



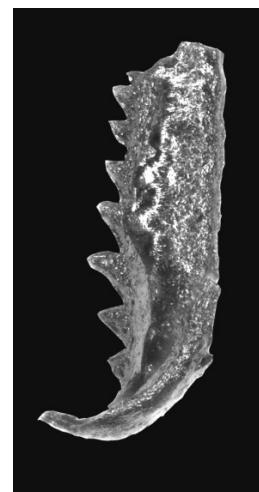
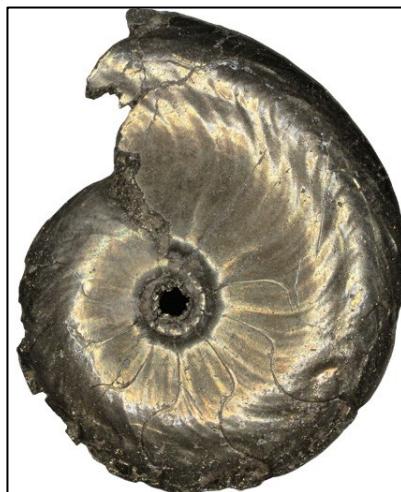
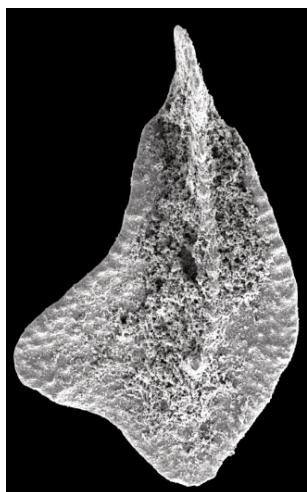
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COMMISSION ON STRATIGRAPHY

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**SUBCOMMISSION ON
DEVONIAN STRATIGRAPHY**

NEWSLETTER No. 36

R.T. BECKER, Editor
WWU Münster
Germany



SDS NEWSLETTER 36

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, Minutes of SDS Meetings, SDS reports to ICS, general IUGS information, information on past and future Devonian meetings and research projects, and reviews or summaries of new Devonian publications.

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Please ease the editing by strictly keeping the uniform style of references, as shown in the various sections !

The Newsletter contributions should be quoted as: “**SDS Newsletter, 36: x-y.**”

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Chairman's Address

Dear SDS Members,

Another complicated year elapsed and I hope all of you are doing well and staying safe. Probably none of us do want to hear words like “Covid-19”, “pandemic” or “restrictions” any more. And I will try to avoid using these annoying phrases in the opening words to our SDS Newsletter, which is No. 36! The Newsletter compiles everything related to the Devonian on an annual basis and is put together mostly from your contributions. I would like to take the opportunity to thank all of you for sharing information and to ask you to continue reporting your Devonian-related activities to make the next issues all-embracingly informative.

The new team is through the first year in their duty: Ladislav SLAVÍK (Chair), Nacho VALENZUELA-RÍOS (Vice-Chair), Uli JANSEN (Secretary), Thomas BECKER (SDS Newsletter Editor) and Carlo CORRADINI (Webperson). Since we had no chance to meet the last year or this year, most information was coming from bulk e-mails from the Secretary. Apart from this, we were mostly involved in various agenda regarding re-scheduling of future meetings and avoiding clashes, the new SDS webpage, Devonian sub-projects, and other issues. So, we are keeping the SDS going, and try moving things forward, although the progress might seem to be slow.

When you are reading these opening words, the new SDS website most probably will have been launched on the ICS webpage. Many thanks to Carlo and Nick CAR (ICS Webmaster) for producing it! It might seem to be more concise than the original webpage but perhaps you will find it transparent and well arranged, largely benefiting from many cross links to the main ICS content. Using the same platform, the websites of all subcommissions are to be of uniform style, concentrated in one place/domain and thus easy to be looked up.

The situation with real-life meetings is still complicated and we still have to communicate various topics via the internet. We hope that our on-line SDS meeting planned for this autumn will be the last one organized this way. And, we are looking forward to enjoy the chance of meeting face to face again next year, communicating a lot more, having scientific discussions and friendly chats related particularly to geology in the field.

For the next year (November 2022) we can only hope that the International Palaeontological Congress (IPC6) in Thailand will take place. SDS (Peter KOENIGSHOF and others) have proposed a Devonian symposium: Devonian palaeoenvironments and mass extinctions. There is also another opportunity for 2022 – to join the bi-annual conference and field meeting of the Silurian Subcommission (ISSS) planned for the next Summer 2022 (organized by Valeri SACHANSKI). As you know, our planned meeting and field trip to New York State has been postponed for 2023 by Jeff OVER and co-organizers. We are still looking forward to meeting there. There is also a chance for the Carboniferous congress (organized by Markus ARETZ). We will see how situation develops, nothing can be predicted. There is no information yet about the already twice postponed 36th International Geological Congress. But writing these lines, I believe that the announced GSA meeting will be held this autumn, and other non “on-line only” events will follow.

I am very pleased that our activities are continued and that the two announced important Devonian-related volumes have already appeared: A special volume of Palaeobiodiversity and Palaeoenvironments “**Global Review of the Devonian-Carboniferous Boundary**” (Guest-editors: M. ARETZ & C. CORRADINI) with 15 contributions on 370 pages, and a special volume of the Scientific Journal of the Hassan II Academy of Science and Technology “**Devonian to Lower Carboniferous stratigraphy and facies of the Western Moroccan Meseta: Implications**

for palaeogeography and structural interpretation” (Guest-editors: R. T. BECKER, A. EL HASSANI & Z. S. ABOUSSALAM) of more than 300 pages. Besides these, many Devonian-related papers produced by our Devonian community are reported in this issue of the SDS newsletter. Most importantly, it is necessary to mention the new issue of Geologic Time Scale, which was released in late 2020. This represents the state-of-the-art of current stratigraphic studies. The Devonian chapter was compiled by Thomas BECKER, John MARSHALL and Anne-Christine DA SILVA, with Frits AGTERBERG, Felix GRADSTEIN, and JIM OGG, as co-authors responsible for geochronology and absolute scaling. Many thanks to all editors/authors/contributors for such a production!

For all of us, this year was far from being normal. The situation, however, seems to be at least a bit better, and many of us could continue somehow their projects and get back to the field. The ICS executive received additional funding from the IUGS for ‘special sub-projects’ within the project ‘Regenerating the Time Lords: Towards the completion, calibration, digitization and outreach of the geological timescale’. Our application for an ICS special grant in order to obtain mainly geochemical data from Pragian–Emsian sections of the Spanish Central Pyrenees was successful, and Nacho VALENZUELA-RÍOS was awarded ICS funds. The small SDS subprojects launched last year and focused mostly on the basal Emsian and the D-C boundary will go on.

Many thanks again for all your Devonian-related activities, stay safe and strong! Let’s go successfully ahead with our Devonian business!

Ladislav SLAVÍK

OBITUARY

Gerhard Karl Bernhard ALBERTI

(22.6.1931 – 15.10.2019)

R. Thomas BECKER



Fig. 1. Gerhard K. H. ALBERTI, during an excursion to Central Asia in 1988 (photo kindly supplied by E. SCHINDLER, Frankfurt a.M.).

In autumn 2019, our long-term SDS member Gerhard K. B. ALBERTI passed away. He was an outstanding, globally renowned specialist of Devonian trilobites and tentaculitoids, and a real pioneer of field work in various regions of North Africa (Morocco and Algeria).

Gerhard ALBERTI was born in Merseburg in eastern Germany and received his Diplom in geology 1955 in Berlin, where he worked until 1958 in the Geological Commission of the DDR. He left the country well before the wall was built and moved to Tübingen, where he completed in 1959 a Ph.D. on Mesozoic and Tertiary dinoflagellates and “hystrichosphaerids”. Subsequently, he joined as a research assistant the State Geological Institute in Hamburg. After his habilitation in 1966 on the upper Silurian and Devonian trilobites of Morocco, he became a Privatdozent at the University of Hamburg, and in 1971 a professor of Geology and Palaeontology, until his retirement in 1994. In 1976 and 1977 he acted as the vice director of the re-named Geological-Palaeontological

Institute. He was known to communicate intensively with his students, encouraging them to develop their own scientific minds. He was married to Lore ALBERTI, who frequently accompanied him in the field and who co-authored several papers, some of which appeared with long delay after her death in 2004. His scientific output was enormous and impressive, first of all his voluminous habilitation work, which was published in two parts (ALBERTI 1969, 1970c). Apart from North Africa, his studies dealt with the Palaeozoic of Sardinia, the Harz and Rhenish Slate Mountains, Thuringia and Franconia of Germany, the Carnic Alps, Nevada, and Victoria (Australia). In many cases, he used biostratigraphic results both for the reconstruction of the regional geological history and for international correlations. Throughout his career Devonian trilobites and dacryoconarids remained the main research topics. There were several short notes written in French and Italian and two Russian contributions. But only a short paper in 1982,

conference and membership reports were written in English. Most of his work was published with the Senckenberg Research Institute in Frankfurt a.M. He communicated with many SDS members but preferred to write manuscripts by himself. For example, there was no cooperation with his younger brother Helmut ALBERTI, who also worked throughout his career on Devonian trilobites. Gerhard ALBERTI was also a long-term member of the German Devonian Subcommission. From 1999 on, heart problems, followed later by poor eyesight, restricted his activities. This resulted in a strong decline of Devonian research. However, based on travel to Africa, he wrote popular science reports on plants and vegetation zones.

His collections were transferred to the Senckenberg Research Institute, Frankfurt a.M.

Acknowledgements: I thank H. BAHLBURG (Münster) and E. SCHINDLER (Frankfurt a.M.) for comments, corrections, and photos.



Fig. 2. Field party in Central Asia in 1988, with F. LANGENSTRASSEN (left), S. SENNIKOV (second), O. H. WALLISER (middle), and G. K. H. ALBERTI (right); photo by E. SCHINDLER.

Taxa named after G. K. B. ALBERTI:

Alberticoryphe ERBEN, 1966; Trilobita, Tropidocoryphinae
Albertiproetus CHATTERTON, FORTEY, BRETT, GIBB & MCKELLAR, 2006; Trilobita, Proctidae
Alberticeras BECKER in BECKER et al. 2018; Ammonoidea, Tornoceratidae
Neaxonella albertii WEYER, 1978; Rugosa, Laccophyllidae
Cornuproetus (Cornuproetus) albertii CHATTERTON & CAMPBELL, 1980; Trilobita, Proctidae
Pilletopeltis albertii PRIBYL & VANEK, 1984; Trilobita, Cheiruridae
Nowakia (Nowakia) albertii RUAN & MU, 1989; Dacryconarida, Nowakiidae
Ense albertii STRUVE, 1992, Brachiopoda.
Eocryphops albertii HOLLOWAY, 2005; Trilobita, Phacopidae
Reedops albertii SANDFORD, 2005; Trilobita, Phacopidae

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SDS REPORTS

Annual Report to ICS

1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy

Reporting: **Ladislav SLAVÍK** (Chair)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

In 2020 many activities of the SDS were stopped and/or delayed due to Covid-19. In spite of the problems working groups have continued its work on the revision of problematic GSSPs (basal Emsian and the Devonian-Carboniferous boundary). The major problems and issues were discussed during the SDS officers video meeting that included editor of SDS newsletter and webmaster. Many SDS members have reported their activities during the “Covid year” and the

Annual Business Meeting is now postponed for 2021. Other continued activities include multidisciplinary international correlation, the postponed organisation of Devonian stratigraphic symposia, publication of the SDS Newsletter and of monographic books/journal volumes, namely the fresh issue of Geological Time Scale.

All listed objectives fit the directions of IUGS and ICS:

- Development of an internationally approved chronostratigraphical timescale for the Devonian with maximum time resolution.
- Promotion of new and modern stratigraphical techniques and their integration into Devonian multidisciplinary schemes.
- Application of GSSP decisions internationally and as a base for a better understanding of patterns and processes in Earth History, including Devonian major global environmental changes.

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 period:

Chair: Ladislav (Lada) SLAVÍK

Vice-Chair: José Ignacio (Nacho) VALENZUELA RÍOS

Secretary: Ulrich (Uli) JANSEN

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

The University of Münster (WW) continue 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.

We have a yearly meeting. SDS members support their own attendance at these.

5. CHIEF ACCOMPLISHMENTS IN 2019 (including any publications arising from ICS working groups)

Following failure of the joint SDS/Uzbekistan/RAS field expedition to Zinzelban Gorge, Uzbekistan, to find the nominated conodont taxon named informally *Polygnathus excavatus* 114, SDS reluctantly came to the conclusion that the base Emsian cannot be defined at this level in Zinzelban. The SDS decided that the GSSP can be moved to another place, but still may remain in Uzbekistan if a better section is available. The joint work on alternative section within the Kitab State Reserve is being carried out by Russian and Uzbek colleagues. During 2017/18 we have informally considered how to progress with a redefinition of the GSSP. We continued these discussions at the IPC in Paris with two presentations on new possible GSSP sections from Spain and the Czech Republic. We met again at STRATI 2019 in Milan and had hoped to receive formal proposals for the base Emsian GSSP. During the “Covid year” we could not meet in the planned SDS meeting in Geneseo, New York State. Therefore, several Devonian subprojects have been launched to speed the accumulation of data in the Eifel Mts., the Rhenish Mts., and the Prague Synform. We have applied for a special ICS project for the Pyrenees. In time of limited international travelling we focussed to work intensively in the “home areas” in order to finish the formal proposals for the GSSP. We can then vote on these and move on forwards for formal consideration by the ICS.

6. SUMMARY OF EXPENDITURE IN 2020 (in US \$):

SDS Newsletter	\$700
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Devonian subprojects:

SDS Newsletter editor BECKER (Rhenish D-C GSSP candidate section)	\$700
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(submitted for publication in summer 2021))

SDS Webmaster CORRADINI (Lochkovian-Pragian Boundary in the Carnic Alps)	\$700
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SDS Secretary JANSEN (Pg/Em brachiopod biostratigraphy in the Eifel region)	\$700
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SDS Chair SLAVÍK (Praha Fm - in search for basal Emsian GSSP level)	7\$00
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7. SUMMARY OF INCOME IN 2020:

ICS	\$4000
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8. BUDGET REQUESTED FROM ICS IN 2021

If global situation permits, in 2021 the SDS will meet for a field-based conference in New York State, USA. This will include 9 total days of fieldwork looking at the new Devonian sections being worked on by our north american colleagues. There will be 2 days of formal conference, including a business meeting at the SUNY Campus in Geneseo. Our focus will again be redefinition of the base Emsian GSSP and meeting to discuss the D-C boundary for redefinition of the base of the Carboniferous. If this event does not take place, we will organize a virtual meeting focused on the GSSP redefinitions instead. The funding would then be alternatively used for continuation of the Devonian subprojects launched in 2020. We request contributions to travel costs for:

SDS Chair to travel from Prague to the USA	\$850
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SDS Vice-Chair to travel from Spain to the USA	\$850
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SDS Secretary to travel from Germany to the USA	\$850
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In addition, we request part support for production of the SDS Newsletter \$700

Total Sum requested from IUGC	\$3250
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9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND

COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

- Formal proposals or progress reports submitted for the revision of the basal Emsian GSSP from several areas.
- Continuation of Devonian subprojects aimed at GSSP redefinition.
- Revision of the D/C boundary with the D/C Boundary Task Group (Chairman: M. ARETZ) in close collaboration with the Carboniferous Subcommission.
- Meet in New York State for fieldwork/conference in Geneseo with 3 days fieldwork before the meeting, 5 days after and 1 day during the 3 days conference.

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

- Redefine the base of the Emsian Stage.
- Redefinition of the Devonian/Carboniferous Boundary with the joint Task Group.
- Annual meetings.

APPENDIX

Names and addresses of current Officers and Voting Members

CHAIR

Ladislav SLAVÍK, Department of Paleobiology and Paleoecology, Institute of Geology of the Czech Academy of Sciences, Rozvojová 269, CZ-165 02 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, Senckenberganlage 25, 60325 Frankfurt,

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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

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, Senckenberganlage 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 Xueping, 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@soton.ac.uk, plants

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

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 & 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

QIE Wenkun, 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

List of Working (Task) Groups and their officers

There is a working group appointed to reinvestigate the D-C boundary. This has 10 members from the SDS and 9 from the SCS.

The Devonian members are:

R. Thomas BECKER, Germany: ammonoids, events
rbecker@uni-muenster.de
Denise BRICE, France: brachiopods
d.brice@isa-lille.fr
Carlo CORRADINI, Italy: conodonts
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Brooks ELWOOD, USA: magnetostratigraphy
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Ji Qiang, China: conodonts
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Sandra I. KAISER, Germany: conodonts, isotope stratigraphy
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John E. MARSHALL, UK: miospores
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Hanna MATYJA, Poland: conodonts
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Claudia SPALLETTA, Italy: conodonts
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WANG Cheng-yuan, China: conodonts
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The Carboniferous members are:

Jim BARRICK, USA: conodonts
jim.barrick@ttu.edu
Paul BRENCKLE, USA: foraminifers
saltwaterfarm1@cs.com
Geoff CLAYTON, Ireland: palynomorphs
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Jiri KALVODA, Czech Republic: foraminifers
dino@sci.muni.cz
Svetlana V. NIKOLAEVA, Russia: ammonoids
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Edouard POTY, Belgium: corals
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Barry RICHARDS, Canada, stratigraphy,
Sedimentology
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YUAN Jin-Liang, China: trilobites
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SDS DOCUMENTS

Palynostratigraphy, regional and inter-regional zonal correlation of middle, upper and uppermost Famennian deposits from New York State and Pennsylvania, USA

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² FGBU All-Russian Geological Research Institute A. P. KARPINSKY (CSEGEI), St. Petersburg, Russia (* in memory of Maya OSHURKOVA, 1932-2020)

³ Geology Department, Bât B-18, University of Liège, B-4000 Liège, Belgium

Abstract

Late Devonian deposits in many regions of the world do not contain faunas for independent dating. A palynological study was performed on more than 150 samples from the middle, upper and uppermost Famennian of New York State and Pennsylvania, USA, as base for biostratigraphical reconstructions. They come from the Upper Westfield Shale Formation, Lower and Upper Northeast Shale Formations, Dextrerville Shale and Sandstone, Ellicott Shale Formation, Lower and Upper Cattaraugus Formation, Oswayo Formation, and Kushequa Member of the Knapp Formation. The stratigraphic ranges of 65 important species are indicated. This includes the range determination of the widespread important Famennian species of the genus *Retispora*: *R. lepidophyta* var. *lepidophyta*, *R. lepidophyta* var. *tenera*, *R. lepidophyta* var. *minor*, and *R. cassicula*. An increase in Devonian species of the genus *Vallatisporites* HACQUEBARD, 1957 was discovered and revealed changes through time. It produced several new species: *V. naumovae*, *V. kedoae*, *V. kedoae* var. *minor*, *V. higgsii*, *V. mcgregorii*, *V. streelii*, *V. dolbii*, *V. enigmus*, and *V. mirus*. (RICHARDSON & al in press). *Vallatisporites naumovae* and *V. kedoae* are

marked zonal species. Two Devonian species, *V. pusillites* s.str. and *V. hystricosus*, determined for the first time in 1957 by G. I. KEDO and M. R. WINSLOW on different continents (Pripyat Depression, Belarus, and Ohio, USA) are redescribed. *Vallatisporites pusillites* s.str. is also a zonal marker. The palynological study of the spore assemblages from the middle, upper and uppermost Famennian deposits of New York and Pennsylvania enable the definition of successive palynozones. These zones provide a foundation for regional and inter-regional zonal correlation with palynozones of the Famennian type region in Belgium. This is based on results from studies of faunas and spores, with palynozones of the Pripyat Depression, Belarus, and partial correlation with palynozones of the Timano-Pechora Province, Russia, which are based on results from foraminifera and conodonts.

Keywords

Miospores, Famennian, New York State, Pennsylvania, biozonation, correlation

1. Miospore stratigraphy and zonal correlation

The study of fossil miospores is usually the sole basis for biostratigraphy of Upper Devonian continental deposits. G. I. KEDO first conducted a palynological study of the middle, upper and uppermost Famennian in the Pripyat Depression of Belarus. The spores *Hymenozonotriletes lepidophytus* KEDO, 1957 – now *Retispora lepidophyta* (KEDO) PLAYFORD 1976 – and *Hymenozonotriletes pusillites* KEDO, 1957 – now *Vallatisporites pusillites* (KEDO) DOLBY & NEVES 1970 – have the most stratigraphic significance. *Retispora lepidophyta* passed through its entire development cycle in the upper and uppermost Famennian of Belarus (KEDO 1957; AVCHIMOVITCH 1993; AVCHIMOVITCH et al. 1993). A similar development cycle of *R. lepidophyta* is observed in the uppermost Famennian of the Timano-Pechora Province in the northeast of the Russian Platform, where the

age of the deposits is defined by assemblages of foraminifera (DURKINA & AVKHIMOVITCH 1988, 1994) and conodonts (DURKINA et al. 1980). *Retispora lepidophyta* is typical, especially *R. lepidophyta* var. *tenera*, in the *Quasiendothyra regularis* foraminifer zone (Palynozone LF), which corresponds to the former *Polygnathus styriacus* conodont zones (*postera* to Lower *expansa* zones). *Retispora lepidophyta* var. *minor* appears in the *Q.*

kobeitusana foraminifer zone (Palynozone LL), which corresponds to upper parts of the former *Bispatherodus costatus* conodont zone (Upper *expansa* or *ultimus* Zone). Palynozone LE from the Pripyat Depression, Belarus, correlates with the same palynozone in the Timano-Pechora Province, Russia, and corresponds to the *Q. dentata* foraminifer zone (DURKINA & AVCHIMOVITCH 1988).

