many years as a mapping geologist in the Lower Devonian of the Rhenish Massif (Rheinisches Schiefergebirge, Germany). He tirelessly studied the monotonous and tectonically disturbed successions, recorded numerous sections bed-by-bed, found macrofossils in rocks appearing at first glance unfossiliferous – and could date these. His publications include long lists of taxa which he has found and determined himself. He was an unassuming colleague – the big stage was not his favourite place. Due to his profound regional field knowledge, however, he was frequently contacted by colleagues whenever a question or problem concerning “his” Lower Devonian came up.

Hans-Georg MITTMEYER was born in 1930 in Darmstadt as the son of a construction engineer and a doctor’s daughter. He already got in contact to geosciences, mining and the Senckenberg Museum in his school years in Frankfurt am Main. During the Second World War, he experienced the destruction of the city

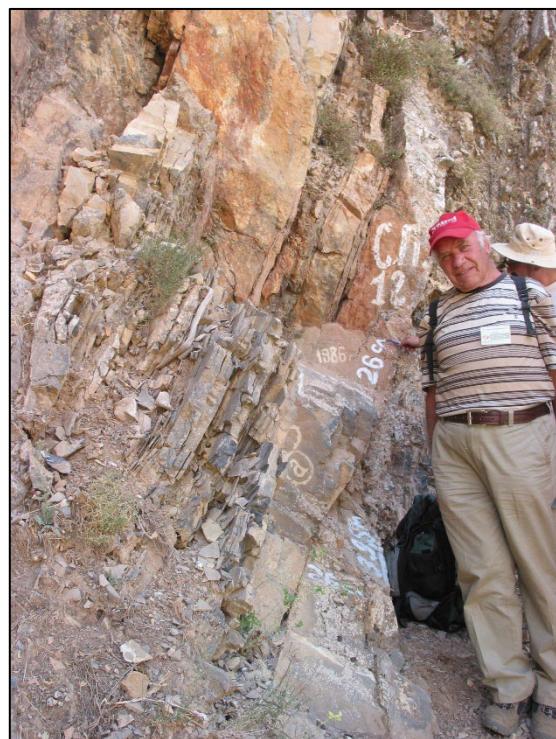
and had to finish school in Heidelberg. He concluded an apprenticeship to become a gardener, but subsequently studied geology, mainly in Hamburg, and for a short time in Munich. The subject of both his diploma (1958) and doctoral thesis (1963) was the Hunsrück-Schiefer (lower Emsian) in the Taunus area. A two-years occupation at an oil company in eastern Turkey followed, where he learnt speaking Turkish, before he started a career at the Geological Survey of Rheinland-Pfalz in Mainz. During his long professional life at the survey – over 30 years –, he mapped vast areas in the southern and central Rhenish Massif, in the Taunus, the Hunsrück, and the East Eifel region, developing own stratigraphic concepts. He redefined the traditional Rhenish stages and substages of the Lower Devonian (MITTMEYER 1974, 1982) and so established a stratigraphic framework for the region. He had a strong interest in the brachiopods, which he found during field work and described several new genera and species (see list below). He was the first, who pointed to the presence of regional ‘Rhenish bioevents’, which are discussed now in a broader context. It was no question for him to continue his work after retirement.

When discussing specific stratigraphic problems with colleagues, he took out paper rolls of several meter length with hand-drawn field sections. Although Hans-Georg MITTMEYER published a number of works in mostly regional journals, a large part of the enormous amount of stratigraphic data, which he collected during five decades, remained unpublished. However, he could summarise main results as a contribution to the monograph on the Devonian of Germany (MITTMEYER 2008). Although his focus was the Rhenish Massif, he maintained contacts to the International Subcommission and attended several international SDS meetings. During the field excursion of the Frankfurt meeting in 1982, he guided the participants to the classic Emsian sections of the Middle Rhine valley.

Hans-Georg MITTMEYER was a member of the German SDS since the mid-seventies,

regularly coming to the annual meetings until 2017. Already retired, he also attended the international SDS field meetings in Morocco (2004) and Uzbekistan (2008). As a sign of his great scientific contribution to the regional geology of the Rhenish Massif, the ammonoid species *Anetoceras mittmeyeri* DE BAETS, KLUG, KORN & POSCHMANN, 2013 from the Hunsrück-Schiefer was dedicated in honour of him (*Palaeontographica, Abt. A*, **299**).

When he worked in the area of the Mosel river, he usually stayed in a town called Sankt Aldegund, whose honorary citizen he was. He liked the local culture of wine festivals and enjoyed the wine from the Mosel area very much. Even at an age of over 80 years, he devoted himself to another great passion, the scuba-diving – in remote areas such as the Maldives, where he spent several weeks every year. For him, it was continuing geological field work on the sea floor.



**Fig. 2.** Hans-Georg MITTMEYER in the Zinzelban section, Uzbekistan (2008).

Hans-Georg MITTMEYER passed away in September 2023 at the age of 93. The community of Devonian researchers has lost an outstanding expert of the Rhenish Lower Devonian and its fossils. His large collection of

rocks and fossils from this area is stored now at the Natural History Museum in Mainz.

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### Brachiopod taxa by H.-G. MITTMEYER

#### Genera

*Subcuspiddella* MITTMEYER, 1965

*Tenuicostella* MITTMEYER & GEIB, 1967

*Arduspirifer* MITTMEYER, 1972

*Euryspirifer (Rhenospirifer)* MITTMEYER, 1972

*Sollispirifer* MITTMEYER, 2008

*Incertia* MITTMEYER, 2008

#### Species/subspecies

*Chonetes mosellanus* MITTMEYER, 1972

*Euryspirifer robustiformis* MITTMEYER, 1972

*Euryspirifer simplex* MITTMEYER, 1972

*Arduspirifer arduennensis prolatestriatus* MITTMEYER, 1973

*Brachyspirifer immaniformis* MITTMEYER, 1973

*Oligptycherhynchus prodaleidensis* MITTMEYER, 2008

*Acrospirifer eckfeldensis* MITTMEYER, 2008

*Acrospirifer primaevus seifensis* MITTMEYER, 2008

*Euryspirifer subsimplex* MITTMEYER, 2008

*Euryspirifer assimilis gracilicosta* MITTMEYER, 2008

*Euryspirifer assimilis latissimus* MITTMEYER, 2008

*Howellella siegia* MITTMEYER, 2008

*Arduspirifer arduennensis initiator* MITTMEYER, 2008

*Incertia subincertissima* MITTMEYER, 2008

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**Stephan HELLING**  
(genannt NIGGEMEYER)  
(11.7.1983 – 17.5.2024)

by  
**Ralph Thomas BECKER**



**Fig. 1.** Stephan HELLING around the time of his M.Sc. Thesis.

On the Friday morning before Pfingsten (Pentecost) 2024, the Palaeontology Working Group of Münster University and Devonian communities of the National and International Subcommissions on Devonian stratigraphy lost unexpectedly CM Stephan HELLING, one of the few remaining enthusiastic researchers of Devonian trilobites (and of many other aspects of geology and palaeontology). He died at the age of only 40 from sudden cardiac arrest at home at his self-crafted desk, where he was found by his beloved partner for more than 19 years, Nadine KATTHÖFER. For his family and his many friends, all this is still difficult to believe. Heart failure was not unknown in his family, but there were no signs of hazardous conditions, when the German SDS members were enjoying Stephan's company in good mood ca. three weeks earlier, during the annual field meeting in the Harz Mountains.

Stephan was born in Beckum, Warendorf region, in the eastern part of Westphalia. First,

he visited the Karl-WAGENFELD School in Stromberg, then the Gymnasium Johanneum in Wadersloh, where he graduated in 2002. He moved subsequently to Münster to study Geosciences and developed soon his interest in Devonian trilobites. For his Bachelor Thesis in 2008, he investigated the youngest known (top-Givetian) scutelluids of the Anti-Atlas, southern Morocco (HELLING & BECKER 2008). Starting his M.Sc. studies, he became student assistant in the library and geomuseum of the Institute of Geology and Palaeontology. The M.Sc. finished with a voluminous thesis on Moroccan Devonian trilobites that had a strong focus on proetids (especially *Gerastos*, with four new; still unpublished species, and a related new genus and species) and phacopids (including, e.g., a new, unpublished *Chotecops* species), and breaking new ground by applying ontogenetic morphometry.



**Fig. 2.** Stephan HELLING (left) and Stephan EICHHOLTZ (right) during the SDS Field Meeting in 2013, at Bou Tchrafine (Tafilelt).

Stephan decided to continue research on Devonian trilobites as a Ph.D. student in Münster, being part-time employed from 2011

to the summer of 2016 as a scientific assistant. This included various teaching obligations that he followed with enthusiasm, as most things in his life, and in a competent, relaxed, humorous and communicative way that made him a very much liked institute member and popular among the students. In parallel, he took on the duty to lead the editing of the *Münstersche Forschungen zur Geologie und Paläontologie*, which is published by a society of active and past Münster geology-palaeontology students. In 2014, he became Corresponding Member of the German Devonian Subcommission, in 2015 CM of SDS.

To support his livelihood, Stephan accepted numerous contracts for excavations in archaeology and – in the frame of palaeontological geoheritage projects – for the LVR-State Service for Ground Heritage Preservation in the Rhineland. This brought him in close contact with many different archaeological and geological topics (see the various contributions in the main publication organ, *Archäologie im Rheinland*) but his scientific heart stayed with the Devonian trilobites. As part of a planned cumulative dissertation, he published on Middle Devonian trilobites from the Rhenish Massif (HELLING & SCHÖLLMANN 2018; HELLING & BECKER 2022) and a required third contribution on a new asteropygid fauna from strata overlying the Hofermühle Reef (Velbert Anticline, Rhineland) had started.

In fact, Stephan could have easily filled another dissertation with his unfinished work on Moroccan trilobites, e.g. of the western Dra Valley, the Frasnian of the Tafilelt (HELLING & BECKER 2012), from Pragian allochthonous blocks in the eastern Sub-Meseta Zone (HELLING & BECKER 2013; RYTINA et al. 2013), from the upper Emsian of El Khraouia (southern Tafilelt, HELLING & BECKER 2015a), Pragian of the Oued Cherrat in the Western Meseta (HELLING & BECKER 2015b), and Givetian of the Skoura region (HELLING in BECKER et al. 2021). Stephan accompanied me many times in Morocco, helped to organize student field trips, and had only a patient smile

and gave understatements when I made him driving in difficult terrain of the Meseta with a hardly suitable non-4WD car (“*and this is really the way you want to go*”).

Apart from his own trilobite research, Stephan co-supervised in 2020 a B.Sc. project by M. GOTTLÖB on Eifelian trilobites from south of the Bou Tisdafine, Sub-Meseta Zone, and in spring 2024 the B.Sc. study of V. CASTRO KÖNIG on phacopids from the Taghanic Crisis Interval of Hassi Nebech, Tafilalt Basin. He also advised K. SEYFFERT for his 2020 M.Sc. Thesis on Emsian phacopids of the Tafilalt. It will be difficult to finalize and publish all the Moroccan studies, but in some cases, there are suitable manuscript parts.



**Fig. 3.** Stephan, stopping on the way to the High Atlas (Skoura region) in spring 2017.

Eventually, Stephan was formally hired at the LVR Rhineland, first with half-time and fixed-time positions, but with prospects for more in the future. In 2022, he had a serious accident in the field, when he ruptured the patellar tendons in both knees. For some while he was moving in a wheel chair and not able to drive, which prevented any visits to Münster and Ph.D. project work. He needed a year to recover fully but was back to full energy. It is a very sad twist of his life, that he had just started his first unlimited LVR contract when his heart failed.

As indicated above, Stephan was a most likable person with a wide array of hobbies and interests. These ranged from his elaborated taste for Heavy Metal music and concerts, often with a group of close friends, travelling with Nadine to either the beaches or mountains of Europe, zoo visits, hand craft, bicycle tours, caring for fishes and freshwater shrimps in his aquariums, to cooking and relaxed evenings with cocktails and films. He loved a good piece of meat and a good beer but could no bear any injustice – or technical failure of his own constructions in the home or garden. He is and will be missed by anyone, who had the pleasure to spend time with him. Apart from Nadine, he is survived by his mother Barbara HELLING and his brother Tobias HELLING.

**Acknowledgements:** Nadine, Stephan’s close friend Martin CAMPE, and Christoph HARTKOPF-FRÖDER supplied the personal information.

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**Fig. 4.** “Good Times” with Stephan: 30<sup>th</sup> June 2012 grill party in Greven, when our Moroccan colleagues of the joint DFG/CNRS Moroccan Meseta Project visited the Münster Palaeontology Group. Back row (from left to right) with Stephan EICHHOLT, Fouad EL KAMEL, R. Thomas BECKER, Dustin WARD, Lhassen BAIDDER, Sven HARTENFELS, Tobias FISCHER, **Stephan HELLING**, and Klaus SCHWERMANN; middle to front row with El Mustafa BENFRIKA, preparator Gerd SCHREIBER, Sören STICHLING, conodont lab leader Eva KUROPKA, Ahmed EL HASSANI, Zhor Sarah ABOUSSALAM with Lea Amira BECKER, Marie-Kristin RYTINA, and Hendrik NOWAK.

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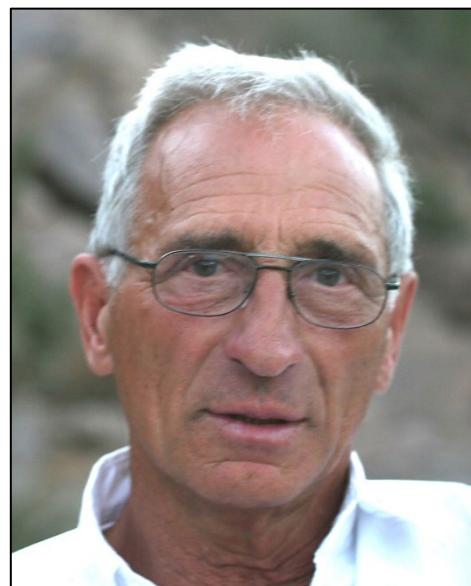
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**Jürgen BOCKWINKEL**  
(8.11.1936 - 21.3.2024)

by  
**Ralph Thomas BECKER**



**Fig. 1.** Portrait of Jürgen BOCKWINKEL.

German palaeontology would be in a poor state if there were not a large number of deeply enthusiastic “amateur” collectors that spend an enormous amount of time, energy, and finances to collect fossils and, in the best circumstances, make them available for research and public museums. There is a much smaller number of both idealistic and competent persons, who dedicate an even larger amount of their resources to become specialists for specific fossil groups and strata, and even internationally fully respected researchers. The latter is the case for Jürgen BOCKWINKEL, who wrote jointly with many others in the period from 2000 to 2024 more than 55 taxonomic and stratigraphic papers, mostly on Devonian and Lower Carboniferous ammonoids.

Jürgen died very unexpectedly, without any signs of immediate medical problems, at the age 87. Driving home from the cinema with his wife Gisa, his heart stopped beating at a traffic light. This threw him out of a fully active life with his family and friends, and with plans for some more unfinished research (e.g. on new rich goniatite collections from Bergisch

Gladbach-Sand, see an example on the cover of this issue). However, he had already decided to slow down and given away most of his collections to the Berlin museum, with a smaller part (some trilobites, pharciceratids, and triainoceratids) finishing in Münster. Apart from the invaluable significance of his published types, the unpublished collections house more important future type material.

Jürgen was born in Cologne but spent most of his early years with his grandfather in southern Germany. He returned to the Rhineland at the age of 16 to finish school and then studied pharmacy at Bonn university. At the same time, he followed his parallel interests in ancient times by taking for nine semesters courses in Pre- and Early History at Cologne University. After receiving his pharmacy degree, he worked for a pharmacy store in Leverkusen that he soon had to take over after the owner died suddenly. At this time, he met his wife Gisa, who also had studied pharmacy at Bonn after his graduation. They got married, had to run first a second pharmacy in the region, and then had two children in 1971 (Stefanie) and 1972 (Erik).



**Fig. 2.** Jürgen BOCKWINKEL (left) and Volker EBBIGHAUSEN (right) hunting for goniatites in the Tafilalt.

For more than 30 years, Jürgen collected fossils in tandem with his close friend Volker EBBISHAUSEN (Fig. 2, for obituary see SDS Newsletter, no. 27, 2012) and others, e.g. of the “Mineralien- und Fossilfreunde Leverkusen e.V.”. First, they explored the Devonian of the

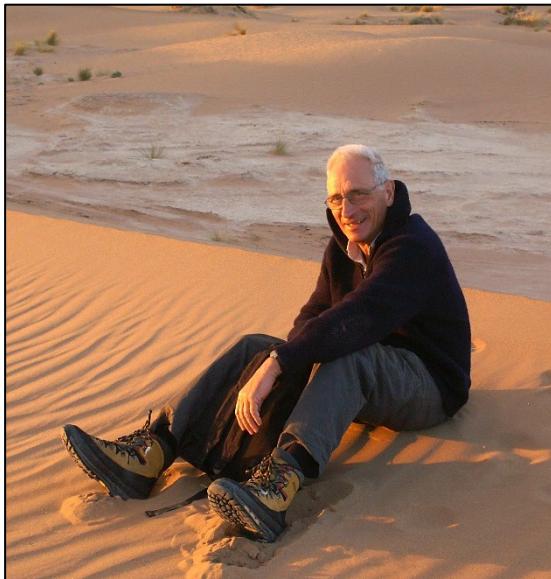
Bergisch Gladbach region and Eifel Mountains, but then they headed off to more remote fossiliferous regions, such as North Africa. They bought their own 4WD vehicles, which were brought down countless times all the thousands of km from Germany to Morocco. Of course, this also enabled them to return their rich “fossil harvest”.

I met Jürgen and Volker for the first time at the annual meeting of the Paläontologische Gesellschaft in Hildesheim in 1995, where they approached me because they had collected lower Famennian goniatites from some of the localities described in my Ph.D. Thesis. They immediately invited me to have a look at their collections at their homes. This became the starting point for a highly enjoyable intensive cooperation, joint Morocco field work, including new ground in the Dra Valley region, and numerous joint publications. They helped to prepare the SDS Field Meeting in the Dra Valley in 2004 and came often to annual business meetings of the German Devonian Subcommission.

After many years in the field, Volker and Jürgen developed routines as in a long-married couple. Attempts to collect in Morocco with other colleagues were less fruitful. Therefore, sometimes one had to work on them to accept the various M.Sc./Ph.D. students that were episodically brought into the field team. For example, during her first Morocco trip, Sandra KAISER brought a large, intensively red suitcase that did not really look suitable for the desert - and she remained connected with this item forever in their campfire conversations. Sarah ABOUSSALAM had it easier because, as a native, she was helpful for many things (e.g. shopping on local markets), because of her admirable collecting eyes, and the tasty tagines produced on the open fire. Sometimes Gisa accompanied her husband to Morocco, spending her attention on the locally common human quartzite tools, which are older than the arrival of *Homo sapiens*.

Later, both Jürgen and Volker also worked intensively with Dieter KORN from Berlin and

colleagues (see publication list), not only in Morocco but also in more challenging regions of southern Algeria. In fact, after the untimely death of Volker EBBIGHAUSEN, Jürgen was so eager to get things published quickly, that I was unable to find the necessary time to finish the writing of various contributions. Some of these, therefore, got eventually published with the Berlin group. But in this context, I am very pleased that the paper on Moroccan maenoceratids (BOCKWINKEL & KORN 2024) got published before fate struck.



**Fig. 3.** Jürgen BOCKWINKEL, sitting in spring 2010 in the evening sun in the sand of Rich Haroun, Tafilalt.

As a person, Jürgen was a very friendly, thoughtful, communicative, generous, helpful, and humorous guy, well-organized, physically strong or even tough, which made it easy for him to travel the world, often with Gisa and the children. He loved the nature, would build a wooden house in the wilderness of eastern Canada (that still exists), or prefer to sleep under the stars in the desert sand, even when scorpions could be found more or less under any rock. Until his last year, he would take part in cycling tours or look after their weekend/holiday house in the Eifel Mountains. He developed some eye trouble and the hip joint needed repair some years ago, but I would not have hesitated to ask him to join us in the field in Morocco for one more time. Nobody

that knew him thought that his active life would end as quickly as it sadly did.

Both Jürgen and Volker will continue to be memorized strongly by all their research collaborators. Not only because of the enormous scientific achievements made, but mostly because of their wonderful personalities. Thoughts go out to the joint nights at small campfires somewhere in the deserts of North Africa.

#### Taxa named after Jürgen BOCKWINKEL

*Mrakibocrinus bockwinkeli* WEBSTER, BECKER & MAPLES, 2005

*Kosmoclymenia bockwinkeli* KORN, 2020

#### Devonian Publications

[18 peer-reviewed, multi-authored papers deal mostly with Lower Carboniferous cephalopods]

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## Michael T. WHALEN

(18.1.1961 – 13.6.2024)

by

James E. DAY



**Fig. 1.** Photograph of Mike conversing with Jared MORROW (in the middle, former CM, deceased 2009) and Jeff OVER (on the left) after hours at the 2003 Geological Society of America Meeting in Seattle, Washington.

I regret to inform members of the SDS of the recent death of our great friend and colleague CM Michael T. WHALEN on June 13<sup>th</sup> in Anchorage, Alaska. Many of us collaborated with Mike on a wide range of research projects and IGCP initiatives related to increasing our understanding of the Devonian. He became a CM in the early 2000s as he published a series of significant papers on the Givetian and Frasnian carbonate platform deposits in the Alberta Rocky Mountains. Mike

was an active member of the Science Party of IODP-ICDP Expedition 364 investigating the Cretaceous Chicxulub Impact site. He joined the Science party in 2001 as evidenced by nearly half of his published research relates to his work on Chicxulub as well as continued research on Carboniferous to Triassic strata in North America.

Mike was born on January 18<sup>th</sup> in Aliquippa, in western Pennsylvania. He is survived by his partner Allie SCHAFER of Fairbanks, AK; his sister Maggie WHALEN Cybulski of Pickerington, Ohio, and his brother Robert (Bob) WHALEN of Missoula, Montana.

Mike completed his undergraduate studies in Geology and Anthropology at Rutgers University in 1982. In 1985, he completed his M.S. research in Geology on Triassic carbonate platform sedimentology and stratigraphy in the Wallowa Terrane of Idaho and Oregon with George STANLEY at the University of Montana. He received his Ph.D. in Geology from Syracuse University in 1993 working with Catherine NEWTON on Permian carbonate stratigraphy and sedimentology of the Park City Formation. He continued significant collaborative research on Triassic and Permian topics through 2024.

His post-doctoral research at the ROSENSTIEL School of Marine and Atmospheric Science at the University of Miami marked the beginning of his significant work on the Devonian of western Canada, focused on carbonate platform and reef evolution and extinction records in the Canadian Rocky Mountains of Alberta, and later in eastern British Columbia. While engaged in field studies related to his post-doc project, he began work with Gregor EBERLI, Peter HOMEWOOD, Eric MOUNTJOY, amongst many notable others. During his post-doc work with Gregor and others, he coordinated field operations in Alberta for the French petroleum geologists working group that provided field training for geologists from Elf Aquitaine, Gaz d'France, Institut Français du Pétrole, and TOTAL. He then joined the faculty at the

University of Alaska-Fairbanks in 1995, where he also held a research appointment at the UA Geophysical Institute and served from 2003-2011 as co-chair of the then Department of Geology and Geophysics. He had many friends in the Fairbanks community and had close ties with many scientists in the USGS and Alaska Division of Geological & Geophysical Surveys.

As noted above, Mike started his research on Devonian carbonate platform and reef development in Western Canada during his Post-Doc at the University of Miami. He focused on the sedimentology, stratigraphy and sequence stratigraphy of the mixed carbonate-clastic reef platform and platform-basin transition deposits in and around the detached Miette and Ancient Wall platforms and other platform systems in the Western Canadian Sedimentary Basin, as evidenced from works including van BUCHEM et al. (1996, 2000) and WHALEN (2000a, 2000b).

My work with Mike began in 1997 after Maya ELRICK (University of New Mexico) asked if I would be interested in working as a biostratigrapher with Mike to establish conodont- and brachiopod-based correlations for the Givetian to Famennian succession. I had never met Mike in person, so the first time I met him was when I drove to Hinton, Alberta, located the helicopter base and then flew into the base camp along the southern margin of the Miette Buildup in Jasper National Park. I was unfamiliar with helicopter-supported base camp operations and neglected to fly in with an ample supply of alcohol. Mike and our colleague Andy KRUMHARDT informed me that it was bad manners to fly into camp without liquid refreshments. I corrected my mistake and never violated camp protocols again.

In our second field season in 1998, I discussed the work I had been doing with Brooks ELWOOD (Louisiana State University) on bulk Magnetic Susceptibility of Middle and Upper Devonian rocks in the Iowa Basin. Mike thought it would prove useful to develop a MS

record for the upper Givetian, Frasnian and lower Famennian of the western Canadian Sedimentary Basin in and around the Miette and Ancient Wall platforms. From that point forward, we routinely conducted integrated lithostratigraphic/geochemical, biostratigraphic and MS sampling of sections in the Alberta Rocky and B.C. Mountains.

Jeff OVER joined us with his students doing field work in Alberta and B.C. in 2003 and 2004. Significant results from study of the Middle and Upper Devonian of western Canada were published during the 2000s that include WHALEN et al. (2002), DAY & WHALEN (2005), WHALEN (2007), and WHALEN & DAY (2008, 2010). I believe Mike was nominated and became a SDS CM during the business meeting of the 2007 SDS Field Conference held in Eureka, Nevada, and he actively participated in a number of IGCP initiatives through the 2010s.

Mike initiated stable isotopic studies of *punctata* and Kellwasser Bioevent intervals in the Alberta Rockies in the late 2000s and 2010s with his students Josh PAYNE and Maciej G. SLIWIŃSKI. He also sought out colleagues with expertise in applications of MS studies for cyclostratigraphic calibration of Devonian successions and began fruitful collaborations with many of our Belgian and Chinese colleagues, including Phillip CLAEYS, Anne-Christine da SILVA, David DE VLEESCHOUWER, Matthias SINNESAEL, Zenghui GUO, and Daizhao CHEN. Notable publications from this period include DA SILVA et al. (2009), SLIWIŃSKI et al. (2010a, 2010b, 2011, 2012a, 2012b), DE VLEESCHOUWER et al. (2012, 2017), CHEN et al. (2013), WHALEN et al. (2015, 2016), and DA SILVA et al. (2014, 2015). His last published Devonian research was the Nature Communications paper entitled “Timing and pacing of the Late Devonian mass extinction event regulated by eccentricity and obliquity” by DE VLEESCHOUWER et al. (2017). From 2017 to June of 2024, much of his published research work focused on IODP/ICDP Expedition 364 investigations of the Chicxulub

Impact site, and continued Carboniferous-Triassic studies with numerous colleagues in Alaska and elsewhere.

I urge you all to keep our great friend close in your thoughts and raise a glass of fine wine in his memory.



**Fig. 2.** Outcrop on the Carbondale River in SW Alberta, just south of the Crowsnest Pass showing reef to basin transition and organic rich basinal shales. Mike's work focused on similar settings further north in Jasper Park and Alberta Provincial lands in central and western Alberta.

### Devonian/Carboniferous Publications

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Devonian session at STRATI and future Devonian symposia, especially the joint ISSS and SDS meeting in Sofia, Bulgaria, and the publication of the SDS Newsletter, which covers all major topics related to the Devonian.

The main objectives of the Subcommission on Devonian Stratigraphy fit within IUGS science policy:

- to develop of an internationally approved chronostratigraphical timescale for the Devonian with maximum time resolution, as part of the ICS standard global stratigraphic scale;
- to produce a stratigraphic table displaying agreed subdivision to stage and substage level marking boundaries that are defined by a GSSP;
- to promote new and modern stratigraphical techniques and their integration into Devonian multidisciplinary schemes.

### 3. ORGANISATION - interface with other international projects/groups

Actively supporting *IGCP 652, Reading geologic time in Paleozoic sedimentary rocks: the need for an integrated stratigraphy*

### 3A. CURRENT OFFICERS FOR 2020-2024:

Chair: Ladislav (Lada) SLAVÍK

Vice-Chair: José Ignacio VALENZUELA-RÍOS

Secretary: Ulrich (Uli) JANSEN

Webperson: Carlo CORRADINI

### 4. EXTENT OF NATIONAL/REGIONAL/ GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS

University of Münster continues to support the staff costs of the SDS Newsletter production and the mailing. The IUGS support pays for the printing. The Newsletter has an ISSN and status as a publication. Since last year, it is published and printed partly in colour; the pdf version is published on the SDS web page hosted by the ICS web. We have regular annual meetings (this year face to face

## SDS REPORTS

### Annual Report to ICS 2023

#### 1. TITLE OF CONSTITUENT BODY

#### Subcommission on Devonian Stratigraphy

#### Reporting: Ladislav SLAVÍK (Chair)

#### 2. OVERALL OBJECTIVES AND FIT WITHIN IUGS SCIENCE POLICY

In 2023 working groups continued to work on the revision of the GSSPs (the basal Emsian and the Devonian-Carboniferous boundary). Intensive efforts to redefine the Basal Emsian boundary continued in three areas – the Prague Synform, the Spanish Central Pyrenees, and Morocco. We expect at least one GSSP proposal in the coming year. The main issues were discussed at the SDS meeting at STRATI in Lille, France, on July 12<sup>th</sup>, and at the regular Annual SDS Business Meeting in Geneseo, New York State, on July 30<sup>th</sup>. A comprehensive monograph entitled "Devonian of New York" was published for the New York meeting in 3 volumes of the *Bulletins of American Paleontology*. There were numerous proposals for new CMs at the 2023 meetings indicating good prospects for the future of the Devonian subcommission. Other SDS activities included the organization of the

again). SDS members support their own attendance at these.

SDS subprojects are supported from home institutes and national funding agencies.

## 5. CHIEF ACCOMPLISHMENTS IN 2023 (including any publications arising from ICS working groups)

- **The Annual Business Meeting of the SDS** took place on July 30<sup>th</sup> in Geneseo, NY, USA in conjunction with the Devonian conference meeting in Geneseo, with field trips from Ohio to the New York State. It was the most important event for our community directly focussed on the Devonian. The conference was very successful, perfectly organized, and both scientific sessions and fieldtrips were highly attended.
- **The SDS meeting in conjunction with the STRATI** was held on July 12<sup>th</sup>.
- At both SDS meetings, the CHAIR informed about major points in the business meeting agenda and the current situation in our Devonian community, on-going Devonian projects (mostly reports on biostratigraphical, petrophysical and geochemical data from the key areas and progress in the Basal Emsian boundary redefinition), Devonian publications, and forthcoming meetings. We had around 40 participants including guests; 14 new CMs were recruited from Belgium, Colombia, Portugal, and the USA.

**Update of the new SDS website** – hosted on the ICS web ([stratigraphy.org](http://stratigraphy.org))

- **Publications:** SDS Newsletter No. 38, and an extensive monograph titled "Devonian of New York", edited by C. A. VER STRAETEN, D. J. OVER, and D. WOODROW, in 3 volumes of the *Bulletins of American Paleontology*, has been published.
- **Formal election of the SDS executive** (officers and voting members) for 2024-

2028. The elections took place in September and October 2023.

## 6. SUMMARY OF EXPENDITURE IN 2023 (in USD):

SDS Devonian meeting in Geneseo, NY, USA and STRATI Lille, France - travel costs:

SDS Chair	700
SDS Vice-Chair	700
SDS Secretary	900
SDS Newsletter	900

## 7. SUMMARY OF INCOME IN 2023 (in USD):

3300

## 8. BUDGET REQUESTED FROM ICS FOR 2024

A joint ISSS and SDS 2024 meeting "Time-schedule of the Silurian and Devonian environmental and biotic changes" is planned for September 2024 in Sofia, Bulgaria. The organization of the meeting is underway. The SDS will have a regular SDS business meeting there. Our main focus will be the discussion on the submitted proposal(s) for redefinition of the Basal Emsian GSSP and the joint Silurian and Devonian symposium. In the next year, the top event – the 37<sup>th</sup> IGC in Busan, South Korea, takes place. The SDS would like to have a representative(s) at the Geological Congress, where the new ICS officers and executives of each subcommission will officially start the 2024-2028 term.

We request contributions to travel costs for both of these events.