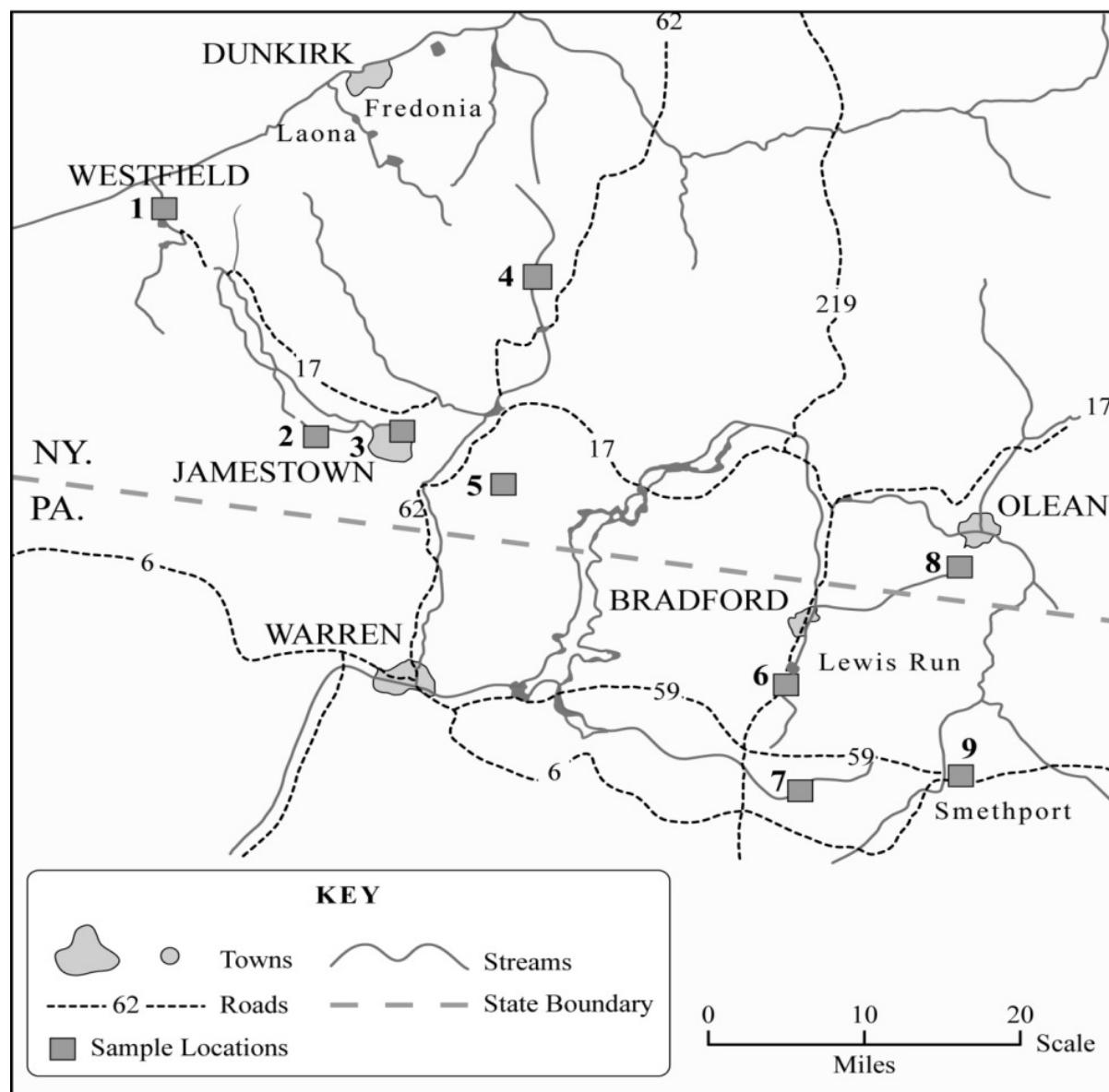


Fig. 1. Location map of New York and Pennsylvania, USA (from RICHARDSON & AHMED 1989). 1 – Westfield Shale, 2 – Ellicott Shale, 3 – Dextrerville Shale and Sanstone, 4 – Lower and Upper North East Shale, 5 – Lower Cattaraugus Formation (Pope Hollow section), 6 – Lower Cattaraugus Formation (Hanley Quarries), 7 – Kushequa Member, Knapp Formation, 8 – Oswayo Formation, 9 – Upper Cattaraugus Formation (Bush Hill section)

The first representative of the genus *Vallatisporites* – *Hymenozonotriletes pusillites* s.str. – was described by G. I. KEDO (1957a). Later, spores with the same size but different sculpture were described as *Hymenozonotriletes pusillites* s.l. (KEDO & GOLUBTSOV 1971). KEDO indicated that it would be possible to recognize some variations or even new species within this taxon. The wide range of variation of *V. pusillites* in Pennsylvania, USA, was first noted by STREEL & TRAVERSE (1978). In our research, *Vallatisporites* miospores are diverse, predominating in the assemblages, and found throughout the upper and uppermost Famennian section of the study region. However, the first Devonian species of *Vallatisporites* – *V. anthoideus* (SENOVA) BRAMAN & HILLS – appeared in the region earlier, at the base of the middle Famennian in the Upper Westfield Formation in New York and Pennsylvania, but did not spread to higher Famennian levels. *Vallatisporites antoideus* have been described by V. F. SENNOVA from the Timano-Pechora Province, Russia (NAZARENKO et al. 1971, p. 164-165, pl. 6, figs. 10-12). Isolated *V. anthoideus* mark the base of the middle Famennian in the Pripyat Depression, Belarus, and are widespread in the Lower and Middle Famennian of Canada (BRAMAN & HILLS 1992).

2. New miospore zonal definitions

The present paper proposes a miospore zonation that applies to the middle, upper and uppermost Famennian deposits in New York and Pennsylvania, USA (Figs. 2, 3). The middle Famennian corresponds to the Upper Westfield and Lower Northeast Shale formations. Palynological study of deposits from these formations allowed determining the ages and carrying out a palynozonal subdivision. One palynozone and two subzones are established

Grandispora flavus Palynozone (GF)

It characterizes middle Famennian sediments of the Upper Westfield Shale and the Lower Northeast Formation. The palynozone is

established by the appearance of the stratigraphically important species *Grandispora flavus*, *V. anthoideus*, and *Convolutispora cancellothyris*; the last two species are characteristic only for palynozone GF. It is divided into two subzones:

Grandispora famenensis var. *minutus* Subzone (FM)

It characterizes the upper part of the Westfield Shale Formation, New York, and spreads into Warren County, Pennsylvania. It is established by the appearance of *Gr. famenensis* var. *minutus*, *V. anthoideus*, and different species of *Diducites* and *Auroraspora*. Other typical species include *Lophozonotriletes lebedianensis* and *Teichertospora torquata*, and *Tergobulaspores immensus* continued to develop. Also present are *Cristatisporites lupinovitchi*, *D. poljessicus*, *D. mucronatus*, *D. commutatus*, *Gr. gracilis*, *A. macra*, *A. luteola*, *A. pseudocristata*, and *Knoxisporites dedaleus*.

The assemblage of subzone FM contains the stratigraphically important species *Tergobulaspores immensus*. RICHARDSON & MCGREGOR (1986) established a *Lagenicula* sp. Subzone (now *Tergobulaspores*) in the Upper Westfield Shale Member, which was correlated with the *rhomboidea* conodont zone of ZIEGLER & SANDBERG (1984). The same level in the Pripyat Depression, Belarus, lies in the middle Famennian and belongs to the *Gr. famenensis minutus* Subzone with *Tergobulaspores immensus* (AVCHIMOVITCH et al. 1993) and conodonts of the *rhomboidea* Zone: *Palmatolepis rhomboidea* SANDEMANN (abundant), *Pa. poolei* SANDBERG & ZIEGLER, *Pa. klapperi* SANDBERG & ZIEGLER, *Pa. glabra lepta* ZIEGLER & HUDDLE, *Pa. glabra glabra* ULRICH & BASSLER, *Pa. regularis* COOPER, and *Polygnathus nodocostata* BRANSON & MEHL (see STRELTCHENKO 1992).

Cristatisporites lupinovitchi Subzone (CL)

It characterizes the lower part of the Northeast Formation. This subzone is established by the highest development of the

zonal species *Cristatisporites lupinovitchi* and a variety of *Diducites* and *Auroraspora* species. Other typical species include *Lophozonotriletes lebedianensis* and *Knoxisporites dedaleus*. Also present are *Grandispora famenensis*, *Gr. tamarae*, *Gr. gracilis*, *Gr. micronulata*, *Gr. microseta*, *D. poljessicus*, *D. mucronatus*, *D. commutatus*, *Spelaeotriletes papulosus*, *A. macra*, *A. luteola*, *A. pseudocrusta*, and *Teichertospora torquata*.

A new step of the sedimentation in the studied region belongs to the upper Famennian and corresponds to three formations – the Upper Northeast Shale, the Dexterville Shale and Sandstone, and the Ellicott Shale. For this time interval, one palynozone and three subzones were established).

***Diducites versabilis* – *Grandispora cornuta* Palynozone (VCo)**

It characterizes upper Famennian sediments of the Upper Northeast, Dexterville and Ellicott Formations. It is established by the appearance of the zonal species and has a significant number and variety of miospores of the genera *Diducites* and *Grandispora*. The Palynozone VCo is divided into 3 subzones:

***Rugulispora radiata* – *Endoculeospora setacea* Subzone (RS)**

It characterizes the Upper Northeast Shale Formation and is established based on the appearance of the zonal species *D. versabilis*, *Gr. cornuta* (one single specimen), *Gr. echinata* and the typical species *Rugulispora radiata* and *Endoculeospora setacea*. *Rugulispora radiata* was described by L. A. JUSHKO (1960, p. 128, pl. 2, fig. 26) as a species of acavate azonate spores with a sculpture in the form of wrinkles (rugulae) and named as *Campotriletes radiatus*.

M. V. OSHURKOVA (2003, p. 109), based on the morphological characters that L. A. JUSHKO used in establishing this species, proposed the combination *Rugulispora radiata* (JUSHKO) OSHURKOVA, which seems more correct. The

assemblages of this subzone differ by different species of *Diducites* and *Grandispora*. Also present are: *Gr. gracilis*, *Gr. famenensis*, *Gr. flavius*, *Gr. tamarae*, *D. mucronatus*, *Lophozonotriletes lebedianensis*, *Knoxisporites dedaleus*, *Cristatisporites lupinovitchi*, *Spelaeotriletes papulosus*, *Auroraspora pseudocrusta*, *A. luteola*, and *Converrucosporites curvatus*.

***Retusotriletes phillipsii* – *Endoculeospora gradzinski* Subzone (PG)**

It corresponds to the Dexterville Formation. Both zonal species first appear in this subzone. *Retusotriletes phillipsii* was identified and described in North America from the upper Famennian (CLENDENING et al. 1980) and also was used as zonal species in RICHARDSON & MCGREGOR (1986) and AHMED (1989). The same species was identified before in Europe from the Famennian of Belgium and named *Retusotriletes* sp. A (BECKER et al. 1974, pl. 15, figs. 11-12). Also present are *Endoculeospora setacea*, *D. versabilis*, *D. mucronatus*, *Gr. cornuta*, *Gr. gracilis*, *Gr. echinata*, *Gr. microseta*, *Gr. flavius*, *Rug. radiata*, *Spelaeotriletes papulosus*, *A. pseudocrusta*, *A. luteola*, and *Convolutispora usitata*.

***Grandispora facilis* – *Apiculiretusispora verrucosa* Subzone (FV)**

It characterizes the Ellicott Formation. The zonal species *D. versabilis* and *Gr. cornuta* are primarily distributed, and all species of the previous subzone continue in this subzone. The first appearances of three species – *Gr. facilis*, *Gr. distincta*, and *Apiculiretusispora verrucosa* – mark this subzone. The first two species are typical only for subzone FV. Also present are *Gr. gracilis*, *Gr. cornuta*, *Gr. microseta*, *Gr. flavius*, *Retusotriletes phillipsii*, *D. poljessicus*, *D. commutatus*, *Endoculeospora setacea*, *E. gradzinskii*, *Rugulispora radiata*, *Spelaeotriletes papulosus*, *Auroraspora pseudocrusta*, and *A. luteola*.

The next step of sedimentation in the studied region belongs to the upper and uppermost

Famennian and corresponds to the Cattaraugus (Lower and Upper), Oswayo and Knapp (Kushequa Member) Formations. It is characterized by the appearance of different *Retispora lepidophyta* and the development of various species of *Vallatisporites*. The differences in sculpture, variable sizes, and stratigraphic distribution form the basis for the definition of new species of *Vallatisporites*. These are described by RICHARDSON et al. (in press) and listed here in an appendix. In the upper and uppermost Famennian, five palynozones with dominating *Vallatisporites* are determined.

Vallatisporites naumovae – *Retispora lepidophyta* Palynozone (NL)

It characterizes the lower part of the Lower Cattaraugus Formation. A large variety of *Vallatisporites* species – *V. naumovae*, *V. higgsii*, and *V. mcgregorii* – appear first in this palynozone. *Vallatisporites naumovae* is typical only for the NL Zone. The second zonal species, *Retispora lepidophyta*, was first described by KEDO & GOLUBTSOV (1971), later by KEDO (1974a) from the uppermost Famennian.

In our material, typical *R. lepidophyta* and *R. lepidophyta tenera* appear first in small quantities in the upper Famennian Lower Cattaraugus Formation, in palynozone NL. *Retispora macroreticulata* (KEDO) BYVSHEVA, 1985 (invalid, see RICHARDSON & AHMED 1989, p. 155, pl. 3, figs. 1-2), with dimension of 80 µm, is more probably *Retispora lepidophyta lepidophyta* or *R. lepidophyta tenera*. *Retispora macroreticulata* (KEDO) BYVSHEVA, 1985 appears in Belgium (STREEL & LOBOZIAK 1996, text-fig. 3) in the Uppermost *marginifera* conodont zone (= *velifer* Zone). *Retispora lepidophyta* (sensu lato i.e., including var. *macroreticulata*) appears first in the Pripyat Depression, Belarus, in the *Retispora lepidophyta* – *Grandispora facilis* Palynozone (LF) (AVCHIMOVITCH 1986).

Various species of the genera *Diducites* and *Grandispora* are dominant in the assemblages of this palynozone. *Apiculiretusispora*

verrucosa, *Rugulispora radiata*, *Retusotriletes phillipsii*, *Endoculeospora gradzinskii*, *E. setacea* are typical for the Upper Famennian. Also present are *Indotriradites tenuicostatus*, *Gr. echinata*, *Gr. cornuta*, *Gr. microseta*, *D. versabilis*, *D. poljessicus*, *D. mucronatus*, *D. commutatus*, *Teichertospora torquata*, *A. pseudocrusta*, *A. luteola*, and *Cardylosporites spathulatus* var. *minor* var. nov.

Vallatisporites kedoae – *Tumulispora malevkensis* Palynozone (KM)

It characterizes the upper part of the Lower Cattaraugus Formation. Spores of the genus *Vallatisporites* prevail: *V. kedoae* and *V. kedoae* var. *minor* appear first and spread in large quantities. This palynozone is characterized by the first appearance of species of the genus *Tumulispora* (*T. varia* and *T. malevkensis*) and of the new species *Verrucosporites scoticus*. Also present are *V. higgsii*, *V. mcgregorii*, *Gr. echinata*, *G. cornuta*, *Apiculiretusispora verrucosa*, *D. poljessicus*, *D. versabilis*, typical *Retispora lepidophyta*, *R. lepidophyta* var. *tenera* (limited), *Rugulispora radiata*, *Auroraspora macra*, *A. pseudocrusta*, *Knoxisporites dedaleus*. *Retispora lepidophyta* (s. str.) appears in the Pripyat Depression, Belarus, in the *Retispora lepidophyta* – *Apiculiretusispora verrucosa* Palynozone (LV) (AVCHIMOVITCH et al. 1988).

Retispora lepidophyta – *Knoxisporites literatus* Palynozone (LL)

It characterizes the Upper Cattaraugus Formation and has a broad development and predominance of *Retispora* spores: *R. lepidophyta*, *R. lepidophyta* var. *tenera*, and *R. lepidophyta* var. *minor*, which abundance corresponds to the base of the uppermost Famennian in Belgium. Spores of *Vallatisporites* are still numerous and various: *V. higgsii*, *V. kedoae* and *V. kedoae* var. *minor* predominate, while two species – *V. hystricosus* and *V. drybrookensis* – appear for the first time. Species of the genus *Diducites* include *D. versabilis* and *D. poljessicus*.

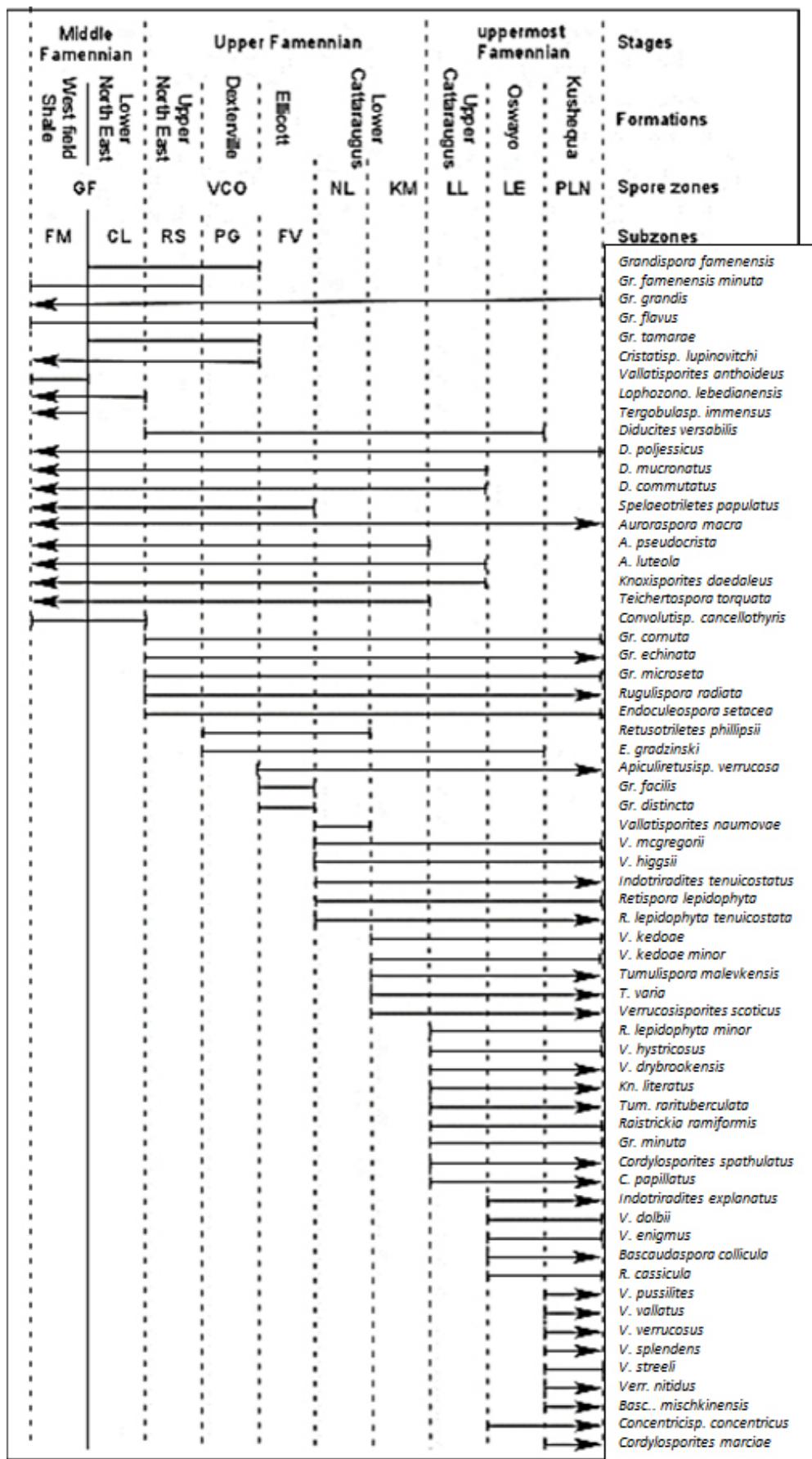


Fig. 2. Middle to uppermost Famennian miospore ranges.

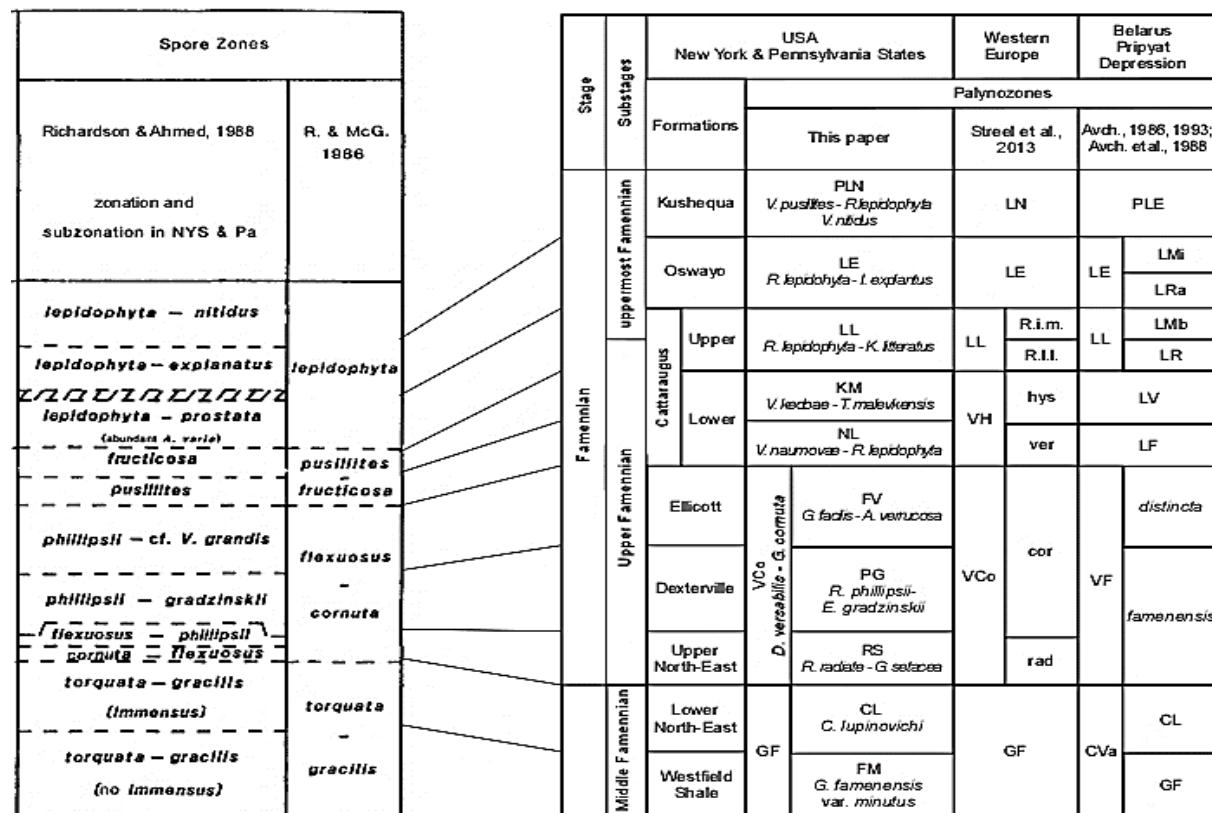


Fig. 3. A proposed correlation of the miospores in the middle, upper, and uppermost Famennian of New York State and Pennsylvania (USA), Western Europe and the Pripyat Depression (Belarus).

New spores appear, such as *Tumulispora rarituberculata* and two species of the genus *Cordylosporites*. Unusual for palynozone LL is the early appearance of *Grandispora minuta* and *Raistrikia ramiformis*. Also present are *Knoxisporites literatus*, *Auroraspora macra*, *A. luteola*, *Endoculeospora setacea*, *E. gradzinskii*, *Apiculiretusispora verrucosa*, *Rugulispora radiata*, *Cordylosporites spathulatus*, *C. papillatus*, and *Indotriradites tenuicostatus*.

Retispora lepidophyta – *Indotriradites explanatus* Palynozone (LE)

It characterizes the Oswayo Formation and was established by the dominance of all varieties of *R. lepidophyta* and the appearance of the new species *R. cassicula*. *Indotriradites explanatus* occurs in a small amount but constantly. The LE assemblages differs by the diversity of *Vallatisporites* species, with a predominance of *V. kedoae* and *V. kedoae* var. *minor*. *Vallatisporites enigmus* and *V. dolbii*

appear for the first time. Spores of the genera *Grandispora* and *Tumulispora* are varied. *Indotriradites tenuicostatus* and *Raistrikia ramiformis* occur only in the lower part of the LE Palynozone. Also present are *V. higgsii*, *V. mckgregorii*, *Diducites poljessicus*, *D. versabilis*, *Grandispora cornuta*, *Gr. minuta*, *Gr. microseta*, *Tumulispora malevkensis*, *T. rarituberculata*, *T. varia*, *Cordylosporites spathulatus*, *Knoxisporites literatus*, *Verrucosisporites scoticus*, *Concentricisporites concentricus*, and *Bascaudaspora collicula*.

Vallatisporites pusillites – *Retispora lepidophyta* – *Verrucosisporites nitidus* Palynozone (PLN)

It characterizes the Kushequa Member of the Knapp Formation at the end of the Famennian stage and of the Devonian system in the studied region. A significant change in the assemblages occurs: many Devonian species complete their development, and typically Carboniferous species appear. However, Devonian species of

the genus *Vallatisporites* and *Retispora lepidophyta* maintain the leading presence in the palynozone. *Vallatisporites pusillites* sensu stricto appears in large number. Spores similar in morphology and size to *V. pusillites* sensu stricto were later assigned to *V. pusillites* sensu lato (KEDO & GOLUBTSOV 1971). New species are selected from *V. pusillites* sensu lato and identified with their stratigraphic distribution in the uppermost Famennian of New York and Pennsylvania.

The zonal index *V. pusillites* sensu stricto has a narrow stratigraphic range and global distribution. In addition, spores of *V. kedoae* and *V. hystricosus* also dominate; *V. higgsii*, *V. kedoae* var. *minor*, *V. enigmus*, *V. mcgregorii*, *V. drybrookensis*, and *V. dolbii* (single) are typical, while *V. streetii* appears for the first time. Typical Carboniferous species, such as *V. vallatus*, *V. verrucosus*, and *V. splendens*, start to appear in this palynozone in low numbers.

Spores of the genus *Retispora* are represented by *R. lepidophyta* var. *tenera* and *R. lepidophyta* var. *minor*. Typical *Retispora lepidophyta* occur in a small amount, and *R. cassinula* is present as a single specimen. Devonian species of *Vallatisporites* and of *R. lepidophyta* complete their development at this stratigraphic level. The zonal marker *Verrucosporites nitidus* appears and is present in constant small amounts.