SDS Chair travel costs	\$950
SDS Vice-Chair travel costs	\$950
SDS Secretary travel costs	\$950
Support for SDS Newsletter	\$900
Web page maintenance	\$150

<b>Total Sum requested from IUGS</b>	<b>\$3900</b>
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## 9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

- Submission of formal proposals or progress reports from key areas for the revision of the basal Emsian GSSP.
- Revision of the D/C boundary with the D/C Boundary Task Group in close collaboration with the Carboniferous Subcommission.
- Real SDS business meeting and Devonian symposia

## 10. KEY OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2020-2024)

- Redefine the base of the Emsian Stage.
- Redefinition of Devonian/Carboniferous Boundary with the joint Task Group.
- Regular Annual Business meetings
- Comprehensive publications on Devonian

## APPENDIX

[Names and Addresses of Current Officers and Voting Members)

### NOMINATED OFFICERS

#### CHAIR

Ladislav SLAVÍK, Department of Paleobiology and Paleoecology, Institute of Geology of the Czech Academy of Sciences, Rozvojová 269, CZ-165 00 Praha 6, Czech Republic, Tel.: 00420 233087247; slavik@gli.cas.cz

#### VICE-CHAIR

José Ignacio VALENZUELA-RÍOS, Dpt. De Geología, Universitat de València C/. Dr. Moliner 50, E-46100, Burjassot, Spain, Tel.: 0034 96 3543412; Jose.I.Valenzuela@uv.es

#### SECRETARY

Ulrich JANSEN, Palaeozoology III, Senckenberg Gesellschaft für Naturforschung, Senckenbergenanlage 25, 60325 Frankfurt, Germany, Tel.: 0049-69- 97075 1146; Ulrich.Jansen@senckenberg.de

#### SDS NEWSLETTER EDITOR

R. Thomas BECKER, Westfälische Wilhelms-Universität, Geologisch-Paläontologisches Institut, Corrensstr. 24, D-48149 Münster,

Germany, Tel.: 0049-251-83 339 51, Fax: 0049-251-83 339 68; rbecker@uni-muenster.de

### WEBMASTER

Carlo CORRADINI, Dipartimento di Matematica e Geoscienze, Università di Trieste, via Weiss 2 - 34128 Trieste, Italy, Tel.: 0039 040 558-2033; ccorradin@units.it

### Voting members, address, country, phone, email, special fields:

R. T. BECKER, Westfälische Wilhelms-Universität, Geologisch-Paläontologisches Institut, Corrensstr. 24, D-48149 Münster, Germany, Tel.: 0049-251-83 339 51, e-mail: rbecker@uni-muenster.de; ammonoids, conodonts, events

C. E. BRETT, Department of Geology, University of Cincinnati, 500 Geology-Physics Bldg., Cincinnati 45221-0013 OH, U.S.A, Tel.: +1-513-5564556, e-mail: brettce@ucmail.uc.edu; sequence stratigraphy

R. BROCKE, Senckenberg Forschungsinstitut und Naturmuseum Frankfurt, Senckenbergenanlage 25, D-60325 Frankfurt am Main, Germany, Tel.: 0049-69-970751162, e-mail: rainer.brocke@senckenberg.de; palynology

C. CORRADINI, Dipartimento di Matematica e Geoscienze, Università di Trieste, via Weiss 2 - 34128 Trieste, Italy, Tel.: 0039 040 558-2033, e-mail: ccorradin@units.it; conodonts

C. CRONIER, Unité Evo-Eco-Paléo (EEP) - UMR 8198. CNRS / Université de Lille - Sciences et Technologies, Batiment SN5, bureau 324, 59655 Villeneuve d'Ascq, France, Tel.: 33 (0)3-20-43-41-51, e-mail: catherine.cronier@univ-lille1.fr; trilobites

A.-C. da SILVA, Pétrologie sédimentaire, B20, Allée du Six Août, 12, Quartier Agora, Université de Liège, 4000 Liège, Belgium, Tel.: +32 – 43662258, e-mail: ac.dasilva@ulg.ac.be; astrochronology

Y. GATOVSKY, Moscow State University, Dept. of Paleontology, Geological Faculty, Vorob'evy Gory, 1, Moscow, GSP-1, 119991, Russia, Tel.: 007 495 9394960, e-mail: gatovsky@geol.msu.ru; conodonts

N. G. IZOKH, Institute of Petroleum Geology and Geophysics, Siberian branch of Russian Academy of Sciences, Acad. Koptyug. Av. 3, 630090 Novosibirsk, Russia, Tel.: + 7 (383)

333-24-31, e-mail: IzokhNG@ipgg.nsc.ru;  
Russia, conodonts

MA, X.-P., Peking University, Department of Geology, Beijing 100871, China, e-mail: maxp@pku.edu.cn; brachiopods

J. E. A. MARSHALL, School of Ocean and Earth Science, University of Southampton, National Oceanography Centre, European Way, Southampton SO14 3 ZH, UK, Tel.: +44-23-80592015, e-mail: jeam@noc.soton.ac.uk, plants, spores

J. D. OVER, SUNY Geneseo, Department of Geological Sciences, Geneseo 14454 N.Y., U.S.A., Tel.: +1-585-24552945291, e-mail: over@geneseo.edu; conodonts

QIE, W.-K., CAS Key Laboratory of Economic Stratigraphy and Palaeogeography, Nanjing Institute of Geology and Palaeontology and Center for Excellence in Life and Paleoenvironment, Chinese Academy of Sciences, Nanjing 210008, China, e-mail: wkqie@nigpas.ac.cn; chemostratigraphy

G. RACKI, University of Silesia, Faculty of Earth Sciences, Department of Palaeontology and Stratigraphy, Będzińska str. 60, 41-200 Sosnowiec, Poland, Tel.: 48-32-3689-229, e-mail: racki@us.edu.pl; brachiopods, event and sequence stratigraphy

C. SPALLETTA, Dipartimento di Scienze della Terra e Geologica Ambientali, Università di Bologna, I-40126 Bologna, Italy, Tel.: +39-051-2094578, e-mail: claudia.spalletta@unibo.it; conodonts

K. TRINAJSTIC, Faculty of Science and Engineering, School of Science, Department of Environment and Agriculture, Bentley Campus 311.117, Australia, Tel.: Phone: +618 9266 2492, e-mail: kate.trinajstic@uwa.edu.au; fish

### List of Working (Task) Groups and their officers

#### Emsian Working Group (EWG)

The Emsian Working group has been recently re-established (2021) in order to solve the problems with the correlation of the Basal Emsian boundary. The members are expected to present and evaluate proposals for the basal Emsian GSSP redefinition. The Working group is open to other specialists involved in this task.

### Members

Ladislav SLAVÍK (Czech Republic)  
José Ignacio VALENZUELA-RÍOS (Spain)  
Ralph Thomas BECKER (Germany)  
Zhor Sarah ABOUSSALAM (Germany)  
Maya ERINA (Uzbekistan)  
Jindřich HLADIL (Czech Republic)  
Nadya IZOKH (Russia)  
Olga IZOKH (Russia)  
Ulrich JANSEN (Germany)  
Aleksey KIM (Uzbekistan)  
Tomáš WEINER (Czech Republic)  
Hedvika WEINEROVÁ (Czech Republic)

### Devonian/Carboniferous Boundary Working Group (DCBWG)

The DCB WG was established in 2008, with the goal to redefine the GSSP for the Tournaisian (equivalent to base of the Carboniferous System), when problems both with the type section (La Serre E', Montagne Noire, France) and the index fossil (*Siphonodella sulcata*, conodont) arose. It includes members named by the Devonian (SDS) and Carboniferous (ISCS) subcommisions. Several meetings and workshop took place up to now. The new GSSP based on the definition of multiple criteria that would work in various environments for a safe recognition of the system boundary is expected to be proposed in the near future.

### Members

Markus ARETZ (France) - Chair  
Carlo CORRADINI (Italy) – Vice-Chair  
Ondrej BABEK (Czech Republic)  
R. Thomas BECKER (Germany)  
Raimund FEIST (France)  
Yuri GATOVSKY (Russia)  
Sandra I. KAISER (Germany)  
Tomas KUMPAN (Czech Republic)  
John E. A. MARSHALL (United Kingdom)  
Hanna MATYJA (Poland)  
Svetlana NIKOLAEVA (Russia)  
D. Jeffrey OVER (USA)  
Wenkun QIE (China)  
Eddy POTY (Belgium)  
Cirille PRESTIANNI (Belgium)  
Barry RICHARDS (Canada)  
Claudia SPALLETTA (Italy)

## Minutes of the Annual SDS Business Meeting, September 14<sup>th</sup>, 2024, Sofia, Bulgaria

University of Mining and Geology,  
“St Ivan Rilski”

by

**Ulrich JANSEN & Ladislav SLAVÍK**

### Attendance

The Chairman (Ladislav SLAVÍK), the Vice-Chairman (Nacho VALENZUELA-RÍOS), and the Secretary (Ulrich JANSEN).

**TMs:** Cathérine CRÔNIER, (new) Sofie GOUWY, (new) Jau-Chyn LIAO, John E. MARSHALL, (new) Jay ZAMBITO.

**CMs:** Polina ANDRÉEVA, Iliana BONCHEVA, Carlo CORRADINI, Maria G. CORRIGA, Tomáš KUMPAN.

**Guests:** Juan Carlos GUTIÉRREZ-MARCO, Bing HUANG, Emilia JAROCHOVSKA, Héctor BARRERA LAHOZ, Štěpán DAMBORSKÝ, Qiao LI, Valeri SACHANSKI, Petr ŠTORCH, Zong Yuan SUN.

**On-line:** CM Nadia IZOKH, (new) TM Sven HARTENFELS, and TM Jinzhuang XUE.

Total attendance: 25 people.

**Apologies for non-attendance** had been received from CM R. Thomas BECKER (SDS Newsletter editor), TM Anne-Christine DA SILVA, (new) TM Cameron PENN-CLARKE, (new) TM Michal GINTER, TM Claudia SPALLETTA, and CM Eberhard SCHINDLER.

The meeting followed the agenda distributed earlier per e-mail. It started at 10:30 a. m. (Eastern European Summer Time, EEST).



**Fig. 1.** SDS Business Meeting 2024, University of Mining and Geology, Sofia, Bulgaria.

### 1. Introduction, thanks to the membership and apologies for absence

Chairman Ladislav SLAVÍK welcomed the audience including the guests from the Silurian Subcommission. He thanked the past voting members of the SDS for their long-time service. Distinguished voting members and long time-officers of the SDS were proposed as honorary

SDS members: Carlton BRETT, R. Thomas BECKER, and Carlo CORRADINI, who was also particularly thanked for his service as SDS webmaster.

The chairman reported the passing of John TALENT (Australia, Devonian conodonts and brachiopods), Hans-Georg MITTMAYER (Germany), Mike WHALEN (USA.), and

Stephan HELLING (Germany). The audience held a minute of silence. Obituaries of these important Devonian workers and dear friends are planned for the next SDS Newsletter.

## 2. Formal approval of 2023 Minutes

The minutes of the informal meeting in Lille (France) and the SDS Business meeting in Geneseo (New York) last year were circulated to the membership in January 9th, early this year. These have been already published in Newsletter No. 38.

## 3. Chairman's Business – New GSSPs approved by ICS

The Chairman reported on ICS activities and approval of new GSSPs:

- The discussion on the **Anthropocene** in spring 2024 had caused an intense debate on voting (= titular) memberships of ICS in general. All memberships were scrutinised, but most of our TMs, new and previous ones, were finally approved at the International Geological Congress in Busan this September.
- A joint statement by the IUGS and ICS on the vote by the ICS Subcommission on Quaternary Stratigraphy has been released [<https://stratigraphy.org/news/152>]. It is with the delegated authority of the IUGS President and Secretary General and on behalf of the International Commission on Stratigraphy (ICS) that the vote by the ICS Subcommission on Quaternary Stratigraphy (SQS) to reject the proposal for an Anthropocene Epoch as a formal unit of the Geologic Time Scale is approved.
- The GSSP for the **Telychian Stage** (upper Llandovery Series, Silurian) has been relocated. The proposal for a revised GSSP for its base was approved by the International Commission on Stratigraphy and forwarded to the IUGS Executive Committee on January the 9th, 2024. The Telychian Stage/Age Global Boundary Stratotype Section and Point (GSSP) was

originally defined in the Cefn Cerig road section, near Llandovery in Wales, UK. The relocated GSSP is linked to the FAD of the graptolite *Spirograptus guerichi*, 0.25 m below a rusty weathering layer, and 0.6 m above a layer of nodules, in the **El Pintado 1 section** within the **Valle Syncline** in the northern part of **Seville Province, Spain**. Commencement of increased *Streptograptus* diversity, including the FAD of *Streptograptus picarrai*, is a secondary marker of the base of the Telychian, together with the ‘Rumba low’ negative  $\delta^{13}\text{C}_{\text{org}}$  excursion culminating 1.4–1.6 m higher in the section.

- The IUGS Executive Committee has voted unanimously to ratify the proposal for a revised GSSP for the base of the **Aeronian Stage** (middle Llandovery Series, Silurian) as approved by the International Commission on Stratigraphy and forwarded to the IUGS EC on January the 9<sup>th</sup>, 2024. The resiting of the new GSSP from the current GSSP in the Trefawr Track section, Wales, UK, has been approved by ICS. The Global Boundary and Stratotype Section and Point for the base of the Aeronian Stage has been proposed at 1.38 m above the base of the black shale succession of the **Želkovice Formation** in the **Hlásná Třebaň section, central Bohemia**, in the **Czech Republic**.

## 4. ICS Matters — ICS business meeting Busan, August 26<sup>th</sup> (8:00–9:30): New ICS Officers

New officers and voting members of the ICS have been elected and finally approved by the IUGS Executive Committee. The call for the nomination of the next ICS Chair and vice-Chair 2024–2028 to take up the posts at the next International Geological Congress in 2024 closed in summer 2023. Lucia ANGIOLINI (Italy) had formally been appointed as Chair of the Nominating Committee on May 2, 2023, and she appointed Prof. Beatriz AGUIRRE-URRETA (Argentina) and Dr. Thomas SERVAIS (France) as Members of the Nominating Committee. The results of the votes were:

**Prof. Elisabetta ERBA**, Milano, Italy, a specialist on Mesozoic calcareous nannofossils was elected as ICS Chair.

**Prof. Shuzhong SHEN**, Nanjing University, China, specialist for Permian-Triassic boundary, events, etc. was elected as new ICS Vice-Chairmen.

During the ICS meeting in Busan, the Chairmen of the subcommissions reported on the activities and Ladislav SLAVÍK presented both the Silurian and Devonian achievements. Dave HARPER thanked the ICS and formally has ended his term as the ICS Chair. He introduced the new Chair Elisabetta ERBA from Milano, Mesozoic.

## 5. Substages – progress, state of the art

Greg RACKI last year (2023) raised the question about substages and proposed Frasnian substages. The situation is still that substages can be formally defined after the definition of all stage boundaries only. From the practical point of view, “lower”, “upper” or “early” and “late” in the names of substages / subages are still to be written in lower case.

## 6. Information about work on GSSPs alternative sections – progress reports

**6.1. Basal Emsian boundary:** The search for alternative sections to the actual basal Emsian GSSP in Zinzelban (Uzbekistan) was agreed upon by the SDS in 2019 (after a second field campaign in Kitab had failed in 2015). Formal proposals are expected until 30 September 2025. Then the formal vote will follow.

- Ladislav SLAVÍK reported that the **Mramorka section** (Central Bohemia, Czech Republic) was presented and published as candidate for the **Basal Emsian GSSP relocation**. In addition, a proposal of the **Požáry section** as possible Auxiliary Stratotype is in review.
- Nacho VALENZUELA-RÍOS reported on the progress in the Pyrenean sections among which are also possible GSSP candidates. The conodonts are well documented but magnetic susceptibility is problematic.

Geochemistry data will be collected. A formal proposal will be presented possibly next year.

## 6.2. Devonian-Carboniferous boundary:

Carlo CORRADINI stated that the D/C Working Group dissolved after 11 years because not more than two terms (2 x 4 years) are allowed according to the ICS regulations. After a timeline agreement, the working group shall formally reconvene. Possible candidate sections are located in France, Belgium, Germany, and the Czech Republic. The future strategy will be discussed at the SDS meeting in the frame of GeoTolosa 2025 in Toulouse.

## 7. SDS Membership – new CMs and Voting members (TMs)

The chairman reported on the votes and new memberships. The previous officers Ladislav SLAVÍK (Chair), Nacho VALENZUELA-RÍOS (Vice-Chair) and Ulrich JANSEN (Secretary) were confirmed for a second term. Sofie GOUWY is the new SDS webmaster. Ladislav SLAVÍK thanked the previous and new voting members. Reconfirmed/newly elected TMs:

Cathérine CRÔNIER (France)  
 Yury GATOVSKY (Russia)  
 Michal GINTER (Poland)  
 Sofie GOUWY (Canada)  
 Sven HARTENFELS (Germany)  
 Olga IZOKH (Russia),  
 Jau-Chyn LIAO (Spain)  
 John E. MARSHALL (United Kingdom)  
 Cameron PENN-CLARKE (RSA)  
 Anne-Christine DA SILVA (Belgium)  
 Claudia SPALETTA (Italy)  
 Kate TRINAJSTIC (Australia)  
 QIE Wenkun (China)  
 XUE Jinzhuang (Beijing, China)  
 Jay ZAMBITO IV (USA)

In total, there are 15 TMs (8 male, 7 female); continents represented: 5.

Jinzhuang XUE proposed four colleagues from China for corresponding memberships:

**ZHANG Li-Jun**

Professor at Henan International Joint Laboratory of Biogenic Traces and Sedimentary Minerals, School of Resources and Environment, Henan Polytechnic University, Jiaozuo, 454003, People's Republic of China; lijun.zhang@hpu.edu.cn (trace fossils, early terrestrialisation).

**SONG Jun-Jun**

Associate professor at Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, 9 East Beijing Road, Nanjing, 210008, People's Republic of China; jjsong@nigpas.ac.cn (Devonian–Carboniferous ostracods).

**ZONG Rui-Wen**

Associate professor at State Key Laboratory of Biogeology & Environmental Geology, China University of Geosciences, No.388 Lumo Road, Wuhan 430074, People's Republic of China; zongruiwen@cug.edu.cn (trilobites).

**WANG Jia-Shu**

Assistant researcher at The Key Laboratory of Orogenic Belts and Crustal Evolution, School of Earth and Space Sciences, Peking University, Beijing 100871, People's Republic of China; jiashuwang@pku.edu.cn (palaeoecosystems, arthropod palaeobiology).

All four proposals were approved. Their Devonian work will be reported on in the next Newsletter. A short discussion on criteria for acceptance of young researchers as CMs followed. There was agreement that they should have published some papers and show continuous, at least 1–2 years work in Devonian stratigraphy. In a few current cases, the aspirants for membership are encouraged to continue their work before they can be proposed in a few years again.

## **8. SDS grants – establishment of the Committee and launch of the SDS grant system**

CM Jeff OVER contacted the SDS officers as there were 5.653 USD left from the budget of

the SDS meeting 2023 in Geneso. He generously donated it to the SDS with the suggestion to establish an SDS grant system to support young colleagues.

The bank charge out of the sum was 42.76 USD so that there is a total sum left of **5.610.24 USD** (accordingly, ca 1.000–1.500 USD would be distributed annually). It was decided to set an age limit of 40 years at the date of application. The SDS grant committee 2024 consists of Ladislav SLAVÍK (President), Ulrich JANSEN (Secretary), Sofie GOUWY, and Jeff OVER (Members).

[After the meeting, the SDS Grant Committee convened, discussed possible candidates and made its decisions for the current year; the grants were handed over in a small ceremony to Hector BARRERA LAHOZ and Štěpán DAMBORSKÝ (each 500 USD)].

## **9. SDS Webpage**

The new webmaster Sofie GOUWY will update the membership list on the SDS webpage. A technical discussion on the update of contents followed (Sofie GOUWY, Bing HUANG). There is a defined colour code for each chronostratigraphic unit that can be used (downloadable as excel sheet from the ICS website). The ICS webmaster is still Nicholas CAR.

## **10. SDS and Devonian Publications**

The last year was very prolific, with regards to the monography on the New York Devonian:

- VER STRAETEN, C. A., OVER D. J. & WOODROW, D. (Eds., 2023). Devonian of New York, 3 vols., 1016 pp.; PRI, Ithaca.

Other Devonian volumes in preparation:

- Special Volumes in *Palaeobiodiversity and Palaeoenvironments* (see Devonian publications, 2<sup>nd</sup> issue under way)
- J. I. VALENZUELA-RÍOS: **Special Issue to honour Peter CARLS**, also in *Palaeobiodiversity and Palaeoenvironments* (scheduled for 2026), deadline for

submission June 2025; short titles of manuscripts should be sent to Jau-Chyn LIAO (Teresa) until October 2024.

- P. ŠTORCH: A **Jiří KŘÍŽ Special Volume** is planned for *Bulletin of Geosciences*.

## 11. Future Meetings

- 2025: **GeoTolosa 2025 – News from the Palaeozoic World**, will be held on June 24<sup>th</sup>–27<sup>th</sup> 2025, at the University Toulouse III Paul SABATIER (France).
- 2025 (December): **ICOS Brazil**
- 2026: **IPC 7** in Cape Town (South Africa), November 30<sup>th</sup> – December 3<sup>rd</sup>, 2026. Possible joint ISSS and SDS meeting.

- 2027: J. I. VALENZUELA-RÍOS has proposed a **STRATI Meeting** in Valencia (Spain), which is still to be confirmed.

## 12. Financial Report

In 2024, the SDS received 2.850 USD (netto, cleaned from bank fees 2.817 USD). The support was spent for the production of the SDS Newsletter and officers' travel support. The SDS Grant Account balance is 4.610.24 USD (see Top 8).

## 13. Any other business

The chairman thanked again the members of both subcommissions for attendance of the SDS meeting and the organizers from Sofia, namely Valeri SACHANSKI and colleagues.

End of Meeting: 11.25 a.m. (EEST).

## SDS DOCUMENTS

### The Lower Famennian (Upper Devonian) biostratigraphy on the western slope of the Southern Urals carbonate sections by conodonts

by

**Rezeda Ch. TAGARIEVA**

The Upper Devonian Frasnian and Famennian (F/F) boundary position is substantiated in the typical western slope of the South Ural Bolshaya Barma, Akkyr, Ryauzyak and Kuk-Karauk carbonate sections. It is documented at the Barma Horizon bottom by the first appearance of the conodont *Palmatolepis triangularis* SANNEMANN and the brachiopod *Parapugnax markovskii* (YUDINA). The F/F global biotic crisis (Upper Kellwasser Event) is reflected by a sharp change in the Barma Horizon faunal biodiversity. Conodont associations are characterized by extremely poor taxonomic assemblages and are represented by a few Early Famennian species (TAGARIEVA 2023).

A new species of the conodont genus *Palmatolepis* – ***Pa. abramovae* sp. nov.** - is described from the Makarovo Horizon of the Famennian Stage. The studied conodont material comes from the four classical sections of the South Urals listed above. In the studied assemblages, *Palmatolepis abramovae* sp. nov. is found together with 25 species of the genera *Ancyrognathus*, *Icriodus*, *Palmatolepis*, *Polygnathus*, and *Pelekysgnathus*. Based on the presence of the zonal species *Pa. minuta minuta* and accompanying characteristic forms, the interval correlates with the Upper *triangularis* (= *Pa. minuta minuta*) Zone. The new species can be considered as an alternative zonal index species, the appearance of which determines the lower boundary of the Makarovo Regional Substage (TAGARIEVA 2024a).

The Makarovo Horizon (Famennian Stage) stratigraphic interval is defined more accurately in the Kuk-Karauk stratotype section (Sikasya

River, west slope of the Southern Urals). It comprises the Upper *triangularis* (*Pa. minuta minuta*), Lower *crepida* (*Pa. crepida*), Lower *rhomboidea* (*Pa. rhomboidea*), and Lower *marginifera* (*Pa. marginifera marginifera*) conodont zones. The absence of intervals equal to the Middle *crepida* (*Pa. termini*), Upper *crepida* (*Pa. glabra prima*), Uppermost *crepida* (*Pa. glabra pectinata*), and Upper *rhomboidea* (*Pa. gracilis gracilis*) zones reflects hiatus phenomena. The Lower *crepida* (*Pa. crepida*) and Lower *rhomboidea* (*Pa. rhomboidea*) zones are revealed in the studied section for the first time. Conodont complexes are represented by rich taxonomic and high quantitative diversity (six genera and 48 species). *Palmatolepis* dominates (up to 92 percent), as typical for deep-water palmatolepid biofacies (TAGARIEVA 2024b).

### References

- TAGARIEVA, R. Ch. (2023). The Upper Devonian Frasnian and Famennian boundary biostratigraphy on the western slope of the Southern Urals by conodonts: Synopsis for doctoral thesis. - Moscow: GIN RAN, 24 pp. [in Russian].
- TAGARIEVA, R. Ch. (2024a). *Palmatolepis abramovae* sp. nov. - A New Conodont Species from the Makarovo Regional Substage (Lower Famennian, Upper Devonian) of the Western Slope of the South Urals. - Paleontological Journal, **58** (2): 196-203.
- TAGARIEVA, R. Ch. (2024b). Conodont biostratigraphy of the Famennian Makarovian Regional Substage in the Kuk-Karauk section, West Slope of the Southern Urals. - Geologica Balanica. **53** (3): 65-70.

## Basal Emsian redefinition – the Moroccan evidence and perspective

by

**Ralph Thomas BECKER, Zhor Sarah ABOUSSALAM & Ahmed EL HASSANI**

### Introduction

The revision of the basal Emsian definition and GSSP has been a major task for SDS since numerous years after it became clear that the currently still valid GSSP in the Zinzelban section of the Kitab Reserve, Uzbekistan, was placed at a much too low position, re-assigning more than half of the traditional Pragian to the lower Emsian (e.g. CARLS & VALENZUELA-RÍOS 2007; CARLS et al. 2008, 2009; WEINEROVA et al. 2024). Therefore, SDS decided in 2007 (BECKER 2009) to search for a new definition near the entry of *Eolinguiipolygnathus excavatus* M114, following a taxonomic concept of CARLS & VALENZUELA-RÍOS (2002). This form, which had been recorded at Zinzelban as *Po. gronbergi* (e.g. VALENZUELA-RÍOS & CARLS 2010), still has not received a valid name. A reconsideration of the *Eol. excavatus* Group by ABOUSSALAM et al. (2015) showed the presence of numerous intermediate forms and complex close relationships with forms from various regions, such as *Eol. ramoni*, *Eol. carlsi*, *Eol. settedabanicus*, *Eol. radula*, *Eol. michaelmurphyi*, and *Eol. excavatus* MJI16a. In addition, only the basal cavity enables a distinction from *Eol. gronbergi*. In our opinion, M114 should be recognized and named as an *excavatus* chronosubspecies with a later FAD than the typical subspecies. This is required to answer the taxonomic questions raised by KIM et al. (2019).

Although more than 15 years have elapsed since the recognition of the problem and the recommendation for a solution, no section has been published that documents the transition from *Eol. excavatus* s. str. to *Eol. excavatus* M114 in a complete bed-by-bed succession, and with associated macrofauna, microfacies, and

geochemistry data. For example, several resampling campaigns in the Kitab Reserve were unsuccessful to document a meaningful *Eol. excavatus* (s.str. and M114)-*gronbergi* (s.str.) succession (e.g. IZOKH et al. 2011a, 2011b, 2018). Unfortunately, this probably means that the basal Emsian GSSP has to be moved away from Zinzelban. The best prospects for a revised GSSP based on the *excavatus* lineage shifted to the Pyrenees (MARTÍNEZ-PÉREZ et al. 2011; MARTÍNEZ-PÉRES & VALENZUELA-RÍOS 2014) and further work is under way (see Membership Report of VALENZUELA-RÍOS et al. in this issue). The proposed index form occurs also abundantly in the Tafilalt of southern Morocco (ABOUSSALAM et al. 2015) but it enters regionally above a conodont-free black shale interval (*Devonobactrites* Shale). This expresses regionally the *atopus* Event Interval sensu BECKER et al. (2012) or the BGE (Bohemian Graptolite Event) sensu WEINEROVA et al. (2024), first recognized as an event by HLADIL & KALVODA (1996).

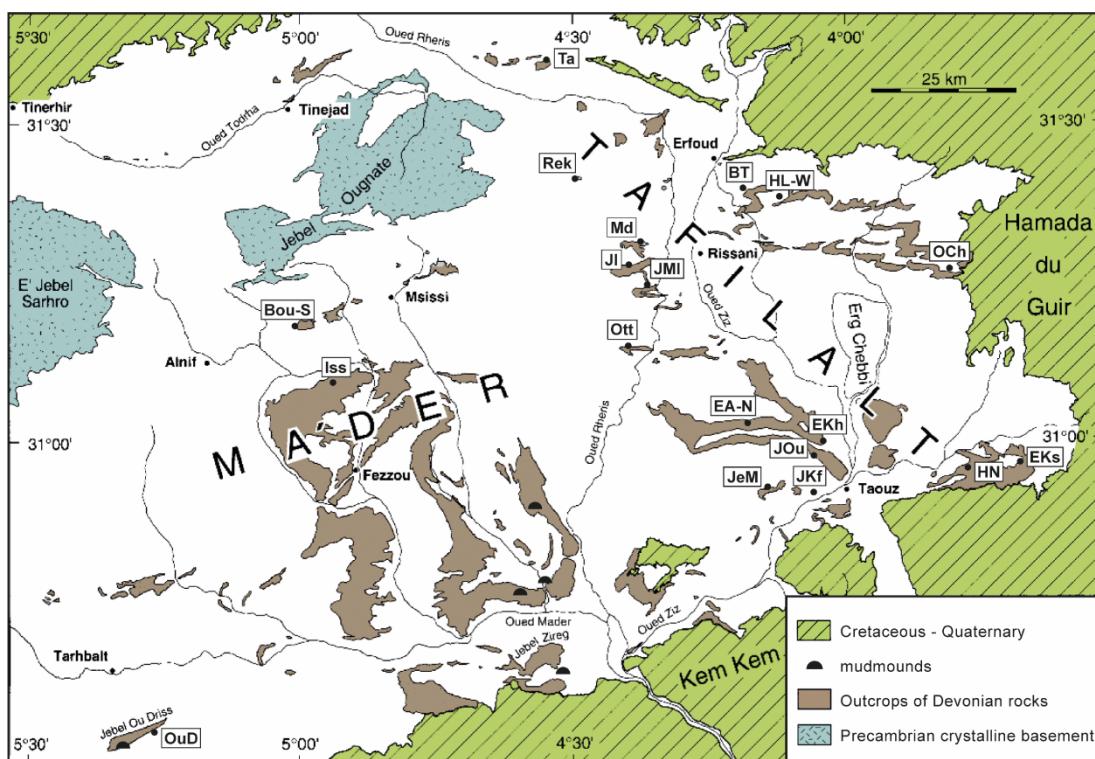
The widespread lack of sections with an *excavatus* M114 FAD in continuous limestone sections is a principle problem that caused the long delay of Emsian GSSP revision. For example, the situation in South China resembles the Tafilalt, with *Eol. excavatus* s.str. and *Eol. excavatus* M114 entering jointly above a shale unit (GUO et al. 2018: Mode section, 2021: Poyun section). In other cases, *Eol. excavatus* M114 occurs sporadically (GUO et al. 2021: Shangkou section) or delayed (LU et al. 2016, 2017: Liujing section, 2018: Shizhou section; GUO et al. 2021: Menggong section). Other distant regions with polygnathids yielded endemic taxa or variants (e.g. Far East Russia; BARANOV et al. 2014). For several regions, such as Nevada or Australia, modern data are lacking.

As a consequence, reviving a concept of SLAVÍK (2004), and based on detailed revisions of classical sections in Bohemia, WEINEROVA et al. (2024) proposed an alternative future definition of the Emsian base by the FAD of *Latericriodus gracilis*. It enters at Mramorka Section A, Bohemia, somewhat below the

*atopus* Event/BGE. This species is long known as a biostratigraphic marker from Celtiberia (CARLS & VALENZUELA-RÍOS 2002, Step 18) and southern Morocco (BULTYNCK 1985). But, unfortunately, it seems to be restricted to the European-North African realm. It is remarkable that icriodids and *Criteriognathus* have mostly not been recorded from the lower Emsian of the many studied Chinese section. However, faunas from a new section brought to Münster by

WANG Zhihong (Wuhan) showed that both groups are in fact present or locally even abundant in South China and seem to have been neglected.

The aim of this contribution is to review in the wider context of lower Emsian stratigraphy the usability of both proposed basal Emsian index conodonts and of the *atopus* Event/BGE in the many different regions of Morocco.



**Fig. 1.** Studied lower Emsian sections of the Tafilalt and Maïder. Bou-S = Boulam-South, Iss = Jebel Issimour, OuD = Ou Driss, Ta = Tantana, ReK = Ras-el-Kebber, BT = Bou Tchrafine sections, HL-W = Hamar Laghdad-West, JI = Jebel Ihrs, JMI = Jebel Mech Irdane, Md = Mdoura-Northeast, Ott = Ottara-West, OCh = Ouidane Chebbi, EA-N = El Atrous N (= Takkat ou el Heyene), JOu = Jebel Ouaoufilal, EKh = El Khraouia, JeM = Jebel el Mrier, JKf = Jebel Kfiroun, HN = Hassi Nebech, EKs = Erg Kseir.

## 2. Anti-Atlas

### 2.1. Tafilalt

The many details published by ABOUSSALAM et al. (2015) for the Anti-Atlas will be summarized briefly. Emsian research has continued in recent years at several sections (Fig. 1), such as Tantana (northern margin of Tafilalt Platform), Ras-el-Kebber (northwestern margin of Tafilalt Platform), Mdoura-Northeast (western margin of Tafilalt Platform), below the basal Givetian GSSP at Jebel Mech Irdane

(central Tafilalt Platform, BECKER et al. 2019), and at Ottara-West (southwestern margin of Tafilalt Platform, Fig. 2). This recent work is based on the collaboration with Heiko HÜNEKE and Ph.D. students at Greifswald, in order to better understand Lower Devonian contourite systems.

The Pragian-Emsian transition of the Tafilalt falls in the Seheb el Rhassel Formation that has been subdivided into still informal units (e.g. ABOUSSALAM et al. 2015). Unit E, the Pragian Limestone (with intercalated marls) is locally

rich in trilobites (e.g. *Reedops*, *Crotalocephalina*, *Paralejurus*, *Odontochile*) and orthoconic cephalopods. Conodont faunas are often sparse or dominated by *Belodella*. Polygnathids are exceedingly rare, with a single member of the *Eoetenopolygnathus pireneae* Group from Bou Tchrafine, resembling specimens identified elsewhere as *Eoct. savagei* or *Eoct. ivanowskyii*. Stratigraphically more meaningful are icriodids, such as *Caudicriodus celtibericus*, occurring throughout the unit, and *Caud. curvicauda* from the top at Jebel Ouaoufilal in the Amessoui Syncline. These date Unit E as upper Pragian *Caud. celtibericus* Zone.



**Fig. 2.** The lower Emsian at Ottara-West, southwestern Tafilalt Platform, with the *Mimagoniatites* Limestone (Unit J) on the left (Heiko HÜNEKE in the middle ground for scale), the *Anetoceras* Limestone (Unit I) crawling from the lower right into the distance, and the thin *Deiroceras* Limestone (Unit G) as a band on the middle right, in the slope between the mostly covered marls of units H and F (at the track).

The absence of *Lat. gracilis* in the top layers of the few sections with icriodids is remarkable. Due to the absence of any polygnathids, it cannot be excluded that the top of Unit E

correlates with the *Eol. excavatus* s. str. Zone (Step 16, CARLS & VALENZUELA-RÍOS 2002).

Unit F, the overlying *Devonobactrites* Shale, is characterized by abundant oldest regional bactritids (the name-giving genus) and other rich macrofauna (Faunule 1 sensu KLUG et al. 2008). It interrupts the conodont succession throughout the region and has been correlated with the final graptolite shale of Bohemia (BGE) and, therefore, regarded as the regional representation of the transgressive and eutrophic *atopus* Event Interval. However, the recent record of *Lat. gracilis* from below the BGE in Bohemia (WEINEROVA et al. 2024) leaves the possibility that the *Devonobactrites* Shale begins earlier, e.g. at the FAD level of *Eol. excavatus* M114. Sequence stratigraphic correlation favors the correlation of the *Devonobactrites* Shale base with the BGE base. There is the challenge to find stratigraphically meaningful conodonts right at base of Unit F in deeper settings of the Tafilalt.

The overlying thin Unit G is characterized by widespread, large-sized orthocones, which gave the name *Deiroceras* Limestone, replacing the taxonomically incorrect previous name “*Jovellania* Limestone”, which had to be restricted to a regional Lochkovian limestone. At the base of the regressive Unit G, *Eol. excavatus* M114 was found at El Khraouia and it continues, partly abundantly, until the top. It may be associated with typical *Eol. excavatus*, *Eol. excavatus* JI116, rare (youngest) *Eol. pannonicus*, and the endemic *Eol. radula* (with early morphotypes in the lower and typical specimens in the upper part). Icriodids of the first bed of the *Deiroceras* Limestone belong locally either to *Caud. celtibericus* or *Caud. curvicauda* but *Lat. gracilis* enters jointly with the regionally oldest *Eol. excavatus* M114 at the base of Unit G at El Khraouia. The Tafilalt succession suggests that conodont Steps 16-18 of Celtiberia (CARLS & VALENZUELA-RÍOS 2002) are hidden within the upper Pragian Limestone and *Devonobactrites* Shale, with sampling-controlled LODs of the basal Emsian index conodonts when limestone deposition resumed. In the upper half of Unit G, *Lat.*

*bilatericrescens bilatericrescens* (e.g. at Bou Tchrafine) and typical *Lat. bilatericrescens multicostatus*, the two index taxa of Step 19, enter. As shown below, Step 19 is the most widely recognizable basal Emsian conodont level in Morocco.

The oldest Tafilalt goniatite, *Praechebbites debaetsi*, enters at the top of the *Deiroceras* Limestone of Jebel Mech Irdane in the upper *Lat. bilatericrescens bilatericrescens* Zone (BECKER et al. 2019; ammonoid zone LD III-B<sub>1</sub>). Since it is morphologically rather advanced (not gyroconic but already slightly convolute), it can be expected that older ammonoids lived elsewhere already in time equivalents of the upper *Eol. excavatus* M114/*Lat. gracilis* zones. The lack of any ammonoids in the rich cephalopod fauna of the underlying *Devonobactrites* Shale makes an even lower range highly unlikely. Therefore, any oldest ammonoid is an indicator of lower Emsian age.