Spores of the genus *Grandispora* – *Gr. echinata*, *Gr. minuta*, *Gr. microseta*, and *Gr. gracilis* – are wide spread. Single *Gr. cornuta* are present, and *Gr. acuta* appears in palynozone PLN. Spores of the genus *Tumulispora* are diverse. *Indotriradites explanatus*, *I. tenuicostatus*, and *Cordylosporites mariae* are typical. *Convolutispora major*, *Retusotriletes minor*, *Raistrickia minor*, *Camptotriletes paprothii*, and Carboniferous species, such as *Bascaudaspora mischkinensis* and *Concentricisporites concentricus*, are typical. *Diducites poljessicus* has a limited distribution. Also present are *Knoxisporites literatus*, *Auroraspora macra*, *Tumulispora malevkensis*, and *T. rarituberculata*.

3. Correlation (Fig. 3)

Many palynological studies have revealed the great importance of species of the genera *Vallatisporites* and *Retispora* for the stratigraphic subdivision of uppermost Famennian sediments of the eastern United States. Tracing the development cycle of the Devonian species of *Vallatisporites* leads to consider this region as a type region, just as the uppermost Famennian of the Pripyat Depression, Belarus, is the type region of *R. lepidophyta*.

The palynozones established above may be correlated with palynozones of the Famennian type region in Belgium, which are based on studies of faunas and spores (STREEL 1986, 2009; STREEL et al. 1978, 1987, 2012, 2013; MAZIANNE et al. 1999; HIGGS et al. 2013), and also with palynozones of the Pripyat Depression of Belarus (KEDO 1957a, 1957b, 1963, 1974, 1974a, 1974b; KEDO & GOLUBTSOV 1971; AVCHIMOVITCH 1986, 1993; AVCHIMOVITCH et al. 1988, 1993).

The Middle Famennian *Grandispora famenensis* Palynozone (GF) correlates with the *gracilis-famenensis* (GF) Zone in eastern Belgium (STREEL et al. 1987; LOBOZIAK et al. 1996) and the *Cornispora varicornata* Palynozone (CVa) of the Pripyat Depression, Belarus. The FM and CL Subzones correspond to GF Subzone and the same CL Subzone in Belarus, respectively (AVCHIMOVITCH et al. 1993). The zonal species *Cornispora varicornata* is not found in the middle Famennian of the eastern USA.

The upper Famennian VCo Palynozone is correlated with the same Oppel Zone of eastern Belgium and with the VF Palynozone of Belarus. The RS, PG and FV Subzones correspond to the *famenensis* and *distincta* Subzones of Belarus.

The uppermost Famennian NL Palynozone is comparable to the lower part of the VH Oppel Zone (*verrucosus-hystricosus* Zone), and with the 'verrucosus' Interval Zone of eastern Belgium.

The KM Palynozone is correlated with the upper part of the VH Ossel Zone and the '*hystricosus*' Interval Zone of eastern Belgium. Such an assemblage is found in the Pripyat Depression of Belarus.

The LL Palynozone is observed in all of the compared regions with the apparent dominance and diversity of the spore genus *Retispora lepidophyta*. Miospores of *Vallatisporites* play an important role in the assemblage of this zone in New York and Pennsylvania.

The LL Palynozone is divided into two subzones in Western Europe: R.l.l. Acme Subzone (with *R. lepidophyta* var. *lepidophyta*) and R.l.m. Subzone (with *R. lepidophyta* var. *minor*). They correspond to the LR (with *R. lepidophyta-Tumulispora rarituberculata*) and LMb Subzones (with *R. lepidophyta-Tholosporites mirabilis*), respectively, in Belarus.

The LE Palynozone can also be traced in all of the compared regions. It is divided into two subzones in Belarus: LRa (with *R. lepidophyta-Raistrickia ramiformis*) and LMi (with *R. lepidophyta-Grandispora minuta*).

The PLN Palynozone correlates with the LN Ossel Zone (with *R. lepidophyta-V. nitidus*) in Western Europe, highlighted in the Hangenberg Black Shale of the Rhenish Massif in Germany (HIGGS et al. 1993, 2013; HIGGS & STREEL 1984; STREEL et al. 1987, 2012, 2013, 2021; STREEL, 2009). Based on the composition of the miospores assemblage, it is close to the PLE Palynozone (with *V. pusillites*-*R. lepidophyta-I. explanatus*) of the Pripyat Depression, Belarus. The PLN Palynozone completes the Famennian Stage and the Devonian System. Deposits corresponding to the level of the PLN Palynozone can be traced in many regions of the world.

Appendix 1: List of taxa with authors cited in the text and figures

Auroraspora asperella (KEDO) VAN DER ZWAN, 1980

A. chagrinensis (WINSLOW) 1962, comb. nov.

A. evanida (KEDO) AVCHIMOVITCH, 2000

- A. luteola* (NAUMOVA) AVCHIMOVITCH, 1993
- A. macra* SULLIVAN, 1968
- A. pseudocrysta* AHMED, 1980
- A. solisorta* HOFFMEISTER, STAPLIN & MALLOY, 1955
- A. varia* (NAUMOVA) AHMED, 1980
- Apiculiretusispora verrucosa* (CARO-MONIEZ) STREEL, 1977
- Comptotriletes paprothii* HIGGS & STREEL, 1984
- Concentricisporites concentricus* BYVSHEVA, 1985
- Convolutispora ampla* HOFFMEISTER, STAPLIN & MALLOY, 1955
- C. cancellothyris* (WALTZ) AVCHIMOVITCH & NEKRYATA, 1993
- C. usitata* PLAYFORD, 1962
- C. vermiformis* HUGHES & PLAYFORD, 1961
- C. zodonica* (NEKRYATA) OBUKHOVSKAYA & NEKRYATA, 1993
- Cordylosporites mariae* (WINSLOW) PLAYFORD & SUTTERTHWAIT, 1985
- C. spathulatus* var. *spathulatus* PLAYFORD & SUTTERTHWAIT, 1985
- C. spathulatus* (WINSLOW) PLAYFORD & SUTTERTHWAIT, 1985, var. *minor* var. nov.
- Cristatisporites lupinovitchi* (AVCHIMOVITCH) AVCHIMOVITCH, 1993
- Diductes commutatus* (KEDO) AVCHIMOVITCH, 1993
- D. mucronatus* (KEDO) VAN Veen, 1981
- D. poljessicus* (KEDO) VAN Veen, 1981
- D. versabilis* (KEDO) VAN Veen, 1981
- Endoculeospora gradzinskii* TURNAU, 1975
- E. setacea* (KEDO) AVCHIMOVITCH & HIGGS, 1988
- Grandispora cornuta* HIGGS, 1975
- Gr. distincta* (NAUMOVA) AVCHIMOVITCH, 1993
- Gr. echinata* HACQUEBARD, 1957
- Gr. facilis* (KEDO) AVCHIMOVITCH, 1988
- Gr. famenensis* (NAUMOVA) STREEL, 1974
- Gr. famenensis* (NAUMOVA) var. *minutus* NEKRYATA, 1974
- Gr. flavus* (KEDO) AVCHIMOVITCH, 1993
- Gr. gracilis* (KEDO) STREEL, 1974
- Gr. macroseta* (KEDO) AHMED, 1978
- Gr. microseta* (KEDO) STREEL, 1974
- Gr. micronulata* (KEDO) AVCHIMOVITCH, 2000
- Gr. minuta* (KEDO) AVCHIMOVITCH, 2000
- Gr. tamarae* LOBOZIAK, 2000
- Gr. ventosus* (KEDO) AVCHIMOVITCH, 1957
- Indotriradites explanatus* (LUBER) PLAYFORD, 1991
- I. tenuicostatus* (KEDO) AVCHIMOVITCH, 1974
- Knoxisporites dedaleus* (NAUMOVA) MOREAU-BENOIT, 1980
- K. literatus* (WALTZ) PLAYFORD, 1963

K. pristinus SULLIVAN, 1968
Lagenicula A sp. STREEL, 1974
Lophozonotriletes lebedianensis NAUMOVA, 1953
Raistrikia minor (KEDO) DOLBY & NEVES, 1970
Raistrikia ramiformis (KEDO) AVCHIMOVITCH & HIGGS, 1988
Retispora cassiscula (HIGGS) HIGGS & RUSSEL, 1981
R. lepidophyta (KEDO) PLAYFORD, 1976
R. lepidophyta (KEDO) var. *tenera* PLAYFORD, 1963
R. lepidophyta (KEDO) var. *minor* PLAYFORD, 1971
R. lepidophyta (KEDO) var. *grandis* PLAYFORD, 1974
Retusotriletes irrasus (HACQUEBARD) AVCHIMOVITCH, 1976
R. phillipsii CLENDENING, EAMES & WOOD, 1980
Rugulispora radiata (JUSHKO) OSHURKOVA, 2003
Spelaeotriletes papulosus (SENNOV) AVCHIMOVITCH, 1993
Synorisporites variegatus RICHARDSON & AHMED, 1989
Teichertospora torquata (HIGGS) MCGREGOR & PLAYFORD, 1990
Tergobulasporites immensus (NAZARENKO & NEKRYATA) TURNAU, 2002
Tholischporites mirabilis (TSCHIBRIKOVA) BYVSHEVA, 1988
Tumulispora malevkensis (KEDO) TURNAU, 1978
T. rarituberculata (LUBER) POTONIE, 1966
T. varia (KEDO) BYVSHEVA, 1988
T. variverrucata (PLAYFORD) STAPLIN & JANSONIUS, 1964
Vallatisporites anthoideus (SENNOV) 1971
V. drybrookensis PLAYFORD & MCGREGOR, 1993
V. hystricosus WINSLOW, 1962 (see Pl. 2)
V. pusillites sensu stricto KEDO, 1957
V. splendens STAPLIN & JANSONIUS, 1964
V. vallatus HACQUEBARD, 1957
V. verrucosus HACQUEBARD, 1957
Verrucosisporites nitidus (NAUMOVA) PLAYFORD, 1964
V. scoticus SULLIVAN, 1968

Appendix 2: New species of *Vallatisporites* and their synonymies in RICHARDSON et al. (in press; see also Figs. 4-6):

Vallatisporites naumovae RICHARDSON, AVCHIMOVITCH & OSHURKOVA sp. nov., pl. I, figs. 1-4; Fig. 4
1988 *Vallatisporites vallatus* var. *major* (KEDO) comb. nov. – AHMED, p. 36, pl. 2, fig. 16.

Vallatisporites higgsii RICHARDSON, AVCHIMOVITCH & OSHURKOVA sp. nov., pl. I, figs. 5-8; Fig. 4
1962 *Cirratriradites* sp. A – WINSLOW, p. 42, pl. 18, figs. 1-2.
1967 *Hymenozonotriletes pusillites* KEDO (pars) – NEVES & DOLBY, pl. 2, fig. 5, non fig. 4.
1970 *Vallatisporites pusillites* (KEDO) DOLBY & NEVES comb. nov. (pars) – DOLBY & NEVES, p. 639, pl. 2, figs. 2, non figs. 1, 3, 4.
1977 *Vallatisporites pusillites* (KEDO) DOLBY & NEVES (pars) – CLAYTON et al., p. 6, pl. 3, fig. 11, non fig. 12, and p. 7, pl. 4, fig. 12, non fig. 11.
1988 *Vallatisporites vallatus* var. *hystricosus* (WINSLOW) CLAYTON et al. (pars) – AHMED, p. 35, pl. 2, figs. 13-15, 17, non fig. 12.
2003 *Vallatisporites hystricosus* (WINSLOW) BYVSHEVA (pars) – TRAVERSE, p. 26, pl. 1, fig. 3, non figs. 1, 2, 4.
2003 *Vallatisporites hystricosus* (WINSLOW) BYVSHEVA – ATTA-PETERS & ANAN-YORKE, p. 18, pl. 2, figs. 7, 8.
2013 *Vallatisporites hystricosus* (WINSLOW) WICANDER & PLAYFORD comb. nov. – WICANDER & PLAYFORD, p. 614, pl. 6, fig. 1.
Vallatisporites dolbii RICHARDSON, AVCHIMOVITCH & OSHURKOVA sp. nov., pl. I, figs. 9, 10; Fig. 5
1963 *Hymenozonotriletes pusillites* KEDO (pars) – KEDO, p. 66, pl. 6, fig. 141, non figs. 138-140, 142.
1988 *Vallatisporites hystricosus* (WINSLOW) BYVSHEVA – AVCHIMOVITCH et al., p. 175, pl. 5, fig. 14.
1993 *Vallatisporites hystricosus* (WINSLOW) BYVSHEVA – AVCHIMOVITCH, p. 427, pl. 6, fig. 7.
Vallatisporites mcgregorii RICHARDSON, AVCHIMOVITCH & OSHURKOVA sp. nov., pl. II, figs. 1, 2; Fig. 5
1963 *Hymenozonotriletes pusillites* KEDO (pars) – KEDO, p. 66, pl. 6, fig. 138, non figs. 139-142.
1970 *Vallatisporites pusillites* (KEDO) DOLBY & NEVES comb. nov. (pars) – DOLBY & NEVES, p. 639, pl. 2, fig. 4, non figs. 1-3.
1988 *Vallatisporites pusillites* (KEDO) DOLBY & NEVES emend. BYVSHEVA (pars) – AVCHIMOVITCH et al., p. 174, pl. 5, fig. 10, non figs. 11-13, 16.
1993 *Vallatisporites pusillites* (KEDO) DOLBY & NEVES (pars) – AVCHIMOVITCH, p. 427, pl. 8, fig. 1, non figs. 2, 3.

- Vallatisporites kedoae*** RICHARDSON,
AVCHIMOVITCH & OSHURKOVA sp. nov., pl II,
figs. 4, 5; Fig. 5
- 1971 *Hymenozonotriletes pusillites* KEDO s.l. (pars)
– KEDO & GOLUBTSOV, p. 33, pl. 3, fig. 14, non
figs. 1–13, 15–19.
- 1986 *Vallatisporites pusillites* (KEDO) DOLBY &
NEVES – RICHARDSON & MCGREGOR, pl. 20, fig.
5.
- 1989 *Vallatisporites pusillites* (KEDO s. l.) DOLBY &
NEVES – RICHARDSON & AHMED, pl. 3, figs. 3,
- Vallatisporites enigmus*** RICHARDSON,
AVCHIMOVITCH & OSHURKOVA sp. nov., pl. I,
figs. 11, 12; Fig. 6
- 1971 *Hymenozonotriletes pusillites* KEDO s.l. (pars)
– KEDO & GOLUBTSOV, p. 33, pl. 3, figs. 11–13,
non figs. 1–10, 14–19.
- Vallatisporites mirus*** AVCHIMOVICH, RICHARDSON
& OSHURKOVA sp. nov., pl. II, fig. 3, Fig. 6
- 1988 *Vallatisporites pusillites* (KEDO) DOLBY &
NEVES emend. BYVSCHEVA (pars) –
AVCHIMOVICH et al., p. 174, pl. 5, fig. 16, non
figs. 10–13.
- 1993 *Vallatisporites pusillites* (KEDO) DOLBY &
NEVES (pars) – AVCHIMOVITCH, p. 427, pl. 7, fig.
1, non fig. 2.
- 2010 *Vallatisporites pusillites* (KEDO) DOLBY &
NEVES (pars) – FILIPIAK AND RACKI, fig. 3 – L,
fig. 5M.
- Vallatisporites hystricosus*** (WINSLOW, 1962)
AVCHIMOVICH & OSHURKOVA comb. nov., pl. II,
fig. 8; Fig. 6
- 1962 *Cirratriradites hystricosus* WINSLOW –
WINSLOW, p. 41, pl. 18, fig. 5.
- 1963 *Hymenozonotriletes pusillites* KEDO (pars) –
KEDO, p. 66, pl. 6, fig. 140, non figs. 138, 139,
141, 142.
- 1971 *Hymenozonotriletes pusillites* KEDO s. l. (pars)
– KEDO & GOLUBTSOV, p. 32, pl. 3, figs. 8, 9, non
figs. 1–7, 10–19.
- 1993 *Vallatisporites pusillites* (KEDO) DOLBY &
NEVES (pars) – AVCHIMOVITCH, p. 427, pl. 8, fig.
3, non figs. 1, 2.
- Vallatisporites streetii*** RICHARDSON,
AVCHIMOVITCH & OSHURKOVA sp. nov., pl. II,
figs. 9–11; Fig. 6
- 1971 *Hymenozonotriletes pusillites* KEDO s.l. (pars)
– KEDO & GOLUBTSOV, p. 33, pl. 3, figs. 15, 16,
non figs. 1–14 and 17–19.

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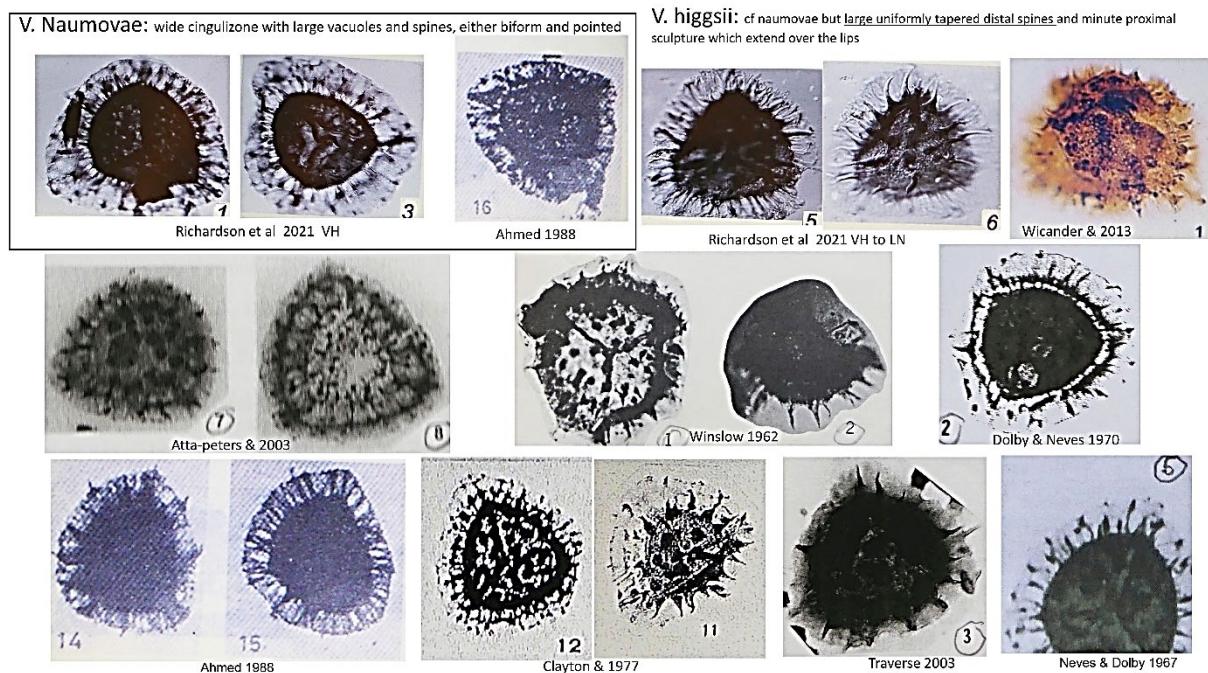
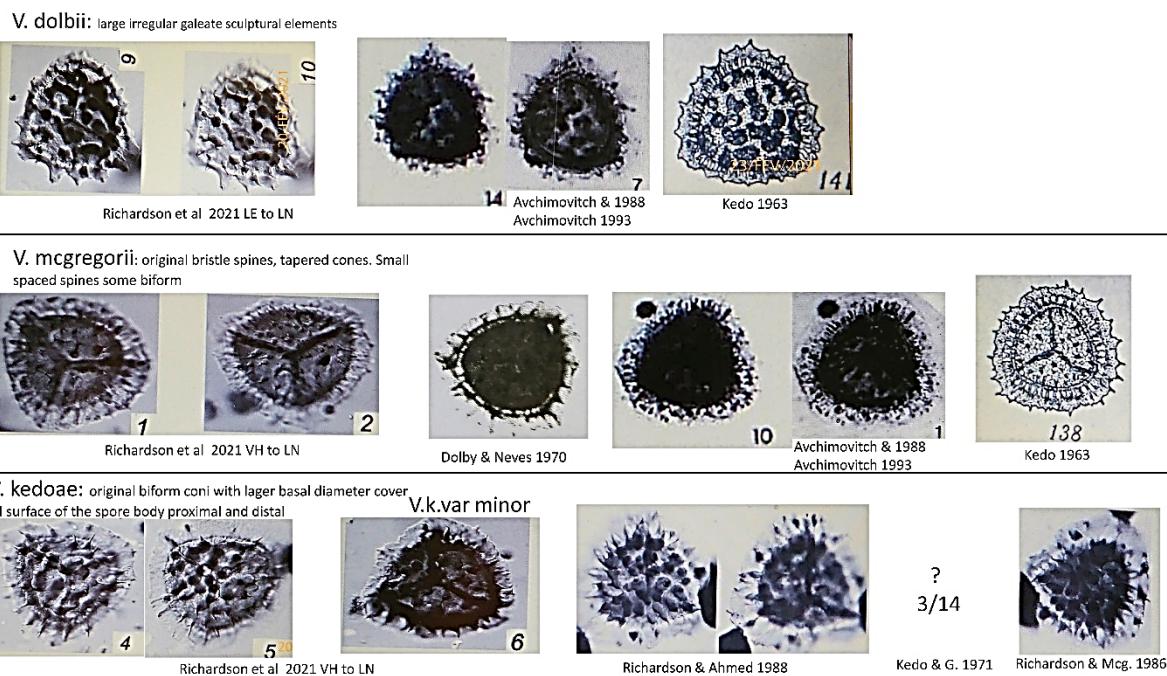
5. References

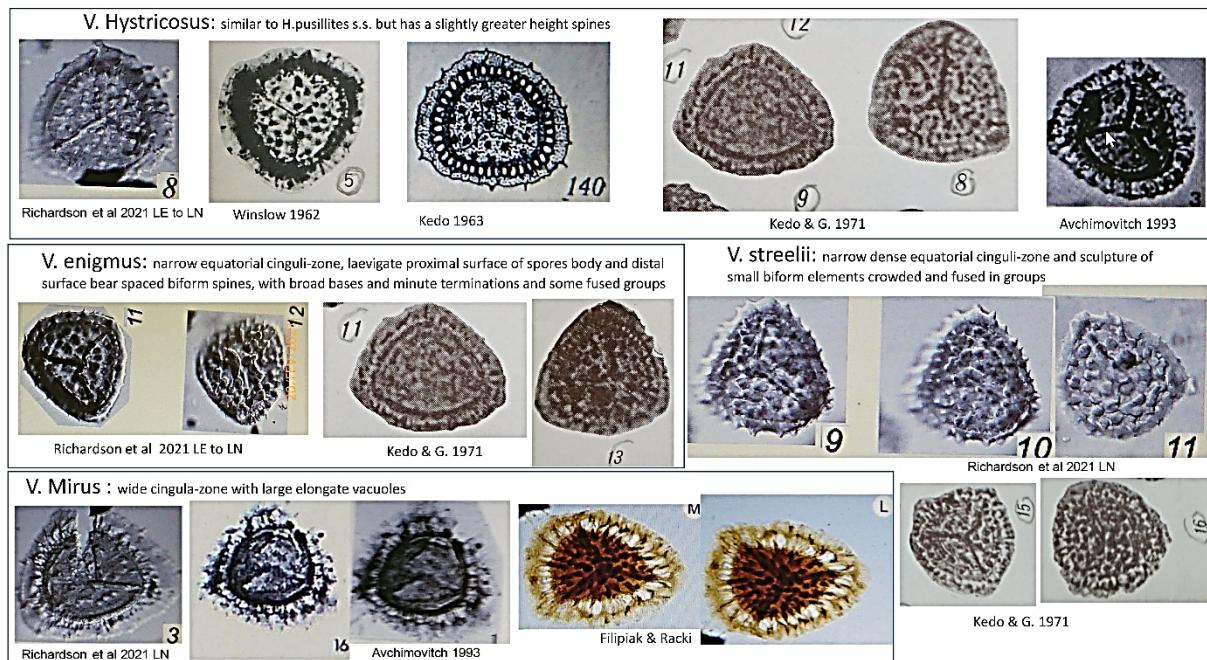
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**Fig. 4.****Fig. 5.**

**Fig. 6.**

**Upper-uppermost Famennian
(Devonian) corals and stromatoporoids
from the Changtazi Formation,
Longmenshan, South China:
implications for the recovery of
metazoan reefs after the
F-F mass extinction**

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1. Introduction

Corals and stromatoporoids are the most important metazoan reef contributors from the Late Ordovician to the Late Devonian. However, this reef community suffered greatly in the global Frasnian/Famennian mass

extinction. The succeeding reefs were characterized by the dominance of microbialites throughout most of the Famennian stage, yet the recovery of metazoan reefs in the Late Devonian has rarely been documented. In this study, we report the occurrence of an upper-uppermost Famennian coral-stromatoporoid biostrome (Fig. 1) from the Changtazi Formation, Longmenshan, South China, representing one of the best-known examples of metazoan reefs after the F/F extinction.

2. The reefal Changtazi fauna

A total of 17 species of stromatoporoids and corals are identified in the formation, comprising stromatoporoids (*Gerronostroma angulatum*, *G. regulare*, *Cystostroma hunanense*, *Cyst. zhonghuaense*, *Stylostroma sichuanense*, *St. huanjiangense*, *Platiferostroma crissum*, *Labechia majaoensis*, *L. longmenshanensis*, *Spinostroma aggregatum*), tabulate corals (*Syringopora honanensis*, *Syr. longmenshanensis*, *Michelinia* sp., *Roemerolites* sp., *Fuchungopora multispinosa*, *F. huilongensis*), and rugose corals (*Cystophrentis simplex*) (Figs. 2, 3).



Fig. 1. Biostrome in the Changtazi Formation, comprising abundant stromatoporoids *Stylostroma* and *Labechia*, as well as the tabulate corals *Roemerolites* and *Syringopora*.

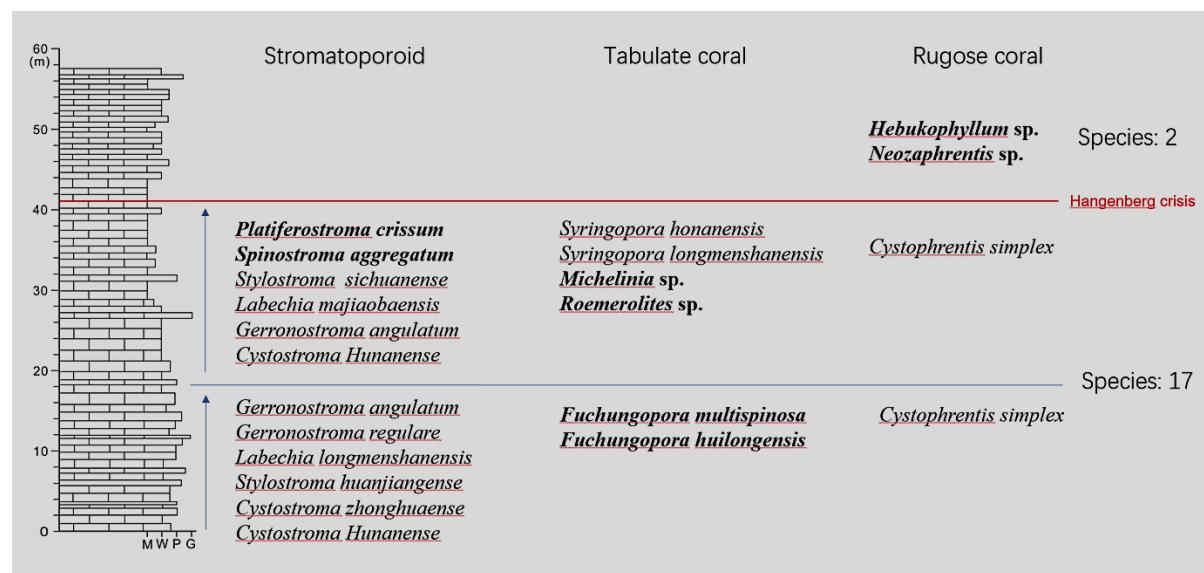


Fig. 2. Simplified lithostratigraphic column of Changtanzi Formation showing the occurrences of stromatoporoids and corals.

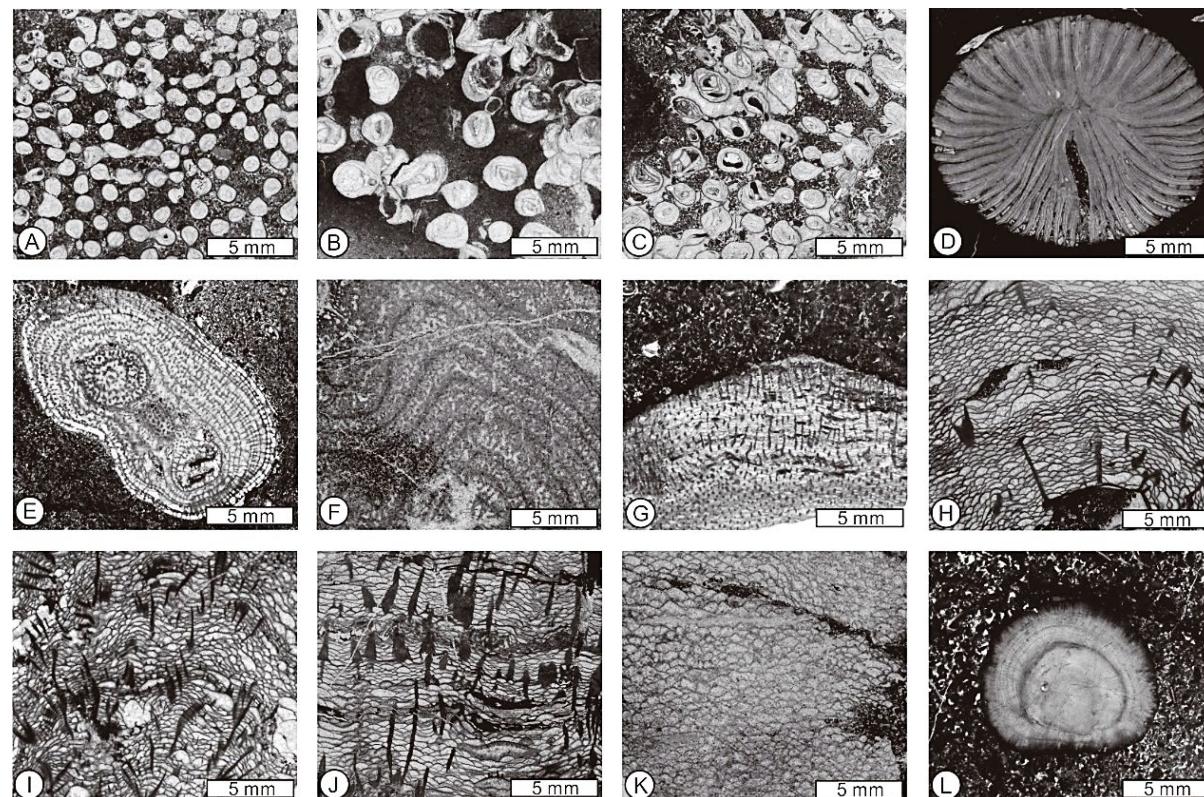


Fig. 3. Representative corals, stromatoporoids, and chaetetid sponge in the Changtanzi Formation, Longmenshan, South China. **A.** *Fuchungopora multispinosa*; **B.** *Stylostromato sichuanense*; **C.** *F. huilongensis*; **D.** *Cystophrentis simplex*; **E.** *Gerronostroma angulatum*; **F.** *G. regulare*; **G.** *Labechia longmenshanensis*; **H.** *L. majiaoensis*; **I.** *Stylostroma sichuanense*; **J.** *Platiferostroma crissum*; **K.** *Cysostroma zhonghuaense*; **L.** *Parachaetetes sp.*

Besides, the formation is also characterized by the abundant occurrences of the sponge *Parachaetetes*. The Changtanzi Formation can be separated into two assemblages by the differences of stromatoporoids and tabulate corals,

particularly species of *Platiferostroma*, *Spinostroma*, *Fuchungopora*, *Roemerolites*, and *Michelinia*. After the Hangenberg Crisis, only two species of deeper-water solitary rugose corals, *Hebukophyllum* sp. and *Neozaphrentis* sp., are observed, indicating the

extinction of coral-stromatoporoid metazoan reefs.

Biotic interactions between tabulate corals and stromatoporoids are frequently found, indicating the recovery of a reef-building community similar to those prior to the extinction event. Although the majority of the interactions belong to post-mortem types, live-live interactions between corals and stromatoporoids do exist. The assemblage of corals and stromatoporoids in Changtanzi Formation resemble those from other Famennian outcrops of South China, but possess obvious differences especially at species level, indicating an endemism feature among the benthic organisms during the uppermost Famennian.

3. Important literature on the reefal fauna

- DONG, D. Y. (1964). Stromatoporoids from the Early Carboniferous of Kwangsi and Kueichow. - *Acta Paleontologica Sinica*, **12**: 280–299.
- DONG, D. Y. (2001). Stromatoporoids of China. - 423 pp.; Beijing (Science Press).
- HILL, D. (1981). Coelenterata, Supplement 1, Rugosa and Tabulata, Vol. 2. - In TEICHERT, C. (Ed.), *Treatise on Invertebrate Paleontology*, Part F: 379–762; Boulder and Lawrence (Geological Society of America and University of Kansas).
- KERSHAW, S. (1994). Classification and geological significance of biostromes. - *Facies*, **31**: 81–91.
- LIN, B. Y. (1958). New data on Lower Carboniferous syringoporids of the eastern parts of the Tsin-lin. - *Acta Palaeontologica Sinica*, **6**: 479–485.
- LIN, B. Y. (1963a). Some Tabulata from the Carboniferous and Permian strata of Southern China. - *Acta Palaeontologica Sinica*, **11**: 579–596.
- LIN, B. Y. (1963b). Some Carboniferous tabulate corals from Nanling range. - *Professional Papers, Chinese Academy of Geological Sciences, Series B, Stratigraphy and Paleontology*, **4**: 1–75.

LIN, B. Y. (1985). A preliminary study on the stratigraphical distribution and zoogeographical provinces of the Carboniferous tabulate corals of China. - *Memorial Geology and Paleontology*, **12**: 27–46.

SHEN, J. W., & WEBB, G. E. (2004a). Famennian (Upper Devonian) calcimicrobial (*Renalcis*) reef at Miaomen, Guilin, South China. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **204**: 373–379.

SHEN, J. W., & WEBB, G. E. (2004b). Famennian (Upper Devonian) stromatolite reef at Shatang, Guilin, South China. *Sedimentary - Geology*, **170**: 63–84.

YANG, S. W. (1978). Tabulata. – In: Stratigraphy and Palaeontology Team, Guizhou Province (Eds.), *Palaeontological Atlas of Southwest China, Guizhou volume 2, Carboniferous-Quaternary*: 189–228; Beijing (Geological Publishing House).

DEVONIAN MEETINGS

Planned Symposium, March 2022

Northeastern Section, Geological Society of America

DEVONIAN OF NEW YORK: A New Extensive Volume on the North American Standard Section.

Conveners: Charles Ver STRAETEN, D. Jeffrey OVER, and Donald L. WOODROW.

The symposium will consist of 13 talks, starting with an overview of the volume, followed by a talk for each of the 12 chapters in the volume, including talks by multiple SDS members (Carlton BRETT, Gordon BAIRD, Jeff OVER, Alex BARTHOLOMEW, Jim EBERT, and Chuck VER STRAETEN; Jay ZAMBITO is also co-author on 2 chapters).



THE 6TH INTERNATIONAL PALAEONTOLOGICAL CONGRESS



FROM NOVEMBER 7TH TO 11TH, 2022, KHON KAEN

<https://ipc6.msu.ac.th/>

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The 6th International Palaeontological Congress

Summary

- Where? Khon Kaen, Northeast Thailand
- When? Monday 7th – Friday 11th, November 2022
- Lead organiser: Palaeontological Research and Education Centre, Mahasarakham University



Credit : Department of Mineral Resources



Credit : Setun Geopark



Credit : Setun Geopark

In autumn 2022, SDS Members should consider to meet at the 6th IPC in Thailand

For details and the state of planning see the homepage at: <http://ipc6.msu.ac.th/>

POTENTIAL NEW YORK STATE SDS MEETING IN SUMMER 2023

Due to the pandemic, the SDS Meeting in New York State has been postponed to summer 2023. Details will be forwarded in the next Newsletter.

DEVONIAN PUBLICATIONS

New volume on Devonian marker fossils of China

QIE, W.-K., QIAO, L.-I., LIANG, K., GUO, W., SONG, J.-J., FENG, L., XU, H.-H., HUANG, P.-U., LIN, M.-L., LU, J.-F., ZHANG, L.-N., LIAO, W.-H. & WANG, C.-Y. (2020). Devonian Stratigraphy and Index Fossils of China. – 540 pp.



This impressive book is, unfortunately, in Chinese only. Its main value for non-Chinese Devonian workers is the wonderful compilation of plates, which display taxa that have hardly been illustrated after their introduction, sometimes in regional journals that are difficult to access. After a detailed (143 pp.) introduction into the Chinese Devonian, with stratigraphic charts, geological maps, and field photos, selected fossil groups are introduced and shown in plates:

Conodonts (38 plates, including taxa, such as *Ancyrognathus glabra*, *Bipennatus auritus*, *Clydagnathus antedeclinatus* and *Cl. hunanensis*, *Eognathodus linearis postclinatus* and *Eo. nagaolingensis*, *Icriodus linglingensis*, *Mashkovia guizhouensis*, *Palmatolepis glabra dixinensis*, *Pa. rectcarina*, *Pa. sihongshanensis*, *Polygnathus chengyuannianus*, and *Polynodosus dapingensis*)

Ostracods (20 plates, including taxa, such as *Entomoprimitia subsandbergeri*, *Maternella neohemisphaerica*, *Richteria nayiensis*, and *Richteria (Richteria) eocostata*)

Rugosa (23 plates, including taxa, such as *Argutastrea pentagona tungkanlingensis*, *Calceola sandalina nanningensis*, *Dohmophyllum guizhouense*, *Macgea houershanensis*, and *Sinospongophyllum planotabulatum*)

Stromatoporids (8 plates, including taxa, such as *Amphipora ninglangensis*, *Atopostroma tuntpuense*, *Intexodictyum hybridium*, *Stachyodes wongchiaoensis*, and *Stylostroma sinensis*)

Brachiopods (34 plates, including taxa, such as *Badainjarania striata*, *Dalerhynchus dingshanglinensis*, *Luofuia delicata*, *Pseudoundispirifer yiwanensis*, *Tangxiangia delicata*, and *Xiaobangdaia zhuogedongensis*)

Dacryoconarids (8 plates, including taxa, such as *Nowakia (Now.) multicostata* and *Now. (Now.) richteri nana*)

Ammonoids (4 plates)

Trilobites (3 plates, including taxa, such as *Cyphaspides orientalis*, *Phacops granulatus guilinensis*, and *Reedops xinjiangensis*)

Graptolithes (1 plate)

Foraminifers (3 plates, including taxa, such as *Carbonella xikuangshanensis* and *Parathurammina hunanensis*)

Macroplants (plates)

Miospores (7 plates, including taxa, such as *Apiculiretusispora hunanensis*, *Crassisporites guangxiensis*, *Grandispora xiaomuensis*, and *Radizonates longtanensis*).

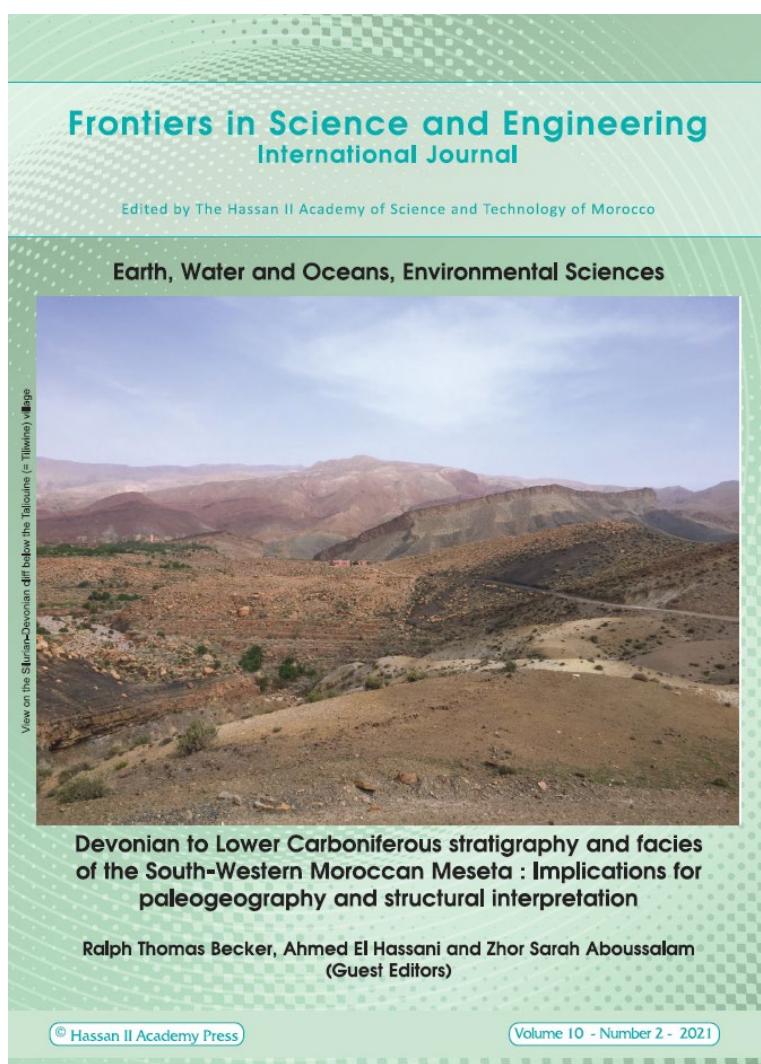
For access to the volume you should contact QIE Wenkun or other authors.

Second volume on the Devonian and Lower Carboniferous of the Moroccan Meseta

BECKER, R. T., EL HASSANI, A. & ABOUSSALAM, Z. S. (Eds., 2021). Devonian to Lower Carboniferous stratigraphy and facies of the South-Western Moroccan Meseta: Implications for paleogeography and structural interpretation. – *Frontiers in Science and Engineering, Earth, Water and Oceans, Environmental Sciences*, **10** (2): 333 pp.; Rabat (Hassan II Academy Press, ISSN 2028-7615).

As the first issue from spring 2020, our second volume on the Devonian and Lower Carboniferous of the Moroccan Meseta stems from the fruitful long-term co-operation between our Devonian group at Münster and

various Moroccan Devonian workers, notably with CM Ahmed EL HASSANI. Since the journal is Open Access, we are confident that the results will be acknowledged by other Devonian workers, especially by our SDS Members. A third issue, dealing with more eastern Meseta sections (e.g., Oulmes region, Devonian south of Meknes, Jebel ben Arab, sections around Azrou, Dechra-Aït-Abdallah region west of Mrirt, Khenifra region) is in progress and due in spring 2023, assuming that we can complete sampling in spring 2022. More general summaries concerning reef growth and extinction, the complex Eovariscan tectonic phases, and the Meseta palaeogeographical development, are planned for higher ranking international journals.



(title photo: Foot of the High Atlas north of Ouarzazate, with the ridge made of Silurian black shale and Lower Devonian, first nodular, than solid limestones, in the middle ground)

The issue deals with a wide range of topics, from litho- and biostratigraphy to carbonate microfacies, palaeogeography, regional correlations and the precise dating of Eovariscan tectonic movements. Many fossil groups, including numerous new or rare forms left in open nomenclature, are illustrated, listed or dealt with in taxonomic appendices:

Ammonoids

- Crassotornoceratinae n. subfam.
 - Crassotornoceras boudoudense* n. sp.
 - Costornoceras multiseptatum* n. gen. n. sp.
 - Costamanticoceras hybris* n. sp.
- Nauilocoids (orthocones, Discosorida)
- ?*Pseudendoplectoceras tazaghtense* n. sp.
 - ?*Pseudendoplectoceras rochi* n. sp.

Conodonts

(with taxonomic descriptions of several forms in open nomenclature)

Trilobites

Brachiopods

Bryozoans

Bivalves

Gastropods

Goniphilus delicatulus n. gen. n. sp.

Stromatoporids

Rugose corals

Revision of *Hebukophyllum arichense*

Tabulate corals

Calcareous foraminifers

(rich Viséan assemblages)

Carboniferous „algospongia“

Content

EL HASSANI, A. & BECKER, R. T.: Introduction. – p. 9-12.

BECKER, R. T., ABOUSSALAM, Z. S., EL HASSANI, A., BAIDDER, L., WEYER, D. & JANSEN, U.: Devonian of the Benahmed region, western Moroccan Meseta. – p. 13-73.

SÖTE, T. & BECKER, R. T.: Upper Frasnian ammonoids and gastropods from Boudouda (Benahmed region, Moroccan Meseta). – p. 75-101.

BECKER, R. T., CÓZAR, P., ABOUSSALAM, Z. S., EL HASSANI, A., BAIDDER, L. & HARTENFELS, S.: Viséan transgression and reworking at Boudouda (NW Benahmed, western Moroccan Meseta). – p. 103-129.

EICHHOLT, S., BECKER, R. T., ABOUSSALAM, Z. S., EL HASSANI, A., MAY, A., JANSEN, U., ERNST, A. & EL KAMEL, F.: Devonian of the Mechra Ben Abbou region (Rehamna) – new data on the reef succession, microfacies, stratigraphy, and palaeogeography. – p. 131-174.

BECKER, R. T., ABOUSSALAM Z. S., EL HASSANI, A., CÓZAR, P., HERBIG, H.-G. & ERNST, A.: The Devonin and Viséan transgression in the Eastern Jebilet (Moroccan Meseta) – review and new data. – p. 175-223.

ABOUSSALAM, Z. S., BECKER, R. T., EICHHOLT, S., EL HASSANI, A., BOUARI, A., MOTTEQUIN, B. & BAIDDER, L.: The Devonian of Jebel Ardouz (Mzoudia region, SW Moroccan Meseta) – new data on stratigraphy, facies, and palaeogeography. – p. 225-249.

BECKER, R. T., ABOUSSALAM, Z. S., EL HASSANI, A., BAIDDER, L., HÜNEKE, H., MAYER, CÓZAR, P., HELLING, S., SEYFFERT, K., AFHÜPPE, L. & MAY, A.: Devonian and the Carboniferous transgression in the Skoura region, Sub-Meseta Zone, Morocco. – p. 251-333.

Chapters can be downloaded individually from the journal homepage:

<https://revues.imist.ma/index.php/fsejournal>

The same homepage can be used to access chapters of the first volume from last year.

IMPORTANT NOTE

Initially, the homepage included one incomplete chapter, which was corrected soon, resulting in changed paginations. For references and quotations, please use only the corrected online pagination as shown above.

PREVIEW

Devonian of New York

Bulletins of American Paleontology

(publication planned for early 2022)

Content

Charles A. VER STRAETEN: Preface.

Charles A. VER STRAETEN: Volume Dedication to Dr. Lawrence (Larry) V. RICKARD.

Chapter 1

Charles A. VER STRAETEN: An Introduction to the Devonian Period, and to the Devonian in New York State and North America.

Chapter 2

James R. EBERT & Damon K. MATTESON: Lithostratigraphy, Multi-Taxa Biostratigraphy and Sequence Stratigraphy of the Helderberg Group (Přídolí – Lochkovian) in New York State.

Chapter 3

Charles A. VER STRAETEN: The Port Jervis, Oriskany, Esopus, and Schoharie Formations, and Equivalents: Pragian and Emsian Strata of New York.

Chapter 4

Charles A. VER STRAETEN, Carlton E. BRETT, Gordon C. BAIRD, Alexander J. BARTHOLOMEW & D. Jeffrey OVER: Lower Middle Devonian (Eifelian-lower Givetian) strata of New York State: The Onondaga Formation and Marcellus subgroup.

Chapter 5

Carlton E. BRETT, Gordon C. BAIRD, James J. ZAMBITO IV & Alexander J. BARTHOLOMEW: Stratigraphy and Facies of the Middle Devonian (Givetian) Hamilton Group in New York State and Adjacent Areas.

Chapter 6

Alexander J. BARTHOLOMEW & Charles A. VER STRAETEN: (no formal title yet; added in Spring 2021, in preparation).

Chapter 7

Gordon C. BAIRD, James J. ZAMBITO IV & Carlton E. BRETT: Tully Formation and Pre-Frasnian Genesee Group Succession.