The *Deiroceras* Limestone is followed by the next lower Emsian transgressive and hypoxic Event, the Chebbi Event, which led regionally to the deposition of the fossiliferous *Metabactrites-Erbenoceras* Shale, Unit H. It is characterized by the rich Faunule 2 sensu KLUG et al. (2008) and the first diverse ammonoid assemblage with *Metabactrites*, *Erbenoceras*, *Chebbites*, *Oculoceras*, and *Gyroceratites* (LD III-B<sub>2</sub> fauna). In the absence of any conodonts, the correlation with the (lower) *Eol. gronbergi* Zone is currently tentative. The main part of the lower Emsian is reached with the *Anetoceras* Limestone (Unit I, LD III-C), characterized by successive entries of *Lat. latus* (with *Lat. beckmanni beckmanni*) and then *Eol. catharinae*, jointly with slightly delayed first *Eol. nothoperbonus*, *Eol. juverefi*, and the often dominant *Criterognathus steinhornensis* (*Eol. catharinae* Subzone = Upper *gronbergi* Zone = Upper *nothoperbonus* Subzone). The *Mimagoniatites* Limestone, rarely with *Mimosphinctes* at the very top (Unit J, *Eol. laticostatus* Zone, LD III-D/E), concludes the lower Emsian.

## 2.2. Maïder

The Pragian Limestone of the Tafilalt (Unit E) correlates with the higher Ihandar Formation of the Maïder, which is famous for rich neritic faunas, especially for its trilobites. While there are Pragian *Pelekysgnathus-Lat. steinachensis* faunas in its lower/middle part, the upper part is poor in conodonts (PLODOWSKI et al. 2000). Near the top, there is a marl interval that may correlate with the *atopus* Event/BSE and *Devonobactrites* Shale (Unit F), followed by a few thin limestones (possibly Unit G) with *Pelekysgnathus* sp., fragmentary icriodids, and *Coelocerodontus* aff. *biconvexus* (section Boulam South, NW Maïder, Fig. 1).



**Fig. 3.** Gyroconic whorl of *Erbenoceras advolvens*, Boulam-Süd, Bed 13, Lower Member, Bou Tiskaouine Formation, *gronbergi* Zone (from STICHLING 2013, pl. 14, fig. 3; GMM B6C.66.1).

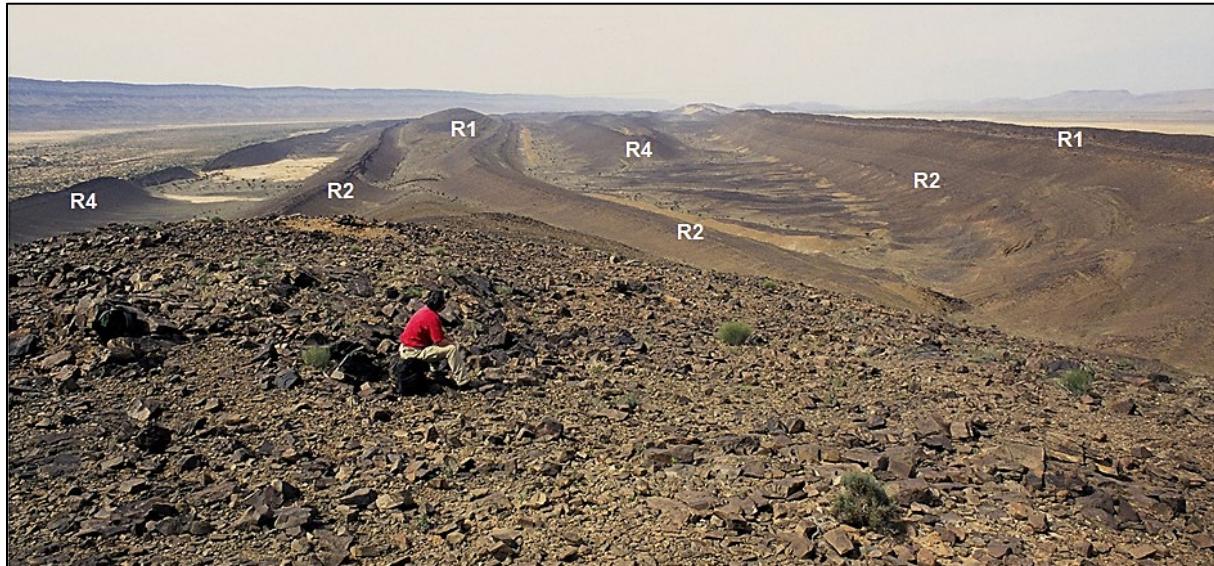
The base of the Bou Tiskaouine Formation yielded in the same section (Bed 12; STICHLING 2013) *Caud. sigmoidalis*, *Caud. cf. celtibericus*, *Crit. miae*, *Eol. excavatus* M114, and poor *Eol. gronbergi*, followed slightly higher (Bed 13) by *Erbenoceras advolvens* (Fig. 3), *Lat. bilatericrescens bilatericrescens*, and *Caud. cf. ultimus*. This supports the placing of the regional *Erbenoceras* Zone (LD III-B<sub>2</sub>) into the (Lower) *gronbergi* Zone. An identical age is likely for Beds 32/32a with early goniatites in the Jebel Issimour section to the South (PLODOWSKI et al. 2000), which also included the *Lat. bilatericrescens* Group. Updating ABOUSSALAM et al. (2015), the Middle and Upper Members of the Bou Tiskaouine Formation are correlated with the *Anetoceras* and *Mimagoniatites* Limestones (Units I/J).

The Ou Driss section in the SW prolongation of the Maïder (Fig. 1) is remarkably similar to the Tafilalt succession. The Lower Member of the Bou Tiskaouine Formation yielded BULTYNCK (1985) *Caud. sigmoidalis*, *Crit. miae*, and *Lat. gracilis*, which gives a local correlation with the *Deiroceras* Limestone (Unit G). The Chebbi Event Interval is developed as a subsequent thick marl unit, followed by equivalents of the higher lower Emsian *Anetoceras* Limestone (Unit I) with *Lat. bilatericrescens bilatericrescens*, *Crit. steinhornensis*, “*Eol. aff. perbonus*”, and an *Eol. gronbergi* that was re-identified as *Eol. juferevi* by BARDASHEV et al. (2002).

### 2.3. Eastern Dra Valley

In the regions ca. from the South of Foum Zguid to Tata, the Pragian-Emsian boundary interval falls in the transition from the shallow-water, brachiopod-rich Merzâ Akhsai Formation (Rich 2 Sandstone) to the basal

limestones of the Mdâouer-el-Kbîr Formation, which record a transgressive trend (see BECKER et al. 2004). From two basal limestones of the latter, in the poorly known Sidi Rezzoug I section, JANSEN et al. (2007) reported *Eol. excavatus* and *Caud. celtibericus* from Fauna C11. The local deepening may represent the global *atopus* Event (BGE). This is supported by the entry of *Lat. bilatericrescens bilatericrescens* in only slightly higher black limestones (JANSEN et al. 2007, Fauna C12). The same or further deepening, probably the Chebbi Event Interval (supported by nowakiids), enabled in the Foum Zgûid region the immigration of *Erbenoceras* faunas (LD III-B<sub>2</sub>; HOLLARD 1963; DE BAETS et al. 2010). The same level with “*Anetoceras*” (= *Erbenoceras*) yielded in the Mdâour-el-Kbîr Ravine the type Fauna II with *Lat. bilatericrescens bilatericrescens* of BULTYNCK & HOLLARD (1980). Regionally, the Emsian base seems to coincide roughly with the base of the Mdâouer-el-Kbîr Formation.



**Fig. 4.** The Lower Devonian at the western end of Rich Tamelougou, SSW of Torkoz, western Dra Valley (RTB for scale in the foreground). R1 = Rich 1 Sandstone Member (Assa Formation), middle Pragian; R2 = Rich 2 Sandstone Member (Merzâ Akhsai Formation), top-Pragian, with the series of low, yellowish weathering hills in the lower slope = *Hollardops* Limestone Member (top lower Emsian); R4 = Rich 4 Sandstone Member, top Emsian.

### 2.5. Western Dra Valley

The type locality of *Lat. gracilis* is the poorly known Iljafane (= Tjafane) section ESE of Akka (see BULTYNCK & HOLLARD 1980, fig.

1). The type level are black limestones at the base of the Oui-n-Mesdôûr Formation. These mark a significant transgression. In terms of sequence stratigraphy, the deepening may

represent the *atopus* Event (BGE) in the middle part of the *Lat. gracilis* Zone, which is not contradicted by the only associated conodont, *Caud. sigmoidalis*. However, as outlined below, a younger Chebbi Event Interval age cannot be ruled; the locality needs to be studied in detail.

Further westwards, in the Assa to Torkoz area, a middle Pragian icriodid fauna with *Caud. curvicauda*, *Caud. angustoides* *castilianus*, and *Lat. steinachensis* occurs in the basal limestones of the Merzâ Akhsai Formation (JANSEN et al. 2004). Middle and upper parts of the formation, especially the massive Rich 2 Sandstone, are devoid of conodonts. This hampers the precise positioning of the B6 (Rich 2) brachiopods assigned by JANSEN et al. (2007) to the “Siegenian”.

The overlying Oui-n-Mesdouâr Formation begins at Bou Tserfine near Assa with calcareous siltstones, as a lower subunit of the Akhal Tergoua Member (BECKER et al. 2004), indicating a gradual deepening. Unfortunately, conodont samples were barren. The middle subunit of the member, consisting of dark-grey limestones and marls with *Odontochile*, yielded in the same section intermediates from *Lat. bilatericrescens* towards *Lat. beckmanni* and early relatives of *Caud. ultimus* (ABOUESSALAM et al. 2015). *Latericriodus beckmanni* has been regarded as an alternative index species of the *Lat. latus* Zone (Step 20 of CARLS & VALENZUELA-RÍOS 2002), but intermediates may have a lower range, in the upper *Lat. bilatericrescens bilatericrescens* Zone (Step 19). Consequently, the Bou Tserfine deepening with black marls and limestones probably reflects the Chebbi Event. Support for this interpretation comes from the conodont record of Rich Tamelougou to the West (S of Aouinet Torkoz; JANSEN et al. 2004b; Fig. 4). It had *Lat. aff. beckmanni* below a fauna with *Lat. beckmanni beckmanni* and *Lat. bilatericrescens bilatericrescens*. ABOUESSALAM et al. (2015) added a single (stratigraphically rather young) *Eol. excavatus* M114 in association with *Lat. beckmanni beckmanni* and *Lat. beckmanni sinuatus*. Therefore, the *Lat. latus* Zone, which

post-dates the Chebbi Event Interval in the Tafilelt, is clearly developed within the higher Akhal Tergoua Member.

At Bou Tserfine, the upper subunit of the Akhal Tergoua Member yielded facies-controlled a monospecific *Lat. bilatericrescens bilatericrescens* assemblage. The only goniatite of the region, a loose *Erbenoceras* (BECKER et al. 2008; Fig. 5), was associated with such a fauna but placed tentatively in the Black Marl Member of the Oui-n-Mesdouâr Formation, which continued the local “*bilatericrescens* ecozone” in higher parts of the lower Emsian.



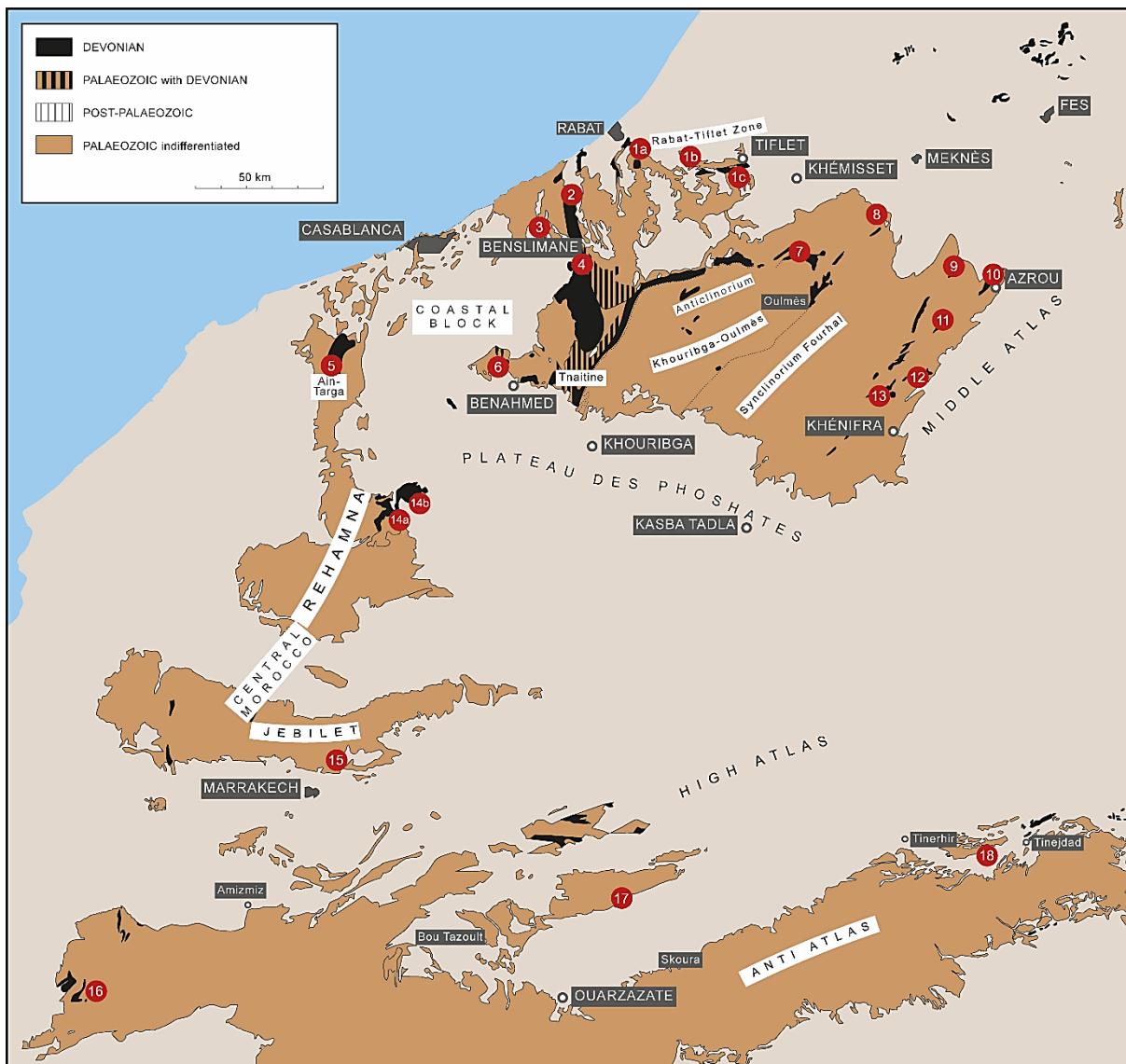
**Fig. 5.** Loose, slightly gyroconic *Erbenoceras* sp. from the western end of Rich Tamelougou, western Dra Valley (max. diameter 67 mm, GMM B6C.66.2).

### 3. Moroccan Meseta (Fig. 6)

#### 3.1. Rabat-Tiflet Zone

In the ca. W-E trending Rabat-Tiflet Zone of the northern part of the Western Meseta, different successions in the West (near Rabat), middle (S of Sehoul), and East (near Tiflet) have to be differentiated. In the whole region, *Caud. celtibericus* is widespread in the lower Emsian (BENFRIKA 1999) but there is no good record of early polygnathids, nor of *Lat. gracilis*.

In the West, *Lat. bilatericrescens bilatericrescens* enters above *Caud. celtibericus* within thin-bedded limestones of the lower Oued Akrech Formation (BENFRIKA et al. 2007, Bou Regreg and Bled Dfa sections). Placing the Emsian base at the formation base is tentative.



**Fig. 6.** Location of Pragian/lower Emsian successions in the Moroccan Mesta. **1a-c.** Rabat-Tiflet Zone, **2.** Oued Cherrat, **3.** Ben Slimane, **4.** Al Attamna, **5.** Coastal Block, Oualad Abbou, **6.** Benahmed region, **7.** Oulmes region, **8.** El Hamman Zone, **9.** Jebel ben Arab, **10.** Azrou, **11.** Bou Khedra-Bou Trou, **12.** Mrirt region, **13.** Ziyyar, **14a-b.** Rehamna, Mechra-ben-Abou and Foum-el-Mejez, **15.** Eastern Jebilet (Jaidet), **16.** Western High Atlas (Talmakent), **17.** Sub-Meseta Zone, Skoura region, **18.** Tisdfine Basin allochthon.

In the central Rabat-Tiflet Zone (section Guenfoudia, see EL HASSANI 1991), there are tectonically displaced dark-grey limestones with pure *Belodella* fauna of Pragian or lower Emsian age, and adjacent light-grey limestone blocks with orthocones and questionable *Lat. bilatericrescens bilatericrescens*. A ca. 40 m alternation of thin-bedded detrital limestones and marls, probable equivalents of the higher Oued Akrech Formation, yielded *Crit. miae*, *Crit. steinhornensis*, and *Lat. bilatericrescens bilatericrescens* near the base, and thick chert

intervals towards the top. This succession represents the main lower Emsian.

Further to the east, at Al Khaloua, a single, not precisely identified early polygnathid was found together with *Crit. miae* in the massive, dolomitic Safsaf Formation, resulting in a suggested basal Emsian age for that unit (BENFRIKA et al. 2007). A *Lat. bilatericrescens bilatericrescens* record comes from higher in the formation. The situation is similar eastwards in the Tiflet Quarry, where the joint entries of *Lat. bilatericrescens bilatericrescens* and *Crit. steinhornensis* high in the Safsaf Formation

(BENFRIKA et al. 2007) recall the Guenfoudia record.

In summary, there are thick limestone successions around the Pragian-Emsian transition in the Oued Tiflet Zone but their conodont record is too episodic and sparse to be helpful for chronostratigraphic definitions

### 3.2. Oued Cherrat

The Oued Cherrat exposes a ca. N-S running Devonian reef belt S of the Rabat-Tiflet Zone. Its succession has been reviewed and revised by BECKER et al. (2020a). The Pragian consists of shales, silt- and sandstones with rich neritic faunas, especially brachiopods and trilobites (Ain Dakhla Formation). A change to neritic limestone, the Beni Moussi Member of the Dhar-es-Smene Formation, occurred higher in the Pragian. A distinctive brachiopod limestone found in a facially diverging section at Ain-Al-Liliga yielded accordingly an upper Pragian monospecific *Caud. cf. curvicauda* fauna.

The brachiopod-trilobite limestones grade upwards into a thick reef limestone, the Çakhrat-ach-Chleh Member. Crinoidal limestones at the base could be dated as lower Emsian *Lat. bilatericrescens bilatericrescens* Zone (with *Caud. celtibericus* in sections Ain Dakhla and Çakhrat-ach-Chlee), followed higher up by a fauna of the *Lat. latus* Zone with *Lat. beckmanni beckmanni*, *Crit. steinhornensis*, and others. The two proposed basal Emsian index conodonts are, unfortunately, missing in the neritic successions throughout the Oued Cherrat.

### 3.3. Ben Slimane

West of a major fault that delimits the Oued Cherrat Zone, the Lower Devonian of the Ben Slimane region has been poorly studied. Supposed Pragian siliciclastics are first overlain by platy, dark-grey, marly limestones, indicating a significant deepening, then by griotte-type nodular limestones with rare cephalopods. In the upper part of the latter, poor upper Emsian anarcestids could be recognized. Despite the apparently pelagic setting, there

were hardly any conodonts in the samples taken from Bled El Bessbass (N of Ben Slimane) and Chaâbat Hamira (S of Ben Slimane). *Belodella* dominates, if any conodonts were found at all. However, it is likely that the local deeping represents one of the two lower Emsian events.

### 3.4. Al Attamna

There is a gradual transition from the reefal Oued Cherrat Zone towards the Al Attamna region as its southern extension. In the geographically intermediate Ain al Qcob section, the massive limestones of the Dhar-es-Smene Formation yielded *Caud. celtibericus*, while *Lat. bilatericrescens bilatericrescens*, mostly a lower Emsian taxon, continues into turbiditic limestones of the basal upper Emsian Ain-Khenig-en-Mer Formation (BENFRIKA & BULTYNCK 2003; compare upper range in ABOUSSALAM et al. 2015).

Further to the South (Sidi Ahmed Lemdoun), *Caud. celtibericus* and a member of the *Eoct. pireneae* Group give an upper Pragian age for the argillaceous Member A of the Sidi Ahmed Lemdoun Formation. The more massive Member B, an equivalent of the reefal phase of the Dhar-es-Smene Formation to the North, is one of the few Meseta units, in which a successive entry of *Lat. gracilis* and *Lat. bilatericrescens bilatericrescens* was shown (BENFRIKA & BULTYNCK 2003), followed even higher by *Crit. steinhornensis*. This succession should be re-sampled in order to get more details and to clarify whether a shale interval below the first *Lat. bilatericrescens bilatericrescens* is the BGE level.

### 3.5. Coastal Block

The Coastal Block lies West of the Western Meseta Shear Zone and is characterized by much lower thermal and tectonic overprint than all other Meseta regions. The best Devonian succession is in the Oulad Abbou Syncline (Fig. 6), ca. 60 km SW of Casablanca. It is characterized by thick neritic to reefal limestones (EL KAMEL 2004) that, unfortunately, lack critical conodonts. On its

western limb, at Ain Targa, a first biostrome is overlain by marly limestones with odontochilids, a distinctive, large-sized trilobite group that disappears elsewhere (Akhal Tergoua Member of the western Dra Valley, *Deiroceras* Limestone of the Tafilalt) in the lower half of the lower Emsian. From a sequence stratigraphic perspective, the deepening episode ending the first local reef phase should represent one of the two lower Emsian transgressive events. New sampling should be attempted.

### 3.6. Benahmed region

The Devonian succession of the Benahmed region S of Al Attamma, including its current knowledge gaps, has been summarized by BECKER et al. (2021a). In the western Beni Sekten area, neritic limestones and intercalated subordinate sandstones yielded a rich shallow-water coral-brachiopod-trilobite fauna (e.g. TERMIER & TERMIER 1951) of Pragian to lower Emsian age. There is no conodont record because the succession was never sampled nor investigated bed-by-bed.

### 3.7. Oulmes region

The Lower Devonian stratigraphy of the Tiliouine to Ain Jemaa region N of Oulmes has also been poorly studied. It consists mostly of shales, silt- and sandstones (Ain Dram Formation), with some brachiopods, trilobites and *Nowakia (Turkestanella) acuaria*, the Pragian index dacryoconarid (e.g. EL HASSANI & BENFRIKA 2000). LAZREQ (1990) reported from an overlying black limestone of section Tiliouine "*Eol. dehiscens*", a specimen which in fact represents an aberrant *Eothenopolygnathus*. Its basal Emsian age is proven by associated *Now. (Now.) zlichowensis*. This suggests a correlation of the dark unit with the Chebbi Event Interval (see dacryoconarid ranges in ALBERTI 1980; BECKER et al. 2018). The higher lower (with *Now. (Now.) cf. barrandei*) and upper Emsian interval is mostly represented by quartzites, calcareous sandstones, and shales.

### 3.8. El Hammam Zone

The elongated El Hamman Zone ranges from the area ca. 10 km NE of Oulmes (around Moulay Hassane) to sections further 15-20 km on, SW of Meknes (Agourai region). In the first, the mixed neritic, mixed sandy-calcareous Lower Devonian succession was briefly described by COGNEY (1967), ALBERTI (1969), and LAZREQ (1990). Pragian black limestones with *Reedops*, *Now. (Turk.) acuaria*, *Caud. curvicauda*, and orthocones are separated by 50 m of shales and 30 m of irregularly-bedded, dark-grey, sandy shales from a calcareous sandstone unit with a basal Emsian fauna, including *Odontochile*, *Myriospirifer*, *Tropidoleptus*, and *Sieberella*. It is overlain by 3 m massive, light-grey limestone with *Icriodus corniger* and *Lat. beckmanni* (LAZREQ 1990), indicating an early upper Emsian age.

In section Ayn Azza of the northwestern Agourai-Bou Alzaz region, there is a ca. 40 m thick, massive limestone unit (Fig. 7), with a rich upper Emsian conodont assemblage at the top. Limestone boulders are underlain by ca. 5 m of thin- to median-bedded., middle-grey, detrital brachiopod limestones that yielded at the base *Lat. bilatericrescens bilatericrescens*, indicating the lower substage. The Emsian base is not exposed in the overgrown slope.

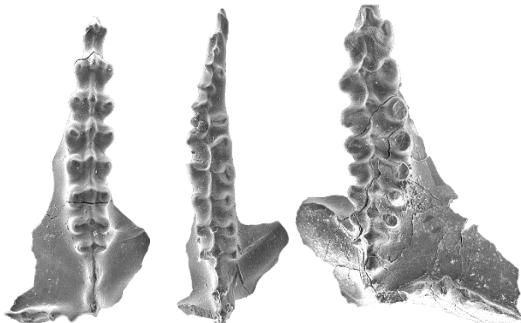


**Fig. 7.** The massive Emsian limestone bar at Ayn Azza, SW of Meknes, with thinner lower Emsian beds occurring at the base.

### 3.9. Jebel Ben Arab

The Jebel Ben Arab Devonian lies ca. 20 km NW of Azrou and has become famous for its lower Emsian plants (GERRIENNE et al. 1999;

MEYER-BERTHAUD & GERRIENNE 2001). The main part of the Lower Devonian consists of poorly fossiliferous, thick shales and siltstones with partly large sideritic and/or calcareous concretions (Ait Mimoun Formation). Only in the northeastern section facing the main road, there is ca. 8 m below the top a variably thick brecciated limestone overlying black shales that indicates synsedimentary Eovariscan seismicity (block faulting). It yielded crinoid debris, *Caud. celtibericus*, *Lat. gracilis*, *Belodella*, and *Neopanderodus* (Fig. 8). The black shale may well correlate with the *atopus* Event Interval (BGE). The famous plants were found 1 km further to the east in different silty shales with *Now. (Now.) zlichovensis* and other dacryconodontids.



**Fig. 8.** Basal Emsian conodonts from the breccia unit (left and middle) and overlying laminated limestone (right) at Jebel Ben Arab. From left to right: *Caud. celtibericus*, *Lat. gracilis*, and *Lat. beckmanni sinuatus*.

A higher level in the lower Emsian (*Lat. latus* Zone) is indicated by *Lat. beckmanni sinuatus* (Fig. 8) from a laminated limestone ca. 5.7 m above the breccia bed. Still the same zone is indicated by associated *Lat. bilatericrescens bilatericrescens* and *Caud. cf. ultimus* from an overlying 2-3 m thick package of griotte-type nodular limestone (sample from south side section). In both sections, solid flaserlimestones with upper Emsian conodonts follow. By contrast to the lower Emsian, the sparse assemblages from its top are dominated by polygnathids.

### 3.10. Azrou

Building on the classical work of BOHRMANN & FISCHER (1985) and numerous

new samples, the allochthonous Devonian successions of Azrou, with three different setting in the Northwest, in the center (Bou Ighial), and in the Northeast (Bab-el-Ari), have recently been summarized by ABOUSSALAM et al. (2023). In a new section of the NW Succession, the upper part of the > 150 m thick calcareous shales of the Bab-el-Ari Formation yielded a fragmentary specimen of the *Lat. bilatericrescens* Group as evidence for a basal Emsian age. It confirms previous records from lateral localities with *Caud. sigmoidalis*, *Eol. excavatus* s. str. ("dehiscens" in BOHRMANN & FISCHER 1985), *Lat. bilatericrescens bilatericrescens* and youngest *Caud. curvicauda*. The Pragian-Emsian boundary will be lower in the upper part of the formation but exposures are limited. The basal limestones of the following Azrou Formation still fall in the lower Emsian, based on *Lat. bilatericrescens* and *Lat. beckmanni*.

In the Bab-el-Ari section, the calcareous shales of the Bab-el-Ari Formation are interrupted by a local, ca. 10 m thick member consisting of coarse crinoidal limestones. They yielded near the base common *Caud. claudiae*, a typical Pragian icriodid, among more dominant *Belodella*. At the top, *Caud. ?celtibericus* was found. The basal Azrou Formation of this section has *Lat. gracilis* and early *Lat. bilatericrescens multicostatus*, suggesting that the *atopus* Event Interval (BGE) is represented by a thick interval of recessive shales just below.

### 3.11. Bou Khedra-Bou Trou

A thick and principally important Lower Devonian succession is exposed along the northern slopes of the Bou Khedra-Bou Trou mountains, ca. 35 km SW of Azrou (another locality name is Al Açama). It is regarded as an autochthonous sequence. Unfortunately, our sampling campaigns showed that local conodont faunas are dominated by single cones, with exceptional, partly abundant *Caud. celtibericus* in a few levels, but without any other icriodids or polygnathids.

An easily recognizable local marker interval consists of reddish shales and sandstones that yielded rare phacopids. It is overlain by ca. 100 m of grey shales alternating with cliff-forming thin- and cross-bedded sandstones, grading upwards into shales with thin limestones with *Belodella* and *Neopanderodus*. Overlying lenticular, sometimes cherty, bluish-grey crinoidal limestones contain the *Caud. celtibericus* assemblages. This interval may represent a top-Pragian or, more likely, basal

Emsian deepening. Support for the latter interpretation comes from the subsequent onset of griotte limestones, resembling those of Jebel Ben Arab, and suggesting a higher lower to upper Emsian age, but *Belodella* is all that we could find. We assume that the alleged Famennian *Scaphignathus* (see EL HASSANI & BENFRIKA 2000, p. 204) from this unit was mis-identified (perhaps, based on a *Pandorinellina*). Givetian conodonts occur in the region, but in a reworking unit above the griotte.



**Fig. 9.** The Pragian/Emsian at Bab-el-Ari, NE of Azrou, with a lower limestone cliff (center) formed by Pragian coarse crinoidal limestones and with basal Emsian icriodids (including *Lat. gracilis*) occurring at the base of the upper cliff (basal Azrou Formation) to the right.

### 3.12. Mrirt area

The Devonian succession of the Mrirt region has been reviewed and refined by BECKER et al. (2020b). It belongs to the central part of the allochthonous Ziar-Mrirt-Nappe, which derived from the East. The Lower Devonian falls into the lower/middle part of the Anajdam Member of the Bou Nebedou Formation. Calcareous shales and thin intercalated limestones of Submember A yielded Pragian trilobites, *Now. (Turk.) acuaria*, and *Caud. aff. curvicauda* (WALLISER et al. 2000). Submember B is a silty-sandy interval indicating regression. It is overlain by a package of thin-bedded nodular limestones (Submember C) with very poor conodont yield (one icriodid fragment from Anajdam) despite pelagic microfacies (dacyroconarid-rich bioclastic wackestones). The deepening trend at the base could represent either the *atopus* (BGE) or Chebbi Event levels but supporting data are lacking. Prospects for a

better local conodont record by re-sampling are, unfortunately, rather low.

### 3.13. Ziyyar

The allochthonous Devonian near Ziyyar (= Ziar) belongs to the southern part of the Ziar-Azrou Nappe. Principles of stratigraphy have been outlined by WALLISER et al. (1995) but many more details, based on intensive resampling, are still unpublished. In the lower part of the succession, a ca. 20 m thick, cyclic package of yellowish nodular shales and limestones yielded Pragian *Now. (Turk.) acuaria*, trilobites, and *Pekekysgnathus serratus serratus*. It is overlain by ca. 2.2 m grey shales, indicating a deepening, possibly the *atopus* Event (BGE) level. A regressive phase is represented by ca. 3 m shales and siltstones. A ca. 2 m thick black shale follows, which could be the basal Emsian Chebbi Event Interval. The main lower Emsian may be developed as a ca.

3.5 m thick alternation of shales and siltstones with thin, often lenticular, nodular or flaser-bedded limestones (Fig. 10). A poor *Lat. bilatericrescens* from ca. the middle is the only proof for this stratigraphic interpretation; most beds yielded no conodonts at all.



**Fig. 10.** The irregular to flaser-bedded lower Emsian limestones at the Zihaar road section, with the level of *Lat. bilatericrescens bilatericrescens* in the bed left of the hammer.

### 3.14. NE Rehamna

Non-metamorphic Lower Devonian successions are exposed in several parts of the NE Rehamna (BEN BOUZIANE 1995; EL KAMEL 2004; see EICHHOLT et al. 2021 for a review and map). The Ouled Barka Formation of the Mechra Ben Abbou, Amdidih and Koudiat ed Diab regions consists of shales, siltstones and neritic limestones with brachiopods and trilobites. Brachiopods reported by GIGOUT (1951) include typical Pragian taxa. So far limited conodont sampling was not successful, probably due to the too shallow facies. The lower Emsian seems to be represented by a less exposed more argillaceous interval.

At the NE end of the Rehamna, the narrow Foum-el-Mejez Graben is characterized by thin-bedded limestones and more massive dolomites of the Oued Kibane Formation. The thin-bedded, bioclastic limestones of the Lower Member overly unfossiliferous siltstones of the Sakhra Touila Formation. They yielded only *Caud. celtibericus* but due to the local deepening trend, a basal Emsian age is more likely than an upper Pragian age.

### 3.15. Eastern Jebilet

Based on HUVELIN (1977), the allochthonous Lower/Middle Devonian of the Eastern Jebilet has been reviewed and refined by BECKER et al. (2021b). In the best studied Jaidet succession in the western region, NE of Marrakech, the upper Lochkovian to upper Emsian belong to the pelagic Jaidet Formation. The Middle Member comprises ca. 20 m of griotte-type nodular limestones and shales with rare *Pelekysgnathus* aff. *elongatus*, *Now. (Turk.) acuaria*, *Reedops*, *Echinopyge*, and odontochilids. It seems to represent all of the Pragian. Despite the pelagic setting, we could not yet obtain a single lower Emsian conodont from the upper part of the Middle Member. The Upper Member yielded rich upper Emsian goniatites and rare polygnathids in two lateral sections. Unfortunately, the Eastern Jebilet is not very suitable for Pragian-Emsian boundary conodont research.

### 3.16. Western High Atlas

Lower Devonian rocks crop out in several tectonic windows in the basement of the western High Atlas (Fig. 6). The succession of Talmakent has been summarized by CORNÉE et al. (1990). Lochkovian to Emsian strata were included in “Formation 14”, consisting of greenish shales, siltstones, and bioclastic limestones. The biostratigraphy was based on diverse brachiopods and trilobites, which require revision.

Our brief new survey concentrated on limestones of “Formation 15” exposed near the main piste from Talmakent in the West to Takerkourt in the East. These are partly dolomitized, often thick-bedded, massive, bluish-grey crinoidal limestones alternating with some marls and thinner limestone interbeds. Remarkable is the abundance or even dominance of bryozoans, a biofacies that is unknown from other Meseta or Anti-Atlas regions. A lower sample from thin-bedded limestones yielded simple cones (*Belodella*, *Neopanderodus*) and *Caud. celtibericus*, suggesting a top-Pragian to basal Emsian age.

An upper sample from bryozoan limestone had the same species and a fragmentary probable *Lat. gracilis*. Until the top, we found no evidence for goniatites or indicators of younger age but the conodont sample from the last exposed limestone was barren.

More detailed work is required, especially because of the unique biofacies. It is perhaps possible to find locally an icriodid-based Pragian-Emsian boundary and marly intervals may correlate with the basal Emsian transgressions. However, any planning of new fieldwork must take into account that the region was affected by the strong ( $M = 6.8$ ) earthquake in 2023.

### 3.17. Sub-Meseta Zone, Skoura

The Lower Devonian of the Skoura region NW to NE of Ouarzazate (Sub-Meseta Zone) has recently been re-studied by BECKER et al. (2021c) and GIBB et al. (2024). The best sections are exposed at Taliouine (= Tiliwine) and Tizi-n-Ourthi but a similar section that is more difficult to reach occurs East of the high Tizi-n-Tichka Pass. From that locality, LAZREQ & OUANAIMI (1998) recorded a fauna with *Eol. excavatus* s. str., *Crit. steinhornensis*, and *Caud. sigmoidalis*, suggesting a middle level within the lower Emsian. This is the youngest known level for the *Eol. excavatus* Group in Morocco (see range chart of ABOUSSALAM et al. 2015, fig. 31).

In the whole Skoura region, the Pragian and lower Emsian is represented by variably fossiliferous and often cyclic nodular or flaser-bedded limestones of the Imi-n-Tazaght Formation. The Middle Member yielded typical Pragian trilobites (several species of *Reedops*, cheirurids, and harpids) and the bivalve *Panenka* that is typical for deeper neritic to condensed, bottom current-influenced pelagic settings. Member 3 is characterized by less argillaceous, more solid cyclic limestones reflecting an intensifying contourite system, with currents coming from the East (GIBB et al. 2024). At the base, a sample with *Caud. celtibericus* indicates the Pragian-Emsian

transition. *Erbenoceras advolvens* from higher parts (see GIBB et al. 2024, fig. 5A) and a loose *Teicherticeras* confirm that the unit reaches equivalents of the *Anetoceras* Limestone of the Tafilelt (higher LD III-C), supporting the Tizi-n-Tichka conodont evidence. The condensed, cross-laminated to cross-bedded limestones of Member 4 mark the peak period of the “Tiliwine Drift”. Overlying finer-grained and cephalopod-rich beds represent the latest lower Emsian with *Mimagoniatites* and *Mimosphinctes* (LD III-D/E).

Unfortunately, the local conodont yield is poor despite the pelagic facies. More sampling may provide better precision for the Emsian base. Currently, it is placed arbitrarily at the base of Member 3. This level yielded in the lateral (to the East) Imi-n-Tazaght section *Caud. curvicauda* in association with *Machaeracanthus*, a typical basal Emsian acanthodian of the Tafilelt (*Devonobactrites* Shale, *atopus* Event Interval). The succession at Tizi-n-Ourthi (Fig. 11) resembles closely that of Taliouine. Its lower Emsian conodont potential has not yet been exploited.



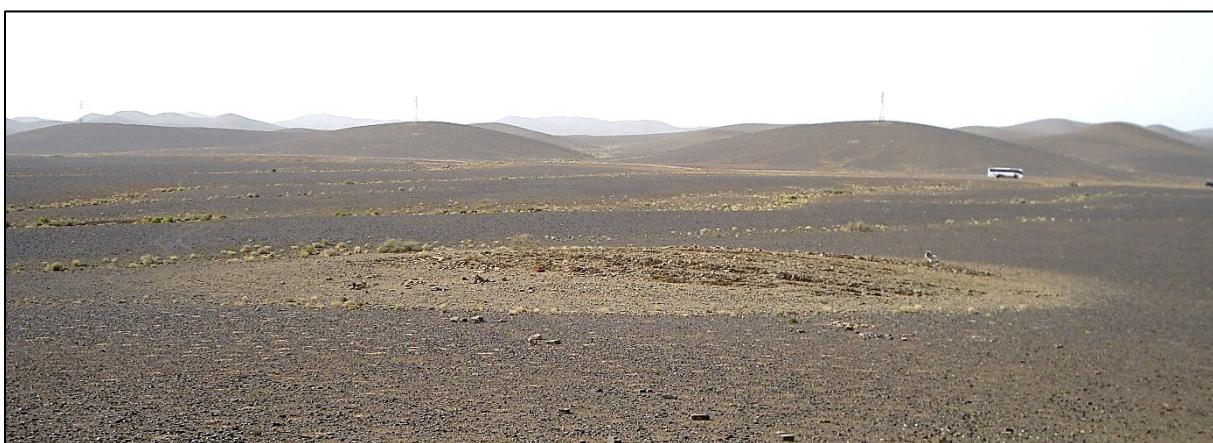
**Fig. 11.** The strongly cyclic Pragian to lower Emsian Imi-n-Tazaght Formation at Tizi-n-Ourthi, NNE of Ouarzazate (Sub-Meseta Zone), overlying top-Silurian to lower Lochkovian black shales of the Tizi-n-Tichka Formation.

### 3.18. Tisdafine Basin

Knowledge of the Pragian and lower Emsian of the Tisdafine Basin in more eastern parts of the Sub-Meseta Zone relies entirely on allochthonous clasts and internally stratified olistolites that were transported into Lower Carboniferous shales of the Bou Tisdafine, East

of Tinerhir. Pragian clasts from the thick breccia at Taourirt n'Khellil (RYTINA et al. 2013) are rich in trilobites, indicating a source from the southern Tafilelt/Maïder regions. A single block with the possibly oldest Moroccan ammonoid, the widely gyroconic *Ivoites* n. sp. (BECKER et al. 2019), unfortunately, lacked conodonts or identifiable nowakiids. More common dacryoconarid wacke- and packstone yielded conodont assemblages of the higher lower Emsian *Eol. gronbergi/Crit. steinhoricensis* Zones (e.g. samples AI L17, E-Tin 2, AI 2011-3). Six km to the east, a continuous Pragian-Emsian boundary lies

obviously within a ca. 45 m large, oval olistolite named as section Bou Tisdafine-West (TALIH et al. 2022, Fig. 12). Near the base, there is in deeper neritic crinoidal limestones an upper Pragian fauna with *Caud. celtibericus*, *Caud. curvicauda*, and *Eoct. pirenaeae*. In the upper part and at the top, the *Crit. steinhoricensis* Zone is developed, but without polygnathids. This gives prospects to find the *Lat. gracilis* interval in between, perhaps near two marly packages that indicate episodic deepening. Further East, the exposed allochthonous units begin with upper Emsian strata.



**Fig. 12.** The oval allochthonous glide block named as Bou Tisdafine-West, surrounded by brownish upper Tournaisian silt-sandstones, with Pragian thin limestones at the base (foreground) and the lower Emsian *Crit. steinhoricensis* Zone at the back of the very low hill; road from Tinerhir to Tinejdad in the middle ground, Lower Carboniferous siliciclastic forming the W-E extending Bou Tisdafine in the background.

#### 4. Conclusions

None of the many Moroccan upper Pragian-lower Emsian sections that have been studied so far has an undisturbed conodont record that could make it suitable as a stratotype candidate. Surprisingly, even when the lithofacies suggests open and subphotic shelf deposition, the conodont yield and alpha diversity are very low. It could be argued to select an Anti-Atlas parastratotype in order to correlate in a chronostratigraphic context the rich regional macrofaunas of the *Devonobactrites* Shale and the onset of the conodont-dated oldest ammonoids from Jebel Mech Irdane.

For revised and refined basal Emsian definition, SDS will have to propose a tightly constrained package of successive markers and

a network of regional parastratotypes, preferably including one in the Kitab Reserve. These should enable global (at least pantropical) correlation into different facies and palaeobiogeographical realms. There is obviously not a single bio- or chemostratigraphical marker that can serve all regions. Apart from the two proposed marker conodonts, the *atopus* Event is an important indicator of climate and sea level change. Stable isotope stratigraphy, one or several index brachiopods, marker nowakiids, and the onset of oldest ammonoids should be part of a “top-Pragian/basal Emsian calendar”. A future GSSP should be tightly embedded in such a time/event framework (from old to young):

1. *Caud. celtibericus* Zone (with *Caud. curvicauda*, Step 15)
 

Morocco: Tafilalt (Pragian Limestone), Maïder (higher Ihandar Formation), Western and Eastern Dra Valley (Rich 2 Sandstone Mbr.), Rabat-Tiflet Zone (Bou Regreg Fm.), Oued Cherrat (brachiopod limestone at Ain-Al-Aliliga), Al Attamna (Mnr. 1, Sidi Ahmed Lemdoun Fm.), Oulmes (Ain Dram Fm.), El Hammam Zone (black limestone unit), Azrou (crinoidal member of Bal-el-Ari Fm. at Bab-el-Ari), Ziyyar (cyclic, nodular trilobite limestone unit), Eastern Jebilet (Middle Mbr., Jaidet Fm.), Skoura (Mbr. 2, Imi-n-Tazaght Fm.), Bou Tisdafine Basin (crinoidal limestone unit).
2. FAD *Eol. excavatus* s. str. (Step 16, base Lower *excavatus* Zone of SANZ-LÓPEZ 2002)
 

Morocco: No record.
3. FAD *Eol. excavatus* M114 (Step 17, base Middle *excavatus* Zone)
 

Morocco: No record.
4. FAD *Lat. gracilis* (Step 18)
 

Morocco: Al Attamna (lower Mbr. B, Sidi Ahmed Lemdoun Fm.).
5. Base transgressive and hypoxic *atopus* Event = BGE (with last monograptids), isotope signal? ("Step 18b")
 

Morocco: Tafilalt (base *Devonobactrites* Shale with oldest tropical bactritids, base LD III-A), N Maïder (marl near top of Ihandar Formation), eastern Dra Valley (base Oui-n-Mesdour Fm. at Sidi Rezzoug), Akka region (base Oui-n-Mesdour Fm. at Iljafane), ?Rabat-Tiflet Zone (base Oued Akrech Fm), ?Ben Slimane (deepening phase), ?Al Attamna (shale unit in Mbr. B, Sidi Ahmed Lemdoun Fm.), Coastal Block (drowning of 1<sup>st</sup> biostrome), Jebel Ben Arab (black shale and breccia bed with *Lat. gracilis*), ?Azrou (shale near top of Bab-el-Ari Formation), Bou Khedra (crinoidal limestone with *Caud. celtibericus* overlying regressive sandstone unit), ?Mrirt region (base Subunit C, Anajdam Mbr.), ?Ziyyar (shale unit above Pragian limestones), ?NE Rehamna (base of Oued Kibane Fm. at Foum-el-Mejez).
6. Regression (end of *atopus* Event Interval = top BGE, "Step 18c")
 

Morocco: Tafilalt (base *Deiroceras* Lst., with sampling-related FOD of *Eol. excavatus* s.str., *Eol. excavatus* M114, and *Lat. gracilis*), SW Maïder (base Bou Tiskaouine Fm. at Ou Driss), Azrou (top of Bab-el-Ari Fm.).
7. FAD *Lat. bilatericrescens bilatericrescens* (Step 19)
 

Morocco: Tafilalt (middle *Deiroceras* Limestone, *Praechebbites* Zone, LD III-B<sub>1</sub>, last odontochiliids), N Maïder (?thin *Deiroceras* Lst. equivalents at Boultam-South), eastern Dra Valley (Fauna C12), Rabat-Tiflet Zone (lower Oued Akrech Fm., within Safsaf Fm.), Oued Cherrat (base Çakhrat-ach-Chlee Mbr.), Al Attamna (middle Mbr. B, Sidi Ahmed Lemdoun Fm.), Azrou (lower Azrou Fm. at Bab-el-Ari).
8. Base transgressive Chebbi Event, ca. base *Eol. gronbergi* Zone ("Step 19b"), isotope signal?
 

Morocco: Tafilalt (base *Metabactrites-Erbenoceras* Shale, base *Erbenoceras* Genozone, LD III-B<sub>2</sub>), N Maïder (Lower Mbr. of Bou Tiskaouine Fm. with *Erbenoceras*), eastern Dra Valley (*Erbenoceras* fauna of Foum Zguid), western Dra Valley (Akhal Tergoua Mbr, Subunit 2 with *Odontochile*), Oulmes (black limestone at Tiliouine), ?Ziyyar (black shale below limestone with *Lat. bilatericrescens bilatericrescens*).
9. Regression, base *Eol. nothoperbonus* Subzone and *Lat. latus* Zone (Step 20, with FAD of *Lat. beckmanni beckmanni*)
 

Morocco: Tafilalt (base *Anetoceras* Limestone, base LD III-C<sub>1</sub>), N Maïder (Middle Br., Bou Tiskaouine Fm.), western Dra Valley (Akhal Tergoua Mbr. Subunit 3)
10. FAD *Eol. catharinae* and *Crit. steinhornensis* (Step 21)
 

Morocco: Tafilalt (middle part of *Anetoceras* Limestone), SW Maïder (*Anetoceras* Lst. equivalent at Ou Driss), Rabat-Tiflet Zone (higher Oued Akrech Fm. equivalents at Guenfoudia, upper Safsaf Fm. at Tiflet Quarry), Oued Cherrat (upper Çakhrat-ach-Chlee Mbr.), Al Attamna (upper Mbr. B, Sidi Ahmed Lemdoun Fm.), Skoura (higher Mbr. 3, Imi-n-Tazaght Fm. at Tizi-n-Tichka).

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**Where palaeontology meets heritage:  
field work and building relationships in  
the Canning Basin (Kimberley,  
Western Australia)**

by

**Christian KLUG, John A. LONG, Alice  
M. CLEMENT, Marcos Ramon FRITZEN,  
Corey J. A. BRADSHAW & Diego C.  
GARCÍA-BELLIDO**

As part of an Australian Research Council project (*The Devonian Gogo Fauna. Diversity, Palaeoecology and Global Significance*), which was already granted in 2021 but got delayed due to COVID restrictions and last year's massive floods that destroyed the bridge at Fitzroy Crossing, we finally were finally able to do the planned field work in the first half of August 2024. Although the grant-applicants included John LONG, Kate TRINAJSTIC, Alice CLEMENT, Derek BRIGGS, Richard CLOUTIER, Mike LEE, and Christian KLUG, the field team only included the authors of this short report (Fig. 1).

The aims of this project encompasses a mix of scientific, outreach, and heritage topics. Concerning heritage, we consulted with some

elders of the Goonyandi people, Rosemary NUGGETT and Ronnie JIMBIDIE, about the possibilities of building a visitor centre and museum to inform visitors about the palaeontological and geological treasures of the region. We also received their permission to search for fossils. Most of the specimens we found we labelled and left with the community at the reception of Mimbi campground. For a few, scientifically interesting specimens, we obtained the permission to bring them to the lab in Adelaide.

Our trip started in Broome, from where we headed to Bandilngan/Windjana Gorge (Fig. 2), a world-renowned locality that exposes a perfect cross section through the Late Devonian reef belt. Results of the pioneering geological work there has long been published (e.g. PLAYFORD & LOWRY 1966), and more recently and comprehensively by PLAYFORD et al. (2009). We then moved on to the land of the Mimbi and Galeru communities, where we stayed for about a week. With permission of the elders of these communities, we visited outcrops of the Frasnian Gogo and Sadler Formations, cracking a few thousand nodules in the search for vertebrates and invertebrates.



**Fig. 1.** The team of the 2024 Gogo-fieldtrip, from left to right: Alice CLEMENT, Corey BRADSHAW, Ramon FRITZEN, Diego GARCÍA-BELLIDO, JOHN LONG, and Christian KLUG, near the entrance of Mimbi cave.



**Fig. 2.** The entrance of Bandilgan/Windjana Gorge, some reef foresets can be seen left of the centre of the photo, the reef core is to the right.



**Fig. 3.** Big nodules from the Gogo Formation, Paddys Valley.

The exceptionally well-preserved fish fauna of the Gogo Formation is well-documented. Over the past decades, nodules (Fig. 3) have yielded a series of highly remarkable fossils, comprising ptyctodontid and arthrodire

embryos and hence, evidence of internal fertilisation, a fossilised heart, and important sarcopterygians that shed light on the fish-tetrapod evolutionary transition (AHLBERG et al. 2009; LONG et al. 2006, 2008; 2009; TRINAJSTIC et al. 2007; CLEMENT et al. 2024). This is an incomplete list, of course. The great diversity of fossils is also evidence for the research potential. We found several well-preserved actinopterygians, a complete *Griphognathus* skull, an *Eastmanosteus* in a big nodule that will likely yield postcranial parts, several arthropods, and cephalopods (Figs. 4-6). Cephalopods are represented by “gomphoceratids” (Fig. 7), abundant orthocones (usually, the sutures are poorly visible, thus it is unclear if they are orthocerids or bactritids), and some ammonoids (cf. BECKER & HOUSE 2009).

One of our aims was also to document the palaeoecology and food webs of the Late Devonian. To this end, we counted the individuals of the various groups we found for a semi-quantitative analysis. We also briefly examined the reefal sediments in Windjana Gorge (Fig. 7) and near the Mimbi and the Galeru communities (Figs. 8, 9). The facies are quite varied and show a broad range of more or less shallow marine deposits including

oncolites, *Stromatactis* limestones, and others (PLAYFORD & LOWRY 1966; PLAYFORD et al. 2009).



**Fig. 4.** A skull of the lungfish *Griphognathus*, seen in ventral aspect, discovered by J. A. LONG.



**Fig. 5.** Articulated actinopterygians are extremely rare in the Devonian worldwide, but reasonably common in the Gogo Formation. This *Moythomasia* was found by D. GARCÍA-BELLIDO.

It was an exciting fieldtrip overall that showed both the area's educational and palaeontological potential of the area. More importantly, the collaboration between the Gooniyandi communities and the visiting researchers matured. We hope that the communities will succeed in securing funding to create a visitor centre to convey the palaeontological and palaeontological findings to both the Gooniyandi people and visitors.

palaeontological and palaeontological findings to both the Gooniyandi people and visitors.



**Fig. 6.** “Gomphoceratids” are moderately common in the Gogo and Sadler Formations. This specimen was found by C. J. A. BRADSHAW.

It was an exciting fieldtrip overall that showed both the area's educational and palaeontological potential of the area. More importantly, the collaboration between the Gooniyandi communities and the visiting researchers matured. We hope that the communities will succeed in securing funding to create a visitor centre to convey the palaeontological and palaeontological findings to both the Gooniyandi people and visitors.



**Fig. 7.** Big stromatoporoids, one of the main reef builders of the Canning Basin, Windjana Gorge.



**Fig. 8.** Slope sediment with a stromatoporoid, an orthocone, brachiopods, and spiritic cements in the reef near the village of the Galeru community.



**Fig. 9.** Textbook quality *Stromatactis* in the reef near the village of the Galeru community.

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## DEVONIAN MEETINGS



23 - 27 June  
Université Toulouse III - Paul Sabatier



**20<sup>th</sup> ICCP** International Congress on the Carboniferous and Permian  
**VARISCAN MEETING 2025**  
From the mantle to the biosphere

# First Circular

### Invitation

We cordially invite you to attend **GeoTolosa2025 – News from the Paleozoic World**, to be held from June 24<sup>th</sup> to 27<sup>th</sup> 2025 at the University Toulouse III, Paul Sabatier (Toulouse, France).

GeoTolosa2025 will bring together scientists from around the globe who study the geosphere, biosphere and atmosphere of Devonian, Carboniferous and Permian times, scientific communities that usually gather separately at the International Congress on the Carboniferous and Permian (ICCP), VARISCAN or International Subcommission on Devonian Stratigraphy meetings. It is our ambition to provide an assembly where these communities can interact and improve our understanding of the Earth system's complex history and evolution during late Paleozoic times.

GeoTolosa2025 will explore a broad range of topics and disciplines, focusing on both endogenic and exogenic processes. Subjects will include **stratigraphy, sedimentology, basin evolution, paleontology, paleoclimate, paleoceanography**, as well as **tectonics, geodynamics, paleogeography**, and **major orogenic systems** such as the Variscan or Central Asian orogenic belts.

All communities will have the possibility to organize specialized sessions over the course of the four-day event. The program will be completed by **pre- and post-meeting field trips**.

We invite you to join us at **GeoTolosa2025**, where you can showcase and experience how vibrant, cutting-edge, and impactful research on Late Paleozoic times can be. We look forward to welcoming you to this exciting gathering of global experts!

Markus ARETZ (Chair of GeoTolosa 2025)

### General Information

**Congress dates:** 24<sup>th</sup> - 27<sup>th</sup> June 2025

**Web site:** [www.geotolosa2025.sciencesconf.org](http://www.geotolosa2025.sciencesconf.org)

**Contact:** [geotolosa2025@sciencesconf.org](mailto:geotolosa2025@sciencesconf.org)

**Chair:** Markus ARETZ

**Local Committee Members:** Julien BERGER, Dominique CHARDON, Frédéric CHRISTOPHOUL, Yoann DENÈLE, Guillaume ESTRADE, Vincent LUCCISANO, Élise NARDIN, Delphine ROUBY, Charlotte SEBASTIAN, TIFFANY VEST

**Scientific Committee Members:** Michel BALLÈVRE (France), Florence CAGNARD (France), CHEN Jitao (China), José Ramón MARTÍNEZ CATALÁN (Spain), Bernard MOTTEQUIN (Belgium), Pavel PITRA (France), Michael STEPHENSON (United Kingdom), Ladislav SLAVÍK (Czech Republic), José Ignacio VALENZUELA RÍOS (Spain), Olivier VANDERHAEGHE (France), Liz WELDON (Australia)

### Congress Schedule

June 20th - June 23rd 2025	Pre-conference field trips
June 23rd 2025	Start registration, ice-breaker party in the evening
June 24th – June 27th 2025	<p>Scientific symposia:</p> <p>Reading the sedimentary record - environments, facies and basin analysis            Reading time - stratigraphy and geochronology            Life on Earth - organisms and ecosystems            From rifting to the construction and destruction of Late Paleozoic orogens - Tectonic, metamorphic and sedimentary records            Oceans and continents in time and space - everything around paleogeography and tectonic reconstructions            Structure and evolution of the Lithosphere - clues from magmatism, geophysics and the mantle            Economic geology - from ore deposits to non-conventional resources            Reconstructing palaeoclimates - from data to models            Regional geology and case studies: from the outcrop to global implications            Gala Diner: June 25th</p>
June 28th – July 1st 2025	Post-conference field trips

### Call for Sessions

We invite you to propose sessions for the different symposia listed above. Please send your proposal before December 1<sup>st</sup>, 2024 to [geotolosa2025@sciencesconf.org](mailto:geotolosa2025@sciencesconf.org). The proposal should include names of convenor(s) and a short description (5-15 lines) of the session.

If you think that something is missing in our list of symposia, please contact the organizers before November 15th, 2024.

### Field trips

We are currently working on proposals for an attractive program of pre- and post-meeting field trips illustrating the Devonian to Permian of France.



For the moment we have commitments for following field trips:

- A geotraverse of the southern French Massif Central: from rifting of the Gondwana margin to Variscan orogeny
- Pre-orogenic and early syn-orogenic sedimentary successions of the Devonian and Carboniferous in SW France from the Montagne Noire to the central Pyrenees
- Late orogenic collapse and Stephanian basins: Decazeville and Saint Perdoux (French Massif Central)

### Venue

Toulouse is the **4<sup>th</sup> largest French city**, in the heart of southwestern France. The town is ideally located, halfway between the Pyrenees Mountains, the Atlantic Ocean and the Mediterranean Sea. Toulouse is traversed by the Garonne River and the charming Canal du Midi. This city tingles your spine with a latin heat that inspires both its temperature and architecture.

The city seduces by its small sinuous streets and diverse medieval to modern monuments, as the City Hall and its Donjon (XVI<sup>th</sup>), or the numerous noble townhouses (XVI<sup>th</sup>-XIX<sup>th</sup>). Toulouse is a cosmopolitan and enthusiastic town, mixing historical heritage and modern lifestyle. Gastronomic specialties include the famous ‘saucisse de Toulouse’, the ‘Cassoulet’, and the delicate ‘foie gras’. The university, founded in 1229, is the third largest in France, one of the oldest in Europe.

The congress will take place on the main **campus of the University Toulouse III Paul SABATIER**. Most of the activities will take place in the central building, e.g. congress desk, plenary sessions in the Marthe Condat Auditorium, poster sessions, coffee and lunch breaks. We have also access to more lecture halls in the neighboring buildings to organize the various sessions of the program.

### Travel

Toulouse can be easily reached by car (Motorways A61, A62, A64, A68), train (Toulouse Matabiau station) and airplane (Toulouse-Blagnac international airport, TLS). The Université Toulouse III, Paul Sabatier campus is situated in the southeast of Toulouse and easily reached by public transport (metro line B) or by car.

[Toulouse-Blagnac international airport](#) is situated at about 8 km northwest of Toulouse. The city center is easily reached by airport shuttle service, [public transport](#), or taxi. [Toulouse Matabiau Train Station](#) is situated in the city center ([voyage-sncf](#) or [tgv-europe](#)). You can also hire a car from one of the many rental car companies at the airport or at the train station.

Please check if your visit in France will require a visa. On request, we will provide official invitation letters to delegates who need to apply for a visa.

### Registration and fees

Registration will be possible via the conference website starting February 1<sup>st</sup>, 2025. The registration will include the lunches for all four days of the conference, which will be organized on site. The

anticipated fees for early bird registration are 400 € for full delegates and 300 € for students. If further financial support can be secured from partners and sponsors, these amounts will decrease.

### Important Dates

- End of **call for sessions**: December 1<sup>st</sup>, 2024
- Dispatch of **second circular**: first week of January 2025
- **Opening abstract submission**: January 1<sup>st</sup>, 2025
- **Opening registration**: February 1<sup>st</sup>, 2025
- **Deadline for abstract submission**: March 10<sup>th</sup>, 2025
- **Notification** oral and poster communication: April 15<sup>th</sup>, 2025
- **Deadline for early bird registration**: April 30<sup>th</sup>, 2025
- Publication of **final scientific program** and **third circular**: June 1<sup>st</sup>, 2025

**See you in Toulouse !**

### 7th International Palaeontological Congress

30 November — 3 December 2026



[The 7th International Palaeontological Congress \(ipc7.site\)](http://ipc7.site)

You are warmly invited to attend the 7th International Palaeontological Congress (IPC7) in South Africa in 2026. This is the first time that this meeting will be held in Africa, and we are delighted to be hosting the meeting in Cape Town during our pleasant early summer season from the 30 November to 3 December 2026.

The venue for IPC7 will be the top-rated sustainably designed Century City Conference Centre (CCCC) ([ccconferencecentre.co.za](http://ccconferencecentre.co.za)), which has cutting-edge technological facilities and the capacity to host hundreds of delegates. The CCCC is situated in Century City, which is just 10 mins from Cape Town's CBD, and hosts several hotels, and numerous restaurants to suit all pockets. CCCC is meticulously maintained, a short walk to the award-winning wetlands and bird sanctuary, Intaka Island (<https://intaka.co.za/>), and the beautifully landscaped Ratanga Park. We are also organising a series of fieldtrips to give delegates a feel for the richly fossiliferous rocks in southern Africa that span significant periods of geological time. Among the fieldtrips planned are a mid-conference day trip to West Coast Fossil Park, as well as a visit to the local Iziko SA Museum of Cape Town. In addition, several pre- and post-conference trips are being planned to the:

- Karoo Basin
- Evolution of Early-Middle Palaeozoic environments and ecosystems of South Africa
- Devonian Ecosystems
- Lower Jurassic of Southern Africa
- Maropeng Cradle of Humankind

Museum collection visits to various museums (see below) in South Africa can be arranged post- or pre- conference.

- Iziko Museums of Cape Town
- Ditsong Museums (Pretoria)
- Albany Museums (Makhanda)
- Bloemfontein National Museum
- Evolutionary Studies Institute (Johannesburg)

The conference is open to any aspect of palaeontology, and we invite you to propose a symposium or themed session on any of the following topics, or on any other topic for which you think you would be able to attract speakers: Early Life: origin, and diversification; Palaeozoic seas; Evolution of trees and forests; Early animals; Tetrapod diversification; Therapsid diversification; Diversification of angiosperms; Rise of Archosauria; The rise and diversification of nonavian dinosaurs; Evolution of birds; Palaeoneurology; Devonian stratigraphy, environments, and palaeontology; Cenozoic vertebrates; Extinctions; Ichnology; Continental Palaeoecology; Indigenous Knowledge; Indigenous palaeontology; Evolution of the brain and nervous system; Palaeohistology of mineralised tissues; Hominin diversification; Palaeosciences to the wider public; Synchrotron imaging and 3D imaging; 3D Morphometrics; General palaeontology.

Preliminary registration for the conference: [The 7th International Palaeontological Congress \(ipc7.site\)](http://The 7th International Palaeontological Congress (ipc7.site))

Future circulars will provide more details regarding abstract submission format and deadline, accommodation, etc. If you have any questions, you are welcome to contact us by email [2026ipc7capetown@gmail.com](mailto:2026ipc7capetown@gmail.com) or on our social media channels.



#### Organising Committee

Prof. Anusuya Chinsamy-Turan, (Chair), Prof. Emese M. Bordy, Dr. Miengah Abrahams, Dr. Maria-Eugenia Pereyra, and Ms Caitlin Rabe (postgrad student) from the University of Cape Town; Prof. Marion Bamford, Prof. Jonah Choiniere, Prof. Julien Benoit, and Dr Cameron Penn-Clarke from the University of the Witwatersrand; Dr. Romala Govender, Iziko Museums of Cape Town; Dr. Mirriam Tawane, Ditsong Museum; Dr. Rob Gess, Albany Museum; Jonatan Dechamps, Website manager.

## 7th International Palaeontological Congress

30 November — 3 December 2026

### IPC7 Call for Symposia Proposals



Symposia may be on all aspects of palaeosciences and its connections to biology, earth and planetary science, from the Archean to the Holocene and cover work from all continents. Suggestions for interdisciplinary, 'cutting-edge' and new technology symposia are particularly welcome.

Conveners/co-conveners should provide a short description of the proposed symposium, and a list of confirmed speakers and their tentative presentation titles. We encourage diversity; race, gender and career stages should be considered when selecting speakers.

In each symposium, oral presentations are limited to 12 minutes with 3 minutes for questions, but keynote presentations could be 30-45mins. The duration of the symposium could ideally be two hours, two and a half hours, or four hours in duration, i.e., 8, 10 or 16 presentation slots. If necessary, longer symposia can be arranged. Posters could also be included as part of the symposium.

IPC7 does not have the funding to invite symposia presenters. In the symposium proposal, conveners should please specify if resources are available to invite keynote speakers and/or other speakers to the symposium, or if speakers will be self-funded.

Symposium proposals, including both the description and the list of presenters and titles, should not exceed two single-spaced pages in length.

Deadline for detailed proposal submissions: 1 November 2024. Please submit your detailed proposal to [2026ipc7capetown@gmail.com](mailto:2026ipc7capetown@gmail.com)

Note that we currently have the following proposed symposia, but we are willing to consider other topics, especially regarding topics that have not yet been suggested, such as plant evolution, palynology, arthropods, Archaean and early Proterozoic life, etc.

1. Flight Evolution in Vertebrates.
2. Recent advances in Mongolian Cretaceous Palaeontology and Geology
3. Origins: work on Triassic and Early Jurassic dinosaurs
4. Continental ichnology - Inclusive of all studies related to trace fossils in the continental realm
5. Palaeohistology of vertebrate mineralised tissues.
6. Paleoneurology, cognition, and behaviour of vertebrates. This will host talks about the evolution of the vertebrate neurosensory system (brain, sense organs, etc.), from fish to hominins
7. Rocks and the Rise of Ordovician Life

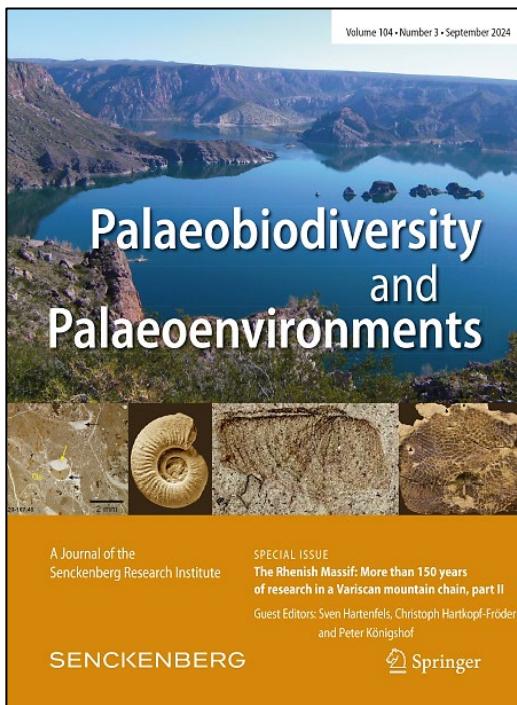
8. Early Vertebrates
9. Devonian stratigraphy, environments and palaeontology with focus on Gondwana
10. Cenozoic mammals (including whales).
11. Current Directions in Human Evolution, Research in Africa
12. workshop on communicating with public audiences, including religious audiences, about evolution
13. Fossils from Himalaya: - Understanding the Tethys and time the India- Tibet Collision
14. ichthyosaur evolution and biology
15. Recent advances in vertebrate taphonomy
16. Quaternary micropalaeontology
17. Gondwana in crisis: life in the southern hemisphere during the Permian-Triassic
18. World Indigenous knowledge and history of science
19. Neogene primates and the origin and evolution of Hominidae
20. Disease in the fossil record
21. Evolution of brain and cranial anatomy through 5 major extinctions

Please visit our website and social media for more information regarding the pre- and post-conference trips are being planned: [The 7th International Palaeontological Congress \(ipc7.site\)](http://The 7th International Palaeontological Congress (ipc7.site))

Preliminary registration for the conference: [The 7th International Palaeontological Congress \(ipc7.site\)](http://The 7th International Palaeontological Congress (ipc7.site))

Future circulars will provide more details regarding abstract submission format and deadline, accommodation, etc. If you have any questions, you are welcome to contact us by email [2026ipc7capetown@gmail.com](mailto:2026ipc7capetown@gmail.com) or on our social media channels.

## DEVONIAN PUBLICATIONS



HARTENFELS, S., HARTKOPF-FRÖDER, C. & KÖNIGSHOF, P. (Eds., 2024). The Rhenish Massif: More than 150 years of research in a Variscan mountain chain, part II. – *Palaeobiodiversity and Palaeoenvironments*, **104** (3): 437-752; link: <https://link.springer.com/journal/12549/volumes-and-issues/104-3>

Together with the first part, published in 2022 (vol. 102 (3): 493-829), the two special issues are part of a series, which provide information about the state of the art geological/palaeontological research on the Devonian to Mississippian in the Rhenish Massif. Due to its excellent fossil record and high-resolution biostratigraphy, it is a key area to study anoxic events, extinction and innovation phases, and ecosystem-climate interactions. Numerous studies, including benchmark papers, have been published over the past 150 years. However, there is still a need for further research on a variety of topics. The special issues and the series will spark further interest in the region for perspective studies, including the application of innovative methods. We invite all colleagues to contribute to the series. Please feel free to contact one of the series editors before submitting your manuscript.