Chapter 8

D. Jeffrey OVER, Gordon C. BAIRD & William T. KIRCHGASSER: The Frasnian Strata - lower Upper Devonian - of New York State.

Chapter 9

Andrew M. BUSH, J. Andrew BEARD, Sarah K. BRISSON, Jaleigh Q. PIER & Michael T. HREN: Stratigraphy of the Frasnian-Famennian Boundary Interval in Shallow-Marine Paleoenvironments of New York and North-Central Pennsylvania (Wiscoway-Caneadea Formations, Upper Devonian).

Chapter 10

Gerald J. SMITH & Robert D. JACOBI: Upper Frasnian and Famennian Stratigraphy in Western New York State.

Chapter 11

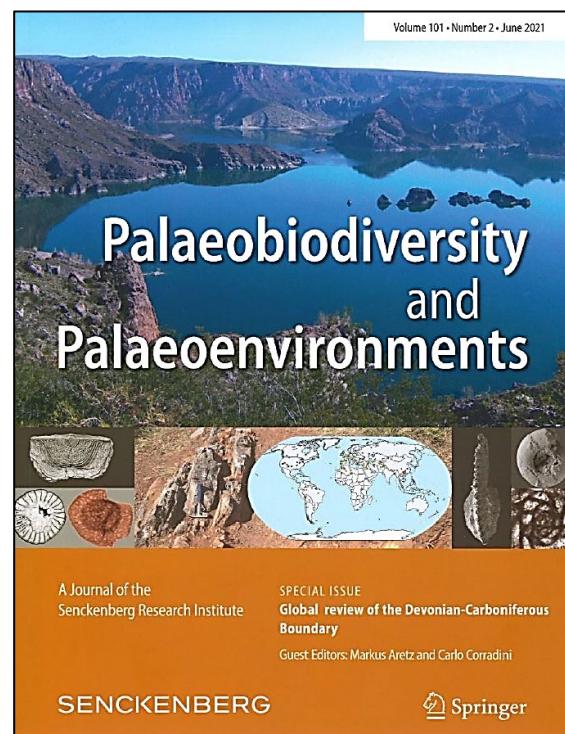
Gordon C. BAIRD, John A. HARPER, D. Jeffrey OVER, Joseph T. HANNIBAL, Scott C. McKENZIE & Irving H. TESMER: Conneaut Group to Basal-Mississippian Stratigraphic Succession and Geochronology, New York-Pennsylvania Borderland and Lake Erie Region.

Chapter 12

Charles A. VER STRAETEN: The Devonian Terrestrial System of New York.

Global review of the Devonian-Carboniferous Boundary

ARETZ, M. & CORRADINI, C. (Eds., 2021). Global review of the Devonian-Carboniferous Boundary. – Palaeobiodiversity and Palaeoenvironments, **101** (2): 285-662.



This volume will become the essential base for the forthcoming discussion on the selection of the GSSP level and for GSSP proposals.

Content

- ARETZ, M. & CORRADINI, C.: Global review of the Devonian-Carboniferous Boundary: an introduction. – p. 285-293.
- FEIST, R., CORNÉE, J.-J., CORRADINI, C., HARTENFELS, S., ARETZ, M. & GIRARD, C.: The Devonian-Carboniferous boundary in the stratotype area (SE Montagne Noire, France). – p. 295-311.
- DENAYER, J., PRESTIANNI, C., MOTTEQUIN, B., HANCE, L. & POTY, E.: The Devonian-Carboniferous boundary in Belgian and surrounding areas. – p. 313-356.
- BECKER, R. T., HARTENFELS, S. & KAISER, S. I.: Review of Devonian-Carboniferous Boundary sections in the Rhenish Slate Mountains (Germany). – p. 357-420.
- MATYJA, H., WORONCOWA-MARCINOWSKA, T., FILIPIAK, P., BRAŃSKI, P. & SOBIEŃ, K.: The Devonian/Carboniferous boundary interval in Poland: multidisciplinary studies in pelagic (Holy Cross Mountains and Sudetes) and ramp (Western Pomerania) successions. – p. 421-472.
- KUMPAN, T., KALVODA, J., BÁBEK, O., GRYGAR, T. M. & FRÝDA, J.: The Devonian-Carboniferous boundary in the Moravian Karst (Czech Republic). – p. 473-485.
- SPALLETTA, C., CORRADINI, C., FEIST, R., KORN, D., KUMPAN, T., PERRI, M. C., PONDRELLI, M. & VENURINI, C.: The Devonian-Carboniferous boundary in the Carnic Alps (Austria and Italy). – p. 487-505.
- CORRADINI, C., MOSSONI, A., CORRIGA, M. C. & SPALLETTA, C.: The Devonian/Carboniferous boundary in Sardinia (Italy). – p. 507-514.
- GRAHAM, J. R. & SEVASTOPULO, G. D.: The stratigraphy of latest Devonian and earliest Carboniferous rocks in Ireland. – p. 515-527.
- OVER, D. J.: The Devonian-Carboniferous boundary in the United States. – p. 529-540.
- MARSHALL, J. E. A.: A terrestrial Devonian-Carboniferous boundary section in East Greenland. – p. 541-559.
- KULAGINA, E. I., ZAYTSEVA, E. L., VEVEL, Y. A., STEPANOVA, T. I., GIBSHMAN, N. B.,

NIKOLAEVA, S. V., KONOVOVA, L. I. & PLOTITSYN, A. N.: The foraminiferal zonal scale of the Devonian-Carboniferous boundary beds in Russia and Western Kazakhstan and its correlation with ammonoid and conodont scales. – p. 561-588.

QIE, W.-K., SUN, Y.-L., GUO, W., NIE, T., CHEN, B., SONG, J.-J., LIANG, K., YIN, B.-S., HAN, S.-P., CXHANG, J.-Y. & WANG, X.-D.: Devonian-Carboniferous boundary in China. – p. 589-611.

KÖNIGSHOF, P., BAHRAMI, A. & KAISER, S. I.: Devonian-Carboniferous boundary sections in Iran. – p. 613-632.

ARETZ, M., CORRADINI, C. & DENAYER, J.: The Devonian-Carboniferous Boundary around the globe: a complement. – p. 633-662.

Geological Society of America, Annual Meeting 2020 (online) Interesting Devonian Abstracts

In alphabetical order; see:

<https://gsa.confex.com/gsa/2020AM/webprogram/start.html#srch=words%7CDevonian%7Cmethod%7Cand%7Cpge%7C1>

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AVILA, T. D., SALTZMAN, M. R., GRIFFITH, E. M. & JOACHIMSKI, M. M.: Silicate weathering and Middle Devonian paleoclimate. – Paper No. 134-4.

BEECH, J.: Where the harpetids are: Paleobiogeography, diversity, and mass extinction in an enigmatic trilobite order. – Paper No. 50-2.

BIDDLE, S. K., LAGRANGE RAO, M., HARRIS, B., FIESS, K. & GINGRAS, M. K.: Recognizing the influence of burrowing meiofauna in marine mudrocks and what it means for paleoredox: A case study of microscopic trace fossils in the organic rich Horn River Group Devonian mudrocks, Northwest Territories. – Paper No. 10-6.

BRISSON, S. K., PIER, J. Q., FERNANDES, A. M., KERR, J. P., BEARD, J. A. & BUSH, A. M.: Mapping paleoecological gradients of brachiopods across the Late Devonian extinction in the Appalachian Basin. – Paper No. 50-6.

- CHEN, J., LU, Y.-H., IKEJIRI, T., SUN J., HOGANCAMP, N. J. & MCGLUE, M. M.: Changes of microbial communities in response to marine environmental volatility through the Late Devonian mass extinction events. – Paper No. 81-3.
- COLE, E. & HIBNER, B. M.: Searching for the Late Devonian Kellwasser Event in the Great Basin region, USA: Was anoxia the main driver of the Late Devonian mass extinction? – Paper No. 76-8.
- DAY, J.: Brachiopod records of the Hangenberg and Early Tournaisian extinctions and post-extinction recovery in the uppermost Devonian – earliest Carboniferous in the Illinois Basin, western Laurussia. – Paper No. 112-5.
- DUNKEL, C. A. & EVANS, J. E.: Sedimentary and geochemical evidence for terrestrial organic matter input driving anoxia events found in Late Devonian black-gray shale transitions, Appalachian Basin, north-central Ohio. – Paper No. 24-4.
- ETTENSOHN, F. R., CLAYTON, G. & MASON, C. E.: Latest Devonian alpine glaciation from the Central Appalachian Basin and its possible influence on coeval black shale deposition. – Paper No. 202-3.
- FRAPPIER, A., LINDEMANN, R. H., LU, Z. & FRAPPIER, B. R.: Paleozoic pelagic profiles: Devonian dacryoconiid microfossils for multiproxy chemostratigraphy. – Paper No. 50-3.
- GOLDSMITH, D. W. & SLAGLE, M. P.: Microfauna of the mid-Paleozoic Fitchville Formation, Lakeside Mountains, Utah. – Paper No. 93-3.
- GROSCH, Z. J., DAY, J. & RENNER, D. J.: Stepped migrations and the development of the Frasnian (Upper Devonian) cosmopolitan brachiopod (spiriferid) faunas in central and western North America carbonate platforms. – Papers No. 112-6.
- HARRIS, B. S., LAGRANGE, M. T., BIDDLE, S. K., FIESS, K. & GINGRAS, M. K.: Comparing the lithofacies, chemofacies and microfacies analyses of the Hare Indian Formation, Northwest Territories, Canada. – Paper No. 10-8.
- HIBNER, B. M. & EDWARDS, C. T.: Was anoxia the main driver of the Late Devonian mass extinction? New insights from paired stable carbon and sulfur isotopes. – Paper No. 76-11.
- JUNIUM, C. K., COHEN, P. & UVEGES, B. T.: Single organic microfossils carbon isotopes during the Late Devonian biotic crisis, insights into ecology and carbon cycle dynamics. – Paper No. 112-2.
- KERR, J. P., BRISSON, S. K., PIER, J. Q. & BUSH, A. M.: Palaeoenvironmental distribution of skeletobiosis across a Late Devonian mass extinction event in the Appalachian Basin. – Paper No. 204-16.
- KONDAS, M.: New palynological data from Devonian deposits of south-central Poland (Miloszow, Holy Cross Mountains). – Paper No. 50-4.
- KONDAS, M.: Unusual Devonian palynomorphs – tentaculitoids (Kowala 1 Borehole, Holy Cross Mountains, south-central Poland). – Paper No. 93-1.
- JOHNSON, A. H., SELLES, C. M. & LEIGHTON, L. R.: Identifying predatory fragmentation in the fossil record: Paleozoic brachiopod example. – Paper No. 204.14 [using *Douvillina* as example].
- MARSHALL, J. E. A., LAKIN, J., TROTH, I. & WALLACE-JOHNSON, S.: UV-B radiation was the Devonian-Carboniferous boundary terrestrial extinction kill mechanism. – Paper No. 112-4.
- MARZA, M. A. M. H., MOWAT, A. C., JELLICOE, K., FERGUSON, G. & MCINTOSH, J.: Critical evaluation of strontium isotopes as a tracer of possible brine contamination in shallow aquifers related to oil/gas production. – Paper No. 149-7 [includes Devonian cases].
- MCKENZIE, S. C. & SESLER, M.: A large Devonian echinoid from the Onondaga Limestone of Western New York. – Paper No. 93-7.
- OVER, D. J., HAGADORN, J. W., SOAR, L. K., BULLECKS, J., TUSKES, K., WISTORT, Z. P., BATES, M. & CHIARTELLO, J.: New conodonts from the Upper Devonian – Lower Carboniferous Dyer Formation, Chaffee Group, Northwest Colorado, USA. – Paper No. 35-3.
- PASTOR-CHACÓN, A., VILLAREOL, C., ISAACSON, P., REYES-ABRIL, J., VELANDIA, F. & SARMIENTO, G.: The Devonian System in northwestern Gondwana: Focus in Colombia. – Paper No. 3-7.
- PERCIVAL, L. M. E., MARYNOWSKI, L., BAUDIN, F., DE VLEESCHOUWER, D., RAKOCINSKI, M., DA SILVA, A.-C. & CLAYES, P.: Locally variable responses to a global carbon-cycle disturbance: Environmental perturbations during the

- Frasnian-Famennian mass extinction. – Paper No. 112-1.
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- See:
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**Geological Society of America
Joint 55th Annual North-Central /
55th Annual South-Central Section
Meeting 2021
Interesting Devonian Abstracts**

See:

<https://gsa.confex.com/gsa/2021NC/webprogram/start.html#srch=words%7CDevonian%7Cmethod%7Cand%7Cpge%7C1>

BRETT, C. E., VER STRAETEN, C., BAIRD, G., BOYER, D. L., OVER, D. J. & WITZKE, B.: “Paleo-dipsticks” and “Paleo-Photometers”: consilience of sedimentologic and paleontological evidence for a moderate depth origin of Middle and Upper Devonian black shales. – Paper No. 9-7.

DAY, J.: High-resolution conodont biostratigraphy and event stratigraphy of a key North American reference section for the upper Frasnian-lower Famennian (Upper Devonian) from the Iowa Basin, central North America. – Paper No. 2-4.

GROSCH, Z., DEVERA, J., MC LAUGHLIN, P. & DAY, J.: Integrated $\delta^{13}\text{C}_{\text{carb}}$ and PXRF elemental chemostratigraphy of the Mocassin Springs-Bailey interval (Ludlow-Lochkovian?) in the Illinois Basin, western Laurussia. – Paper No. 6-5.

SAJA, D. B. & HANNIBAL, J. T.: Reinterpretation of putative “arthrodire egg cases” from the Famennian Cleveland Member as extremely large thylacocephalian arthropods. – Paper No. 2-2.

MEMBERSHIP NEWS

CM Alex BARTHOLOMEW

Much like everyone, 2020 and 2021 were rather surreal years of existence for me and my family here in New York State. We remained relatively healthy through it all, and I did a lot of local hiking carrying our youngest daughter for her daily naps, but sadly I did not get out to do much field work due to the pandemic. I did, however, make some teaching innovations including recording field videos at various Silurian and Devonian localities in the Hudson Valley and Catskill Mountain region in southeastern New York State and taking high-resolution photographs using a Gigapan camera mount of several important outcrops in our region. I hope to continue this project by recording videos of various geologists on key outcrops across the state and making more high-resolution photographs as well.

I co-chaired a session at the Northeastern Regional meeting of the Geological Society of America with CM James EBERT (SUNY Oneonta) entitled “Classic Ground and New Developments: Stratigraphy and Sedimentology in the Northeast”. We had many interesting talks presented in an on-line format including many talks on the Devonian succession in the northeastern US. I presented a talk entitled: “Revision and Correlation of Uppermost Silurian Strata in Northeastern New Jersey and Southeastern New York” based upon fieldwork conducted over several seasons with various undergraduate students here at SUNY New Paltz. While not specifically Devonian, the goal of this project was to try to sort out the strata right around the Silurian/Devonian boundary in southeastern New York/northeastern New Jersey. This project has yielded some interesting results in terms of the timing of faunal change through this interval, indicating a major faunal being recorded in the upper portions of the Manlius Formation, likely the expression of the Klonc bioevent in this region.

Along with my coauthors, I continue to work on various chapters for the Devonian of New York volume led by CM Chuck VER STRAETEN (NYSM), including the Onondaga-Marcellus and Hamilton Group chapters. Discussions in the winter/spring of 2021 ultimately resulted in Chuck and I working to write a last-minute new chapter on the stratigraphy of the easternmost Hamilton Group rocks in New York State. This region records the transition from open marine to terrestrial facies and is in general poorly understood due to poor exposure and rapid facies changes over short lateral distances. Our new chapter will include a thorough review of previous work conducted in this region along with some new insights that have resulted from many fruitful discussions about several key beds in this region. Of particular note are anomalous faunas in these strata including brachiopods like *Schizophoria* that occur within the lower Givetian of the Appalachian Basin solely in a very narrow geographic and stratigraphic range in eastern New York State. We look forward to the completion of this volume and the upcoming SDS meeting and field excursion across New York State to show some of our new findings to our colleagues.

TM R. Thomas BECKER, CM Zhor Sarah ABOUSSALAM, and the Münster Group

Since the pandemic made field work very difficult, especially abroad, the last year was successfully used to finish a large number of manuscripts. In our case, the autumn/winter lockdown phase was rather productive.

In the focus of first half year was the completion of the second volume on the Devonian and basal Carboniferous of the Moroccan Meseta. It resulted in seven chapters that are outlined in the Devonian publications section (therefore, not repeated in our following publications list). The second part grew gradually more and more, because we had to incorporate results from more than ten years of research. We like to re-emphasize the close cooperation with our good friend (Moroccan CM and co-editor) Ahmed EL HASSANI (Rabat).

Apart from members of our team, the volume benefitted considerably from the expertise concerning sedimentology and various fossil groups of Pedro CÓZAR (Madrid), Hans-Georg HERBIG (Cologne), Sven HARTENFELS (Cologne), Andreas MAY (Unna), Uli JANSEN (Frankfurt a.M.), Andrej ERNST (Hamburg), Heiko HÜNEKE and Oliver MAYER (Greifswald), and Dieter WEYER (Berlin). Among the Moroccan colleagues, L. BAIDDER (Casablanca), Ali BOUARI (Marrakech), Mustafa BENFRIKA, and Fouad EL KAMEL (Casablanca) contributed, either in the field and/or by own data. The second volume is not yet the end. A third volume is planned, but after a pause, since first we must be able to return to the field for the completion of sampling of some of the localities (Fig. 1).

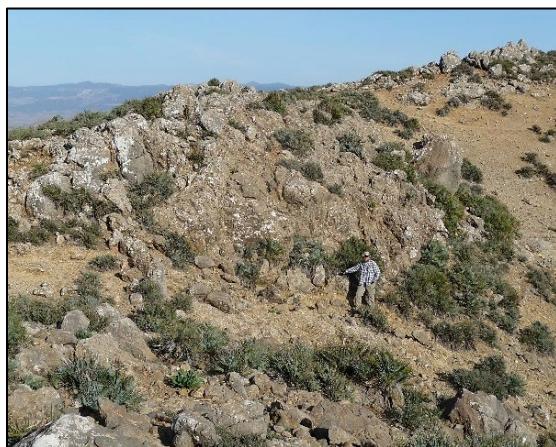


Fig. 1. Huge allochthonous glide block of Givetian reef limestone (with O. MAYER for scale) at Awajgal (Dechra-Aït-Abdallah region, W of Mrirt), eastern part of Western Meseta.

In parallel with the Academy Volume, we cooperated with Amine TALIH, Ph.D. student at the Mohammed V University, Rabat (supervisors: M. SAADI and A. BENMLIH). His work concentrates on the Devonian of the Tisdefine Basin in the Tinejdad region (SE Morocco), at the critical boundary between the stable Gondwana shelf (Tafilalt-Maïder) and Meseta that was later subject to more intensive Variscan deformation. Results have been submitted for publication in the Journal of African Earth Sciences.

Another Moroccan project that went on for several years, is the close cooperation with Heiko HÜNEKE and his students at Greifswald. The project concentrates on the so far poorly understood contourite sedimentation both in the Tafilalt and at the foot of the High Atlas (Skoura Devonian). For the Tafilalt, two manuscripts are currently subject to corrections after their reviews. Another Moroccan paper in review describes rich ostracod faunas from around the Emsian-Eifelian boundary of the western Dra Valley (GROOS-UFFENORDE et al.).

The long-term cooperation with our Chinese friends MA Xueping and ZONG Pu resulted in the description of new upper Famennian *Gonioclymenia* faunas (ZONG et al. 2021) that were discovered since the first monographic treatment (ZONG et al. 2015) in the Junggar Basin of Xinjiang. As noted before, another planned ammonoid contribution will deal with upper Frasnian *Manticoceras* faunas of Hunan. Based on a stay of Xueping a long time ago in Münster, a manuscript on the spiriferids of the Refrath Formation of the Rhenish Massif (Bergisch Gladbach-Paffrath Syncline) is close to completion.



Fig. 2. Part of the jaw of a bony fish, *Ad. pramosica* Zone, lower Frasnian, Beringhauser Tunnel section (photo K. DUDA).

Devonian ammonoid work continues with Till and will involve new M.Sc. projects (see below). The many topics listed last year are still relevant but other manuscripts were given preference. One of the local private collectors, Hartmut KAUFMANN, gave us free insights into

his wonderful collection and he is willing to donate critical specimens for ongoing revisions and faunal descriptions. For example, he has valuable and partly rare specimens from the Odershausen Limestone of the Kellerwald, the Adorf Limestone of Martenberg (Fig. 3), Effenberg, and Nehden, including a nice *Archoceras* topotype.



Fig. 3. A rare *Trimanticoceras* from Martenberg (collection and photo of H. KAUFMANN).

After a long delay (the editors at Senckenberg are not to blame), the extensive revision of Rhenish D-C boundary sections was eventually published (BECKER et al. 2021). On purpose, it did not include much information concerning our best section at Borkewehr near Balve, the type-section of the Wocklum Limestone and *Protognathodus kockeli*. A multidisciplinary approach resulted in a long manuscript (HARTENFELS et al.) submitted to Palaeobiodiversity and Palaeoenvironments. In addition, we returned to the old Oberrödinghausen Railway Cut in order to resample the Hangenberg Limestone. Unfortunately, it turned out that its upper part is currently not exposed any more. As previously announced, Sven and I will resume work on the Lalla Mimouna section in southern Morocco. It will include an attempt to deal with the unsolved “siphonodelloid” taxonomy.

CM Zhor Sarah ABOUSSALAM

Sarah contributed a wealth of conodont (Fig. 4) and microfacies data to the second Meseta volume, where she acted as co-editor and co-

author of most chapters. Unfortunately, the pandemic prevented its presentation at the annual (2021) meeting of the Hassan II Academy of Science and Technology of Morocco, which had to be cancelled. She compiled already many new data for the third volume, due in 2023, which will mostly concern northern and eastern parts of the western Meseta (e.g., the Tiflet, Tiddas, Azrou, and Khenifra regions). In parallel, many new Givetian and Frasnian conodont samples from the Tafilalt were identified for the collaboration project with Heiko HÜNEKE (Greifswald).

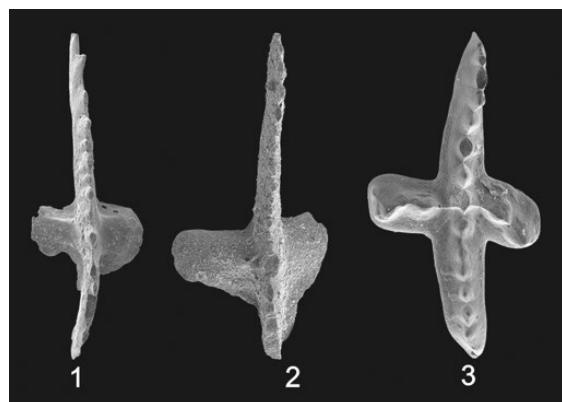


Fig. 4: Examples for Lower Devonian conodonts from Asserhmo, eastern Skoura region, southern Morocco. 1. *Criteriognathus miae*, 2. *Cr. steinhornensis*, 3. *Ancyrodelloides transitans*.

In the Rhenish Massif, new conodont faunas from the lower Frasnian of Beringhauser Tunnel, the lower Givetian of Binolen (LÖW et al. in prep.), and the Frasnian of Hofermühle and the Hahnenfurt Railway Station (Wuppertal region) were studied. Markus ARETZ and Elise NARDINE (both Toulouse) sent twenty samples from the Montagne Noire region for age determinations, which was partly successful. Apart from the conodont work, the bactritid M.Sc. Thesis of Lars OTTO was co-supervised.

Research assistants/Ph.D. students

Till SÖTE is in the third year of his PhD project on the upper Frasnian tornoceratids (Goniatitida). He published his first joint manuscript with Thomas, Carlo HERD and Jürgen BOCKWINKEL in the Paläontologische Zeitschrift (PalZ). Furthermore, he published a paper on the ammonoids, bactritids, and

gastropods from Boudouda in the second Moroccan Meseta volume (SÖTE & BECKER 2021). Two more manuscripts on the so far neglected but rich tornoceratid fauna of Büdesheim, Eifel Mts. (presented at the annual PalGes conference in Vienna) and on Frasnian ammonoid faunas from Ouidane Chebbi and Oued Mzerreb (Fig. 5) in southern Morocco are nearly finished and should be submitted within the next months. The current results support previous ideas that the Lower Kellwasser Event did not have such a devastating impact on ammonoids as the Upper Kellwasser Event. Another manuscript, on the tornoceratid ammonoids of the Martenberg, will be done jointly with Thomas and with the help of Hartmut KAUFMANN and Felix SAUPE.