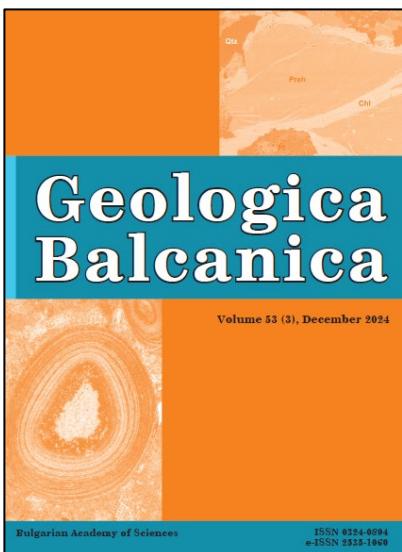
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## MEMBERSHIP NEWS

### CM Markus ARETZ

Despite limited time for personal research over the past year, I have continued to work on several projects and topics. My research on the Devonian-Carboniferous Boundary and Devonian reefs remains ongoing. I am in the process of preparing a proposal to submit to the SCCS for the validation of the new boundary criterion for the SDS. Although the proposal is nearly complete, some data still need to be reviewed, and a few corrections are required.

Significant progress has been made in the study of Devonian reefs, particularly through two Ph.D. projects. In January 2024, **Tanja UNGER** (Bochum) successfully defended her thesis on the exceptional exposures of a Givetian reef system in the Klutert Cave. **Matthieu SAILLOL** (Toulouse) is in the final stages of his Ph.D., which focuses on the evolution of Lower Devonian reefs in various regions of France and the Carnic Alps. His defense is scheduled in the coming months.

Additionally, two books — one in English and one in French — on the Variscan orogeny were published earlier this year. These books contain an extensive chapter on the Devonian and Carboniferous sedimentary basins, co-authored with Elise NARDIN (Toulouse), Frédéric CHRISTOPHOUL (Toulouse), and Julien DENAYER (Liège).

Finally, preparations for **GeoTolosa** (June 2025) are progressing well. This event will bring together scientists from around the world to discuss the geosphere, biosphere, and atmosphere of the Devonian, Carboniferous, and Permian periods. We look forward to welcoming many SDS members next year in Toulouse (see circular under Devonian Meetings).

### CM Gordon C. BAIRD

With Carlton BRETT and Randy BLOOD, we wrote up and submitted a short paper as a follow-up submission for the SDS Geneseo 2023 Summer Meeting paper presentation, although this new

paper topic was an entirely different one than that presented at the conference. The new paper represents preliminary documentation of a widespread, but largely unreported and minimally characterized phenomenon of regional thermal-burial-related darkening of low TOC (total organic carbon) shales and calcareous mudrocks that appears to be covariant with the paleotemperature proxy conodont CAI (Color Alteration Index). With increased thermal-burial changes, this mudstone darkening effect coincides with loss of color in many fossils and conspicuous increase of light reflectance in graptolites. These changes are documented for certain Ordovician and Devonian shale units as they are traced from the craton into the Appalachian Basin across southern Ontario into New York State. We believe, pending future quantification and calibration of these parameters with standing paleotemperature burial proxies, they will be of particular use in exploration as well as other aspects of sedimentary geology.

### Publications

G. BAIRD contributed to a post-conference part of a multi-day field trip, conducted 08/03/23 – 08/07/23, linked to the Summer 2023-SDS meeting held in Geneseo, NY. Although this would have best come in the 2023 Newsletter, final, citeable assembly of the post-meeting multiauthor-multi-day documents was not available to me until after the last newsletter sending deadline.

BARTHOLOMEW, A. J. & VER STRAETEN, C. A. (Eds., 2023). Lower and Middle Devonian Strata of New York State: Genesee River Valley to Hudson Valley, 2023. - International Commission on Stratigraphy, Subcommission on Devonian Stratigraphy Meeting, Guidebook for Field Trip 4, 131 pp.; SUNY Geneseo, NY. [with stop contributions from Gordon BAIRD, Alex BARTHOLOMEW, Carlton BRETT, Anne-Christian DA SILVA, James EBERT, William KIRCHGASSER (deceased), Jeff OVER, William STEIN, Dennis TERRY, Chuck VER STRAETEN, and James ZAMBITO].

TSUJITA, C. J. & BAIRD, G. C. (2024). Tentaculitids in subvertical (life) position in the Middle Devonian Arkona Formation, southern Ontario, Canada. - Palaios, 39: 113-126; doi.org/10.2110/palo.2023.029.

## CM Alex BARTHOLOMEW

The last summer was spent doing some field work on the Middle Devonian of southeastern New York State with a student from St. Andrews University in the UK and some of Carl BRETT's students from the University of Cincinnati. **Sophia CATON**, a student at St. Andrews University, who is from Long Island (southern NYS), was home for the summer and needed to do a mapping project. She contacted Carl BRETT and me to ask if we could help her out with some work in the Middle Devonian of NYS and we said sure! For a week we visited sections in the Hudson Valley as a group, seeing many of the good Stony Hollow/lower Marcellus interval sections. Sophia then spent a month measuring sections, mapping structure, and taking samples for isotopic analysis from brachiopods from the Stony Hollow interval of the Hudson Valley, as well as collecting some samples from the Arkona/Hungry Hollow interval in southern Ontario. She will report on these finding in the coming months as she finishes up her work back in Scotland.

Last fall, I have been awarded a research sabbatical by my university and I am beginning a research project with undergraduate students on the stratigraphy of the upper Helderberg/lower Tristates group interval in southeastern New York State/northern New Jersey/northeastern Pennsylvania. This interval near the Lochkovian/Pragian stage boundary contains a substantial unconformity (the Wallbridge Unconformity between the Tippicanoe and Kaskaskia mega-sequences of SLOSS) across much of eastern North America EXCEPT in this study area, where deposition was nearly continuous. This interval also contains the boundary between the Helderberg and Oriskany Evolutionary-Ecological Sub-Units (EESUs). My research will focus upon documenting the stratigraphy of this interval across the study area, delineating where the sections are most conformable, and then sampling for macrofauna to better understand the nature and timing of the EESU turnover event. A fun aspect of this project is that this interval is best exposed around a locality called Trilobite Mountain in southeasternmost New York State, with an

abundant trilobite fauna, including the rare trilobite *Phalangocephalus dentatus* (BARRETT) along with large dipleurid trilobites as well (see Fig. 1).



**Fig. 1.** Pygida of *Phalangocephalus dentatus* (BARRETT) from the Port Jervis Formation, Monatgue, N.J.

## TM R. Thomas BECKER, CMs Z. Sarah ABOUSSALAM, Till SÖTE, and the Münster Group

The Münster Devonian Group is still traumatized by the unexpected and sudden death of our Ph.D. student and good friend Stephan HELLING (see obituary). Only two months earlier, we lost our old friend Jürgen BOCKWINDEL with whom we shared so many remarkable Morocoo trips. It is bizarre and frightening that both perished in a similar way by heart failure just from one minute to the next, as if switched off.

Among the positive highlights of the last year was the March field trip to Morocco with Mieke and Till, and jointly with Heiko HÜNEKE from Greifswald and his new research student Marcel SCHLEMBACH, a former Münster student. In the

Tafilalt, we pursued contourite research (see GIBB et al. 2024a, 2024b), this time with a focus on the lower Emsian. For Mieke LÖW, who is now a full-time research assistant, a second focus were Frasnian sections with good goniatites but we also collected more pharciceratids and the F-F boundary at Rich Gaouz. Before driving down to the Anti-Atlas, we met our good old friend Ahmed EL HASSANI and Amine TALIH. In the Meseta, we sampled on a rainy day Ahmed's old Guenfoudia section in the Rabat-Tiflet Zone for microfacies and conodonts. Results will go into our planned third volume on the Moroccan Meseta, again to be published in the *Frontiers in Science and Engineering* journal of the Hassan II Academy of Science and Technology of Morocco. Progress of the volume slowed down because of the completion of too many other manuscripts but we hope to get it done over the coming winter season.

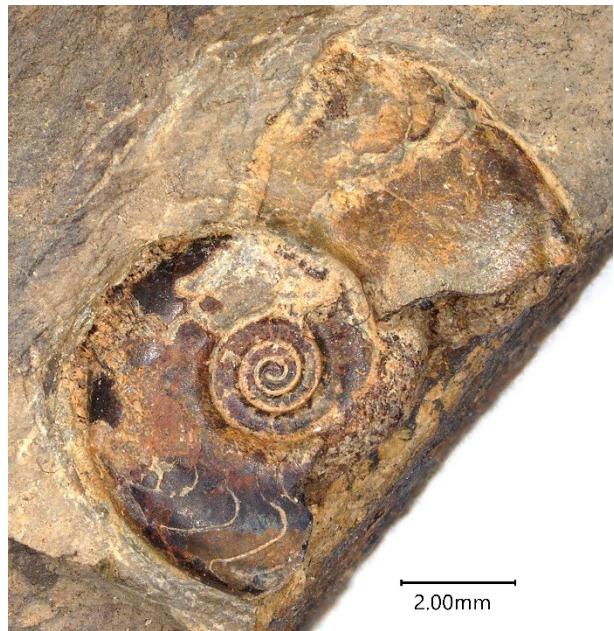


**Fig. 1.** Field meeting in the metamorphic limestone succession of the central Jebilet, March 2024. From left to right with A. SOULAIMANI, N. LAZREQ, A. EL HASSANI, M. LÖW, T. SÖTE, and A. TALIH.

In the central Jebilet, we met Nezha LAZREQ and Abderrahmane SOULAIMANI from Marrakech (Fig. 1), who had described in 2023 Upper Devonian conodont remains from strongly metamorphozed limestones that were always thought to be Viséan in age. In my long personal research history, I have never seen Upper Devonian limestones that were partly made of andalusite or garnets.

Based on older collections, a range of other Moroccan discoveries have just been published or have been submitted. These include Givetian plants

from Oum el Jerane (MEYER-BERTHAUD et al. 2024), rare pharciceratoids that clarify the origin and early evolution of the superfamily (BECKER submitted), and new, rare goniatites and clymeniids from the Dasberg Event beds (to be submitted in November). An intensive survey of all published Anti-Atlas Devonian ammonoid faunas, unpublished thesis data and Münster collections, with more than 3.500 individual records from specific zones and localities, resulted in a high-resolution regional palaeodiversity analysis. It was presented at a special mollusk symposium in honor of the retiring Dieter KORN and Martin ABERHAN at the Museum für Naturkunde, Berlin, in spring 2024 (BECKER 2024a). A similar presentation will be given at the annual meeting of the Paläontologische Gesellschaft in Warsaw, Poland, in September. Peter MÜLLER is still waiting for the English translation of a joint manuscript on new top-Tournaisian (Erdbach Limestone equivalent) trilobites from the Jebel Begaa in the southeastern Tafilalt.



**Fig. 2.** A new oldest (basal Frasnian) species of *Acanthoclymenia* from black shales drowning the Neandertal Reef in the Bergisches Land (western Rhenish Massif).

Research in the Rhenish Massif continued a focus on reefal facies and the dating of reef extinctions. Rare goniatites from a black shale immediately overlying the poorly studied Neandertal Reef (yes, the one with the famous early

man living in karst caves) enabled a precise dating of the drowning event (BECKER 2024c). The annual conference of the *Oberrheinischer Geologischer Verein* took place in early September in Münster. An excursion led through the thick Hönne Valley Reef and also showed the *Annulata* Event and Devonian-Carboniferous boundary in the condensed overlying pelagic succession. A field guide was published in their regular journal (BECKER et al. 2024). Together with Sven HARTENFELS and Sören STICHLING, Thomas examined several borehole cores of the Lhoist Germany/Rheinkalk through the upper reef and post-reefal nodular limestones, which expose a surprising complexity of thin black shale events. One core will be permanently transferred to Krefeld, one to Münster, where they will be available for detailed studies, jointly with David DE VLEESCHOUWER and students.

Rhenish ammonoid work benefits considerably from material that is made available by amateur collectors, notably by Hartmut KAUFMANN. By a series of unlikely coincidences, we managed in spring 2024 to purchase a large part of the ammonoid collection of H. BOTTKE from the red iron limestones of the eastern Rhenish Massif. He was the mining geologist of the Adorf region and published goniatite and conodont faunal lists, mostly from the subsurface. (e.g., BOTTKE 1962, *Roemeriana*, **6**, 1965, *Beihefte zum Geologischen Jahrbuch*, **63**). Later, he joined the now closed institute at Clausthal-Zellerfeld in the Harz Mts. We assumed that the Clausthal collection was transferred to Göttingen but in fact various original collections (including BOTTKE material) was simply ordered to be thrown away. Accidentally, it could be saved by a local amateur collector, who died this year and his widow offered the fossils and rocks, including many goniatites, for sale on the internet.

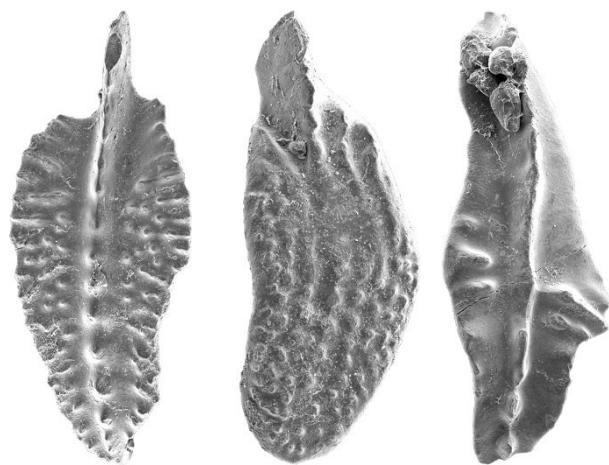
As a preparation for a planned project on the poorly understood global ammonoid extinctions within the Hembergian (middle Famennian, Upper Devonian III), the ammonoid-based definition of the Hembergian has been revised (BECKER 2024b). In parallel, the description of new Frasnian crinoid faunas from the Eifel Mts. and their stratigraphical

context has now been published (BOHATY et al. 2024). I have not yet given up the hope that the voluminous book on the mid-European Variscides, which includes a detailed review of Devonian and Lower Carboniferous events, will be eventually published (BECKER 2024c); the manuscript was first written in 2021 but received an update in 2023.

Cooperation with **Ahmed ZEGHARI** from Algeria continued and after two rounds of reviews and corrections, there are now good prospects that the Lower Devonian siliciclastic microbialite paper will make it soon.

### **CM Zhor Sarah Aboussalam**

Sarah continued her major effort to identify all new Moroccan conodonts (Fig. 3) and to document all microfacies thin-sections for the planned third Meseta volume. Some of the samples from the spring field trip have not yet been completed. In addition, she continues to identify conodonts for the contourite project of Heiko and the Greifswald Group, resulting in her co-authorships (e.g. GIBB et al. 2024a, 2024b). There are more Rhenish samples from reefal/postreefal outcrops, with results used in the Hönne Valley Guidebook (BECKER et al. 2024).



**Fig. 3.** Top-Givetian conodonts from Amdawar north of Dechra-Ait-Abdallah, eastern Western Meseta, Morocco.

### **CM Till SÖTE**

Till has left geology/palaeontology for a very different full-time profession but is still living in the Münster region and co-supervising B.Sc./M.Sc. theses on Devonian topics, especially on ammonoids (e.g. the theses of Max GROßKLAUS and

Alex KLEMENT). He took holidays to join our spring field trip in Morocco. At least three publications are waiting for Thomas to find the time for their completion: the upper Frasnian tornoceratids of Oued Mzerreb (Dra Valley, Morocco) and Ouidane Chebbi (eastern Tafilalt), and the lower Famennian goniatites of the Canning Basin.

### Ph.D. students

After a long pause due to a change of his full-time position in environmental geology, Stephan EICHHOLT returned to the institute in evenings to finish his microfacies work on the Oulmes/Ain Jemaa reef in the Moroccan Meseta. Progress has been made and there should be a publication in the third Meseta volume, probably in the first half of 2025.

In the frame of his full-time position in the Geological Survey of NRW in Krefeld, Sören STICHLING continues mapping projects in the Devonian and Lower Carboniferous of the Rhenish Massive, with some focus on the reefs, not only of the Hönne Valley (the lingering Ph.D. project). For example, he will survey a planned bore hole through the Schwelm Reef.

Mieke LÖW completed her M.Sc. revision of upper Frasnian (pre-Kellwasser) manticoceratids from the Rhenish Massif, but more and more material became available, so that she will have to continue the topic in her new position as research assistant and Ph.D. student. She will deal in future with top-Frasnian (UD I-K/L) faunas from Büdesheim (Eifel), Bergisch Gladbach-Sand and traditional Rhenish localities (Martenberg, Beul), including *Crickites* from the Upper Kellwasser Limestone. During the spring field work in Morocco, she managed to collect good goniatites in all Frasnian localities, even in places that were thought to be poor in suitable material (Fig. 4). The Frasnian gephueroceratids of Morocco will form the second part of her Ph.D. project.

### M.Sc. Students

Alexander KLEMENT finished his project on the middle Famennian (Upper Devonian III) ammonoids of the WAPET H section in the Mt.

Pierre region of the Kimberleys, Western Australia. All species, including a new *Pernoceras*, *Falcitornoceras* and raymondiceratid genus, were characterized by ontogenetic morphometry. But this was a difficult task due to the strong sparitization of inner and diagenetic corrosion of the outer whorls. Comparisons with contemporaneous German species were made. Alex made sure to finish his Master since a position in environmental geology was already waiting for him.

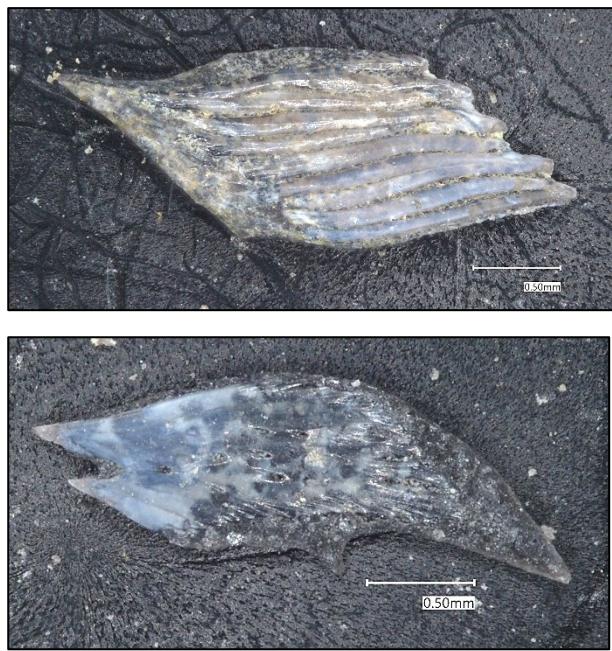


**Fig. 4.** Field photo of a large middle Frasnian *Manticoceras* in unusual siderite preservation from the previously unstudied succession overlying laterally the Hollard Mound at the eastern end of Hamar Laghdad.

### B.Sc. students

Max GROBKLAUS finished his project on the lower Frasnian *Koenenites-Hoeninghausia* fauna of Sadler Ridge in the Canning Basin. Based on detailed ontogenetic morphometry, the local representatives of both genera were refined and several morphotypes can be distinguished.

Verena BUSCHHAUS finalized early in 2024 her project on the abundant actinopterygian scales and subordinate teeth/jaw parts of Wusten in the eastern part of the northern Hofermühle Reef of the northern Bergisches Land. We are aware that early actinopterygians had several different scales on parts of their body (Fig. 5), but the high amount of partly very different scale types suggests that several species of bony fishes once roamed the open, initial biostrome. Scales become rare in the main reefal succession.



**Fig. 5.** Two strongly different palaeoniscid fish scales from the base of the northern Hofermühle Reef at Wusten (Velbert Anticline, northern Rhenish Massif).

Viola KÖNIG CASTRO submitted in March 2024 her thesis on two new phacopid species from the Taghanic Crisis Interval of Hassi Nebech, Tafilalt Basin, southern Morocco. One is probably a slightly atypical new species of *Cronierella*, the second a new genus and species with unusually large eyes. Viola started to write a publication on these.

## Publications

### Regular papers

BECKER, R. T. (2024b). New ammonoid records and the definition of the base of the German Hemberg-Stufe (Famennian III, Upper Devonian). – *Palaeobiodiversity and Palaeoenvironments*, **104** (3): 683-705; doi.org/10.1007/s12549-024-00623-4.

BECKER, R. T. (2024c in press). Devonian and Lower Carboniferous global events in the Central Variscan orogen. – In: LINNEMANN, U. (Ed.), *Geology of the Central European Variscides and its Avalonian-Cadomian precursors*; Springer.

BECKER, R. T. (2024d in press). Das Absterben des devonischen Neandertal-Riffes datiert durch seltene Goniatiten. - *Archäologie im Rheinland*, **2023**: 52-55.

BECKER, R. T., HARTENFELS, S., STICHLING, S., LÖW, M. & ABOUSSALAM, Z. S. (2024). Riffentwicklung und globale Events im Raum Hönnetal (nördliches Rheinisches Schiefergebirge, Nordsauerland, Mitteldevon – Unterkarbon). - *Jahresberichte und*

*Mitteilungen des oberrheinischen geologischen Vereins, Neue Folge*, **106**: 181-216; doi: 10.1127/jmogr/106/0009.1

BOHATY, J., AUSSICH, W. I. & BECKER, R. T. (2024). Frasnian crinoid associations of the Prüm Syncline (Eifel, Rhenish Massif, Germany) – biostratigraphic framework and macrofossil assemblages. – *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*, **312** (1): 31-83; doi: 10.1127/njgp/2024/1200.

GIBB, A., M., HÜNEKE, H., JADHAV, J., GIBB, L. M., MEHLHORN, P., AYER, O., ABOUSSALAM, Z. S., BECKER, R. T., EL HASSANI, A. & BAIDDER, L. (2024a). Contourite-drift archive links Late Devonian bioevents with periodic anoxic shelf water cascading. – *Geology*, 6 pp.; doi.org/10.1130/G52117.1.

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#### **CM Randy BLOOD**

Over the course of the past year, my work with colleagues Ashley DOUDS and Scott MCCALLUM has continued on stratigraphy and sedimentology of units deposited around the Frasnian/Famennian boundary in the Appalachian Basin. This includes deposits of the Upper Hanover Shale, namely the Point Gratiot Bed (Upper Kellwasser Equivalent), and the overlying division. The name Beaver Meadow Member has formally been suggested for this upper division of the Hanover Shale in a contribution to the forthcoming Proceedings of the SDS Geneseo 2023/IGCP 652 volume: “*Stratigraphy, Sedimentology, and Diagenesis of Centimeter-Scale Black Shale Beds and Associated Strata in the Uppermost Deposits of the Upper Devonian (Famennian) Hanover Shale, Western New York, U.S.A.*”. Currently, we are working on an integrated study of elemental abundance and

pyrite framboid diameters at cm-scale resolution through the Point Gratiot Bed and black shales of the Beaver Meadow Member and overlying Dunkirk Shale Formation. The goal of this research is to provide a detailed understanding and comparison of bottom and pore water redox conditions during deposition of these units and gain insight into possible causes of the expression of the Kellwasser Event as a black shale in the Appalachian Basin. This work includes cooperation with Sarah CARMICHAEL and student Miguel MORENO at Appalachian State University and Thomas HEGNA at SUNY Fredonia. I, along with A. DOUDS and S. MCCALLUM are also working on mineralogical and elemental analysis of these beds to understand the association of Li-ion battery metals (Li, REEs, Mn, Co, Cu, and Ni) with major elements and minerals. Finally, work continues when opportunities arise to study pyrite framboid diameters and elemental abundances in the Marcellus Subgroup across the Appalachian Basin. Ultimately, we hope to provide a basin-scale synopsis of bottom and pore water redox conditions that includes both outcrop and subsurface datasets.

#### **TM Carlton E. BRETT**

Following the “Year of the Devonian” and its many activities, associated with the SDS Meeting in New York in summer 2023, I have had to turn attention to other matters, primarily involving Ordovician and early Silurian stratigraphy as a lead up to completing a new volume on the stratigraphy and paleoenvironments of Paleozoic strata of the Cincinnati Arch. We hope to do another volume on the Silurian-Devonian.

However, I have remained connected to Devonian through research with graduate student Martin WELYCH-FLANAGAN, and with Christopher WAID, Erika DANIELSON, and others at the Ohio Geological Survey (OGS). Martin and I have begun collaboration with the OGS on mapping and improved correlations for the Middle Devonian (Eifelian to lowest Givetian) Columbus Limestone and Delaware Formation. To this end, we have studied a series of drill cores bridging central Ohio with the northern Sandusky region on the rim of the

Michigan Basin. We will attempt to extend high resolution correlations into the Onondaga and Marcellus black shales of the eastern Ohio subsurface and then into Pennsylvania and western New York using a combination of available drill cores and a network. We have also begun re-examining and correlating outcrops in the Columbus area. We hope to continue the effort northward and to tackle the issue of the upper Eifelian Dundee Formation of northern Ohio, which has long remained poorly understood.

In tandem with this effort, we are working with **Benjamin DATTILO** of the Purdue University Fort Wayne and Indiana Geological Survey on the equivalent Jeffersonville and Sellersburg-North Vernon succession in southern Indiana. To date, we have made a reconnaissance survey some ten outcrops and are working toward a finer subdivision and higher resolution correlation with the Columbus and Delaware formations of Ohio and to examine faunal turnovers recorded in this interval.

As a part of this overall effort, Martin WELYCH-FLANAGAN and I have been working on amassing a database on the Eifelian-Givetian stratigraphy and faunas of the eastern mid-continent and comparing these biotas with those of better-known New York and Pennsylvania. This effort is helping to test several aspects of sequence stratigraphy and its relationship to ecological-evolutionary subunits (EESUs) that Gordon BAIRD (Fredonia) and I have proposed nearly three decades ago (BRETT & BAIRD 1995, coordinated stasis paper); the research also builds upon work by Mike DESANTIS and myself (DESGANTIS & BRETT, 2011; BRETT et al., 2011), both in a special issue of *Palaeogeography, Palaeoclimatology, Palaeoecology*. Thus far, we have compiled data on megafauna from Eifelian-lower Givetian units in New York, Pennsylvania, Ontario, Michigan, north and central Ohio, southern Indiana, Missouri, and Alabama. These data compiled from a few papers by the principal workers in each region, show a remarkable degree of lateral continuity of faunas, with 80-90 % of brachiopod, mollusk and coral genera being shared with those in New York though lower proportions in some other groups, notably ostracods. In addition, our preliminary results show

approximately coincident turnovers among the three previously identified major faunas of the Eifelian-Givetian interval: (i.e. the Onondaga, Stony Hollow, and Hamilton faunas of our earlier papers) throughout much of the region. We are working with Gordon BAIRD, Alex BARTHOLOMEW (SUNY New Paltz), Jay ZAMBITO (Beloit College), George MCINTOSH (Emeritus Curator of Rochester Museum and Science Center), Gerry KLOC (Rochester), and others to assemble more detailed local occurrence, and paleoenvironmental data on brachiopod, trilobite, cephalopod, and crinoid faunas, and also to examine the provenance of various faunal elements that appear abruptly at the beginnings of Eifelian-Givetian EE Subunits and to extend that work upward through the Givetian. With new MS student Thomas VAN TASSEL and his former undergraduate advisor Judith NAGEL-MEYERS (St. Lawrence University), we are hoping to extend more detailed studies on the regional and temporal distribution of mollusk faunas, especially bivalves, and the timing and sources of invasion of new taxa.

In addition, I have continued to work with Jay ZAMBITO, Anne-Christine DA SILVA (Université de Liège), and her Ph.D. student Jarno HUYGH on time-series analysis of magnetic susceptibility and high-resolution gamma ray, as well as elemental profiles to examine cyclostratigraphy of the Eifelian-Givetian interval. Powders have been drilled through all calcareous units (most of the core) at 0.6 to 0.1.5 m intervals for analysis of  $\delta^{13}\text{C}_{\text{carb}}$ , C/S, and XRF for major and trace elements. Thomas ALGEO, here at Cincinnati, is analyzing B/Ga ratios of the samples as a proxy for paleosalinity.

During 2023 and early 2024, Gordon BAIRD and I continued work with Greg DIETL, Curator, Leslie SKIBINSKI, Collection Manager, and Stephen MAYER, assistant and expert on local Devonian fossils, at Paleontological Research Institution (PRI). Efforts assemble, integrate, and digitize our combined collections from the Devonian of New York State and elsewhere have nearly been completed with funding from an NSF Grant.

This effort is combined with plans for a digital atlas of Middle Devonian fossils and an extensive

database of geographic and stratigraphic data, based on these collections; this project has moved slowly as Jonathan HENDRICKS, formerly of PRI, who had spearheaded the project, has moved to the Milwaukee Public Museum. However, nearly 200 species have been photographed and we are planning to continue the effort of providing documentary information on these taxa with input from University of Cincinnati graduate students Martin WELYCH-FLANAGAN and Thomas VAN TASSEL.

Gordon BAIRD, Randy BLOOD and I have worked to complete a preliminary project started years ago on color/hardness gradients in shales and fossil color (especially trilobites) in the Devonian and Ordovician of the Appalachian Basin. Darkening and hardening of shale as well as convergence of more varied light brown colors in calcitic fossils toward a monochromatic dark gray to black, appears to parallel change in conodont color alteration indices and other indicators of differential heating of the strata from western to central New York localities. Thus, the simple metrics of coloration, slakeability of shale may provide useful and relatively inexpensive means of evaluating thermal histories in basins. A paper has been submitted to the Devonian SDS 2023 Meeting volume to be published through *Bulletins of American Paleontology*.

Finally, chance discovery by amateur paleontologists James HANNA and Jonathan HOAG, in 2023 of new specimens of a fossil solutan “carpoid” (very primitive asymmetrical echinoderm) from the Middle Devonian (Givetian) Windom Shale of Penn Dixie Fossil Park in western, NY, led to a collaboration with Ronald PARSLY (Emeritus Professor, Tulane University and the world expert on solutans). We are presently completing a paper including systematic description, implications for evolution, and the paleoecology of Devonian solutans. The discovery of this new species results in the range extension of this entire class of echinoderms by 80 million years and provides a classic example of a “Lazarus Taxon”.

## CM Andrés Felipe PASTOR-CHACÓN

My research is mainly devoted to the stratigraphy and sedimentary processes of the Devonian of Colombia and Venezuela, as I currently hold a position as a basin analyst in the Servicio Geológico Colombiano for natural hydrogen exploration. This report covers the period from 2016 to June 2024.

As you may know, the Colombian and Venezuelan brachiopods were pivotal in paleontological taxonomy for defining several families, beginning with the studies of Norman WEISBORD in 1926 and Kenneth CASTER in 1939. In 2016, I began my master's studies in a well-preserved outcrop of the Floresta Formation (late Emsian-late Givetian) in the Floresta Massif, which also contains the correlative levels studied by CASTER (1939). The aim of such research was to investigate the depositional and sedimentary processes of the Floresta Fm., with a multidisciplinary study integrating also lithgeochemistry, organic geochemistry and cyclostratigraphy. In parallel, I benefited from the participation of other masters and bachelor students in the Floresta region. German PARDO (M.Sc.) explored the kinematics of the Soapaga Fault, a basement-related fault with suspected activity extending from the Proterozoic. Luisa RENGIFO (M.Sc.) studied the depositional processes of the clastic facies of the basal formation (El Tibet Fm., and lateral equivalents) of the Devonian succession. Diego VELÁZQUEZ (M.Sc.) investigated the depositional processes of the upper formation (Cuche Fm.) of the Devonian succession. Additionally, Juan Camilo BELTRÁN (B.Sc.) provided a preliminary classification of the Eifelian and Givetian bivalves along the Floresta Formation. Part of this research was published in peer-reviewed journals and congresses from 2020 to 2024.

In parallel, in 2019, the Dirección de Hidrocarburos of the Servicio Geológico Colombiano, started a project sponsored by the Agencia Nacional de Hidrocarburos, to study the Paleozoic succession preserved in the Llanos Orientales Basin as a potential petroleum system. This resulted in the rediscovery of several outcrops

and stored core data, not only from the Devonian. For example, along with the Colombian peace process signed in 2016, several localities, including the Rio Batá section, previously studied by Fritz STIBANE in 1968, were re-mapped and described by the project with the improvement of security in the region. The Rio Batá contains a well-exposed section of Devonian and Carboniferous sediments, and the first Mississippian vertebrates of Colombia were presented by Héctor BOTELLA (University of Valencia) and collaborators in 2020 as a short communication in the *Journal of Vertebrate Paleontology*. Similarly, at least five well cores of the Devonian succession (Frasnian-Fammenian possibly) were described by the project, but this information is currently under embargo, but we expect a future publication dealing with it. As a result, in 2022, the project identified the upside potential of the Paleozoic succession in the Llanos Orientales, especially of the Middle Ordovician, as a conventional and unconventional play. During the next few years, the Paleozoic succession of the subsurface of the Llanos Orientales Basin will continue to be studied as part of the Natural Hydrogen Exploration project by the Servicio Geológico Colombiano, opening possibilities for future collaborations.

In 2020, along with a group of collaborators, I presented as a corresponding author two contributions to the GSA Connects 2020 and the 1st Colombian Paleontological Congress, as part of my master's studies. During GSA Connects 2020, we were invited by the editorial team of *Earth-Science Reviews* from Elsevier to contribute with a review of the Devonian System in Colombia. Such a review was published in 2023, covering various topics of basin dynamics in the Colombian basin and resulting in a refined paleogeographic model.

In 2023, I began my Ph.D. studies at the Universidad Nacional de Colombia, aiming to continue detailing the depositional processes and stratigraphy of the Devonian succession in the Rio Bata. One of the recurring problems of the Colombian Devonian succession lies in the rare presence of pelagic organisms or the limited presence of temperature-sensitive geo-thermocronometers that aid in supraregional

correlations with horizons, zones, and subzones in different GSSPs. However, in 2019, we collected a goniatite in the lower part of the Floresta Formation, as we will prepare a publication along with Thomas BECKER (Münster). We are open and invite local and international collaborators to support our project in different topics.

Lastly, in 2024, the Floresta municipality and its authorities began the process of designating the Floresta Valley as a UNESCO Global Geopark Geosite. This action highlights the importance of the fossil-rich Floresta Formation to both the local community and its heritage. The area is celebrated for its paleontological wealth, which are valuable for scientific research and promote social appropriation. We are supporting such processes by providing technical information about the fossiliferous intervals, their stratigraphy, and depositional environments.

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#### **TM Carlo CORRADINI**

My research is mainly devoted to conodont biostratigraphy from Silurian to the Lower Carboniferous in several regions, specially focusing on the Lower Devonian, and on the Silurian/Devonian and Devonian/Carboniferous boundaries. The latter are mainly related with the International Task Group on the redefinition of the Devonian/Carboniferous Boundary (led by M. ARETZ, Toulouse).

The Carnic Alps represents my main research area. Geology and stratigraphy of several sectors are investigated (together with several colleagues). Main research in progress focuses on the

Lochkovian stratigraphy, the Lochkovian/Pragian boundary, and the evolution of the sedimentary basin during the Lower and Middle Devonian. The older pelagic limestones above the main reefal bodies are in study, too.

Joint-research with colleagues from various institutions continue: in the Montagne Noire (France), research deals with conodonts, stratigraphy and facies in the Famennian and lowermost Tournaisian (with C. GIRARD, R. FEIST, and others); studies on conodonts from some sections in the Ardennes are in progress (with J. DENAYER).

Taxonomic studies on Early (with Maria G. CORRIGA) and Late Devonian (with C. SPALLETTA, C. GIRARD, and others) conodonts are in progress.

### **Publications**

CORRADINI, C., SIMONETTO, L., CORRIGA, M. G., PONDRELLI, M., SPALLETTA, C. & PERRI, M. C. (2023). Stratigraphic sections in La Valute-Chiarò area (Mt Zermula, Carnic Alps, Italy). - Gortania Geologia, Paleontologia, Paletnologia, **45**: 19-36; doi: 10.57614/GORT20380410.2023.45.2.

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### **CM Maria G. CORRIGA**

My research is mainly devoted to Silurian and Devonian conodonts and biostratigraphy in several regions (mainly the Carnic Alps and Sardinia).

In the Carnic Alps, I'm studying several classic and new sections of Silurian and Early Devonian age, mainly in the central sector of the chain. Main research in progress focuses on the Lochkovian conodonts and the Lochkovian/Pragian boundary. In Sardinia, I'm revising the conodont fauna of the

classical Mason Porcus section (Silurian-Lower Devonian).

Studies on Silurian and Devonian conodont taxonomy continue, mainly focusing on Lower Devonian ozarkodinids (with Carlo CORRADINI).

### **Publications**

CORRADINI, C., SIMONETTO, L., CORRIGA, M. G., PONDRELLI, M., SPALLETTA, C. & PERRI, M. C. (2023). Stratigraphic sections in La Valute-Chiarò area (Mt Zermula, Carnic Alps, Italy). - Gortania Geologia, Paleontologia, Paletnologia, **45**: 19-36; doi: 10.57614/GORT20380410.2023.45.2

### **CM James E. (Jed) DAY**

Activities over the last year include continued collaborative work on the conodont biostratigraphy of the Pragian-Middle Givetian of the central and southern Illinois basin that continues with CM Sofie GOUWY of the GSC-Calgary, Brian WILHITE of Grow Mark Petroleum, and ISU students (see DAY & GOUWY 2023; JACOB et al. 2023). We plan to publish results of this long-term surface and subsurface investigation in 2025. Another study to be published soon is the re-study of the *Polygnathus varcus* from its' type locality in southern Minnesota with CMs S. GOUWY and Jay ZAMBITO. In-situ *Po. varcus* were recovered from the Little Cedar Formation associated with other species of the upper *Po. ansatus* and lower *Ozarkodina semialternans* – *Schmidtognathus latifossatus* zones. Shales with mixed Cretaceous pollen and spores and Givetian conodonts that were the source of type specimens of *P. varcus* were not exposed at the type locality in the abandoned quarry at Varco, Minnesota.

Biostratigraphic investigation of the Givetian-Tournaisian New Albany Shale with collaborators at the USGS and Illinois and Indiana Geological surveys is focused on establishing cross-basin correlations and high-resolution geochemical data sets from multiple cores housed at the ISGS and IGS. This core-based project is being conducted with funding from the USGS to assess REE and other strategic metals resources in organic-rich shales. Results of the new high-resolution

biostratigraphic investigation of the conodont sequence and LKE and UKE intervals in the type section of the Sweetland Creek Shale were presented last summer at the SDS meeting in New York (DAY & LONG 2023). Large samples of two ash beds that straddle the F-F boundary sampled by Pat MC LAUGHLIN of the ISGS have not yielded zircons, but do yield conodonts. Jeff OVER sampled the same ash beds and also reported on the lack of datable zircons.

**Tim DE BACKER** (Ghent University) completed his superb study of the Late Frasnian and Early Famennian chitinozoan fauna and biostratigraphy in the Sweetland Creek type section earlier this year (DE BACKER et al. 2024). Tim documented pathological (teratological) chitinozoan morphotypes within the UKE interval. Gavin LONG, CM Neo MCADAMS (Texas Tech University) and I are currently documenting pathological morphotypes of species of *Polygnathus*, *Palmatolepis* and *Ancryognathus* from the LKE interval in this same section. I continue collaborative work with Neo MCADAMS and her students on the Frasnes Event interval in different North American Basins (MCADAMS et al. 2023), as well as the Late Frasnian conodonts from the Iowa Basin.

Continuous sampling and processing of cores spanning the Pridoli-Lochkovian Klonk Event interval from Tennessee was completed this summer. This completes the sampling program to develop high-resolution Sr isotopic, trace element and REE geochemistry of conodont apatite through the entire Devonian System in the Illinois Basin in collaboration with Poul EMSBO of the USGS. Results of some of our histological and geochemical work on conodont elements reveals the fascinating function of white matter in the elements of the conodont feeding apparatus (see EMSBO et al. 2023).

With the publication of most of the results of **Matt BRAUNS'** Ph.D. dissertation (BRAUN et al. 2023), our working group has largely concluded the integrated surface and subsurface investigation of the Late Famennian-Tournaisian of in the western Illinois and adjacent Iowa basins the upper Mississippi River Valley including the type

Kinderhookian (see other older papers listed below). These studies feature important data on the record of the Hangenberg Event as developed in the western Illinois Basin and a restudy of Latest Famennian and Tournaisian conodonts.

I am planning to retire from full-time teaching at ISU at the end of the Spring 2026 semester, but will continue to work on Devonian and Carboniferous projects and hope my faculty colleagues fill my position with a talented stratigrapher and paleontologist.

## Publications

### Papers

DE BACKER, T., DAY, J. E., EMSBO, P., MC LAUGHLIN, P. & VANDENBROUCKE, T. (2024 online). Chitinozoan response to the Kellwasser events': population dynamics and morphological deformities across the Frasnian-Famennian mass extinction. - Papers in Palaeontology, e1557: 39 pp.; doi: 10.1002/spp.21557.

BRAUN, M. G., BANCROFT, A. M., HOGANCAMP, N. J., STOLFUS, B. M., HEATH, M. N., CLARK, R. J., TASSIER-SURINE, S., DAY, J. E. & CRAMER, B. D. (2023). Resolving complex stratigraphic architecture across the Burlington shelf and identifying the Devonian-Carboniferous (Hangenberg) and Kinderhookian-Osagean (Tournaisian) boundary biogeochemical events in the type area of the Mississippian subsystem. - GSA Bulletin, 136 (5/6): 2157-2177; doi.org/10.1130/B36974.1.

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STRAUSS, J. V., FRASER T., MELCHIN, M. J., ALLEN, T. J., MALINOWSKI, J., FENG, X., TAYLOR, J. F., DAY, J. E., GILL, B. C. & SPERLING, E. A. (2020). The Road River Group of northern Yukon, Canada: early Paleozoic deep-water sedimentation within the Great American Carbonate Bank. - Canadian Journal of Earth Sciences, 57 (10): 1193–1219; https://doi.org/10.1139/cjes-2020-0017.

STOLFUS, B. M., CRAMER, B. D., CLARK, R. J., HOGANCAMP, N. J., DAY, J. E., TASSIER-SURINE, S. A. & WITZKE, B. J. (2020). An expanded stratigraphic record of the Devonian–Carboniferous boundary Hangenberg biogeochemical Event from Southeast Iowa (U.S.A.). - *Bulletin of Geosciences*, **95** (4): 469–495.

UVEGES, B. T., JUNIUM, C. K., BOYER, D. L., COHEN, P. & DAY, J. E. (2019; online 2018). Biogeochemical controls on black shale deposition during the Frasnian-Famennian biotic crisis in the Illinois and Appalachian Basins, USA, inferred from stable isotopes of nitrogen and carbon. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **531** (108787): 14 pp.; doi.org/10.1016/j.palaeo.2018.05.031.

EMSBO, P., PREMO, W. R., McLAUGHLIN, P. I., LEONID, N., VANDENBROUCKE, T. R. A., DAY, J. E., DU BRAY, E. A., MANNING, A. H. & BANCROFT, A. M. (2018). Impact of Sedimentary-Exhalative Hydrothermal Systems on Marine Chemistry and Mass Extinctions: Applications for Ore Genesis Research and Mineral Exploration. - *Society of Economic Geologists Special Publications*, **21**: 14 pp.

#### *Field Conference Guidebooks*

DAY, J. E. (Ed., 2023). Field Guide and Stop Descriptions for the 36<sup>th</sup> Annual Great Lakes Section, Society for Sedimentary Geology (GLS-SEPM) & 75<sup>th</sup> Annual TRI-STATE Field Conference (Saturday November 11<sup>th</sup> & Sunday November 12<sup>th</sup>, 2023), Carbondale, Illinois: Aspects of the Paleozoic History of the Southern Illinois Basin. - Field Guide to Saturday Stops 1-5 and Sunday Optional Stops 1-3, 37 pp.

CRAMER, B. D. CLARK, R. J. & DAY, J. E. (2019). The Devonian-Carboniferous Boundary in the Type Area of the Mississippian. - 35<sup>th</sup> Annual Great-Lakes Section – Sepm, 74<sup>th</sup> Annual Tri-State Geological Field Conference. Iowa Geological Survey Guidebook, **30**, 80 pp.

DAY, J. E. & GOUWY, S. (2023). STOP 1: Early and Middle Devonian Stratigraphy, Biostratigraphy And  $\Delta^{13}\text{C}_{\text{carb}}$  Chemostratigraphy in the Type Area of The Grand Tower Formation. – In: DAY, J. E. (Ed.), Field Guide and Stop Descriptions for the 36<sup>th</sup> Annual Great Lakes Section. Society for Sedimentary Geology (GLS-SEPM) & 75<sup>th</sup> Annual TRI-STATE Field Conference, Carbondale, Illinois: 4-14.

CRAMER, B. D., STOLFUS, B. M., DAY, J. E., CLARK, R. J., HOGANCAMP, N. J., WITZKE, B. J. & TASSIER-SURINE, S. (2019). The Devonian-Carboniferous

Boundary in the Mississippi River Valley of Iowa, Illinois, and Missouri. - *Iowa Geological Survey Guidebook*, **30**: 1-9.

HOGANCAMP, N. J., STOLFUS, B. M., CRAMER, B. D. & DAY, J. E. (2019). A Revised Conodont Zonation of the Tournaisian (Kinderhookian to Lower Osagean) and Implications for Stratigraphic Correlation in North America. - *Iowa Geological Survey Guidebook*, **30**: 11-17.

DAY, J. E., GARBER, K. & WITZKE, B. J. (2019). Brachiopod Sequence in the Latest Devonian Hangenberg Extinction and Devonian-Carboniferous Boundary Intervals in Southeastern Iowa, Northeastern Missouri, and West-Central Illinois – Central North America. - *Iowa Geological Survey Guidebook*, **30**: 19-43.

#### *Abstracts*

DAY, J. E. (2024). Middle-Upper Devonian (Mid Givetian-Early Famennian) Event History of The Cratonic Basin Inboard Of The Ouachita Continental Margin In Southern-New Mexico. - *Geological Society of America, Abstracts with Programs*, **56** (6): 1 p.

DAY, J. E. & LONG, G. (2023). Upper Devonian Lower and Upper Kellwasser Extinction Record in the Sweetland and Grassy Creek Shales in the Iowa Basin of Central North America. – In: Subcommission on Devonian Stratigraphy and IGCP 652, Reading geologic time in Paleozoic sedimentary rocks, Field Conference and Business Meeting, Abstracts with Program: 32-33.

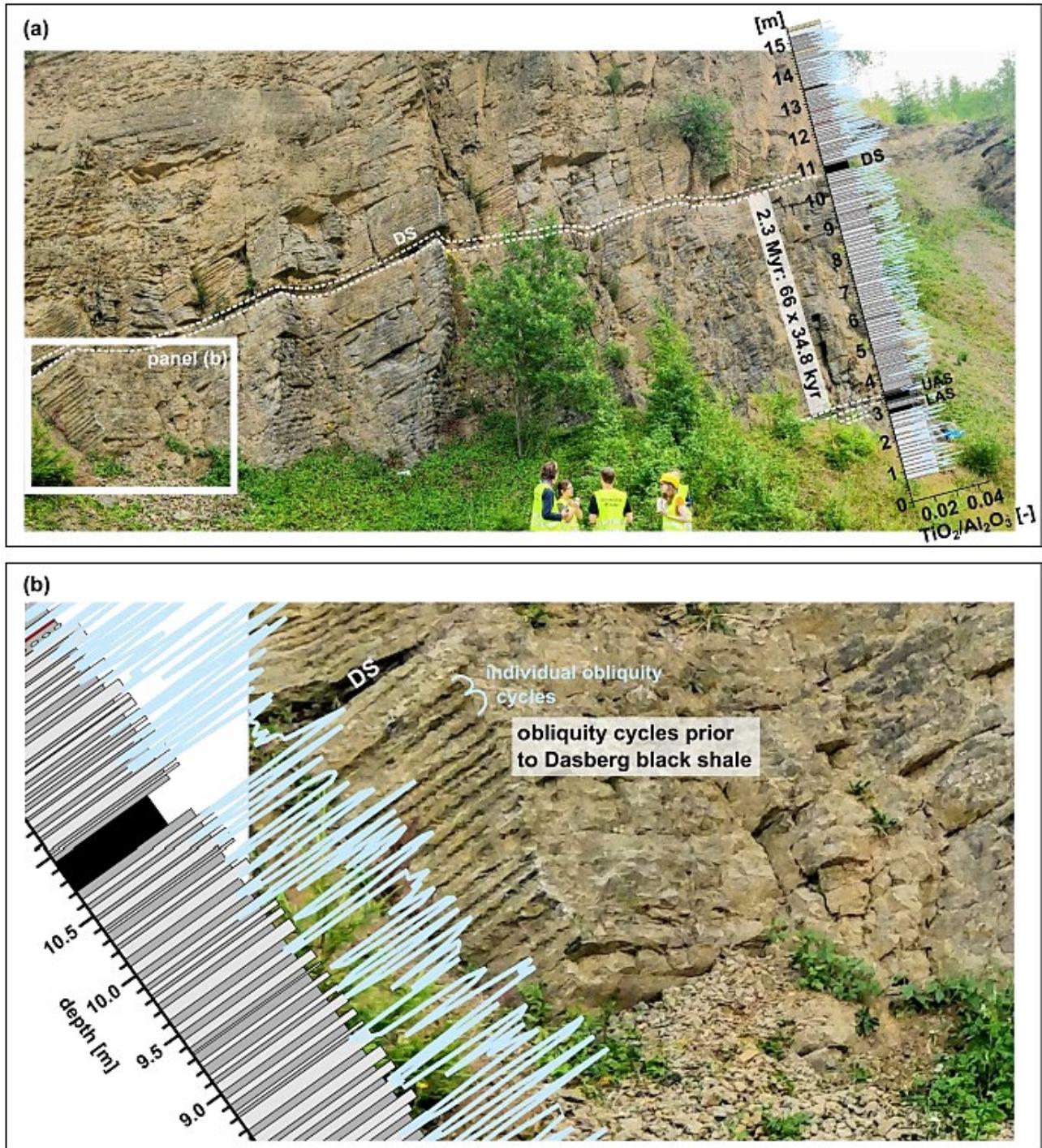
EMSBO, P., J. DAY, J. E., THOMPSON, A. BANCROFT, R. MOSCATI, P., MCLAUGHLIN, M. P. & T. VANDENBROUCKE, T. (2023). Much more than a biostratigraphic tool: A geochemical and histological reappraisal of the conodont. – In: *Abstracts and Programs, 4<sup>th</sup> International Congress on Stratigraphy: sciencesconf.org:strati2023:458243*.

JACOB, A., DAY, J. E. & WILHITE, B. (2023). Conodont Faunas and Biostratigraphy of The Lingle/St. Laurent Formation from the Deep Subsurface of The Illinois Basin in Edwards, Wayne and White Counties, IL, and Posey County. – In: *Geological Society of America, Abstracts with Programs*. **55** (6), 1 p.; doi: 10.1130/abs/2023AM-395873

MCADAMS, N. E. B., DAY, J. E., MORGAN, D. & FIORITO, A. (2023). Integrated conodont, carbon isotope, trace element, and sequence stratigraphic data from the Givetian-Frasnian ‘Frasnes Event’ and *falsiovalis*

excursion in Iowa and Nevada, USA. - In: Subcommission on Devonian Stratigraphy and IGCP 652, Reading geologic time in Paleozoic sedimentary

rocks, Field Conference and Business Meeting, Abstracts with Program: 56.



**Fig. 1.** Astrochronological interpretation laid over the lithology. (a) *Annulata*-Dasberg interval with 66 limestone-marl couplets, inferred to have a duration of ca. 2.3 Myr, resulting in a duration estimate of 34.8 kyr for each couplet. (b) Detail of couplets below the Dasberg. Limestone-marl couplets and corresponding TiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> fluctuations are interpreted as obliquity cycles.

## CM David DE VLEESCHOUWER

In 2024, I published a review paper on pre-Cenozoic cyclostratigraphy in *Nature Reviews, Earth and Environment*, with a particular emphasis on the Devonian period. The paper highlights both the reproducibility of cyclostratigraphic results and the influence of astronomical forcing on the timing of oceanic anoxic events.

The DFG-funded research project, "Astronomical Signatures in Late Devonian Black Shales of the Rhenish Massif," concluded on September 27, 2024, with the successful Ph.D. defense of **Nina WICHERN**. Nina's research tested the hypothesis that Milanković insolation forcing influenced the timing of major anoxic intervals, including the Kellwasser, *Annulata*, Dasberg, and Hangenberg events. Her findings provided compelling evidence supporting this hypothesis for each of these widespread oxygen-deficient intervals. Her doctoral work led to two first-author papers: WICHERN et al. (2024a) and WICHERN et al. (2024b).

Additionally, two forthcoming papers will address findings from the Effenberg quarry (Fig. 1) and Oberrödinghausen railroad cut composite, focusing on the last ~5 million years of the Famennian. One will cover stratigraphic and timescale issues, while the other will delve into paleoclimate and paleoenvironmental aspects.

In my research group at Münster, **Jakob QUABECK** has recently begun his Ph.D. work on the cyclostratigraphy of the Devonian–Carboniferous boundary in Belgium. This project is funded by the DFG and titled "*Investigating a potential systematic link between the flux of cosmic material and Earth's orbital eccentricity throughout the Phanerozoic*". In July 2024, we sampled the Royseux and Spontin sections at centimeter resolution. This research is closely coordinated with Anne-Christine DA SILVA, who is conducting similar work on the Anseremme and Chanxhe sections, and Steven GODERIS, who is

investigating micrometeorite fluxes across this interval for these sections.

## Publications

- DE VLEESCHOUWER, D., PERCIVAL, L. M. E., WICHERN, N. M. A. & BATENBURG, S. J. (2024). Pre-Cenozoic Cyclostratigraphy And Palaeoclimate Responses to Astronomical Forcing. - *Nature Reviews, Earth & Environment*, **5**: 59-74; doi.org/10.1038/S43017-023-00505-X.
- WICHERN, N. M. A., BIALIK, O. M., NOHL, T., PERCIVAL, L. M. E., BECKER, R. T., KASKES, P., CLAEYS, P. & DE VLEESCHOUWER, D. (2024a). Astronomically-Paced Climate and Carbon-Cycle Feedbacks in the Lead-Up to the Late Devonian Kellwasser Crisis. - *Climate of the Past*, **20** (2): 415-448; doi.org/10.5194/Cp-20-415-2024.
- WICHERN, N. M. A., BIALIK, O. M., NOHL, T., BECKER, R. T., & DE VLEESCHOUWER, D. (2024b). Decoding Deep-Time Rhythms: Probing the Limit of Stratigraphic Correlation in the Time-Specific Facies of the Late Devonian Usseln Limestone (Rhenish Massif, Germany). - *Geophysical Research Letters*, **51** (10): E2024gl109392; doi.org/10.1029/2024gl109392.

## CM James R. EBERT

Recent activities included the preparation of Chapter 2 on the Přídolí/Lochkovian of New York State for the new Devonian of New York special issues of the *Bulletins of American Paleontology* and related field trip stops for the SDS meeting in Geneseo. I am currently engaged in a revision of a manuscript on Pragian stromatoporoids with Carl STOCK, Andreas MAY, Chis SCOTSESE, and James HAGEDORN. This paper, when revised, will be published in *Palaeogeography, Palaeoclimatology, Palaeoecology*. I have another paper, also currently in revision, for Newsletters on Stratigraphy. That paper focuses on the Silurian-Devonian systemic boundary in New York State.

In addition to writing, editing and the like, I am also studying part of the Lansing Core from the Finger Lakes region of New York State. The

portion of the core that I am investigating includes some of the Helderberg Group, the Oriskany Sandstone, and the lowest part of the Esopus Formation. I have prepared polished slabs and acetate peels for approximately 50% of this part of the core. Petrographic examination of the slabs and peels is currently in progress.

Furthermore, I continue to build synthetic gamma ray profiles for outcrops of the Helderberg Group, with the ultimate goal of improving the level of detail in correlations. Thus far, the most significant result of this work has been better correlation of tephra beds in the New Scotland Formation.

## Publications

EBERT, J. R. & MATTESON, D. K. (2023). Chapter 2: Lithostratigraphy, multi-taxa biostratigraphy, and sequence stratigraphy of the Helderberg Group (Přídolí–Lochkovian) in New York State.

– In: VER STRAETEN, C., OVER, D. J. & WOODROW, D. L. (Eds.), Devonian of New York, Volume 1: Introduction and Přídolí to lower Givetian (Upper Silurian to Middle Devonian) stages.). Bulletins of American Paleontology, **403/404**: 103-151.

VER STRAETEN, C., OVER, D. J., WOODROW, D.L., HENDRICKS, J., ALLMON, W. D., HERMSEN, E. J., EBERT, J. R., BOYER, D. & COLOSIMO, A. (2023). Devonian of New York: An Extensive Overview, and Guide to Future Research. – Geological Society of America, Abstracts with Programs, **55** (6): 1 p.; doi: 10.1130/abs/2023AM-396195.

Ebert, J. R. & Matteson, D. K. (2022). Chapter 2: Lithostratigraphy, Multi-Taxa Biostratigraphy and Sequence Stratigraphy of the Helderberg Group (Přídolí – Lochkovian) in New York State. – Geological Society of America, Abstracts with Programs, **54** (3): 1 p.; doi: 10.1130/abs/2022NE-373601.

STOCK, C., MAY, A., EBERT, J. R., SCOTSESE, C. & HAGADORN, J. (2024 in revision). Early Devonian (Pragian) decrease in global generic diversity of stromatoporoids, and their extreme decrease in paleogeographic distribution in North America. – Palaeogeography, Palaeoclimatology, Palaeoecology.

EBERT, J. R. & MATTESON, D. K. (2024 in revision). The Silurian-Devonian Boundary in the Appalachian Standard Succession (New York State, USA). - Newsletters on Stratigraphy.

## CM Sofie GOUWY

Was “out of service” since September 2023 because of serious health issues. Now back at work full-time for the Geological Survey of Canada (Calgary Division) mainly on the Devonian conodont biostratigraphy in the Mackenzie Mountains (NW Territories, Canada). Collaborating with Martyn GOLDING and Jed DAY on a new Devonian-Carboniferous biostratigraphy project west of Great Slave Lake (NW Territories, Canada) and with Jed DAY on the Devonian biostratigraphy of Illinois.

## CM Sven HARTENFELS

My activities were mainly dedicated to two subjects, (1) the bio- and lithostratigraphic dating of drill cores, which were sunk by the Geological Survey of North Rhine-Westphalia, and (2), as one of the guest editors, realising the special *Palaeobiodiversity and Palaeoenvironments* issue on “*The Rhenish Massif: More than 150 years of research in a Variscan mountain chain, part II*”.

In 2023 and 2024, several drill cores were sunk by the Geological Survey in the course of an ongoing deep geothermal characterisation of the subsurface of North Rhine-Westphalia. These activities were focussed in particular on the Düsseldorf-Duisburg and Wuppertal regions. Target horizons are Devonian reefal limestones, the so called “Massenkalk”, on the one hand and limestones related to the Carboniferous “Kohlenkalk Platform” on the other. This shallow-marine platform extended from the Aachen region to the northwestern edge of the Velbert Anticline.



**Fig. 1.** The excursion party of the Oberrheinischer Geologischer Verein in the Givetian Emil Quarry of the Hönne Valley region (don't go on your own: training ground for armed police forces and anti-terrorist squads), with the massive reef core on the left and center and the well-bedded lagoonal sequence to the right (north).

In cooperation with R. Thomas BECKER (Münster) and Martin ARNDT (Krefeld), M.Sc. student **Jonathan SCHATZ** (Münster) was supervised, who worked on conodont biostratigraphy as well as lithofacies and carbonate microfacies analyses of the drill core “An der Drucht 1”, Mississippian (Tournaisian to Viséan) in age.

Together with Christoph HARTKOPF-FRÖDER (Cologne) and Peter KÖNIGSHOF (Frankfurt a. M.), a second part of the special issue “*The Rhenish Massif: More than 150 years of research in a Variscan mountain chain*” was realised and published at the end of September 2024 as Volume **104** (3) of *Palaeobiodiversity and Palaeoenvironments*, exactly two years after the publication of the first part. It includes two contributions on Givetian reefs in the Lahn Syncline, three taxonomic publications, and four stratigraphic studies. We have dedicated this special issue to the late **Hans-Georg HERBIG** and, therefore, a comprehensive obituary has been written in honour of our colleague and friend.

In one of the four stratigraphic contributions, I present – under the title “*Upper Devonian to Mississippian global environmental change and impact on conodonts*” – excerpts of my cumulative habilitation thesis. Chapters with reference to the Upper Devonian (hemi)pelagic conodont zonation as well as conodont biofacies

analysis will be published in a separate article on the potential of conodont investigations by KÖNIGSHOF & HARTENFELS (in press).

Jointly with Thomas and Sören STICHLING (Krefeld), participants of the 143<sup>th</sup> Annual Meeting of the *Oberrheinischer Geologischer Verein* were guided to reefal (Binolen, abandoned Emil Quarry, Asbeck Quarry, Beul, abandoned quarry next to the Balve Cave) and post reefal limestone sections (Ballberg, Borkewehr) in the Hönne Valley region (Figs. 1-3).

## Publications

AMLER, M. R. W., ARETZ, M. & HARTENFELS, S. (2023). Preface: Palaeontological papers written in honour of Professor Dr. Hans-Georg HERBIG, a tribute and memorial. – *Paläontologische Zeitschrift*, **97** (4): 667–669.

ARETZ, M., AMLER, M. R. W. & HARTENFELS, S. (2023). An obituary for Professor Dr. Hans-Georg HERBIG (March 8<sup>th</sup>, 1955–August 1<sup>st</sup>, 2023). – *Paläontologische Zeitschrift*, **97** (4): 671–675.

BECKER, R. T., HARTENFELS, S., STICHLING, S., LÖW, M. & ABOUSSALAM, Z. S. (2024). Reef development and global events in the Hönne Valley region (northern Rhenish Massif, Nordsauerland, Middle Devonian – Lower Carboniferous). – *Jahresberichte und Mitteilungen des Oberrheinischen Geologischen Vereins, Neue Folge*, **106**: 181–216.



**Fig. 2.** Quarryman artwork overlooking the hugh Givetian Asbeck reef quarry (back reef facies), partly filled by the “blue lagoon”.



**Fig. 3.** Sven explaining the D-C boundary conodonts at Borkwehr, the proposed basal Carboniferous GSSP candidate section of the Rhenish Massif (with the poster lying on debris of the boundary interval).

CHANG, J. Y., HAN, S. P., QIN, B. X., GUO, W., HARTENFELS, S., SONG, J. J., LIANG, K., YIN, B. A. & QIE, W. K. (2024). Conodont biostratigraphy of regional Yangshuoan Stage (upper Famennian, Devonian) in China. – Journal of Stratigraphy, **48** (1): 57–76.

HARTENFELS, S., HARTKOPF-FRÖDER, C. & KÖNIGSHOF, P. (2024). The Rhenish Massif: More than 150 years of research in a Variscan mountain chain, part II. – Palaeobiodiversity and Palaeoenvironments, **104** (3): 437-443; doi.org/10.1007/s12549-024-00625-2.

HARTENFELS, S., AMLER, M. R. W., ARETZ, M. & FRIEDEL, J. (2024). A tribute and memorial for Professor Dr. Hans-Georg HERBIG (March 8<sup>th</sup>, 1955 – August 1<sup>st</sup>, 2023). – Palaeobiodiversity and Palaeoenvironments, **104** (3): 445-459; doi.org/10.1007/s12549-024-00626-1.

HARTENFELS, S. (2024). Upper Devonian to Mississippian global environmental change and impact on conodonts. – Palaeobiodiversity and Palaeoenvironments, **104** (3): 629-682; doi.org/10.1007/s12549-024-00622-5.

#### Editorials

HARTENFELS, S., HARTKOPF-FRÖDER, C. & KÖNIGSHOF, P. (Eds., 2024). The Rhenish Massif: More than 150 years of research in a Variscan mountain chain, part II. – Palaeobiodiversity and Palaeoenvironments, **104** (3): 437-752.

#### Abstracts

ABOUSSALAM, Z. S., BECKER, R. T., HARTENFELS, S. & EL HASSANI, A. (2023). Conodont stratigraphy and facies development of the Azrou region (eastern part of Western Moroccan Meseta). – Subcommission on Devonian Stratigraphy and IGCP 652, Reading geologic time in Paleozoic sedimentary rocks, Geneseo, New York, 27 July – 06 August 2023, Program and Abstracts: 14–15.

#### TM Ulrich JANSEN

The taxonomic studies on latest Silurian to earliest Mid-Devonian brachiopods from the Rhenish Massif have been continued. Recent stratigraphic results are going to be presented at the SDS Annual Meeting in Sofia (JANSEN 2024). Spiriferide taxon range and brachiopod assemblage zones have been established and are now subdivided into subzones. An overview work on the Devonian–Carboniferous brachiopods of the Rhenish Massif – with a focus on their biostratigraphy – has been prepared and submitted to *Palaeodiversity and*

*Palaeoenvironments* (JANSEN & MOTTEQUIN in press); another manuscript submitted to the same journal concerns the Silurian–Lower Devonian spiriferide and spiriferinide brachiopods from the Ardennes (MOTTEQUIN & JANSEN), and a third one a new species of *Cyrtina* from the Rhenish Lower Devonian (JANSEN). Some smaller taxonomic questions were clarified with the help of internship students, in particular Suphakan THONGSONG (University of Lille), who spent two months at the Senckenberg.

A new cooperation with Ahmed ZEGHARI and Thomas BECKER on Silurian–Lower Devonian stratigraphy of sections in the southern Tindouf Basin (Algeria) has been started. I have examined and determined the brachiopods collected by Ahmed and could provide some biostratigraphic alignments.

In spring 2024, my co-authors and myself have finally updated, revised and resubmitted three chapters for the forthcoming monographic Springer book on the Central European Variscides (U. LINNEMANN, Ed.), dealing (1) with the Rhenish Massif, (2) Silurian–Carboniferous brachiopods, and (3) the Hunsrück Slate (see SDS Newsletter 38).

Apart from the scientific work, I have spent much time for preparing the acquisition of collections and curating the new acquisitions, mainly Devonian brachiopods.

## Publication

JANSEN, U. (2024). Revised taxonomy and biostratigraphy of brachiopods from the upper Přídolí–lower Eifelian of the Rhenish Massif (Germany). - Joint ISSS-SDS Meeting, 12–17 September 2024, Sofia, Bulgaria. *Geologica Balcanica* **23** (3): 85–90.

## CM Peter KÖNIGSHOF

Present studies focus mostly on sedimentology, facies, and biostratigraphy in the southern Gobi (Shine Jinst region, Mongolia, Gobi Altai Terrane, Central Asian Orogenic Belt). This work is done in collaboration with an international working

group. A large section ranging from the Lower Devonian Chuluun Formation to the Mississippian Indert Formation was studied. The facies development in the Shine Jinst region exhibits a fundamental break in the carbonate platform evolution in the Lower Devonian due to a major regression and deposition of several meter-thick conglomerates. Also, in the Eifelian, thick-bedded conglomerates occur, which are comparable with coeval sediments of the Bayankhoshuu Ruins section in the eastern part of southern Mongolia. The sediments point to a remarkable uplift or sea-level fall in both successions. Conodont findings of the studied Shine Jinst section confirm the occurrence of time-equivalent strata of the Choteč Event, the Dasberg Crisis, and the Hangenberg Event, found elsewhere in the world, which are described from Mongolia for the first time.

Other activities concerned field work in Thailand, Iran, and in the Rhenish Massif. In collaboration with colleagues from Iran, we studied the Tuye-Darvar section in NE Iran, a manuscript was submitted on the tectonic framework and biostratigraphy from a succession in northern Thailand (Inthanon Terrane), and in the Rhenish Massif two reef sections have been studied.

As we received more manuscripts for the Special Issue on the “Rhenish Massif” than expected (published in 2022 in *Palaeobiodiversity and Palaeoenvironments*, 102/3, edited by S. HARTENFELS, C. HARTKOPF-FRÖDER and P. KÖNIGSHOF), the same Guest Editors will publish a second volume in 2024 (*Palaeobiodiversity and Palaeoenvironment*, 104/3). Two contributions to a planned Springer book on “*The Variscan Orogen of Central Europe: Geodynamics – Geochronology – Geobiology*” (U. LINNEMANN, Ed.) have been accepted.

## Publications

KÖNIGSHOF, P., LOOS, S. & RUTKOWSKI, J. (2024). Lithofacies variability and facies analysis of a Givetian reef in the southwestern Lahn Syncline (Rhenish Massif, GERMANY). - In: HARTENFELS, S., HARTKOPF-FRÖDER, C. & KÖNIGSHOF, P.

- (Eds.), The Rhenish Massif: More than 150 years of research in a Variscan mountain chain – Part II. Palaeobiodiversity and Palaeoenvironments, **104** (3): 461-491; doi.org/10.1007/s12549-023-00585-z.
- KÖNIGSHOF, P. & FLICK, H. (2024). Fringing reef growth in the Mid-Devonian: An example from the southern Rhenish Massif, Germany. - In: HARTENFELS, S., HARTKOPF-FRÖDER, C. & KÖNIGSHOF, P. (Eds.), The Rhenish Massif: More than 150 years of research in a Variscan mountain chain – Part II. Palaeobiodiversity and Palaeoenvironments, **104** (3): 493-509; doi.org/10.1007/s12549-023-00591-1.
- STRIBRNÝ, B., KORN, D., KÖNIGSHOF, P., ERBACHER, J. & BLUMENBERG, M. (2024). Die Kupfererz Lagerstätte Marsberg. - Geologisches Jahrbuch, Reihe A, **166**: 88 pp.; ISSN 0044-2259.
- KÖNIGSHOF, P., CARMICHAEL, S., WATERS, J., WATERS J. W., MUNKHJARGAL, A., GONCHIGDORJ, S., CRÔNIER, C., NAZIK, A., DUCKETT, K., FORONDA, J., ZIEGER, J. & LINNEMANN, U. (2024). Devonian to Mississippian strata of the Shine Jinst region revisited: Facies development and stratigraphy in southern Mongolia (Gobi Altai Terrane). - Palaeobiodiversity and Palaeoenvironments, **104** (4). doi.org/10.1007/s12549-024-00608-3.
- SATTARI, E., BAHRAMI A., KÖNIGSHOF, P., VAZIRI-MOGHADDAM, H. & TAHERI A. (2024). Biostratigraphy and facies around the D/C boundary interval of the Tuye-Darvar section, Eastern Alborz Range, NE Iran. - Boletín de la Sociedad Geológica Mexicana, **76** (1); doi.org/10.18268/BSGM2024v76n1a280224.
- UDCHACHON, M., THASSANAPAK, H., MCKENZIE, R., BURRETT, C., KÖNIGSHOF, P. & LINNEMANN, U. (2024 submitted). Tectonic significance of zircons and reworked conodonts, Inthanon Terrane, Thailand.
- KÖNIGSHOF, P., JANSEN, U., LINNEMANN, U. & MENDE, K. (2024 in press). The Rhenish Massif. - In: LINNEMANN, U. (Ed.), The Variscan Orogen of Central Europe: Geodynamics – Geochronology – Geobiology; Springer (Heidelberg, New York).
- KÖNIGSHOF, P. & HARTENFELS, S. (2024 in press). Conodont research: An important tool applied to the Central European Variscides. - In: LINNEMANN, U. (Ed.), The Variscan Orogen of Central Europe: Geodynamics – Geochronology – Geobiology; Springer (Heidelberg, New York).