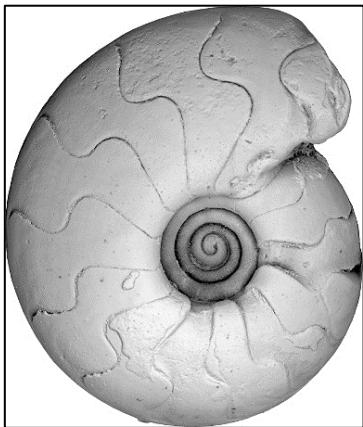


Fig. 5: Representative of a new aulatornoceratid genus from the Frasnian of Oued Mzerreb, eastern Dra Valley, southern Morocco.

Apart from his work on ammonoids, Till is working closely together with Mieke LÖW and other authors on the Binolen initial reef fauna.

Felix SAUPE continued his study on Frasnian conodont stratigraphy and diversity in the Rhenish Massif. He finished his joint manuscript with Thomas on the famous Martenberg, which has been restudied in order to document the microfacies development and to refine the conodont stratigraphy around the global *semichatovae* Event/Transgression. On a global scale, the Martenberg section is currently the best bed-by-bed documented section for facies changes, conodont and goniatite biostratigraphy at the middle/upper Frasnian transition. Therefore, it is regarded as a

candidate for a future GSSP selection. The manuscript is currently under revision and will be published in the mentioned Rhenish Massif issue in *Palaeobiodiversity and Palaeoenvironment*.

A second manuscript on high precision conodont stratigraphy and alpha diversity around the Kellwasser Crisis at Beringhauser Tunnel (eastern Sauerland) is in good progress. Faunas are partly exceedingly rich but the manuscript hopefully will be finished by the beginning of the next year. Furthermore, Felix will continue to work on samples of the former Schlupkothen Quarry (southeastern end of the Velbert Anticline), which was investigated before by Alexander KLEMENT in the frame of his B.Sc. project.

In case you were wondering about the new family name (previously LÜDDECKE), it remains to say that Felix and Anna SAUPE got married in August.

Anna SAUPE is currently working on living benthic foraminifera in contourite drift systems to evaluate their potentials as proxies for (palaeo-) oceanic current pattern reconstructions, in the frame of her Ph.D. project at the University of Cologne. But the results of her M.Sc. thesis on biofacies analysis of agglutinated foraminifera along a middle/upper Famennian transect from Central Europe to North Africa are planned to be published in a joint manuscript.

Sören STICHLING is now responsible at the Krefeld Geological Service for the region of the Remscheid-Altena Anticline. Accordingly, work on a multi-authored manuscript on the drowning and extinction of the Hönne Valley Reef Complex was resumed and will be submitted to the Rhenish Massif Devonian volume of *Palaeobiodiversity and Palaeoenvironments*.

Stephan EICHHOLT has a full-time position in an environmental geology company near Münster, but managed to submit his microfacies data on the Devonian Rehamna reefs to the second Meseta volume (EICHHOLT et al. 2021). As a co-author, Andreas MAY was so kind to

identify the coral and stromatoporid taxa. Work has begun on a third paper dealing with the Givetian reef limestones of the Oulmes and Azrou-Mrirt regions.

Master students

Mieke LÖW finished her B.Sc. project on the microfaunas of the initial reef phase of the Hönne Valley Reef complex at Binolen in the northern Rhenish Massif. Results will be part of a multi-authored manuscript for the Rhenish Devonian volume of Palaeobiodiversity and Palaeoenvironments. This will involve microfacies analyses (Till, Thomas & Sören), conodont stratigraphy (Sarah), and identifications of macrofauna (Andreas MAY, Unna, and Simon Felix ZOPPE, Frankfurt a.M.). For her M.Sc., Mieke was asked to change to Frasnian ammonoids (gephuroceratids), beginning this fall.

After completion of his M.Sc., **Lukas AFHÜPPE** agreed to run for some time the micropalaeontology lab at Münster. Therefore, he is mostly occupied by our conodont samples. He contributed to the second Meseta volume (two new Emsian discosorids, AFHÜPPE & BECKER in BECKER et al. 2021) and started to translate his M.Sc. into English, as a preparation for publication. Apart from this, he wrote a short joint manuscript with Thomas on a new Givetian discosorid from Binolen. So far, no discosorid has been described from German reef facies.

Lara HOLDERIED is working full time with a publishing company. Therefore, her M.Sc. Thesis on middle Frasnian goniatites from the Canning Basin is progressing slowly. But she will get there.

Konrad SEYFFERT worked after the completion of his M.Sc. on Emsian phacopids from Morocco for the study organization of our faculty administration. This slowed manuscript preparations.

Lars OTTO finished his M.Sc. project on lower/middle Frasnian bactritids from the Canning Basin, using a modern morphometric approach. His analyses confirmed that there are

several new endemic species (Fig. 6) and even a new endemic genus. Since he now works full-time in environmental geology, the publication of the important results will take some time.

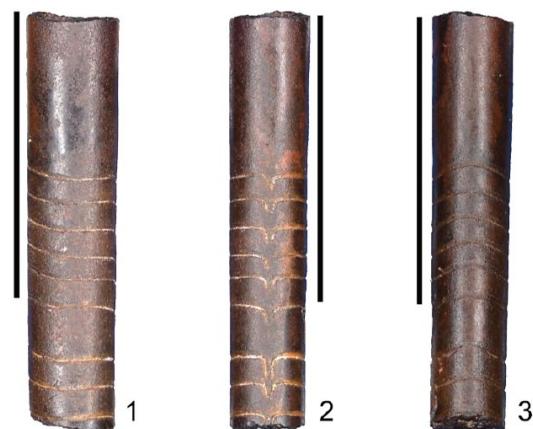


Fig. 6. New species of *Lobobactrites* from the Canning Basin (middle Frasnian of McIntyre Knolls), showing an unusual episodic interruption of normal septal spacing (scale bar = 1 cm).

Max KERN is near the completion of his M.Sc. Thesis on a core of the northern Hofermühle Reef complex (Velbert Anticline, NW Rhenish Massif). Apart from detailed microfacies analyses, carbonate diagenesis and secondary porosities formed by dolomitizations are key elements of the study, which is part of a larger project to explore the geothermal energy prospects of surface reefs and carbonate platforms in our state. Stephan BECKER from the Krefeld Geological Survey co-supervises the master work.

Alexander KLEMENT will begin this autumn a Ph.D. project on the morphometry-based taxonomy and palaeobiogeography of middle Famennian ammonoids of the Canning Basin.

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Regular Publications

- BECKER, R. T. (2020 submitted). 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.
- BECKER, R. T., HARTENFELS, S. & KAISER, S. I. (2021). Review of Devonian-Carboniferous

- Boundary sections in the Rhenish Slate Mountains (Germany). – Palaeobiodiversity and Palaeoenvironments, **101** (2): 357-420.
- BECKER, R. T., EL HASSANI, A. & ABOUSSALAM, Z. S. (Eds., 2021). Devonian to Lower Carboniferous stratigraphy and facies of the South-Western Moroccan Meseta: Implications for palaeogeography and structural interpretation. – Frontiers in Science and Engineering, Earth, Water and Oceans, Environmental Sciences, **10** (2): 1-311. [open access; for the individual chapters see Devonian Publications]
- GROOS-UFFENORDE, H., SCHINDLER, E., BECKER, R. T., DOJEN, C., BROCKE, R. & JANSEN, U. (2021 submitted). Late Early Devonian ostracods from the Torkoz area (SW Morocco) and the Emsian/Eifelian biounit boundary. – Paläontologische Zeitschrift.
- HARTENFELS, S., BECKER, R. T., HERBIG, H.-G., QIE, W.-K., KUMPAN, T., DE VLEESCHOUWER, D., WEYER, D. & KALVODA, J. (2021 submitted). The Devonian-Carboniferous transition at Borkewehr near Wocklum (northern Rhenish Massif, Germany) – a potential GSSP section. – Palaeobiodiversity and Palaeoenvironments.
- SAUPE, F. & BECKER, R. T. (2021 submitted). Refined conodont stratigraphy at Martenberg (Germany) as base for a formal middle/upper Frasnian substages boundary. – Palaeobiodiversity and Palaeoenvironments.
- SÖTE, T., BECKER, R. T., HERD, K. J. & BOCKWINDEL, J. (2021). Upper Frasnian Tornoceratidae (Ammonoidea) from the Sand Formation (Bergisch-Gladbach-Paffrath Syncline, Rhenish Massif). – Paläontologische Zeitschrift, **95** (2): 237-273.
- STICHLING, S., BECKER, R. T., HARTENFELS, S., ABOUSSALAM, Z. S. & MAY, A. (2021 in prep.). Drowning, extinction and subsequent facies development of the Devonian Hönne Valley Reef Complex (northern Rhenish Massif, Germany). – Palaeobiodiversity and Palaeoenvironments.
- TALIH, A., ABOUSSALAM, Z. S., BECKER, R. T., SAADI, M. & BENMLIH, A. (2021 submitted). Stratigraphy and tectono-sedimentary processes of allochthonous Devonian deposits of the Tisdisine Basin, Eastern Anti-Atlas, Morocco. – Journal of African Earth Sciences.
- ZONG, P., BECKER, R. T. & MA X.-P. (2021 online).
- The ammonoid *Gonioclymenia* fauna from the Upper Devonian (upper Famennian) of western Junggar, northwestern China. – Geological Journal, **2021**: 1-20, doi: 10.1002/gj.4182.
- Abstracts*
- LÖW, M., SÖTE, T., BECKER, R. T., MAY, A., STICHLING, S., ABOUSSALAM, Z. S. & ZOPPE, S. F. (2021). Microfauna and Microfacies from the initial reef stadium of Binolen in the Hönne Valley (Sauerland, Middle Devonian). – 92nd Annual Meeting of the Paläontologische Gesellschafts, Vienna, 26 Sept. – 01 Oct., 20021, Abstract Volume.
- SÖTE, T. & BECKER, R. T. (2021). Exceptionally high diversity in the Frasnian (Upper Devonian) Tornoceratidae (Ammonoidea) from Büdesheim (Rhenish Massif, Germany). – 92nd Annual Meeting of the Paläontologische Gesellschafts, Vienna, 26 Sept. – 01 Oct., 20021, Abstract Volume.
- Devonian B.Sc./M.Sc. Thesis*
- LÖW, M. (2020). Mikrofaunen aus dem initialen Riffstadium von Binolen im Hönnetal (Sauerland, Givetium). – B.Sc. Thesis, WWU Münster, 59 pp.
- OTTO, L. (2021). Lower and Middle Frasnian Bactritida (Cephalopoda) from the Canning Basin (NW Australia) – morphometry, systematics, and palaeobiogeographical comparisons. – M.Sc. Thesis, WWU Münster, 141 pp.

CM Alain BLIECK

I am still interested in Cambrian to Late Devonian early vertebrates, and in particular in ostracoderms, including Pteraspidomorphi et al. My very best topics are biostratigraphy, palaeobiogeography, and palaeoenvironments. However, phylogenetic analysis, and especially, cladistics, is also of importance to me. I have several dozen papers in progress, including one on “Two new Eodevonian Pteraspids from the Fossil-Lagerstätten of Waxweiler, Eifel, and Odenspiel, Bergisches Land (FRG) in the Ardenne-Rhenish Slate Massif” by Alain R. M. BLIECK, David K. ELLIOTT, Adriana LOPEZ-ARBARELLO, Jessie CUVELIER, Peter BARDENEHEUER & Sébastien OLIVE (to be

submitted), and one on “Ressources géologiques pour l’industrie, l’architecture et l’art dans le nord de la France” by Alain BLIECK, Jean-Jacques BELIN, Jessie CUVELIER, Patrick DE WEVER, Bernard MAITTE, Francis MEILLIEZ & Didier TORZ, that is, a Société Géologique du Nord contribution, in French, submitted to the organizing committee of the 60th Congress of Société Savantes du Nord de la France, Roubaix, 2019.

TM Carlton E. BRETT

Although field study of Devonian rocks in 2021 was again minimal, I have continued to work extensively on two projects: A) revisions of three large chapters on Middle Devonian stratigraphy for a *Bulletins of American Paleontology* volume on New York State Devonian, edited by CM Charles VER STRAETEN, New York State Geological Survey and TM Jeff D. OVER (SUNY College Geneseo). CMs Gordon BAIRD (SUNY College Fredonia), Alex BARTHOLOMEW (SUNY College, New Paltz), Jay ZAMBITO (Beloit College) and I have prepared two extensive manuscripts on stratigraphic terminology, re-description of units, chronostratigraphy, and facies analysis of the Middle Devonian of New York and adjacent regions. The full volume will be published electronically (print on demand) early in 2022. Our intent remains to have the text and charts published in time for the upcoming SDS Devonian meeting in New York State.

During 2021, the Paleontological Research Institution (PRI), CM Gordon BAIRD and I received a National Science Foundation (NSF) Grant to complete the curation and reorganization of our extensive Devonian collections and to create a major center for Paleozoic fossils. We are continuing to work with the assembling, integration, and digitization of our combined collections made over the past four decades from the Devonian of New York State and elsewhere. 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. We hope to showcase this collection at the SDS meeting.

In addition, I worked, briefly, with Dr. Patrick MC LAUGHLIN and CM Jay ZAMBITO on sampling Devonian phosphatic beds in Tennessee, Kentucky, and New York State. The purpose of this study is to detail the geochemistry of phosphate beds and to determine their rare earth element content. This may provide a new categorization of distinctive types of phosphatic beds and yield insights into depositional processes.

I also continued to work collaboratively with researchers on Gondwana Devonian paleontology and taphonomy with CM Luiza PONCIANO (SDS) Universidade Federal do Estado do Rio de Janeiro, Brazil and her students. Finally, research continued with Dr. Damien PAS (Utrecht University) and TM Anne-Christine DA SILVA (Université de Liège) and on the Devonian cyclostratigraphy of New York State.

Award: Received the Laurence L. SLOSS Award for Excellence in Sedimentary Geology from the Geological Society of America, October, 2020.

[Dear Carl: Our congratulations! The Editor.]

TM Rainer BROCKE

Research activities, in particular field and laboratory work, were strongly impaired by Covid 19, as everybody knows. New data are slowly coming out.

However, some manuscripts could be pushed forward. One of them, mainly dealing with Eifelian ostracods from Morocco, by H. GROOS-UFFENORDE together with other colleagues, has been submitted.

Further manuscripts connected with the Eifel and Mosel area are in preparation.

CM Carole J. BURROW

I have submitted a revision of the Acanthodii Handbook of Paleoichthyology to publisher Friedrich PFEIL; hopefully it will be released next year. Collaborative work with David K. ELLIOTT on a small acanthodian fauna from Death Valley in California, and with Sue TURNER and Mike MURPHY on the vertebrate fauna of the Birch Creek II section in Nevada have been submitted for publication. I am still working on the Early and Middle Devonian gnathostomes of Scotland and Spitsbergen with Mike NEWMAN and Jan DEN BLAAUWEN. A manuscript is still in preparation with Sue TURNER on microvertebrate assemblages from the ?Early Devonian of the Northern Territory. However, this work is dependent on Sue's re-evaluation of all the Australian late Early-early Middle Devonian thelodont taxa. I am also still working on the Cravens Peak Beds fauna from a small limestone outcrop in the G58eorgia Basin of western Queensland – the only such deposit anywhere in the Devonian of central Australia.

Publications

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- DEARDEN, R. P., DEN BLAAUWEN, J. L., SANSON, I. J., BURROW, C. J., DAVIDSON, R., NEWMAN, M. J., KO, A. & BRAZEAU, M. D. (2021). A revision of *Vernicomacanthus* Miles with comments on the characters of stem-group chondrichthyans. - Papers in Palaeontology: 1-29; doi:10.1002/spp2.1369.
- LONG, J. A., THOMSON, V., BURROW, C. J. & TURNER, S. (2021). Fossil chondrichthyan remains from the Middle Devonian Kevington Creek Formation, South Blue Range, Victoria. - In: PRADEL, A, DENTON, J. S. S. & JANVIER, P. (Eds.), Ancient Fishes and their Living Relatives: a Tribute to John G. MAISEY: 239-245; Munich (Dr Friedrich Pfeil).
- MAISEY, J. G., DENTON, J. S. S., BURROW, C. J. & PRADEL, A. (2021). Architectural and

ultrastructural features of tessellated calcified cartilage in modern and extinct chondrichthyan fishes. - Journal of Fish Biology, **98** (4): 919-941; doi:10.1111/jfb.14376.

NEWMAN, M. J., DEN BLAAUWEN, J. & BURROW, C. J. (2020). Two newly identified cheiracanthid acanthodontians from the Mey Flagstone Formation (Givetian, Middle Devonian) of the Orcadian Basin, Scotland. - Scottish Journal of Geology, **57** (1): 34-51; doi:10.1144/sjg2020-009.

NEWMAN, M. J., BURROW, C. J., DEN BLAAUWEN, J. & GILES, S. (2021). A new actinopterygian *Cheirolepis jonesi* nov. sp. from the Givetian of Spitsbergen, Svalbard. - Norwegian Journal of Geology, **101** (4): 202103, 14 pp.; doi:10.17850/njg101-1-3.

NEWMAN, M. J., DEN BLAAUWEN, J., BURROW, C. J. & JONES, R (2021). Earliest vertebrate embryos in the fossil record (Middle Devonian, Givetian). - Palaeontology, **64** (1): 21-30; doi:10.1111/pala.12511.

YOUNG, G. C. & BURROW, C. J. (2020). Late Devonian antiarch remains (placoderm fish) from the Gilberton Formation, north Queensland. Memoirs of the Queensland Museum – Nature, **62**: 87-203; doi:10.17082/j.2204-1478.62.2020.2020-04.

TM Carlo CORRADINI

My research is mainly devoted to conodont biostratigraphy from the Silurian to Lower Carboniferous in several regions, specially focusing 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). I co-authored a few papers on selected areas published in a thematic issue of *Palaeobiodiversity and Palaeoenvironments* ("Global review of the Devonian-Carboniferous Boundary", edited by Markus ARETZ and me; see Devonian Publications): Montagne Noire (FEIST et al.), Carnic Alps (SPALLETTA et al.), Sardinia (CORRADINI et al.), and a summary of the regions not dealt with in other contributions (ARETZ et al.). Other papers on the DCB came from a cooperation with Polish colleagues and

deal on sections in Uzbekistan (RACKOCINSKI et al., NARCKIEWICZ et al.).

The Carnic Alps represents my main research area. Geology and stratigraphy of several sectors are investigated (together with several colleagues). Beside a review of the Devonian/Carboniferous sections (SPALLETTA et al.), other published papers deal with the classical Ordovician-Lower Devonian Valentintörl section (CORRIGA et al.) and the geology of the Mt Zermula area (CORRADINI et al.). In addition, a geological map of the central sector of the Carnic Alps (PONDRELLI et al.) was updated according to the recent new lithostratigraphical scheme. Finally, the guidebook of the field trip organized in connection with the 90th Congress of the Italian Geological Society was published (CORRADINI & PONDRELLI). Research in progress concerning the Carnic Alps is mainly focused on the evolution of the sedimentary basin during the Lower and Middle Devonian.

Papers on other Devonian topics were published: GIRARD et al. discussed the Famennian palaeogeography on the basis on MS data in various peri-Gondwana areas, and SUTTNER et al. deal with Middle Devonian palaeotemperatures.

Even if the pandemic prevented traveling abroad, joint-researches with colleagues from various institutions are still active. 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 and E. POTY). Extra-European Devonian researches deal with conodont stratigraphy of the Silurian and lowermost Devonian of the Precordillera, Argentina (with M.-J. GOMEZ, A. MESTRE, and S. HEREDIA).

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

Publications

- PONDRELLI, M., CORRADINI, C., SPALLETTA, C., SUTTNER, T. J., SIMONETTO, L., PERRI, M. C., CORRIGA, M. G., VENTURINI, C. & SCHÖNLAUB, H. P. (2020). Carta geologica del settore centrale delle Alpi Carniche (Austria-Italia). - Comunità di montagna della Carnia editore.
- CORRADINI, C., PONDRELLI, M., SIMONETTO, L., CORRIGA, M. G. (2020). Geology of Mount Zermula massif (Carnic Alps, Italy). - Gortania Geologia, Paleontologia, Paletnologia, **42**: 5-24.
- GÓMEZ, M. J., MESTRE, A., CORRADINI, C. & HEREDIA, S. (2021). A new species, *Ozarkodina huenickeni*, from the upper Silurian - Lower Devonian in San Juan Precordillera, South America. - Journal of South American Earth Sciences, **108**: 103174; doi:10.1016/j.jsames.2021.103174.
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- ARETZ, M. & CORRADINI, C. (2021). Global review of the Devonian-Carboniferous Boundary: an introduction. - Palaeobiodiversity and Palaeoenvironments, **101**: 285-293; doi: 10.1007/s12549-021-00499-8.
- FEIST, R., CORNEÉ, J. J., GIRARD, C., CORRADINI, C., HARTENFELS, S. & ARETZ, M. (2021). The Devonian/Carboniferous Boundary in the strato-type area (SE Montagne Noire, France). - Palaeobiodiversity and Palaeoenvironments, **101**: 295-311; doi: 10.1007/s12549-019-00402-6.
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- CORRADINI, C., MOSSONI, A., CORRIGA, M. G. & SPALLETTA, C. (2021). The Devonian/Carboniferous Boundary in Sardinia (Italy). - Palaeobiodiversity and

- Palaeoenvironments, **101**: 507-514; doi: 10.1007/s12549-019-00411-5.
- ARETZ, M., CORRADINI, C. & DENAYER, J. (2021). The Devonian-Carboniferous Boundary around the globe: a complement. - Palaeobiodiversity and Palaeoenvironments, **101**: 633-662; doi:10.1007/s12549-021-00495-y.
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- NARKIEWICZ, K., CORRADINI, C., ABDIEV, N. & NARKIEWICZ, M. (2021). Conodont biostratigraphy and biofacies across the Devonian-Carboniferous boundary in the Kule section (Uzbekistan). - Geological Quarterly, **65** (17): 14 pp.; doi: 10.7306/gq.1588.
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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. A paper on the classical, strongly

tectonized, Valentintörl section, also including a taxonomical part (CORRIGA et al.) was published, as well as geological maps of selected area with explanatory notes (PONDRELLI et al., CORRADINI et al.).

In Sardinia, a paper on the Silurian-Lower Devonian area of Perda S'altari is in progress, and I'm revising the conodont fauna of the classical Mason Porcus section.

My research also deals on Silurian and Devonian conodont taxonomy, mainly focusing on Lower Devonian ozarkodinids (with Carlo CORRADINI).

Publications

- CORRIGA, M. G., CORRADINI, C., PONDRELLI, M., SCHÖNLAUB, H. P., NOZZI, L., TODESCO, R. & FERRETTI, A. (2021). Uppermost Ordovician to lowermost Devonian conodonts from the Valentintörl section and comments on the post Hirnantian hiatus in the Carnic Alps. - Newsletters on Stratigraphy, **54**: 183-207; doi:10.1127/nos/2020/0614.
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M. (2021). Paleotemperature record around the Middle Devonian Kačák Episode. - *Scientific Reports*, **11** (16599); doi: 10.1038/s41598-021-96013-3.

TM Catherine CRÔNIER

Ongoing research on Devonian sequences especially with V. BAULT (PhD student) in North Africa and V. SEROBYAN (PhD student) in Armenia.

I am always interested in trilobites, both as fascinating organisms and as potential windows into how morphological disparity changes over deep time, particularly across major mass extinction boundaries. My current projects are mainly devoted to Devonian trilobites in several areas.

I am part of a collaborative effort to characterize faunas from the Western Mongolia (colleagues A. MUNKHJARGAL, P. KÖNIGSHOF, J. A. WATERS, and S. K CARMICHAEL) and China (coll. J. A. WATERS). The Western Mongolian Working Group have conducted fieldwork in Mongolia with the goal of identifying Late Devonian extinction and anoxia events that were previously recognized in coeval CAOB terranes in western China.

I am also part of a collaborative effort to characterize faunas from Armenia (coll. T. DANELIAN, V. SEROBYAN, B. MOTTEQUIN, and A. GRIGORYAN). The Upper Devonian carbonate-siliciclastic sedimentary sequences contain an abundant and diverse brachiopod fauna that still remains poorly studied.