## CM Tomáš KUMPAN

In the past year, my Devonian research was mainly focused on the topics of conodont stratigraphy and geochemistry. The manuscript on the carbon isotopic stratigraphy of the Hangenberg Event and weaker lower Tournaisian isotopic events, recorded in the Líšeň Formation of the Moravian Karst, Czech Republic, were submitted. I also dealt with the conodont biostratigraphy and chemostratigraphy of various Moravian sections from different parts of the Frasnian, Famennian, and Tournaisian (limestones of the Macocha and Líšeň formations). In addition to the carbonate formations, my research also focused on the sedimentology of the so-called “basal clastic formation” of the Moravian-Silesian Basin, which is of Neoproterozoic, Cambrian, and Devonian age. The research is carried out in collaboration with colleagues from the Czech Geological Survey (Pavel HANŽL, Igor SOENYO – geochemistry, radionuclide dating). Manuscripts concerning the origin of the red colouring of Devonian limestones from the Carnic Alps and Montagne Noire are in preparation.

## TM John E. A. MARSHALL & the Southampton Group

This last year has been busy as regards fieldwork. We have been to the Cantabrian Mountains and coastal sections in Asturias in Spain for the final visit. This is a NERC funded grant led by Charlie WELLMAN from Sheffield and includes David BOND (Hull) on the stable isotopes and geochemical indicators of extinction together with Gilda LOPES as the post-doc focusing on the acritarchs and chitinozoans. Some of these sections are very well-known having been studied by CRAMER in the 1960's at the very beginning of palynology. We have been greatly assisted in our sample collection by our local Project Partners Javier

SANZ-LÓPEZ and Silvia GARCÍA-LÓPEZ, who some of you may remember from various conodont meetings.

For a month in July and August of 2024, I was back to East Greenland (Figs. 1-2) on a Swedish expedition led by Grzegorz NIEDZWIEDZKI from Uppsala and focusing on tetrapods and fish at the D-C boundary. This is funded by the ERC awarded to Per AHLBERG. Many new and interesting tetrapod specimens (about which I know nothing) were found at a high level in the Devonian. I did some repeat

sampling through the D-C boundary terrestrial extinction lake on Celsius Bjerg together as a continuous series of large blocks. These will continue to be analysed at sub-centimetre level for palynology,  $\delta^{13}\text{C}_{\text{TOC}}$ ,  $\delta^{15}\text{N}_{\text{TOC}}$ , TOC%, BSEM fabric, and Itrax XRF analysis to better understand the terrestrial extinction and spore malformation. Interesting results are being revealed. I was also accompanied by Chris BERRY from Cardiff University (Wales), who is engaged on a parallel palaeobotanical study and particularly the reconstruction of the tetrapod environment.



**Fig. 1.** Henning BLOM and Daniel SNITTING, both Uppsala, wrapping earliest Carboniferous fish on Celsius Bjerg, Ymer Ø, East Greenland.

Conference attendance included the XVI IPC and XI IOPC held concurrently in Prague, Czech Republic; the Palaeontological Association Annual Meeting in Cambridge, and the *Life and the Planet Earth System* meeting in London. I also attended a workshop on the ORS of Greenland held at GEUS in Copenhagen.

The publication highlight is the *Old Red Sandstone* chapter in the 5<sup>th</sup> edition of the *Geology of Scotland*. A completely revised chapter on the Old Red Sandstone that is now full colour and will be available digitally from the Geological Society of London. This took

forever, especially the 36 figures. Although sadly, a kilted and bag-piping Alex BARTHOLOMEW was removed from Siccar Point by the editors. It has also been a useful opportunity to better integrate the stratigraphy of the onshore and offshore Old Red Sandstone.

#### Publications

- SMART, M. S., FILIPPELLI, G., GILHOOLY III, W. P., OZAKI, K., REINHARD, C. T. MARSHALL, J. E. A. & WHITESIDE, J. H. (2023). The expansion of land plants during the Late Devonian contributed to the marine mass extinction. - Communications Earth & Environment, 4 (1): 449.

MARSHALL, J. E. A. (2024). Old Red Sandstone: continental sedimentation on the eroding Caledonian Orogen. - In: SMITH, M. & STRACHAN, R. (Eds.), *The Geology of Scotland*. Geological Society, London; doi.org/10.1144/GOSS-2022-43.



**Fig. 2.** Celsius Bjerg camp in alternative weather.

### TM Jeffrey D. OVER

I am continuing study of conodonts, geochemistry, magnetic susceptibility, and astrochronology of Middle through Upper Devonian strata and the Devonian-Carboniferous boundary. Focus is in the Appalachian Basin and shallow water platform of the Dyer Formation in Colorado, the later in cooperation with colleagues at the Denver Museum of Nature and Science and Tomas KUMPAN at Masaryk University in Brno, Czech Republic. In July, the Devonian of SW England was visited (Fig. 1).



**Fig. 1.** Field photo, when the tide was low, of Lower Merope Island, North Cornwall, famous for its pyritic upper Frasnian goniatites.

### CM Cameron PENN-CLARKE

**Change in affiliation:** In 2023, I joined the Evolutionary Studies Institute at the University of the Witwatersrand, Johannesburg, as a Senior Researcher, after leaving the Council for Geoscience after a pleasant and productive four years as a survey geologist in the Western Cape Province. As part of the University of the Witwatersrand's commitment to research in palaeo- and geosciences, I have received a generously sized facility at the university to store collected specimens as well as a space to work on material with students and collaborators. The facility has recently been refurbished and will be put to use in the coming months once it has been formally named.

In 2023, Zubair JINNAH and I (alongside our Ph.D. candidate, Christopher HARRIS) successfully co-supervised a B.Sc. Hons student, **Banele CHABANGU**, on a project that investigated the petrographic discrimination of the Rooirand and Perdepoort members of the Witpoort Formation. He graduated from the university earlier this year and has embarked on a career in industry.

In 2024, I am supervising a single BSc Hons candidate, **Cole NAAMDHEW**, who is assisting me in building a GIS database of all known Devonian fossil occurrences in South Africa that will be maintained for future discoveries and research. To date, he has helped me "clean" around 4.000 individual fossil data points from the Cape Fold Belt. His project (due to be completed in October 2024) is showing great promise in mapping out local distributions in fossil faunas across the Cape Basin as well as their corresponding ecological habitats. These data are, in turn, linked to other datasets (e.g. publications, biozonation and geological maps, etc.) that can be used to flesh out any further associations of fossils with their surrounding strata. The results of this study will be published in 2025.

My doctoral candidate, **Christopher HARRIS** (co-supervised by Rob GESS and Zubair JINNAH) is due to complete his Ph.D. by the end of August 2024. His thesis is focused on

understanding the sedimentology and palaeontology of the Late Devonian (Famennian) Witpoort Formation in the Eastern Cape. His detailed multidisciplinary study of these strata has revealed an array of new insights into the nature of high latitude environments and local base-level change at the South Pole during the latest Devonian, which will certainly make for a series of excellent publications over the course of 2025.

In terms of collaborators, I am working on research with the following colleagues:

- Prof. Marion BAMFORD (Evolutionary Studies Institute, University of the Witwatersrand): palaeobotany, palynology
- Prof. Nikki WAGNER (Department of Geology, University of Johannesburg): organic petrology and geochemistry
- Prof. Gabriela MANGANO (University of Saskatchewan, Canada): ichnology, palaeoecology
- Prof. Luis BUATOIS (University of Saskatchewan, Canada): ichnology, palaeoecology
- Prof. David HARPER (Durham University, UK): brachiopod palaeontology, stratigraphy, palaeobiogeography
- Dr. Clarisa VORSTER (Department of Geology, University of Johannesburg): geochronology
- Dr. John ALMOND (retired): South African Devonian palaeontology, sedimentology and stratigraphy
- Dr. Zubair JINNAH (University of the Witwatersrand, Johannesburg): alluvial sedimentology and stratigraphy
- Dr. Robert GESS (Albany Museum, Makanda): Devonian palaeontology and stratigraphy

Current and ongoing research with collaborators and students pertaining to the Devonian:

1. Timing of Early-Middle Devonian biocrises in South Africa.

The aims of this research are to try resolve age relative age constraints for observed

biocrises in South Africa using detrital zircon geochronology to see if these events might be correlated with global biocrises.

2. The Silurian-Devonian Terrestrial Revolution at high palaeolatitudes.

This research investigates changes in the evolution of alluvial environments and geometry of fluvial deposits with the invasion of plants on land.

3. Ichnological signatures of Devonian biocrises at high latitudes.

This research investigates changes in ichnofaunas and substrates through successive biocrises during the Devonian, with focus on high latitude regions.

4. Palynology of Silurian-Devonian deposits in South Africa.

This laboratory intensive research aims to devise means for extracting Silurian-Devonian palynomorphs from the Cape Fold Belt which, until recent, has not been successful.

5. Lilliputian effect in Devonian faunas through biocrises in South Africa.

This research investigates the validity of purported lilliputian faunas through successive biodiversity turnover events associated with Early-Middle Devonian biocrises as well as potential implications.

6. Palaeobiogeography, ecology and biostratigraphy of the South African Devonian.

This research aims to create a biozone map of the South African Devonian to investigate the distribution of faunas in the Cape Basin through time and their possible controls.

7. Stratigraphy and sedimentology of Middle Devonian deposits in South Africa.

Ongoing contributions for the South African Committee for Stratigraphy look at the formalisation, description, mapping, and correlation of Middle Devonian stratigraphic units.

8. Revisions of *Geology of South Africa* textbook.

I am involved in the revision of the *Geology of the Cape Supergroup* chapter in the upcoming edition of the *Geology of South Africa* textbook.

I had a productive past 12 months wrapping up integrated biostratigraphic and sequence stratigraphic research on the recognition of Early-Middle Devonian biocrises in South Africa published in *Earth-Science Reviews*, vol. 246 (November 2023). This research, in collaboration with David HARPER, has helped bring to light the recognition of several sea-level related biodiversity turnover events that saw the demise of the Malvinoxhosan biota in South Africa. Furthermore, this research suggests a remarkable similarity between turnover events in South Africa and South America, suggesting regional controls at play as well as promises of a future West Gondwanan local biostratigraphic framework. At present, I am working with collaborators at the University of Johannesburg on a follow up publication to the *Earth-Science Reviews* paper that focuses on the geochronology of the South African Devonian to see if observed biodiversity turnovers in West Gondwana are related to global Early-Middle Devonian biocrises.

Further to this, a publication on indigenous knowledge of fossils in South Africa was published as part of a special issue in *Geological Society of London, Special publication*, vol. 543. Here, evidence for knowledge of Devonian fossils (among others) by pre-colonial societies in South Africa was presented. Those of interest include several instances, where trilobite fossils were collected by Middle-Later Stone Age people as well as rock art depicting possible lycopod fossils.

#### *Palaeontological Society of Southern Africa 2024*

The 22<sup>nd</sup> Conference of the Palaeontological Society of Southern Africa will be held in Graaff-Reinet from 8-13 September. The conference includes (for the first time in the history of the meeting) a dedicated session on Ordovician-Devonian palaeontology, where several talks will be presented by Rob GESS and his team at the Devonian Ecosystems Project as well as by my team and collaborators from Wits University. Information about the conference can be found at: <https://www.palaeosa.org/pssa22.html>.

#### *Geological Society of South Africa Geocongress 2025*

Next year is the biennial meeting of the Geological Society of South Africa (Geocongress), which will be held at the University of Free-State (Bloemfontein) from 24-27 June 2025. Although a dedicated Devonian session is not on the cards for the conference, a session on Palaeozoic-Mesozoic deposits is guaranteed to include talks on Devonian research. Information can be found at: <https://geocongress2025.org.za/>.

#### *7<sup>th</sup> International Palaeontological Congress 2026*

It gives us great pleasure to announce that South Africa will be hosting the next international palaeontological congress in Cape Town from 30<sup>th</sup> November-3<sup>rd</sup> December 2026. Rob GESS and I have championed a standalone Devonian symposium (*Devonian stratigraphy, environments and palaeontology with focus on Gondwana*) that will further serve as the venue for the 2026 business meeting of the Subcommission on Devonian Stratigraphy. Further to this, Rob GESS and I will be organising pre- and post-conference fieldtrips focusing on sites in the Cederberg and greater Makanda area, with a visit to the Devonian Ecosystems Project lab and gallery. Information about the conference will be updated regularly on our official website: <https://www.ipc7.site/>

#### **Devonian publications 2023-2024**

##### *Papers*

PENN-CLARKE, C. R. & HARPER, D. A. T. (2023). The Rise and Fall of the Malvinoxhosan (Malvinokaffric) bioregion in South Africa: Evidence for Early-Middle Devonian biocrises at the South Pole. - *Earth-Science Reviews*, 246 (104595); doi: 10.1016/j.earscirev.2023.104595.

HELM, C. W., BENOIT, J., PENN-CLARKE, C. R., RUST, R., GROENEWALD, D. & VICKERS-RICH, P. (2024). Indigenous knowledge of palaeontology in Africa. – In: CLARY, R. M., PYLE, E. J. & ANDREWS, W. M. (Eds.), *Geology's Significant Sites and their Contributions to Geoheritage*. Geological Society, London, Special Publications, 543; doi: 10.1144/SP543-2022-236

**Abstracts**

PENN-CLARKE, C. R., VORSTER, C. & HARPER, D. A. T. (2024). End of Days at the End of the World: U-Pb detrital zircon geochronology of high-latitude Devonian regions suggest extinction events were globally extensive. - 22<sup>nd</sup> Biennial Meeting of the Palaeontological Society of South Africa, Graaf Reinet, South Africa, 8-14 September 2024.

PENN-CLARKE, C. R., BAMFORD, M. K., WAGNER, N. (2024). Earliest coal beds from the Silurian-Devonian Terrestrial Revolution at high-latitudes: Evidence from the Middle Devonian of South Africa. - 22<sup>nd</sup> Biennial Meeting of the Palaeontological Society of South Africa, Graaf Reinet, South Africa, 8-14 September 2024.

NAAMDHEW, C. & PENN-CLARKE, C. R. (2024). Spatiotemporal distributions of Devonian benthic communities in South Africa. - 22<sup>nd</sup> Biennial Meeting of the Palaeontological Society of South Africa, Graaf Reinet, South Africa, 8-14 September 2024.

HARRIS, C., JINNAH, Z. A. & PENN-CLARKE, C. R. (2024). A transgressive model for the Waterloo Farm black shale lagerstätte (Late Devonian Period). - 22<sup>nd</sup> Biennial Meeting of the Palaeontological Society of South Africa, Graaf Reinet, South Africa, 8-14 September 2024.

PENN-CLARKE, C. R. & VORSTER, C. (2023). Patagonia: Gondwana's "Dark Passenger"? Tectonocyclic-induced extinction events in South Africa during the Devonian. - GSSA Geocongress 2023, Stellenbosch, South Africa, 11-13 January 2023: 194; doi: 10.25131/ZYMF7244.

PENN-CLARKE, C. R. (2023). South African Devonian biozones identified with network analysis provide evidence for a pulsed extinction event at high latitudes. - GSSA Geocongress 2023, Stellenbosch, South Africa, 11-13 January 2023: 321; doi: 10.25131/ZYMF7244.

HARRIS, C., GESS, R., PENN-CLARKE, C. R. & JINNAH, Z.A. (2023). *Zoophycos* in the Witpoort Formation (Witteberg Group, Cape Supergroup, South Africa). - GSSA Geocongress 2023, Stellenbosch, South Africa, 11-13 January 2023: 314; doi: 10.25131/ZYMF7244.

**CM Dmitry P. PLAX and the Belarusian Devonian Group**

The Belarusian Devonian group includes researchers at the Institute of Geology, Branch of the State Enterprise «Research and Production Center for Geology», and the Belarusian National Technical University (D. P. PLAX).

In 2023–2024, members of the Group continued studying various problems of the Devonian of Belarus, participated in scientific and practical conferences, and published the results of their work in peer-reviewed journals. Publications are listed below.

**Publications***Journal papers*

GRUDININ, A. (2023). Lithofacial structure features of the Polotsk horizon and the Lan' Superhorizon of the Rechitsa oil field of the Pripyat Trough. – Litasfera, **59** (2): 130–137 [in Russian, with English summary].

PLAX, D. P., KUZNETSOV, A. B., GAVRILOVA, A. A. & KULKOV, A. M. (2023). Reference Sections, fossil Ichthyofauna and Sr Isotope Signature of the Lower Frasnian Sediments of the Latvian Saddle and Orsha Depression, Belarus. – Stratigraphy and Geological Correlation, **31** (6): 522–550; doi: 10.1134/S0869593823060084.

KUZMENKOVA, O. F., LAPTSEVICH, A. G., STIFEEVA, M. V., NOSOVA, A. A., STRELTSOVA, G. D., VOLKOVA, G. D., PLAX, D. P. & POSPELOV, A. V. (2023). Early Famennian Trachyandesite Magmatism of the Pripyat Paleorift, East European Platform: U–Pb Age and Petrology. – Stratigraphy and Geological Correlation, **31** (6): 551–570; doi: 10.1134/S0869593823060059.

TSYHANKOU, A., CHEKAN, A. & KUDRASHOU, A. (2023). First experience of water injection in low-permeability non-conventional reservoirs in the example of Eletsko-Petrikovskie deposits of Rechitsa oil field. – Litasfera, **59** (2): 138–147 [in Russian, with English summary].

MURASHKO, O. (2023). Conodonts from the Lochkovian sediments of the Belarusian part of the Volyn Monocline (Tomashovka 11 borehole). – Litasfera, **59** (2): 4–13.

PLAX, D. P. & LUKŠEVIČS, E. (2023). A new Early Devonian antiarch placoderm from Belarus, and the

- phylogeny of Asteroleridoidei. – *Acta Palaeontologica Polonica*, **68** (3): 513–527; doi:10.4202/app.01075.2023.
- PLAX, D. P. & NEWMAN, M. J. (2023) Formal description of *Valentinaspis profundus* gen. et sp. n., a placoderm fish and zone fossil from the Emsian of Belarus and Estonia. – *Fossil Record* 9, New Mexico Museum of Natural History and Science Bulletin, **94**: 525–532.
- PLAX, D. P. (2023). New data on *Diplacanthus kleesmentae* VALIUKEVICIUS, 1986 from the Vitebsk Regional Stage (Upper Emsian) of the Lower Devonian of Belarus. – BarSU Herald. Series “Biological Sciences (General biology). Agricultural Sciences (Agronomy)”, **14** (2): 58–68.
- PLAX, D. P. (2024). About two new families of acanthodian fishes (Acanthodii) – Doklady of the National Academy of Sciences of Belarus, **68** (3): 214–219; doi: 10.29235/1561-8323-2024-68-3-214-219 [in Russian].
- MURASHKO, O. V. & PLAX, D. P. (2024). Conodonts and ichthyofauna from the Lochkovian sediments of the Orlia 28 borehole section (Podlasie-Brest Depression, Belarus). – *Litasfera*, **60** (1): 4–11.
- DANKINA, D., ŠEČKUS, J. & PLAX, D. P. (2024). Middle Devonian actinopterygians from Lithuania and Belarus. – *Fossil studies*, **2**: 141–159; doi: 10.3390/fossils2030007.
- Abstracts*
- MURASHKO, O. V. (2023). Conodonts from the Lower Devonian (Lokhkovian) deposits of the southwestern part of Belarus in the section of the Rataichitsy 12 well (Kamyenyets district, Brest region). – In: Actual problems of Earth sciences: research of transboundary regions: collection of materials of the VI International scientific and practical conference, Brest, 26–28 Oct. 2023: 166–169 [in Russian].
- KUZMENKOVA, O., BIBIKAVA, A., VOSKOBONIKOVA, T., EROSHENKO, A., SACHENKO, T. & OBUCHOVSKAYA, V. (2023). Sedimentary volcanomictic rocks of the Zadon Suprahorizon of the Lower Famenian of the Pripyat Trough. – In: Lithogenesis and Minerageny of Precambrian and Phanerozoic Sedimentary Complexes of Eurasia. Proceedings of the X International Conference on Lithology, Voronezh, 18–23 Sept. 2023: 204–208 [in Russian, with English summary].
- SHMYGALEVA, A. M. & GRIBIK, Ya. G. (2023). On the influence of oil deposit development on the geofluidodynamic regime of the Devonian reservoirs of the northern part of the Pripyat trough. – In: Actual problems of Earth sciences: research of transboundary regions: collection of materials of the VI International scientific and practical conference, Brest, 26–28 Oct. 2023: 212–216 [in Russian].
- PLAX, D. P. (2024). Ichthyofauna from the deposits of the Starobin Regional Stage of the Upper Famennian pf the Pripyat Trough of Belarus. – In: Patterns of evolution and biostratigraphy. Proceedings of the LXX session of the Palaeontological Society of the Russian Academy of Sciences, St. Petersburg, 1–5 Apr. 2024: 254–255 [in Russian].

## CM Eberhard SCHINDLER

The first full year of retirement was not so productive than expected; but some (partly long-lasting) projects were put forward. Results from our Turkish–German cooperation projects have been completed (e.g., on the first Turkish scyphocrinoids with Reimund HAUDE and others), and are prior to submission.

A book chapter in Ulf LINNEMANN’s ‘monster volume’ on the Variscan Orogen in Central Europe dealing with various aspects of the famous Hunsrück-Schiefer, authored by Uli JANSEN and myself, was finally submitted. Work on the Eifel area has been revitalised together with colleagues from Germany and the US.

Studies on a probable leftover of the Ediacara Biota in Lower Devonian rocks of the Mosel area are still ongoing (see last report) with my descendant at Senckenberg, Simon DARROCH.

A new study (using N isotopes) together with colleagues from the Max Planck Institute in Mainz, the University of Frankfurt and others on coral photosymbiosis in Mid-Devonian reefs (Devonian corals from the Sauerland and Eifel areas, the Moroccan Tafilalt, and West-Sahara

are compared with Recent corals) has been submitted.

### TM Ladislav SLAVÍK and Czech CMs

In 2024, the “Pragian/Emsian boundary project” in the Prague Synform was extended by half a year. Our team consisting of CM Jindra HLADIL, CM Tomáš WEINER and CM Hedvika WEINEROVÁ of the Institute of Geology of the Czech Academy of Sciences focused on finishing the interpretation of data collected from several sections with the Bohemian Graptolite Event (BGE). The paper on the Mramorka Quarry, which was selected as a possible candidate section for the GSSP redefinition, was published. Also, the evaluation of the possible SABS (Standard

Auxiliary Boundary Stratotype) for the Basal Emsian boundary was finished and the manuscript on the Požár 3 section was submitted. Our team continues work on the Pod Barrandovem section with focus on ichofabrics, sedimentology and biostratigraphy.

Since October 2023, Mrs. Jiayi YIN, Ph.D. student from Wuhan University, joined our Department of Paleobiology and Paleoecology. She stays for one year. Together with her and Chinese colleagues WANG, Z. H., SHEN, Z., ZHANG, X. S., LIU, Y. L., MA, J., GONG, Y. M. and ZONG, R. W., a comprehensive review on the Silurian–Devonian boundary in China was finished and published. Another paper on the Silurian–Devonian Boundary in Northern Xinjiang, NW China has been submitted.



**Fig. 1.** The Požár 3 section with the location of the Bohemian Graptolite Event (BGE)

### Publications

HOLCOVÁ, K., VACEK, F., ČÁP, P., BRUTHANOVÁ, J., SLAVÍK, L., MERGL, M., KRAFT, P., KERKHOFF, M. L. H. & CHADIMOVÁ, L. (2024). Microboring organisms – an overlooked Early Palaeozoic marine ecosystem: Case study from the Prague Basin (Czech Republic). –

*Palaeoworld*, **33** (1): 39–56;  
[doi.org/10.1016/j.palwor.2023.01.010](https://doi.org/10.1016/j.palwor.2023.01.010).

YIN, J. Y., SLAVÍK, L., LU, J. F., MA, J., LIU, Y. L., ZONG, R. W. & GONG, Y. M. (2024). Discovery of the earliest Devonian conodonts from Xinjiang, Northwest China. – *Palaeoworld*, **33**

- (5): 1256-1267; doi.org/10.1016/j.palwor.2023.10.001.
- WEINEROVÁ, H., SLAVÍK, L., WEINER, T. & HLADIL, J. (2024). In search for the Basal Emsian GSSP in the Prague Synform: Mramorka – a possible candidate section. – Newsletters on Stratigraphy **57**(2): 171–201; doi.org/10.1127/nos/2024/0795.
- YIN, J. Y., SLAVÍK, L., WANG, Z. H., SHEN, Z., ZHANG, X. S., LIU, Y. L., MA, J., GONG, Y. M. & ZONG, R. W. (2024). The Silurian–Devonian Boundary of China: Review and perspectives. – Earth-Science Reviews, **254** (104805); doi.org/10.1016/j.earscirev.2024.104805.
- SLAVÍK, L., MANDA, Š., ŠTORCH, P., TASÁRYOVÁ, Z. & ČÁP, P. (2024). Towards the chronostratigraphic subdivision of the Přídolí Series. – Geologica Balcanica **53** (3): 105.
- SLAVÍK, L., WEINEROVÁ, H., WEINER, T. & HLADIL, J. (2024). Presentation of the Candidate sections for the basal Emsian boundary redefinition. – Geologica Balcanica **53** (3): 106..
- SLAVÍK, L., WEINEROVÁ, H., WEINER, T. & HLADIL, J. (2024). The Basal Emsian boundary – the only pending stage issue in the Devonian stratigraphy. - In: The 37<sup>th</sup> International Geological Congress 2024, August 25-31, 2024 BEXCO, Busan, Republic of Korea, Abstract #617.
- WEINEROVÁ, H., SLAVÍK, L., WEINER, T. & HLADIL, J. (2024). Mramorka – možný kandidátsky profil pro redefinovanou spodní hranici emsu. - In: Paleozoikum 2024, Sborník abstraktů, **25**. ročník: 25-26, Brno.

## CM SONG Jun-Jun

### Research Interests

Specialist of marine ostracods (Crustacea) from Devonian to Carboniferous: Systematics, Palaeoecology, Palaeoenvironment and palaeogeography reconstructions, dynamics of biodiversity during crises/events (F-F and D-C boundary events), more specifically:

- Ostracod biostratigraphy of Devonian-Lower Carboniferous
- Evolution of Palaeozoic ostracods
- Co-evolution between biota and environments during the Devonian.

### Devonian publications

- SONG, J.-J. & GONG, Y.-M. (2017). Late Devonian global ostracod palaeobiogeography. - Lethaia, **50** (1): 7-25.
- SONG, J.-J., CRASQUIN, S. & GONG, Y.-M. (2017). Ostracods of the Late Devonian Frasnian/Famennian transition from western Junggar, Xinjiang, NW China. - Alcheringa, **41** (2): 250-276.
- HUANG, C., SONG, J.-J., SHEN J. & GONG, Y.-M. (2018). The influence of the Late Devonian Kellwasser events on deep-water ecosystems: Evidence from palaeontological and geochemical records from South China. - Palaeogeography, Palaeoclimatology, Palaeoecology, **504**: 60-74.
- SONG, J.-J. & GONG, Y.-M. (2018). *Wangshangkia*, a new Devonian ostracod genus from Dushan of Guizhou. - Journal of Micropalaeontology, **37**: 341-346.
- SONG, J.-J., CRASQUIN, S. & GONG, Y.-M. (2018). Ostracods (Crustacea) as shelf to basin indicators: evidence from Late Devonian Yangdi and Nandong sections in Guangxi, South China. - Journal of Micropalaeontology, **37**: 257-281.
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## TM Claudia SPALLETTA

I am continuing research on the lithostratigraphy and sedimentology of the Devonian-Mississippian sequence of the Carnic Alps, with special focus on Middle-Late Devonian and Tournaisian-Visean conodont biostratigraphy and taxonomy. The studies are carried out mainly in collaboration with my friends Monica PONDRELLI and Carlo CORRADINI.

## Publication

CORRADINI, C., SIMONETTO, L., CORRIGA, M. G., PONDRELLI, M., PERRI, M. C. & SPALLETTA, C. (2023). Stratigraphic sections in the La Valute-Chiarsò area (Mt Zermula, Carnic Alps, Italy). *Gortania* - Geologia, Paleontologia,

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### **CMs Thomas J. SUTTNER and Erika KIDO**

Together with Dieter WEYER and Tomasz WRZOŁEK, Erika and I continued the joint study on the late Frasnian corals and associated conodonts from the Harz Mountains. Tomek prepared a whole lot of additional coral thin sections for the taxonomic description of phillipsastreid taxa. Also, there happened some progress on the Early Devonian of the Carnic Alps. That study was mainly coordinated by Carlo CORRADINI and Monica PONDRELLI. Besides that, collaboration with Stana VODRÁŽKOVÁ and Jiri FRYDA continued.

### **TM José Ignacio (Nacho) VALENZUELA-RÍOS and CM Jau-Chyn (Teresa) LIAO**

Activities during the report period have mainly focused on participation in the Spanish Paleontological Society meeting and in the preparation for two relevant professional meetings: 1) the next SDS meeting to be held in Sofia (Bulgaria), and 2) the Spanish Geological Meeting that will be celebrated in the Sobrarbe UNESCO Global Geopark (Spain). Additionally, we have continued with the compilation of biostratigraphic and geophysical data pertaining to the Pragian/Emsian boundary in two selected sections in the Pyrenees. First geochemical samples from these two localities have been prepared and we hope to have preliminary results by the end of this year. We have continued with the study on lower and middle Famennian conodonts in the Spanish Pyrenees.

As in previous years, Nacho and Teresa have concentrated their efforts on Lower, Middle and Upper Devonian conodont biostratigraphy, Middle Devonian conodont biofacies, and the analysis of Lower and Middle Devonian microfacies in selected Pyrenean sections. Recently, and together with Héctor BARRERA-

LAHOZ, we have started the analysis of Upper Devonian conodont biofacies as well.

In the fall of 2023, Teresa was granted from the Spanish Ministry for a short stay in Montpellier, where she continued her studies on selected sections and intervals from the Montagne Noire in cooperation with Catherine GIRARD and Raimund FEIST. To this team, the Ph.D. student **Felix NESME** joined, with a particular focus on morphometry and shape analysis. New and preliminary results of this cooperation will be presented in the SDS meeting.

We keep processing samples and analysing sequences from the Pyrenees and the Iberian Cordillera. This year our focus has been on Lochkovian, upper Frasnian, and Famennian sections. Specifically, we are supervising a new Ph.D. student, **Héctor BARRERA-LAHOZ**, from the University of Zaragoza, whose primary conodont research is focused on a diachronic stratigraphic unit spanning the F/F boundary in the Pyrenees. First taxonomic results have been published in the Spanish Journal of Paleontology; the biostratigraphic analysis has been submitted to *Paleobiodiversity and Paleoenvironments*, and the biofacies interpretation will be presented in the SDS meeting in Sofia. Two presentations dealing with Lower and Middle Devonian conodont evolution are scheduled for the upcoming Spanish Paleontological Society meeting (October 2024, La Coruña). Cooperation with Portuguese colleagues (mainly Gonçalo SILVÉRIO, Noel MOREIRA and Gil MACHADO) continues and resulted in the publication of a relevant Eifelian succession in the southwester part of the Ossa-Morena Zone in Portugal.

As previously reported, we have started multidisciplinary studies on Devonian sections and outcrops in both the Spanish Central Pyrenees and the Iberian Chains. This year, we have focussed on preparing geochemical samples in two selected Pyrenean sections (Isábena-1 and Baliera-6), which include the Pragian-Emsian transition. The results will be combined with the palaeomagnetic data that

were already presented last year (STRATI 2023 and MagIber2023) in collaboration with Spanish colleagues from the GEOtransfer Research Group at the University of Zaragoza. The geochemical analysis will be accomplished at the National Research Centre (CSIC), Geochemical Lab in Granada.

Our long-term project involving the detailed analysis of Bohemian conodont faunas around the S/D interval, initiated in collaboration with Mike MURPHY and the late Peter CARLS, is progressing.

Our cooperation with paleobotanics, which began in the Lower Devonian strata of the Iberian Chains, continues to expand. We aim to augment the palaeontological characterization of Lower Devonian strata in the Iberian Chains by including the palynological record, extending this on-going project to Middle and Upper Devonian strata. The first evidence for land plants in the Frasnian of the Iberian Chains, were presented, as preliminary results, at the Spanish Paleontological Society Meeting (Valencia, October 2023).

We have also started to focus on the identification of “Events” in the Spanish Pyrenees and to study them from a multidisciplinary point of view.

Teresa continues her Middle and Upper Devonian joint project with Susana GARCÍA-LÓPEZ from the University of Oviedo, focusing on selected localities in the Cantabrian Mountains. She is currently concentrating in the Kačák Event in several Spanish sections.

Our collaboration with the late friend Xiuquin CHEN (Suzi) and our former Ph.D. student Jianfeng LU continues to yield results, mainly related to Pragian and Emsian outcrops in South China. These efforts mark the initial steeps in the envisaged long-term Chinese-Spanish cooperation.

In terms of heritage protection actions in Spain, and as we reported last year, we are actively involved in a project affecting Devonian outcrops in the Spanish Pyrenees. A company has proposed extending the current

sky-resort near Cerler by connecting two valleys. Given that this action necessitates the construction of a new road at high elevation (over 2.200 m), where Devonian rocks crop out, we were called upon to assess the impact of this road. Preliminary results confirm the presence of Pragian, Emsian, Givetian, and Frasnian rocks. In the initial phase, we recommended the preservation of these outcrops, and both the company and the government accepted our proposal. The road will be deviated to avoid affecting the outcrops, and we were able to collect a variety of Devonian microfossils, including conodonts. This year, as additional portions of the mountain will be affected, they have once again solicited our assistance, and a new fieldwork (and subsequent lab processing and report writing) is envisaged.

Other important actions in relevant Spanish outcrops include: 1) the stratigraphical and palaeontological study of Lower Devonian outcrops in Ossa-Morena and Central-Iberian areas in south-western Spain, in collaboration with other Spanish colleagues (Miguel PARDO and Esperanza FERNÁNDEZ). This project entails large field-campaigns and mapping in rough areas. 2) The continuation of our long-term collaboration with the late Peter CARLS on the Devonian of the Iberian Chains, a classical and key area for “Rhenish” (neritic) facies. 3) **CM Jenaro L. GARCÍA-ALCALDE** continues to publish comprehensive monographs on brachiopods from the Cantabrian Mountains. 4) The Ph.D. proposal, dealing with the Silurian-Devonian outcrops in Spain and Portugal (Centro-Iberian and South Portuguese Zones) co-supervised with Noel MOREIRA, was granted and, consequently, the doctoral student **Gonçalo SIVÉRIO** continues his Ph.D. under this cooperation. 5) A Ph.D. proposal focusing on upper Frasnian and lower and middle Famennian rocks, fossils (mainly conodonts) and geophysical and geochemical signals has been launched. The candidate, Héctor BARRERA-LAHÖZ, has already presented preliminary results and published two papers.

## Publications

### Papers

BARRERA-LAHOZ, H., VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2024). Lower and middle Famennian conodonts of the CP section (Spanish Central Pyrenees): A taxonomic study. - Spanish Journal of Paleontology, **39** (1): 33-70; doi.org/10.7203/sjp.28695.

BARRERA-LAHOZ, H., VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2024 in press). Lower and middle Famennian (Upper Devonian) conodont biostratigraphy from Compte section (Central Pyrenees), Spain. - Palaeobiodiversity and Palaeoenvironments.

VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2024). Biodiversity and Evolutionary phases of Lochkovian (Lower Devonian) Conodonts in the Pyrenees: A Comparative Study. - Marine Micropaleontology, **187**; /doi.org/10.1016/j.marmicro.2023.102326

SILVÉRIO, G., LIAO, J.-C., VALENZUELA-RÍOS, J. I., MACHADO, G., BARRETO, P., & MOREIRA, N. (2024). Middle Devonian reef-derived calciturbidites of western Ossa Morena Zone (Portugal): conodont biostratigraphy of the Eifelian Pedreira da Engenharia Limestone. - Journal of Iberian Geology; doi.org/10.1007/s41513-024-00242-0.

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BARRERA-LAHOZ, H., VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2023). Bioestratigrafía y biofacies de conodontos del Fameninense inferior y medio en la sección Compte (Devónico Superior, Pirineos Centrales). - In: ROS-FRANCH et al. (Eds.), Libro de Resúmmenes de las XXXVIII Jornadas SEP. Palaentological Publications, **4**: 110.

BARRERA-LAHOZ, H., VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2024). Frasnian-Famennian conodont biofacies from the Compte section (Pyrenees, Spain). - Geologica Balcanica, **53** (3): 95.

CASCALES-MIÑANA, B., DIEZ, J.B., VALENZUELA-RÍOS, J. I., GOZALO, R., SENDER, L.M., SERVAIS, T. & STEEMANS, P. (2023). First paleobotanical data from the Upper Devonian Bolloncillos Formation (Zaragoza province, NE Iberian Peninsula). - In: ROS-FRANCH et al. (Eds.), Libro de Resúmmenes de las XXXVIII Jornadas SEP. Palaentological Publications, **4**: 95.

LIAO, J.-C., GIRARD, C., FEIST, R. & VALENZUELA-RÍOS, J. I. (2024). Conodontos en las proximidades del límite entre Devónico Medio y Superior en la sección estratotípica de Col du Puech de la Suque (Montaña Negra, Francia). - XXXIX Jornadas de la Sociedad Española de Paleontología.

LIAO, J.-C., NESME, F., GIRARD, C., VALENZUELA-RÍOS, J. I. & FEIST, R. (2024). The Taghanic evidence (Middle Devonian) at the Col du Puech de la Suque section (Montagne Noire, France). - Geologica Balcanica, **53** (3): 110

LIAO, J.-C. & VALENZUELA-RÍOS, J. I. (2023). Análisis zonal y evolución de la biodiversidad de los conodontos del Givetense (Devónico Medio) en las sucesiones pirenaicas. - In: ROS-FRANCH et al. (Eds.), Libro de Resúmmenes de las XXXVIII Jornadas SEP. Palaentological Publications, **4**: 114.

VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2024). Global comparison on Lochkovian (Lower Devonian) conodont evolution dynamics. - XXXIX Jornadas de la Sociedad Española de Paleontología.

VALENZUELA-RÍOS, J. I., MURPHY, M. A. & LIAO, J.-C. (2024). Exploring the potential of Lochkovian (Early Devonian) conodont bioevents for chronostratigraphic subdivision. - Geologica Balcanica, **53** (3): 112.

VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2023). Diversidad y evolución de los conodontos del Lochkoviense (Devónico Inferior) en el Pirineo español. - In: ROS-FRANCH et al. (Eds.), Libro de Resúmmenes de las XXXVIII Jornadas SEP. Palaentological Publications, **4**: 116.

## CM Charles VER STRAETEN

The largest event over the last year was the August 2023 release of *Devonian of New York*. This three-volume set, at over 1000 pages, present large-scale overviews to highly detailed information rarely publishable in scientific journals. I acted as lead editor, along with Jeff OVER and Don WOODROW (VER STRAETEN et al. 2023). Authors throughout the volumes are chiefly authored, in alphabetical order, by SDS members Alex BARTHOLOMEW, Gordon BAIRD, Carlton BRETT, James EBERT, Jeff

OVER, Chuck VER STRAETEN, and James (Jay) ZAMBITO. The volumes were released during the 2023 New York SDS meeting banquet in the PRI museum at Ithaca.

I was sole author on the Dedication, Introduction, and three chapters, and lead and 2<sup>nd</sup> author on two additional chapters. More significant papers of mine I consider to be: 1) Volume 1, Chapter 1, an overview of the Devonian Period, the Devonian of North America/Laurentia, and a history of Devonian research and a bottom to top presentation of Devonian strata in New York (VER STRAETEN 2023c); and 2) Chapter 5, Volume 3, which focuses on a broad yet detailed overview of early Givetian to Famennian terrestrial geology and palaeobiology in New York State (VER STRAETEN 2023e).

The other chapters in Devonian of New York extend from new interpretation of the Lochkovian in New York to extension of correlations of the Famennian through western New York to Pennsylvania and Ohio.

The Devonian of New York State had long been considered the Devonian standard section for North America. Other researchers consider the volumes to be a guide to future research over the next 50 years or more, for work not only in New York but across the U.S., and for comparison of New York's standard section for the Devonian of North America to other regions across the globe.

Devonian of New York, published by the Paleontological Research Institution in their *Bulletins of American Paleontology* is available in paper copies, or as pdf downloads through their webpage at:

<https://pri-giftshop.myshopify.com/collections/publications/products/403-408-devonian-of-new-york-vols-1-3> and  
<https://pri-giftshop.myshopify.com/collections/publications/products/403-408-devonian-of-new-york-digital-chapters>.

My main research thrust continues to be lower Givetian to Frasnian terrestrial strata of the Catskill Mountains in eastern to east-central New York State. The last dozen years of work

in these strata, along with a review of previous research, permitted publication of the extensive Devonian terrestrial chapter at the end of Devonian of New York (VER STRAETEN 2023e).

Catskills terrestrial strata are on the order of 2.4 km thick, and occur across approximately 9.5% of the State of New York (approximately 12.019 km<sup>2</sup>). The strata were deposited on an alluvial plain extending down from the rising Acadian Orogen to the Devonian eastern interior seaway, including the foreland basin system of the Acadian orogen.

Over most of its area the terrestrial bedrock is extensively covered by forests and soils. This, and lateral discontinuities of terrestrial strata in general, have prevented correlation through most of the succession.

The introduction of 3-d rotatable lidar imagery, for the first time provides a view through the forest cover and thin soils. Studied through side view of the mountainsides, rock layers can be observed, and can sometimes be correlated mountain to mountain to mountain.

Finally, I invite collaborations with SDS paleontologists/biostratigraphers. I have a lot of Emsian to Eifelian faunal material for biostratigraphic work from the Appalachian Basin, eastern United States (the states of New York, Pennsylvania, Maryland, Virginia and West Virginia). Samples include: 1) goniatites (Thomas BECKER and Gerry KLOC), conodonts, palynology, brachiopods, dacryconarids and more. Some of the material is in small samples, others in larger rocks. A few portions of this have been examined (e.g., BROCKE et al. 2016)

## Publications

### Editorials

VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. L. (2023a). Devonian of New York, Volume 1: Introduction and Pridoli to Lower Givetian (Upper Silurian to Middle Devonian) Stages. - *Bulletins of American Paleontology*, **403/404**: 290 pp.; doi: 10.32857/bap.2023.403.

VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. L. (2023b). Devonian of New York, Volume 2:

Lower to upper Givetian (Middle Devonian) Stage. - *Bulletins of American Paleontology*, **405/406**: 388 pp.; doi: 10.32857/bap.2023.405.

VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. L. (2023c). Devonian of New York, Volume 3: Frasnian to Famennian (Upper Devonian) Stages and the Devonian Terrestrial System in New York. - *Bulletins of American Paleontology*, **407/408**: 338 pp.; doi: 10.32857/bap.2023.407.

#### Papers

VER STRAETEN, C. A. (2023a). Preface. - In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 1: Introduction and Přídolí to lower Givetian (Upper Silurian to Middle Devonian) stages. *Bulletins of American Paleontology*, **403/404**: 1–5; doi: 10.32857/bap.2023.403.01.

VER STRAETEN, C. A. (2023b). Dedication: To Dr. Lawrence (Larry) V. RICKARD. - In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 1: Introduction and Přídolí to lower Givetian (Upper Silurian to Middle Devonian) stages. *Bulletins of American Paleontology*, **403/404**: 7–10; doi: 10.32857/bap.2023.403.02.

VER STRAETEN, C. A. (2023c). Chapter 1: An Introduction to the Devonian Period, and the Devonian in New York State and North America. - In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 1: Introduction and Přídolí to lower Givetian (Upper Silurian to Middle Devonian) stages. *Bulletins of American Paleontology*, **403/404**: 11–102; doi: 10.32857/bap.2023.403.03.

VER STRAETEN, C. A. (2023d). Chapter 3: The Port Jervis, Oriskany, Esopus, and Schoharie Formations, and Equivalents: Pragian and Emsian Strata of New York. - In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 1: Introduction and Přídolí to lower Givetian (Upper Silurian to Middle Devonian) stages. *Bulletins of American Paleontology*, **403/404**: 153–204; doi: 10.32857/bap.2023.403.05, supplementary material available at <https://www.priweb.org/devonian-ny/>.

VER STRAETEN, C. A., BRETT, C. E. BAIRD, G. C. BARTHOLOMEW, A. J. & OVER, D. J. (2023). Chapter 4: Lower Middle Devonian (Eifelian–Lower Givetian) strata of New York State: The

Onondaga Formation and Marcellus Subgroup. – In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 1: Introduction and Přídolí to lower Givetian (Upper Silurian to Middle Devonian) stages. *Bulletins of American Paleontology*, **403/404**: 205–280; doi: 10.32857/bap.2023.403.06.

VER STRAETEN, C. A. (2023e). Chapter 5: The Devonian Terrestrial System of New York. - In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 3: Frasnian to Famennian (Upper Devonian) stages and the Devonian terrestrial system in New York. *Bulletins of American Paleontology*, **407/408**: 211–330; doi: 10.32857/bap.2023.407.05, supplementary material available at <https://www.priweb.org/devonian-ny/>.

BARTHOLOMEW, A. & C. A. VER STRAETEN. (2023). Chapter 2: Marine strata of the Middle to Upper Hamilton Group (Middle Devonian, lower Givetian), eastern outcrop belt in New York State. - In: VER STRAETEN, C. A., OVER, D. J. & WOODROW, D. (Eds.), Devonian of New York, Volume 2: Lower to upper Givetian (Middle Devonian) stage. *Bulletins of American Paleontology*, **405/406**: 197–258; doi: 10.32857/bap.2023.405.02, supplementary material available at <https://www.priweb.org/devonian-ny/>.

#### Abstracts

GARDNER, N., BOVIS, J. M., BOCK, R., ENGELMAN, R., GODLESKY, C., HODNETT, J.-P., SCOTT, B., SHELL R. & VER STRAETEN, C. (2024). Paleontological Discovery in the Emsian–Eifelian (Devonian) Needmore Formation in West Virginia: 150 Years of Exploration and Beyond. - 2024 North American Paleontological Convention, University of Michigan, Ann Arbor, MI.

VER STRAETEN, C. A. (2024). Preservation Potential of Airfall Volcanic Tephras, Terrestrial Settings/Devonian. - Geological Society of America, Abstracts with Programs, **56** (1); doi: 10.1130/abs/2024NE-397709

VER STRAETEN, C. A. (2023). Investigating the Acadian-Neoacadian orogenies: Multiple foreland lessons. - Geological Society of America, Abstracts with Programs, **55** (6); doi: 10.1130/abs/2023AM-396196.

- VER STRAETEN, C. A. (2023). Devonian of New York: An extensive overview, and guide to future research. - Geological Society of America, Abstracts with Programs, **55** (6); doi: 10.1130/abs/2023AM-396195.
- GREB, S., BREZINSKI, D. K., CARTER, K. M., CLARK, R., DINTERMAN, P. A., HARRISON, W.B., LASEMI, Y., LEETARU, H. E., McDONALD, J., MOORE, J., SLATER, B., SPARKS, T., SOLIS, M., VER STRAETEN, C. & WAID, C. (2023). Using a systems approach to understanding carbon storage potential in the Midwest and Eastern United States. - Geological Society of America, Abstracts with Programs, **55** (6); doi: 10.1130/abs/2023AM-395003.

## CM WANG Yia-Shu

### Research interests

Terrestrialization, arthropod palaeobiology, palaeoecosystems, sedimentary environments.

### Devonian publications

HUANG, P., LIU, L., LIU, L., WANG, J.-S. & XUE, J. (2022). *Sphenophyllum* BRONGNIART (Sphenopsida) from the Upper Devonian of South China. – Palaeoworld, **31**: 402-418.

HUANG, P., ZHANG, X., WANG, J.-S., FU, Q., WANG, X. & XIONG, C. (2023). Revisiting the plant fossils from the Upper Devonian Wutong Formation at the Shizikou section of Chaohu, Anhui Province. - Acta Palaeontologica Sinica, **62**: 245-259.

WANG, J.-S., LIU, L., XUE, J., LAMSDELL, J. C. & SELDEN, P. A. (2022). A new genus and species of eurypterid (Chelicerata, Eurypterida) from the Lower Devonian Xiaishancun Formation of Yunnan, southwestern China. – Geobios, **75**: 53-61.

WANG, J.-S., ZHANG, L., HUANG, P., LIU, L. & XUE, J. (2024). Sedimentology and ichnology of the Xiaishancun Formation of Qujing, Yunnan shed light on the earliest Devonian marginal-marine environments and ecosystems in South China. - Palaeogeography, Palaeoclimatology, Palaeoecology, **647** (112220).

XUE, J.-S., WANG, J., LI, B., HUANG, P. & LIU, L. (2022). Origin and Early Evolution of Land Plants and the Effects on Earth's Environments.

- Earth Science, Journal of China University of Geosciences, **47**: 3648-3664.

XUE, J., WANG, J.-S., HUANG, P., LIU, L., HUANG, T., ZHANG, L., WANG, X., SHEN, B., WANG, D., LIU, J., DAVIES, N. & BASINGER, J. (2023a). The colonization of drylands by early vascular plants: Evidence from Early Devonian fossil soils and *in situ* plant traces from South China. - Earth-Science Reviews, **237** (104290).

XUE, J., LI, B., WANG, J.-S., LIU, L., HUANG, P., XIONG, C. & SHEN, B. (2023b). Coupling relationship between radiation of early vascular plants and the long-term water cycle. - Chinese Science Bulletin, **68**: 1459-1472.

YANG, S., HUANG, P., LIU, L., WANG, J.-S., ZHANG, J. & XUE, J. (2022). A New Zosterophyllopsid Plant with Encrusted Microconchids from Lower Devonian Guijiatun Formation of Qujing, Yunnan Province. - Acta Scientiarum Naturalium Universitatis Pekinensis, **58**: 861-874.

ZHOU, Z., ZHAO, J., WANG, J.-S., WU, C., XIAO, B. & HUANG, P. (2022). New material of *Zosterophyllum australianum* from the Lower Devonian Mangshan Group in Duyun, Guizhou and its palaeogeographic implications. - Journal of Palaeogeography (Chinese Edition), **24**: 479-492.

## CM XUE Jin-Zhuang

In 2024, we have been mainly focusing on Devonian deposits and fossils of South China. In a recent study (WANG et al. 2024), we demonstrated that the Xiaishancun Formation of Qujing, Yunnan, typically records the deposition of hyperpycnal flow systems, which have been rarely reported in the Paleozoic. We recognized nineteen ichnogenera and 32 ichnospecies from this formation, which were grouped into two ichnoassemblages, the *Lockeia-Ptychoplasma-Oravaichnium* ichno-assemblage and the *Cruziana-Diplichnites-Monomorphichnus* ichno-assemblage. The Xiaishancun Formation of Qujing is generally considered earliest Devonian in age and thus our study provides new insights into the understanding of marginal-marine environments and biotas of South China,

immediately following the Silurian–Devonian transition event.

WANG Y. L. et al. (2024) reported the zosterophylloidsid genus *Gosslingia* from the Lower Devonian of Guizhou, China. Our finding represents the first report of *Gosslingia* from the South China Block and the most convincing occurrence of this genus outside of the type locality (Wales, UK).

I participated in the geochemical study of Mg isotopic systematics of the Wuzhishan Formation around the Devonian-Carboniferous boundary (HUANG et al. 2024). In this study, we presented the evolutionary trend of Mg signals across the suggested DCB and proposed a new weathering model to explain Mg isotopic signals in the sedimentary record.

I convened with colleagues a session at the 37<sup>th</sup> International Geological Congress (IGC 2024), entitled the *Evolution of Land Plants and Plant-Environment Interactions during Geological Time*, and another session at the 6<sup>th</sup> International Conference of Palaeogeography, entitled *How do fossil data advance our knowledge of palaeoenvironments and palaeogeography?* Many interesting talks were presented.

In 2024, **WANG Jia-Shu** finished his doctoral thesis entitled *Early Devonian coastal zone environments and ecosystems in South China-Sedimentological and ichnological evidence from the Lower Devonian of Qujing, Yunnan, China*, and obtained his Ph.D. degree from Peking University. He began his academic career at the Geological Museum of China since August.

## Publications

HUANG, T.-Z., SHEN, B., HUANG, K.-J., NING, M., LI, C., XUE, J.-Z., SUN, Y.-L. & HUANG, B.-Q. (2024). Revisiting the Mg isotopic systematics of siliciclastic components of sediments and sedimentary rocks: A new geochemical proxy of continental weathering in Earth's history. - Science China, Earth Sciences, **67**: 620-633.

WANG, J.-S., ZHANG, L.-J., HUANG, P., LIU, L., XUE, J.-Z. (2024). Sedimentology and ichnology of the Xiaishancun Formation of Qujing, Yunnan:

Earliest Devonian marginal-marine environments and ecosystems in South China. - Palaeogeography, Palaeoclimatology, Palaeoecology, **647** (112220).

WANG, Y.-L., LIU, L., HUANG, P., QIN, M., XUE, J.-Z. (2024). New material of the zosterophylloidsid *Gosslingia* from the Lower Devonian of Guizhou, southwestern China. - Journal of Paleontology; doi: 10.1017/jpa.2023.97.

## CM Gavin YOUNG

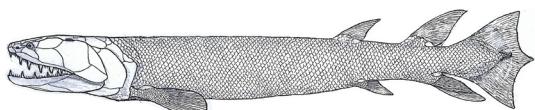
The Department of Materials Physics (formerly Dept. of Applied Maths) in the ANU Research School of Physics, developed and houses the high-resolution XCT scanning facilities of the ANU. This has been the home for ANU research on Devonian vertebrates for over a decade.

An ongoing project that has consumed much time and energy is a co-authored manuscript with Carole BURROW (Queensland Museum), and Prof. LU Jing (IVPP; Institute of Vertebrate Paleontology & Paleoanthropology, Beijing) on CT scanned uncrushed material of a new species of *Palaeospondylus* from the Early Devonian Cravens Peak limestone in the Georgina Basin. This reveals much new information about braincase structure, previously unknowable in the many thousands of compressed examples of the type species, the highly enigmatic *Palaeospondylus gunni* from the Middle Devonian black shales of Achanarras, Scotland. Hopefully, our MS will be published in 2024.

Another paper (also co-authored with Carole and Jing) that came out in 2023 documents new material of the probable actinopterygian (ray-finned) fish *Ligulalepis* from various NSW Lower Devonian limestones. Some significant specimens come from the limestones at Wee Jasper, exposed around Lake Burrinjuck, ~50 km northwest of Canberra. For the same Wee Jasper limestones, a paper on Devonian mesophotic coral ecosystems has been finalised with Polish Devonian coral experts Mikołaj ZAPALSKI and Błażej BERKOWSKI, who

conducted fieldwork with GCY at Wee Jasper in July, 2022. Devonian corals are very abundant at Wee Jasper, but there is only one previous detailed study, by PEDDER et al. (1970, *J. Paleont.* **44**: 206-251). The earlier work by Dorothy HILL (1941) was mainly focused on the Taemas-Cavan area, a larger outcrop of the Burrinjuck limestones about 20 km east of Wee Jasper. The new study has clarified detailed correlations between the two outcrops for subdivisions of the Taemas Formation. Also prepared for this paper are new reconstructions of all the Devonian fish that occur with the coral assemblage.

Within the lowest limestone in the Wee Jasper sequence (the Cavan Limestone), the Pragian-Emsian boundary was identified by the conodont studies of MAWSON et al. (1992, *Proc. R. Soc. Vict.* **104**: 23-56). The most extensive exposures of the Cavan Limestone (but highly folded) are in the eastern outcrop, the type section being on Cavan Station, the property owned by media mogul Rupert MURDOCH, which has produced numerous significant Devonian fossils. A well-illustrated book (see review; YOUNG 2021b) covers the history of Cavan Station and MURDOCH's acquisition, and features images of the fossiliferous limestone beds and Devonian fish in its introductory chapter.



**Fig. 1.** New full body restoration of the giant lobefin *Edenopteron keithcrooki* (total length 2.5–3 m, based on its 48 cm long lower jaw).

A major field project near Eden, on the NSW south coast (Eden Project), ongoing since 2019, has suffered serious delays outside our control. This project is investigating large sarcopterygians (lobe-finned fishes) and associated antiarchs (a new species of *Remigolepis*) from the Upper Devonian (Famennian) Worong Point Formation. Apart from *Edenopteron keithcrooki* YOUNG et al., 2013, there are several new sarcopterygian taxa.

With a lower jaw up to 48 cm long, *Edenopteron* is the largest Devonian tristichopterid known from semi-articulated remains (Figs. 1-2). The project began with a major field excavation in November 2019, involving a group from IVPP organized by LU Jing, including a documentary team. The excavation was to be finalised in early 2020, followed by a helicopter lift-out from the rock platform, the only way to get this material up the coastal cliffs (as done for an Australian Museum excavation led by Alex RITCHIE in 1996).



**Fig. 2.** Life-size model of *Edenopteron* head and shoulder girdle, on display at ANU, with LU Jing (left) and HU Yuzhi (right) for scale.

But in early 2020, the entire region was ravaged by massive bushfires. We were unable to access the site for further excavation until July 2021, with follow up fieldwork in December 2021 and February 2022. A latex cast of the remaining fossil surface was made (dimensions 235 x 75 cm), from which a resin mould was prepared (Fig. 3).

Following this, extreme wet weather during 2022-23 rendered the access track impassable until early 2024, when we could resume the excavation. The fossil stockpile, representing at least 17 articulated Upper Devonian Gondwana sarcopterygians, mainly undescribed, remains on the rock platform until a helicopter lift-out can be arranged (Fig. 4). This material is destined for the palaeontological collection of the Australian Museum, as is also the type material of *Edenopteron keithcrooki*, much time

and effort being currently expended arranging its transfer out of the ANU (some of the pitfalls for type fossil material held in university collections is discussed in YOUNG 2021a).



**Fig. 3.** Monica YEUNG (left) and Bruce LOOMES (Canowindra, right) with the resin mould he prepared, now on display in a Chinese museum (organized and financed by Prof. LU Jing).



**Fig. 4.** Fossil stockpile of at least 17 articulated Famennian lobe-finned fish on a coastal rock platform south of Eden, NSW, as at April 2024.

Even so, sarcopterygian remains from the Famennian Worange Point Formation near

Eden have been described and figured by YOUNG (2024) in an investigation of the age of the tetrapod *Metaxygnathus* from Jemalong in central NSW. The porolepiform *Holoptychius* AGASSIZ, 1839 is one of the most widespread Late Devonian fossil fish, associated with the tetrapods *Ichthyostega* and *Acanthostega* in the Famennian of East Greenland, and previously said to occur in the Jemalong fossil fish assemblage associated with *Metaxygnathus*.

The articulated type specimen of *Holoptychius nobilissimus*, from the uppermost Dura Den beds of the Old Red Sandstone at Clashbennie in Scotland, was first illustrated in MURCHISON's *Silurian System* (1839). Key evidence confirming a correlation between the marine strata of Devon, and the Old Red Sandstone of Scotland was the identification by Louis AGASSIZ of an isolated scale of *Holoptychius* from the 'Silurian' of Belgium, forming the basis for the erection of the Devonian System by SEDGWICK & MURCHISON (1839).

However, resolution of marine-nonmarine correlation for Devonian sequences in other regions remains a significant research topic, and my detailed comparison of porolepiform scales from Jemalong in central NSW confirmed they do not belong to *Holoptychius*. Instead, they are closely similar to *Glyptolepis*, typical of the Middle Devonian in Europe. This new evidence suggests that the age of the Jemalong assemblage should be revised downwards to Givetian-Frasnian or older, rather than Famennian as previously interpreted. However, while YOUNG (2024) was in press, RETALLACK (2024, *Lethaia*; doi.org/10.18261/let.57.1.5) appeared claiming the opposite, that *Metaxygnathus* is of Famennian age, and stratigraphically higher than the Canowindra fish assemblage (also Famennian; cf. previous assessments that it is late Frasnian or older). These contradictions are discussed in a new manuscript under preparation.

## Publications

- BURROW, C. J., YOUNG, G. C. & LU, J. (2023). Dermal skeleton of the stem osteichthyan

- Ligulalepis* from the Lower Devonian of New South Wales (Australia). - Spanish Journal of Palaeontology, **38** (1): 23–36.
- CASAS, J. E., BERRY, C., MOODY, J. M. & YOUNG, G. (2022). Formación Campo Chico, una increíble Ventana a la flora y fauna fósil del Devónico (Givetiano-Frasniano) en la Sierra de Perijá, Venezuela. - Publicacion Electronica de la Asociación Paleontológica Argentina, **22** (1): 20-35; doi.org/10.5710/PEAPA.08.03.2022.401.
- CHOO, B., HOLLAND, T., CLEMENT, A. M., KING, B., CHALLANDS, T., YOUNG, G. & LONG, J. A. (2024). A new stem-tetrapod fish from the Middle-Late Devonian of central Australia. - Journal of Vertebrate Paleontology; doi 10.1080/02724634.2023.2285000.
- YOUNG, G. C. (2021a.) Addendum to Robert William DAY's Obituary. - The Australian Geologist, **199**: 41-42.
- YOUNG, G. C. (2021b). Cavan Station: Its early history, the Riley legacy and the Murdoch vision [by] Nicola Crichton-Brown. - The Australian Geologist, **201**: 45 [book review].
- YOUNG, G. C. (2024). Relative age of the Devonian tetrapod *Metaxygnathus*, based on the associated fossil fish assemblage at Jemalong, New South Wales. – Alcheringa, **48** (2): 278-297; doi.org/10.1080/03115518.2024.2327039.
- CM James J. ZAMBITO IV**
- This last year, my students and I have primarily focused on studying black shale successions in the Illinois and Michigan Basin, with the goal of refining our use of  $\delta^{13}\text{C}_{\text{TOC}}$  as a chemostratigraphic tool for recognizing Devonian global events. This work was been funded by the *American Chemical Society Petroleum Research Fund* (#60525-UR2) and the Keck Geology Consortium (NSF #2050697). Preliminary reports on our work in the Michigan Basin are available as part of the Keck Short Contributions series (see bottom of webpage here: <https://keckgeology.org/2024/07/36th-keck-proceedings-volume/>; select reports listed in publications below), and I hope to report on publication of additional results next year as articles are currently in preparation and review.
- Additionally, I have continued to work with Carlton BRETT, Gordon BAIRD, and Alexander BARTHOLOMEW on various projects related to the relationship of faunal turnover and paleobiogeographic changes with environmental volatility in the Devonian. Most recently, my students and I have begun a new project on constraining the age and provenance of the poorly studied Middle and/or Late Devonian Sylamore, Bushberg, and Misener sandstones in Illinois, Missouri, and Oklahoma, respectively.
- Publications**
- Papers*
- ZAMBITO IV, J. J. & VOICE, P. J. (2024). Integrated stratigraphic and paleoenvironmental study of the Middle-Late Devonian carbonate to black shale transition in the Michigan Basin. - Keck Geology Consortium Short Contributions, **36**: 8 pp.; doi: 10.18277/AKRSG.2024.36.11.
- JOHNSON, I. R. & ZAMBITO IV, J. J. (2024). Characterizing the sediment source of the Ellsworth Formation of the Michigan Basin using lithostratigraphy and chemostratigraphy. - Keck Geology Consortium Short Contributions, **36**: 6 pp.; doi: 10.18277/AKRSG.2024.36.18.
- Abstracts*
- ZAMBITO IV, J. J., VOICE, P. J., GIEHLER, M. C. & GUGINO, J. P. (2024). Identification of middle Givetian - early Famennian global events in the Michigan Basin, U.S.A., - Joint ISSS-SDS Meeting, 12-17 September, Sofia, Bulgaria. *Geologica Balcanica*, **53** (3): 114.
- CM ZHANG Li-Jun**
- Research Interests**
- Silurian-Devonian trace fossils and terrestrialization, (the study of animal-substrate interactions) and its relationship with sedimentology, sequence Stratigraphy, palaeoecology and palaeobiology.
  - Macroevolution of ichnogenera response to mass extinction (e.g., F-F, P-T) and early life explosion and radiation (Cambrian-Ordovician...).

## Devonian publications

- WANG, J.-S., ZHANG, L.-J., HUANG, P., LIU, L. & XUE, J.-Z. (2024). Sedimentology and ichnology of the Xiaishancun Formation of Qujing, Yunnan: Earliest Devonian marginal-marine environments and ecosystems in South China. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **647** (112220).
- XUE, J., WANG, J., HUANG, P., LIU, L., HUANG, T., ZHANG, L.-J., WANG, X., SHEN, B., WANG, D., LIU, J., DAVIES, N. S. & BASINGER, J. F. (2023). The colonization of drylands by early vascular plants: Evidence from Early Devonian fossil soils and in situ plant traces from South China. - *Earth-Science Reviews*, **237** (104290).
- ZHAO, Z., ZHANG, L.-J. & GONG, Y.-M. (2019). Morphology and ethology of the Late Devonian trace fossil *Rhizocorallium* from the Xichuan section of Central China. - *Lethaia*, **53**: 217-228.
- ZHANG, L.-J., KNAUST, D. & ZHAO, Z. (2016). Palaeoenvironmental and ecological interpretation of the trace fossil *Rhizocorallium* based on contained iron frambooids (Upper Devonian, South China). - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **446**: 144-151; doi: 10.1016/j.palaeo.2016.01.012.
- ZHANG, L.-J. & ZHAO, Z. (2016). Complex behavioural patterns and ethological analysis of the trace fossil *Zoophycos*: evidence from the Lower Devonian of South China. - *Lethaia*, **49** (2): 275-284; doi:10.1111/let.12146.
- ZHANG, L.-J., FAN, R.-Y. & GONG, Y.-M. (2015). *Zoophycos* macroevolution since 541 Ma. - *Scientific Reports*, **5** (14954); doi:10.1038/srep14954.
- ZHANG, L.-J. & ZHAO, Z. (2015). Lower Devonian trace fossils and their palaeoenvironmental significance from western Yangtze Plate, South China. - *Turkish Journal of Earth Science*, **24** (5): 325-343
- ZHANG, L.-J. (2014). Lower Devonian tempestites in western Yangtze, South China: insight from *Zoophycos* ichnofabrics. - *Geological Journal*, **49** (2): 177-187.

## CM ZONG Rou-Wen



### Research interests

Devonian integrated stratigraphy, Trilobites, Silurian-Devonian Boundary, Orogenic geology

### Publications

- YIN, J.-Y., SLAVÍK, L., WANG, Z.-H., SHEN, Z., ZHANG, X.-S., LI, Y.-L., MA, J., GONG, Y.-M. & ZONG, R.-W. (2024). The Silurian-Devonian Boundary of China: Review and perspectives. - *Earth-Science Reviews*, **254** (104805).
- ZONG, R.-W., YIN, J.-Y., MA, J., DU, X.-Q., LIU, Y.-L. & LIU, S.-B. (2023b). Lower Devonian sequence and Silurian-Devonian boundary in northern Xinjiang, NW China: a preliminary study. - SDS Newsletter, **38**: 67-71.
- YIN, J.-Y., SLAVÍK, L., LU, J.-F., MA, J., LIU, Y.-L., ZONG, R.-W., GONG, Y.-M. (2023). Discovery of the earliest Devonian conodonts from Xinjiang, Northwest China. – *Palaeoworld*; doi: 10.1016/j.palwor.2023.10.001.
- ZONG, R.-W. (2023). Variation in eye lenses of two new Late Devonian phacopid trilobites from western Junggar, NW China. - *Journal of Paleontology*, **97** (4): 891-905.
- MA, J., YIN, J.-Y., LIU, Y.-L., DU, X.-Q., LIU, S.-B. & ZONG, R.-W. (2023). The latest encrinurid trilobites from the Lower Devonian of Xinjiang, Northwest China. - *Geological Magazine*, **160**: 1578–1585.
- ZONG, R.-W., EDGECOMBE, G. D., LIU, B.-C., WANG, Y., YIN, J.-Y., MA, J. & XU H.-H. (2023a). Silurian freshwater arthropod from northwest China. - *Papers in Palaeontology*, **9** (e1488).
- ZONG, R.-W. & GONG, Y.-M. (2022b). Malformations in Late Devonian brachiopods

- from the western Junggar, NW China and their potential causes. - *PeerJ*, **10** (e13447).
- ZONG, R.-W. & GONG, Y.-M. (2022a). Allopatric molting of Devonian trilobites. - *Scientific Reports*, **12** (e13851).
- ZONG, R.-W. & GONG, Y.-M. (2020). Discovery of scyphocrinoid loboliths in western Junggar, Xinjiang, NW China: Implications for scyphocrinoid paleobiogeography and identification of the Silurian–Devonian boundary. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **557** (109914).
- ZONG, R.-W., WANG, Z.-H., FAN, R.-Y., SONG, J.-J., ZHANG, X.-S., SHEN, Z. & GONG, Y.-M. (2020). New knowledge on the Hongguleleng Formation and Devonian–Carboniferous boundary in western Junggar, Xinjiang. - *Acta Geologica Sinica*, **94** (8): 2460-2475 (in Chinese with English abstract).
- ZONG, R.-W. & GONG, Y.-M. (2018). Possible courtship behaviour of Devonian fish: Evidence from large radial trace fossils in northwestern China. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **505**: 180-186.
- ZONG, R.-W. & GONG, Y.-M. (2017). Behavioural Asymmetry in Devonian Trilobites. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **476**: 158-162.
- ZONG, R.-W., FAN, R.-Y., GONG, Y.-M. (2016b). Seven 365-Million-Year-Old Trilobites Moulting within a Nautiod Conch. - *Scientific Reports*, **6** (e34914).
- ZONG, R.-W., WANG, Z.-Z., JIANG, T., GONG, Y.-M. (2016a). Late Devonian radiolarian-bearing siliceous rocks from the Karamay ophiolitic mélange in western Junggar: Implications for the evolution of the Paleo-Asian Ocean. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **448**: 266-278.