Valentin BAULT (PhD student) continued and is about to finish his study on the comparison of Devonian trilobites from Morocco and Algeria. His attention has been focused on their patterns of diversity and disparity and their palaeobiogeographic relationships. Taking advantage of the exceptional record of Devonian trilobites in North Africa, a new dataset was compiled in order to reveal their long-term evolutionary history leading to their extinction. Initial results on the trilobite diversity patterns were presented

at the annual conference of the French Paleontological Association (APF) in Aix en Provence (France) and the PalAss meeting in Valencia (Spain). This study is now published in *Palaeogeography, Palaeoclimatology, Palaeoecology*.

Vahram SEROBYAN (PhD student from Armenia) has just finished his study on Upper Devonian brachiopods from his home country. In an effort to revise and update their systematic classification and to assess their diversity in this area after the Kellwasser extinction event, his attention has been focused first especially on rhynchonellides and athyrides. From a paleobiogeographic viewpoint, the studied brachiopod fauna clearly shares affinities with contemporaneous ones from other regions of the Gondwanan northern margin that extend eastwards of the South Armenian Block (SAB) to Afghanistan and Pamir, although there are also many endemic elements. These results are now published in the *Journal of Paleontology*.

Publications

- ALLAIRE, N., ABBACHE, A., CRÔNIER, C. & MONNET, C. (2020). Famennian (Late Devonian) ammonoids from the Ouarourout section (Saoura Valley, Algeria). - *Annales de Paléontologie*, **106**: 1–27; doi:10.1016/j.anpal.2019.08.002.
- BAULT, V., CRÔNIER, C., ALLAIRE, N. & MONNET, C. (2021). Trilobite biodiversity trends in the Devonian of North Africa. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, **565**; doi:10.1016/j.palaeo.2020.110208.
- CRÔNIER, C., ARIUNTOGOS, M., KÖNIGSHOF, P., WATERS, J. A. & CARMICHAEL, S. K. (2020). Late Devonian (Famennian) phacopid trilobites from western Mongolia. - *Palaeobiodiversity and Palaeoenvironments*; doi:10.1007/s12549-020-00449-w.
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Palaeoenvironments; doi:10.1007/s12549-020-00445-0.

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TM Anne-Christine DA SILVA

As last year, the pandemic situation didn't allow much field work and much meeting participation. Our funding in the framework of the IGCP-652 project "Reading time in Paleozoic sedimentary rocks" allowed to support some young researcher to participate to the international association of sedimentologists virtual meeting (IAS, Prague) and to the European Geophysical Union meeting (EGU, Vienna). We sampled the Devonian-Carboniferous boundary of Chanxhe in Belgium for cyclostratigraphy (work in progress with Julien DENAYER from the University of Liège).

I participated to those publications in relation with the Devonian:

BALTHASAR et al. (2021) focus on the analysis of the skeletal structure of Silurian and Devonian stromatoporoids through the application of electron backscatter diffraction (EBSD). Those Silurian and Devonian specimens are compared as a reference with a well preserved chaetetid sponge from the Carboniferous Buckhorn Asphalt Quarry (a fossil lagerstätte). Despite the poor preservation of the Silurian and Devonian specimens, they show similar bundles of crystal fibers interpreted as their original microstructure, which acted as precursors for the coarse overprinting recrystallisation. Micro-porosity and micro-dolomite inclusions are interpreted as evidence of an original composition of high-Mg calcite (HMC). The possible HMC skeletal composition of Palaeozoic stromatoporoids supports earlier views that the mineral composition of hypercalcifying reef builders is

linked to Phanerozoic oscillations in the ratio of Mg:Ca, expressed as aragonite-calcite seas; stromatoporoids thrived in times of calcite-seas.

FERGUSSON et al. (2021) worked on the Frasnian reef complexes along the northern margin of the Canning Basin, in north-western Australia. The Frasnian Hull Platform developed on an active tilted fault-block, and reveal significant lateral and vertical facies variations superimposed on prominent metre-scale cyclicity. This study uses numerical analyses of facies and magnetic susceptibility data from three measured sections along the Hull platform to test whether a tectonic signal can be distinguished from eustatic and other signals, through geostatistical analysis of facies variations, power and wavelet spectral analyses and Markov analysis. The results indicate a complex set of controls on deposition on the Hull Platform with orbital record embedded with local tectonic effects underlying eustatic signals and autogenic processes adding a localized stochastic response.

Publications

FERGUSSON, I. J., DA SILVA, A. C., CHOW, N. & GEORGE, A. D. (2021). Interplay of eustatic, tectonic and autogenic controls on a Late Devonian carbonate platform, northern Canning Basin, Australia. - *Basin Research*, **33**: 312-341; doi:10.1111/bre.12468.

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CM Sven HARTENFELS

Much work was devoted in late 2020 to finalize my cumulative habilitation thesis, which combines results of my research activities in the last ten years. The procedure was successfully completed in January 2021. Entitled "Upper Devonian to Lower Carboniferous global environmental change

and impact on conodonts”, it stems from fruitful cooperations within our Devonian and Carboniferous family. It has been and it is a great pleasure to cooperate with you. Thank you very much!

Apart from this, field work continued and concentrated mostly on Famennian and lower Mississippian successions of the Rhenish Massif. Our multi-proxy survey of the Devonian/Carboniferous Boundary section at Borkewehr is submitted and should be published in the forthcoming Special Issue of Palaeobiodiversity and Palaeoenvironments. Lower Famennian conodont data from Bergisch Gladbach (Kreishaus succession, in cooperation with Hans Martin WEBER, Essen, and Dieter WEYER, Berlin) and the Hönne Valley (in cooperation with Sören STICHLING, Krefeld, Thomas BECKER and Sarah ABOUSSALAM, both Münster, and Andreas MAY, Unna) are to be published in the same issue. Its working title “Devonian and Mississippian of the Ardenno-Rhenish Massif” (compare SDS Newsletter No. 35, p. 59) finally changed to **“The Rhenish Massif: More than 150 years of research in a Variscan mountain chain”**.

In continuing collaboration with Stephan BECKER, Sarah Esteban LOPEZ, Tobias FRITSCHLE, Christoph HARTKOPF-FRÖDER, Matthias PIECHA, Martin SALAMON, Sascha SANDMANN, Sören STICHLING (all Krefeld), Hans-Georg HERBIG (Cologne), and the Münster Group, other Rhenish sections were studied for conodonts and carbonate microfacies, amongst others.

Jointly with Sandra I. KAISER and Michael RASSER (both Stuttgart), Michael JOACHIMSKI (Erlangen), Tomáš KUMPAN (Brno), and Catherine GIRARD (Montpellier), several European upper Famennian to lower Mississippian sections were investigated for geochemistry and biostratigraphy. Under the leadership of Sandra KAISER, the manuscript is well advanced and should be submitted at the end of the year.

As far as time is left, our Moroccan projects are continued. Some reworked Famennian

conodonts from the Moroccan Meseta (Boudouda) were published in BECKER et al. (2021b). The taxonomic work on early siphonodellids of Lalla Mimouna, northern Maider has also progressed.

Marie SCHEEL finished her B.Sc. Thesis on conodont biostratigraphy at Ziyyar I. Intercalated in an alternating limestone/shale succession, a 27 cm thick black shale unit represents the first confirmed record of the global 4th order Dasberg Crisis Interval in the Moroccan Meseta.

In cooperation with Carsten MÜNKER (Cologne), **Simon JOSEPHS** is currently working in his M.Sc. Thesis on the Nd isotope composition of conodonts from the pelagic Upper Ballberg section, Rhenish Massif. From the same locality, LÜDDECKE et al. (2017) already published carbonate microfacies and conodont biofacies data.

Ellen MAUS documents in her M.Sc. Thesis a new drill core from the Herzkammer Syncline, Rhenish Massif, in terms of conodont biostratigraphy and microfacies. Although the major part of the well corresponds to a transitional facies between the Kulm and Kohlenkalk, the uppermost Devonian may have been drilled, too. This project is carried out in cooperation with the Geological Survey, North Rhine-Westphalia, Krefeld (Stephan BECKER, Tobias FRITSCHLE, Martin SALAMON, and Sören STICHLING).

Publications

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- HELLING, S., HARTKOPF-FRÖDER, C. & HARTENFELS, S. (in press). Dreidimensional erhaltene Bohrgänge in Brachiopodenschalen aus dem Unterdevon. - Archäologie im Rheinland, **2020**: 18–20.
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Mountains (Germany). - In: ARETZ, M. & CORRADINI, C. (Eds.), Global Review of the Devonian-Carboniferous Boundary. Palaeobiodiversity and Palaeoenvironments, **101** (2): 357–420.

BECKER, R. T., CÓZAR, P., ABOUSSALAM, Z. S., EL HASSANI, A., BAIDDER, L. & HARTENFELS, S. (2021b). Viséan transgression and reworking at Boudouda (NW Benahmed, western Moroccan Meseta). - In: BECKER, R. T., EL HASSANI, A. & ABOUSSALAM, Z. S. (Eds.), Devonian to Lower Carboniferous stratigraphy and facies of the South-Western Moroccan Meseta: Implications for palaeogeography and structural interpretation. Frontiers in Science and Engineering, Earth, Water and Oceans, Environmental Sciences, **10** (2): 81–107.

ARIUNTOGOS, M., KÖNIGSHOF, P., HARTENFELS, S., JANSEN, U., NAZIK, A., CARMICHAEL, S. K., WATERS, J. A., SERSMAA, G., CRÔNIER, C. & ARIUNCHIMEG, Y. (2020 online). The Hushoot Shiveetiin gol section (Baruunhuurai Terrane): Sedimentology and facies from a Late Devonian island arc setting. - Palaeobiodiversity and Palaeoenvironments, **101** (3): 663–687 [printed 2021, doi:10.1007/s12549-020-00445-0].

FEIST, R., CORNÉE, J.-J., CORRADINI, C., HARTENFELS, S., ARETZ, M. & GIRARD, C. (2020 online). The Devonian-Carboniferous boundary in the stratotype area (SE Montagne Noire, France). - In: ARETZ, M. & CORRADINI, C. (Eds.), Global Review of the Devonian-Carboniferous Boundary. Palaeobiodiversity and Palaeoenvironments, **101** (2): 295–311 [printed 2021, doi:10.1007/s12549-019-00402-6].

CM Peter E. ISAACSON

As a former (and delinquent) CM, I humbly add belated news. I continue work on the D/C boundary, with a focus on proxy sections. We had great hopes for such in Montana, with work on the enigmatic Sappington Formation. Further work has continued in South America, and it discussed below.

I wish to express my gratitude for the many years of collaboration with Dr. Mercedes DI PASQUO, on palynological dating of Bolivian, Argentine, and U.S. late Paleozoic successions.

Her dynamism and hard work have been wondrous.

Montana U.S.A. Devonian-Mississippian boundary

The latest information is from the PhD dissertation of Dr. Beverly RICE, with contributions by Drs. George GRADER and Ted DOUGHTY, as follows: Ages of units within the Sappington Formation and Trident Member of the Three Forks Formation were revised based on results from 61 sections. The Sappington Formation in southwestern Montana was deposited in a shallow back-bulge basin formed by the Antler Orogeny during Late Devonian B Early Mississippian time. Black shales in units 1 and 6 of the Sappington Fm correlate with the lower and upper black shales of the Bakken Fm of eastern Montana, North Dakota, and Saskatchewan. Silty units 2 through 5, therefore, correlate with the Middle Member units of the Bakken Fm, although biostratigraphically useful conodonts have not been identified in the Middle Bakken so far. Shallow marine units of the Sappington Formation provided a mixture of marine and terrestrial organisms for biostratigraphic study. The conodonts *Siphonodella praesulcata* and *Siphonodella sulcata* were recovered from Sappington Formation units 3, 4, and 5. *Siphonodella praesulcata* had previously been found in units 2, 3, and 5 and was used as an indicator of the uppermost Devonian, while *S. sulcata* was an indicator of the earliest Mississippian. The lineage of these conodonts is undergoing revision; since they have been found together it is possible they are morphological variations of the same species. Extensive previous work on unit 1A to the unit 1C basal lag indicated a conodont biozonation of the *Palmatolepis gracilis expansa* Zone. A first record of identifiable conodonts in Unit 4 was documented in this study. An Early Mississippian conodont with nodose ornamentation, *Siphonodella* cf. "*S. hassi*", was found in lower Unit 4 within unique fossiliferous channel sandstone at Antelope Valley; therefore, the Devonian-Mississippian boundary was placed below Unit 4 in this study

with assignment of Unit 4 to the *Siphonodella cooperi* Zone. *Siphonodella cooperi* was found in oolite in lower Unit 5 at Moose Creek. Therefore, Unit 5 was also assigned to the *Siphonodella cooperi* Zone. Unit 6 was confirmed to be upper *Siphonodella sandbergi* conodont Zone, based on the presence of *S. sandbergi* and *S. quadruplicata*, and the absence *S. crenulata*, as was previously documented. Results from this study placed units 4 and 5 within the same conodont biozone; the *Siphonodella cooperi* Zone is the 4th conodont zone younger than the Devonian-Mississippian boundary, and is placed in the lower Tournaisian stage of the Mississippian. The Devonian-Mississippian boundary is below Unit 4, and is likely in Unit 3 based on regional correlation with the Leatham Fm. in Utah and with the global Hangenberg Crisis extinction events. In contrast, a diverse miospore assemblage containing *Retispora lepidophyta* was found throughout the shale of Unit 4 and in shale found in Unit 5. Rare *Verrucosporites nitidus* was also found in units 4 and 5. Although in Europe and eastern North America these species together delineate the uppermost Devonian with the extinction of *R. lepidophyta* at the Devonian-Mississippian boundary, *R. lepidophyta* was found in early Mississippian strata in the correlative Bakken Formation in a previous study. Conodonts found in Units 4 and 5 in this study were definitively Mississippian based on ornamentation and rostral ridges. Controversy remains as to whether or not *R. lepidophyta* is *in situ* or is reworked into younger sediments. If this species is *in situ*, then its range must be extended upwards into the lower Tournaisian stage of the Mississippian for western North America, thereby making it less useful as an indicator of the Devonian-Mississippian boundary. Dr. Mercedes DI PASQUO, Argentina, and Dr. Sandra KAISER, Germany, verified palynological and conodont identifications and discussions, respectively.

The underlying Three Forks Formation was deposited in a pre-existing basin, and its upper Trident Member contained upper and lower limestone units separated by green shale.

Conodonts, such as *Palmatolepis glabra pectinata* and *Pa. glabra distorta*, that were recovered from the Lower Trident Limestone unit allowed assignment to either the *Palmatolepis marginifera marginifera* or *Palmatolepis marginifera utahensis* conodont Zones. Conodonts from a lag at the base of the Trident green shale allowed a tentative assignment to the *Palmatolepis rugosa trachytera* Zone, based on the presence of *Polygnathus* cf. *P. subirregularis*. More work on these units may provide definitive biozonations. Previous work on the Upper Trident Limestone unit indicated a conodont biozonation of *Pseudopolygnathus granulosus*.

Colombian Devonian update

I am pleased to report that PASTOR-CHACÓN, REYES-ABRIL, PIRAUIVE, ISAACSON, VELANDIA, SARMIENTO, RIVADENEIRA, and VILLAROEL are authors of ATThe Devonian system in northwestern Gondwana: focus in Colombia,@ which will appear in Earth Science Reviews at year=s end.

The Devonian tectonic, stratigraphic, paleontologic, biostratigraphic and paleobiogeographic histories of several Colombian basins will be presented. Several fossil groups, including brachiopods, trilobites, fish, conodonts, miospores, and chitinozoans update Colombian biostratigraphy.

Re-examination of *Schuchertella* in Brasil

Devonian orthotetides from South America have often been uncritically assigned to a limited number of broadly described species. A new species, *Schellwienella clarkei* n. sp., was described from the Ponta Grossa Formation, Paraná Basin, southern Brazil. These brachiopods had been identified as *Schuchertella agassizi*. *Schellwienella clarkei* n. sp. differs from *Schuchertella agassizi* on the basis of shell structure, dental plates, and cardinalia. Brachiopods from the Ponta Grossa and São Domingos formations (Brazil) described by CLARKE (1913) as *Schuchertella agassizi* are identified herein as *Schellwienella clarkei* n. sp. The generic assignment is

supported by the presence of pseudopunctae, dental plates supporting hinge teeth, a median septum in the ventral valve, and a triangular muscle field. This new classification is also known from coeval deposits of Bolivia. Shell microstructure is confirmed as an important taxonomic criterion within orthotetides. Published studies on orthotetides dealt mostly with North American material and their results were applied uncritically to South American taxa.

Publication

PAIS DE REZENDE, J. M. & ISAACSON, P. E. (2021). *Schellwienella clarkei* (Orthotetida, Brachiopoda): a new species from the Devonian of the Paraná Basin, Brazil. - Journal of Paleontology, **95** (4): 733B747.

TM Nadezhda G. IZOKH and the Novosibirsk Group

Our team continued the investigation of Devonian and Lower Carboniferous bio- and chemostratigraphy of the Russian Arctic region (lower riches of the Lena River), Siberia and Central Asia. The research group includes:

Drs. N. G. IZOKH, O. T. OBUT, and E. S. SOBOLEV, research fellow **T. A. SHCHERBANENKO**, and PhD student **B. M. POPOV** from the TROFIMUK Institute of Petroleum Geology and Geophysics, SB RAS.

Dr. O. P. IZOKH from the SOBOLEV Institute of Geology and Mineralogy, SB RAS.

Different topics were under investigation:

TM Nadezhda G. IZOKH – Devonian and Lower Carboniferous conodonts of Siberia, the Russian Arctic region (lower riches of the Lena River), and Central Asia.

CM Olga T. OBUT – Upper Devonian radiolarians of Central Asia and the Rudny Altai.

CM Olga P. IZOKH continues isotope-geochemical studies of the Devonian of the Salair, Russian Arctic region (lower riches of the Lena River), and Kitab State Geological Research (Uzbekistan).

Evgeny S. SOBOLEV – Middle Devonian ammonoids of the West Siberia.

Boris M. POPOV – Devonian ostracods of Siberia.

Tatiana A. SHCHERBANENKO – Devonian brachiopods of Siberia.

Main results on Eastern Kazakhstan

The Upper Devonian and Carboniferous conodonts in carbonate and siliceous rocks of the Char Folded Belt (Eastern Kazakhstan) were studied. The found conodont associations are represented by widely distributed species of the genera *Ancyrodella*, *Ancyrognathus*, *Belodella*, *Gnathodus*, *Mehlina*, *Neopolygnathus*, *Nothognathella*, *Palmatolepis*, *Polygnathus*, *Protognathodus*, and *Siphonodelta*. Among the identified taxa, index species of some conodont zones were found (IZOKH & OBUT 2020).

Main results of Kuznetsk Field Trip

The terrigenous section along the Sukhaya Creek near the former village of Lermontovo (Kuznetsk Basin) was studied. A complex of ammonoids, with *Agoniatites* ex gr. *vanuxemi* (HALL), *Fidelites* sp., and *Cabrieroeras* sp., was found in the upper part of the section. Based on the identified complex of ammonoids, these deposits belong to the upper Eifelian *Agoniatites* genozone and are correlated with the upper part of the Akarachkino Beds of the Zarechny Horizon.

Publications

Regular papers

IZOKH, N. G. & OBUT, O. T. (2020). New finds of Upper Devonian and Carboniferous conodonts from Char folded belt of East Kazakhstan. - Bulletin of Moscow Society naturalists, Geological Series, **95** (2): 42–50 [in Russian].

IZOKH, N. G., SOBOLEV, E. S., POPOV, B. M. & SHCHERBANENKO, T. A. (2021). Middle Devonian biostratigraphic correlative levels of the Zarechne Horizon of the Salair. - Proceedings of Paleontological Society of the Russian Academy of Sciences, IV: 33-40; St.

Petersburg (Publishing House of VSEGEI) [in Russian].

POPOV, B. M. & IZOKH, N. G. (2021). Upper Devonian ostracods from the Stolb Island (Lena River delta). - Proceedings of Paleontological Society of the Russian Academy of Sciences, IV: 26-32; St. Petersburg (Publishing House of VSEGEI) [in Russian].

Abstract

IZOKH, N. G. (2021). Early and Middle Frasnian conodonts of the North Kharaulakh (Lena River delta) - In: Theoretical and applied aspects of paleontology. Proceedings of LXVII Session Paleontological Society of the Russian Academy of Sciences; St. Petersburg (Publishing House of VSEGEI) [in Russian].

TM Ulrich JANSEN

In 2021, the study of latest Silurian to earliest Devonian brachiopods from the Rhenish Massif (Germany) has been continued, but was limited by other projects (partly ‘non-Devonian’ ones). Taxonomically, the monographic work includes new data on most brachiopod groups, but it is concentrated on strophomenides, orthides, and spiriferides. Also, some inarticulates have been reviewed. A stratigraphic focus is at present put on the brachiopod development directly below and above the traditional basal Emsian boundary in its Rhenish type region, which is much younger than the GSSP boundary level in the Zinzilban gorge. The revision of stratigraphically significant brachiopod taxa is under way.

Joining a Moroccan-German working group, brachiopods from the Meseta and Benahmed regions (Morocco) have been studied. In this context, I contributed to two chapters in a monographic book on the Devonian of these areas (BECKER et al. 2021, EICHHOLT et al. 2021).

For a forthcoming book on the Central European Variscides (Ulf LINNEMANN, Ed.), three chapters are prepared in cooperation with colleagues:

1) Brachiopods of Central Europe (Silurian to Lower Carboniferous) – palaeogeographic

and palaeobathymetric constraints (in cooperation with A. T. HALAMSKI and B. MOTTEQUIN, submitted). In this work, the state of brachiopod palaeobiogeography in the considered time interval is critically reviewed. The palaeobathymetric distribution of Central European brachiopod occurrences is discussed. In particular, the Early Devonian faunas and rhenotypic subfacies are referred to BOUCOT’s Benthic Assemblage (BA) zones and possible absolute depths.

2) Fossils and age of the Hunsrück-Schiefer – a unique taphonomic window in the Lower Devonian of the Rheinisches Schiefergebirge (Germany) (E. SCHINDLER & U. JANSEN). In this work, I contribute with biostratigraphic arguments from the brachiopods to the age discussion of the Hunsrück-Schiefer in different areas.

3) Rhenish Massif (H. G. HERBIG, P. KÖNIGSHOF, U. JANSEN, K. MENDE).

In the framework of a revision of the ostracode fauna from the Torkoz area in the southern Anti-Atlas (UFFENORDE et al., submitted), associated brachiopods have been studied. These confirm the latest Emsian age suggested by the ostracodes and show close relationships to faunas in Western and Central Europe.

Publications

BECKER, R. T., ABOUSSALAM, Z. S., EL HASSANI, A., BAIDDER, L., WEYER, D. & JANSEN, U. (2021). Devonian of the Benahmed region. - Frontiers in Science and Engineering, **10** (2): 13-73.

EICHHOLT, S., BECKER, R. T., ABOUSSALAM, Z. S., EL HASSANI, A., MAY, A., JANSEN, U., ERNST, A. & EL KAMEL, F. (2021). Devonian of the Mechra Ben Abbou region (Rehamna) – new data on the reef succession, microfacies, stratigraphy, and palaeogeography. - Frontiers in Science and Engineering, **10** (2): 109-152.

MUNKHJARGAL, A., KÖNIGSHOF, P., HARTENFELS, S., JANSEN, U., NAZIK, A., CARMICHAEL, S. K., WATERS, J. A., GONCHIGDORJ, S., CRÔNIER, C., ARIUNCHIMEG, Y., PASCHALL, O. & DOMBROWSKI, A. (2021). The Hushoot

Shiveetiin gol section (Baruunhuurai Terrane): Sedimentology and facies from a Late Devonian island arc setting. - Palaeobiodiversity and Palaeoenvironments, **101** (3): 663-687; <https://doi.org/10.1007/s12549-020-00445-0>.

CM Sandra Isabella KAISER

The conodont and isotopic studies of Famennian and Tournaisian successions focus on the continuation of my ongoing projects in the following regions: Graz Paleozoic (Austria): Trolp and other sections in the western Graz Paleozoic; Carnic Alps (Austria): In cooperation with H.-P. SCHÖNLAUB and F. EBNER we are re-studying a forgotten D/C boundary section in limestone facies with the Hangenberg Black shale; Franconia (Germany); Montagne Noire (France): re-evaluation of the current GSSP at La Serre in terms of stable isotopes and conodont biostratigraphy; Albortz Mts. (Iran); Rhenish Massif (Germany). Studies are in cooperations with colleagues from Germany, France, Austria, Iran, Uzbekistan, Czech Republic.

The most current studies focus on Famennian bioevents (*Annulata* Event, Dasberg Crisis, Dreher and Hangenberg Event) and climate change, and the timing of the Late Paleozoic Ice Age. Also, a re-evaluation of the current definition of the DCB in terms of conodont biostratigraphy is in preparation.

CM Peter KÖNIGSHOF

Due to the pandemic, field work in foreign countries was not possible as it was originally planned for the last year (2020). Thus, research activities concentrated on finishing manuscripts, e.g. from Mongolia, Iran and Morocco, mainly from shallow-water successions. Of special interest have been shallow-subtidal to outer ramp and hemipelagic to pelagic settings within the Central Asian Orogenic Belt (CAOB). Although the CAOB is the world's largest Palaeozoic accretionary orogenic belt and several petrological and structural studies were conducted, detailed sedimentological and biostratigraphical

descriptions are scarce. Thus, we studied two large sections in different terranes of the CAOB, in the Gurvansayhan- or in the Mandalovoo Terrane and in the Baruunhuurai Terrane, respectively. In Morocco, we proposed a new age of the Sarhlef Formation based on metamorphosed conodonts, which provides new insights on the geologic evolution and stratigraphy of the entire region (Jebilet Massif). Finally, results on Devonian/Carboniferous boundary sections in Iran were published. Further research activities concerned the Rhenish Massif, which will result in publication of some manuscripts in the near future. Research activities planned for 2021 may take place in Mongolia, Thailand, Iran and Vietnam.

As a result of long-lasting collaboration between the University of Science and Technology, Ulaanbaatar, Mongolia, and Senckenberg, section Historical Geology and Facies, the PhD candidate, Ariuntogos MUNKHJARGAL, will defend her PhD at the end of 2021 at the J. W. GOETHE University in Frankfurt am Main.

In collaboration with Markus ARETZ and Carlo CORRADINI (Guest Editors), a Special Issue on “Global review of the Devonian-Carboniferous Boundary” was published (Palaeobiodiversity and Palaeoenvironments, Vol. 101/2). Another Special Issue on the Rhenish Massif, in collaboration with Christoph HARTKOPF-FRÖDER and Sven HARTENFELS, is in progress and planned to be published in 2022.

Publications

SATTARI, E., BAHRAMI, A., KÖNIGSHOF, P. & VAZIRI-MOGHADDAM, H. (2021). Late Devonian (Famennian) and Carboniferous (Mississippian-Pennsylvanian) conodonts from the Anarak section, central Iran. - Palaeobiodiversity and Palaeoenvironments, **101** (3); doi.org/10.1007/s12549-020-00451-2.

MUNKHJARGAL, A., KÖNIGSHOF, P., WATERS, J. A., CARMICHAEL, S. K., GONCHIGDORJ, S., THASSANAPAK, H., UDCHACHON, M. & SHARAV, D. (2021). The Mandalovoo–Gurvansayhan terranes in the Southern Gobi of Mongolia: new

- insights from the Bayankhoshuu Ruins section. - Palaeobiodiversity and Palaeoenvironments, **101** (3), doi.org/10.1007/s12549-020-00471-y.
- ROELOFS, B., KÖNIGSHOF, P., TRINAJSTIC, K. & MUNKHJARGAL, A. (2021). Vertebrate microremains from the Late Devonian (Famennian) of western Mongolia. - Palaeobiodiversity and Palaeoenvironments, **101** (3), doi.org/10.1007/s12549-021-00503-1.
- WATERS, J. A., WATERS, J. W., KÖNIGSHOF, P., CARMICHAEL, S. K. & ARIUNTOGOS, M. (2021). Famennian crinoids and blastoids (Echinodermata) from Mongolia. - Palaeobiodiversity and Palaeoenvironments, **101** (3), doi.org/10.1007/s12549-020-00450-3.
- CRÔNIER, C., ARIUNTOGOS, M., KÖNIGSHOF, P., WATERS, J. W. & CARMICHAEL, S. K. (2021). Late Devonian (Famennian) phacopid trilobites from western Mongolia. - Palaeobiodiversity and Palaeoenvironments, **101** (3); doi.org/10.1007/s12549-020-00449-w.
- NAZIK, A., KÖNIGSHOF, P., ARIUNTOGOS, A., WATERS, J. A. & CARMICHAEL, S. K. (2021). Late Devonian ostracods from the Late Devonian Hushoot Shiveetiin gol section (Baruunhuurai Terrane, western Mongolia) and their palaeoenvironmental implication and palaeobiogeographic relationship. - Palaeobiodiversity and Palaeoenvironments, **101** (3), doi.org/10.1007/s12549-020-00446-z.
- MUNKHJARGAL, A., KÖNIGSHOF, P., HARTENFELS, S., JANSEN, U., NAZIK, A., CARMICHAEL, S.K., WATERS, J. A., GONCHIGDORJ, S., CRÔNIER, C., ARIUNCHIMEG, Y., PASCHALL, O. & DOMBROWSKI, A. (2021). The Hushoot Shiveetiin gol section (Baruunhuurai Terrane): Sedimentology and facies from a Late Devonian island arc setting. - Palaeobiodiversity and Palaeoenvironments, **101** (3); doi.org/10.1007/s12549-020-00445-0.
- KÖNIGSHOF, P., BAHRAMI, A. & KAISER, S. I. (2021). Devonian/Carboniferous Boundary sections in Iran. – In: ARETZ, M. & CORRADINI, C. (Eds.), “Global review of the Devonian-Carboniferous Boundary”. Palaeobiodiversity and Palaeoenvironments, **101** (2): 613–632; doi.org/10.1007/s12549-020-0438-z.
- LAZREQ, N., KÖNIGSHOF, P., ESSAIFI, A., BOUARI, A. & OUTIGUA, A. (2021). The Sharlef Formation of the Draa Sfar – new biostratigraphic data based on metamorphosed conodonts. - Palaeogeography, Palaeoclimatology, Palaeoecology, **572**; doi.org/10.1016/j.palaeo.2021.110395.
- LU, J. F. & KÖNIGSHOF, P. (2020). Eifelian (Middle Devonian) species of *Bipennatus* from the Beiliu Formation at Nalai, South China. - Palaeoworld, **29** (4) 682–694 https://doi.org/10.1016/j.palwor.2019.12.002.
- LU, J. F. & KÖNIGSHOF, P. (2020). Morphometric patterns of the shelf-like protuberance in the late Emsian-early Eifelian polygnathid conodonts. Lethaia, **53** (3): 345–361.
- PARVIZI, T., BAHRAMI, A., KÖNIGSHOF, P. & KAISER, S. I. (2021 in press). Conodont biostratigraphy of Upper Devonian-Lower Carboniferous deposits of eastern Alborz (Mighan section, NE Shahrud). – Palaeoworld; doi.org/10.1016/j.palwor.2021.01.008.
- LU, J. F., VALENZUELA-RIOS, J. I., KÖNIGSHOF, P., LIAO, J.-C., WANG, Y., QIE, W.-K. & XU, H.-H. (2021). Emsian (Lower Devonian) conodonts from the Daliangtang Formation at Daliangtang, southeastern Yunnan, China. – Palaeoworld; doi.org/10.1016/j.palwor.2020.11.003.

CM Semen A. KRUCHEK, CM Dmitry P. PLAX, and the Belarusian Devonian Group

In 2021 the Belarusian Devonian Group from “The Institute of Geology”, Branch of the State Enterprise “Research and Production Centre for Geology”, including Dr. S. A. KRUCHEK (leader of the Group, stratigraphy), Dr. V. I. AVKHIMOVITCH (miospores), V. Y. OBUKHOVSKAYA (miospores), O. V. MURASHKO (conodonts), Dr. O. F. KUZMENKOVA (magmatic complexes), Dr. A. G. LAPTSEVICH (magmatic complexes) et al., and also Dr. D. P. PLAX (ichthyofauna) from the Belarusian National Technical University and Dr. Y. V. ZAIKA (corals) from the United Enterprise “Geoservice”, have been exploring different aspects (regional geology, stratigraphy, palaeontology, lithology, paleogeography, geophysics, tectonics, isotope geology, etc.) of the Devonian of Belarus. Publications of research results of the second half of 2019 and the first one of 2020 are presented below. Publications of the second half of 2021, which are in print, will be listed in the next Newsletter (in 2022). Due to the fact that most of the papers are published in Russian, brief English summaries are given to them (references and summaries are given in authors’ editions).

Publications

Journal papers

PLAX, D. P. & ZAIKA, Y. V. (2020). On the Zhelon deposits (Frasnian, Upper Devonian) of the Latvian Saddle in the basins of the Saryanka and Rositsa Rivers (Belarus) – Natural Resources, 2: 18-35.

Detailed lithological and stratigraphic characteristics of typical outcrops of the Zhelon Regional Stage, exposed in basins of the Saryanka and Rositsa Rivers, are provided. A new local stratigraphic unit, the Degtyarevo Formation, is distinguished. Its composite section, consisting of a series of exposures, is given. In some of outcrops of the Degtyarevo Formation the deposits enclose abundant

palaeontological material: skeletal elements of various representatives of ichthyofauna and sparse invertebrates (scolecodonts, fragmentary inarticulate brachiopods, and fine carbonified plant remains). On the basis of palaeontological data and lithological composition it was possible to clarify the geological age of the studied deposits and suggest a precise correlation of the Degtyarevo Formation (Zhelon Regional Stage). The provided data will be applicable for the future refinement of the current Stratigraphic Chart of the Devonian deposits of Belarus (2010).

PLAX, D. P. & MURASHKO, O. V. (2021). Stratigraphy and ichthyofauna of the Upper Emsian-Eifelian deposits in the Bykhov 1 and Korma 1 borehole sequences in the East of Belarus – Natural Resources, 1: 40-67.

The paper presents the results of a palaeoichthyological study of core samples from the Bykhov 1 and Korma 1 boreholes drilled in eastern Belarus. Based on the ichthyofauna, lithological and geophysical data, a detailed stratigraphic division of the upper Emsian-Eifelian deposits exposed in the studied boreholes has been performed. Their detailed description is provided. Vertebrate evidences were used to compare these deposits with the formations of similar age developed within the adjacent territories of the Ukraine, Russia, and the Baltic States. The ichthyofauna data were used to clarify the stratigraphic distribution of some taxa in the upper Emsian-Eifelian deposits of Belarus, to supplement their systematic composition within the studied territory, and also to complement the palaeontological characteristics of the regional stratigraphic units of the Stratigraphic Chart of the Devonian Deposits of Belarus (2010). The presented results should be taken into account when performing in future large-scale geological surveys within the studied area.

MURASHKO, O. V. & PLAX, D. P. (2021). Conodonts from the deposits of the Rechitsa Regional Stage (Fransian Stage) of the Gomel Structural Dam in the section of the Uvarovichi 94 borehole – Lithosphere, 54 (1): 156-159 (in Russian).

The paper gives information on the study of the conodont elements from the deposits of the Rechitsa Regional Stage (Upper Frasnian) of the Uvarovichi 94 borehole.

ZAIKA, Y. U. (2020). Frasnian Tabulata and Rugosa from the Graliova Quarry (Vitebsk Region of Belarus. Western part of the Main Devonian Field) – Herald of the Baranavichy State University, Series: Biological Sciences, **8**: 9-27.

The paper covers the taxonomic composition, living conditions, and stratigraphic distribution of tabulate and rugose corals in the middle Frasnian (Upper Devonian) deposits exposed in the Graliova quarry. This locality is confined to the Orsha Depression and to the western part of the Main Devonian Field (MDF). The following species are reported: *Mastopora compacta* (TCHERNYCHEV), *Syringopora fragilis* SOKOLOV, *Scoliopora denticulata* (MILNE-EDWARDS & HAIME), *Thamnopora cervicornis* (BLAINVILLE), *Thamnopora polyforata* (SCHLOTHEIM), *Alveolites suborbicularis* LAMARCK (Tabulata), *Disphyllum paschiense* (SOSHKINA) and *Hexagonaria arctica* (MEEK) (Rugosa). Representatives of *Scoliopora* and *Syringopora* are not common in other parts of the MDF, whereas the genus *Aulopora*, which is prevalent in most of the MDF, is absent in the Graliova quarry. Thus, it can be concluded, that the middle Frasnian fauna of the Orsha Depression is not completely identical to the fauna of the MDF. This specificity must be taken into account when correlating the Middle Frasnian strata within the Orsha Depression, as well as between this region and the rest of the MDF.

MURASHKO, O. (2020). Stratigraphic significance of the conodont fauna from the Devonian sediments of Belarus – Lithosphere, **53** (2): 29-41.

The article presents data on the conodont fauna from Devonian sediments in the territory of Belarus. The stratigraphic significance of each genus has been evaluated; markers; first appearance, disappearance and transitional forms and their degree of diversification have been determined. Twenty-six conodont genera are cosmopolitan and suitable for global

correlations. Belarusian conodont collections generally confirm international paleontological databases. However, there are clarifications for the time of appearance of the genus *Latericriodus* MÜLLER, as well as for the time of disappearance for the genus *Mesotaxis* KLAPPER & PHILIP. With a considerable facies diversity of the Devonian deposits in Belarus, conodont complexes are dominated by *Icriodus*, *Palmatolepis*, and *Polygnathus* biofacies, that indicates the eurybiontism of these genera.

KUZMENKOVA, O., LAPTEVICH A., AIZBERG, R., NOSOVA, A., VOLKOVA, G. MANKEVICH, S. & YUTKINA, E. (2020). Lateral-temporal sequence of rock complexes of the Late Frasnian-Early Fammenian Pripyat-Dnieper magmatism area – Lithosphere, **52** (1): 3-20 (in Russian, with English summary).

In order to determine the sequence of magmatism and the nature of magmatic sources in the Devonian Pripyat-Dnieper area (at the north-western end of the Pripyat-Dnieper-Donetsk Magmatic Province) in the south-west of the East European Platform, the authors conducted an analysis of geological, geophysical, lithological and petrological-geochemical studies of volcanics. The magmatic formations belong to four complexes (Zhlobin, Uvarovichi, Pripyat and Loev) formed during discrete stages of magmatic activity. They compose a single lateral-temporal series of the Late Devonian (late Frasnian-early Fammenian) cycle.

KUZMENKOVA, O. F., LAPTEVICH, A. G. & NOSOVA A. A. (2020). The Upper Devonian magmatic complexes of the South-East Belarus – Doklady of the National Academy of Sciences of Belarus, **64** (5): 599–608 (in Russian, with English summary); doi.org/10.29235/1561-8323-2020-64-5-599-608.

For the first time, the authors determined lateral-temporal series of magmatic complexes of the late Frasnian- early Fammenian Pripyat-Dnieper Magmatic Area. This is based on the geochemical study of rocks of the Pripyat-Dnieper Magmatic Area (north-western part of the Pripyat-Dnieper-Donetsk Magmatic

Province) in the south-west of the East European Platform using the principles of structural-material analysis and taking into account previous studies. The series consists of four complexes of magmatic activity: Zhlobin Complex (Rechitsa Time, beginning of the late Frasnian), Uvarovichi Complex (Late Voronezh Time, middle of the late Frasnian), Pripyat Complex (Skolodin (Skolodin-Chernin?) Time, end of the late Frasnian), and Loev Complex (Yelets (Yelets- Petrikov?) Time, early Famennian). The rocks of the Zhlobin Complex belong to an alkaline-ultramafic (carbonatite-kimberlite-nephelinite) formation; the Uvarovichi Complex to an alkaline-mafic formation (basaltoids and phonolites), the Pripyat Complex to an alkaline-mafic-salic formation (trachyandesites), and the Loev Complex to an alkaline-ultramafic (nepheline) formation.

NARKIEWICZ, M., NARKEWIECZ, K., KRUCHEK, S. A., BELKA, Z., OBUKHOVSKAYA, V. Y. & PLAX, D. P. (2020). Late Eifelian Kačák Episode in the epeiric Belarusian Basin: Role of terrestrial-marine teleconnections – Palaeogeography, Palaeoclimatology, Palaeoecology, **3**: 1-20; doi.org/10.1016/j.palaeo.2020.110106.

NARKIEWICZ, M., NARKIEWICZ, K., KRUCHEK, S. A., BELKA, Z., OBUKHOVSKAYA, V. Y. & PLAX, D. P. (2020). Late Eifelian Kačák Episode in the epeiric Belarusian Basin (SE Euramerica) – SDS Newsletter, **35**: 48-50.

STREEL, M. & STEEMANS, P. (2020). The Devonian / Carboniferous transition based on miospores in Europe – SDS Newsletter, **35**: 29-47 (with materials on Belarus by G. I. KEDO and V. I. AVCHIMOVITCH).

For a further contribution see the Documents section.

Abstract

PLAX, D. P. (2021). New localities of the redeposited Devonian ichthyofauna in the Quaternary deposits of Belarus – In: A. Y. ROZANOV et al. (Eds.), Proceedings of the LXVII session of the Palaeontological Society at the Russian Academy of Sciences, April 5-9, St. Petersburg: 125-126 (in Russian).

CM Tomáš KUMPAN

My ongoing research is focused on three main topics: multiproxy stratigraphy of the Devonian-Carboniferous boundary, geochemistry of Devonian red limestones, and geochemistry and petrology of Devonian microbial rich facies.

Together with Jiří KALVODA, we contributed with element geochemistry chapter to a manuscript on the Devonian-Carboniferous boundary at the Borkewehr section, Rhenish Massif, Germany, which was submitted this summer (with authors Sven HARTENFELS, R. Thomas BECKER, Hans-Georg HERBIG, Wenkun QIE, David DE VLEESCHOUWER, and Dieter WEYER). A manuscript concerning the petrophysics and geochemistry of the Sardinian Devonian-Carboniferous sections Bruncu Bullai and Monte Taccu is prepared in collaboration with Carlo CORRADINI, Jiří KALVODA, Daniel ŠIMIČEK, and Jiří FRÝDA. The Devonian-Carboniferous boundary interval at Křtiny (Moravian Karst, Czechia) was resampled in high-resolution manner for conodont biostratigraphy by my student Tereza MALÁ. New conodont data were supplemented by carbon isotopes and trace element geochemistry record, and manuscript is prepared now.

A paper concerning the red Emsian limestones from the Barrandian, Czechia, was published this year (BÁBEK et al. 2021). A manuscript on the geochemistry and sedimentology of red pelagic Famennian limestones from the Moravian Karst, Czechia, is being prepared. Preliminary results were presented during the virtual conference “35th Meeting of Sedimentology” (CÍGLER & KUMPAN 2021). Red limestones of the Findenig and Pal Grande formations were sampled for element geochemistry in the Carnic Alps (in cooperation with Carlo CORRADINI and Monica PONDRELLI) in September 2020 and August 2021.

Pragian microstromatolites from the Barrandian (VODRÁŽKOVÁ et al. 2021) and various lower Tournaisian microbial grains

from the Moravian Karst were studied using laser-ablation ICP-MS in 2020. Microbialites around the Frasnian-Famennian boundary at the Šumbera section in the Moravian Karst (together with Hedvika WEINEROVÁ and Tomáš WEINER) were studied in 2021.

Study of trace element geochemistry of the Timan and Kellwasser Event intervals at Beringhauser Tunnel, Rhenish Massif, Germany, is underway, in collaboration with R. Thomas BECKER. The manuscript on a Famennian carbon and oxygen isotope record from the European sections is prepared together with Sandra I. KAISER.

Publications

BÁBEK, O., VODRÁŽKOVÁ, S., KUMPAN, S., KALVODA, J., HOLÁ, M. & ACKERMAN, L. (2021). Geochemical record of the subsurface redox gradient in marine red beds: A case study from the Devonian Prague Basin, Czechia. – *Sedimentology*; doi.org/10.1111/sed.12910.

CÍGLER, V. & KUMPAN, T. (2021). Palaeoenvironmental context of the Famennian red pelagic limestones in the Křtiny quarry (Czechia). – In: BÁBEK, O. & VODRÁŽKOVÁ, S. (Eds., 2021), 35th Meeting of Sedimentology: Prague, Czech Republic 21–25 June 2021, Palacký University: 110.

VODRÁŽKOVÁ, S., VODRÁŽKA, R., KUMPAN, T., KALVODA, J., MUNNECKE, A., FRÝDA, J., KOUBOVÁ, M. & HOLÁ, M. (2021). Ferruginous coated grains in the Lower Devonian Řeporyje Limestone (Prague Basin, Czech Republic). – In: BÁBEK, O. & VODRÁŽKOVÁ, S. (Eds.), 35th Meeting of Sedimentology: Prague, Czech Republic 21–25 June 2021, Palacký University: 453.

TM John E. A. MARSHALL & the Southampton Group

It is hard to know what has happened in 2020-21. I have had a year in Southampton but have also been Programme Leader for the Geology degrees, so life has been a total whirl of organising a degree, reorganising a degree, and quite a lot of local fieldwork. We got as far as the Devonian once which was a grand day

out. The good news is that I have finished as Programme Leader so will get more time for research from now.

The highlight from this year was Per Ahlberg from Uppsala being awarded an ERC to study early tetrapods (the important ones in the Devonian) and I am a core participant. So, this is support to return to East Greenland and work with colleagues from Syktyvkar in Komi, Russia increasing our understanding of the environment and ages of the tetrapods.

I am also a partner on a new NERC grant to study the Silurian and Devonian palynology of the Cantabrian sections in northern Spain. This is led by Charlie WELLMAN from Sheffield and includes David BOND (Hull) on the stable isotopes and geochemical indicators of extinction. Our start has been delayed by a year but we hope to begin fieldwork this September before the season ends.

This year we had the new edition of the *Geologic Time Scale* when I was delighted to be able to contribute to the enormous efforts of Thomas BECKER. The first paper was also published from our 2018 expedition around the coast of northern Spitsbergen that took us through the entire stratigraphic sequence. This is the part of the project led by Neil DAVIES (Cambridge) looking at how the sediment system responds to the evolving palaeo-equatorial vegetation.

Conference attendance has been virtual including GSA, the Palaeontological Association Annual Meeting, TMS and AASP. We also had a successful online meeting with our colleagues in Syktyvkar on *Trigger Factors of the Evolution of the Organic World*.

Publications

BECKER, R. T., MARSHALL, J. E. A. & DA SILVA, A.-C. (2020). The Devonian Period. – In: GRADSTEIN, F. M., OGG, J. G., SCHMITZ, M. D. & OGG, G. M. (Eds.), *Geologic Time Scale 2020*, vol 2: 733-810; Amsterdam etc. (Elsevier).

BENNETT, C. E., KEARSEY, T. I., DAVIES, S. J., LENG, M. J., MILLWARD, D., SMITHSON, T. R., BRAND, P. J., BROWNE M. A. E., CARPENTER, D. K.,

- MARSHALL, J. E. A., DULSON, H. & CURRY, L. (2021). Palaeoecology and palaeoenvironment of Mississippian coastal lakes and marshes during the early terrestrialisation of tetrapods. - *Palaeogeography, Palaeoecology, Palaeoclimatology*, 564110194.
- TEL'NOVA, O. P., KULKOV, A. M. & MARSHALL, J. E. A. (2021). New methods of investigation in paleopalynology. - *Zhurnal Obschei Biologii*, **82**: (1), 48-5.
- MARSHALL, J. E. A. (2021). A terrestrial Devonian-Carboniferous boundary section in East Greenland. - *Palaeobiodiversity and Palaeoenvironments* **101**: 541-559.
- DAVIES, N. S., BERRY, C. M., MARSHALL, J. E. A., WELLMAN, C. H. & LINDEMANN, F. J. (2021). The Devonian Landscape Factory: plant-sediment interactions in the Old Red Sandstone of Svalbard and the rise of vegetation as a biogeomorphic agent. - *Journal of the Geological Society*, **178**; doi.org/10.1144/jgs2020-225.
- MARSHALL, J. E. A., LAKIN, J., TROTH, I. & WALLACE-JOHNSON, S. M. (2021). UV-B radiation was the Devonian-Carboniferous boundary terrestrial extinction kill mechanism. - eLetter (1), response to comment; <https://www.science.org/doi/10.1126/sciadv.aba0768>
- GUO, X. W., ZHANG, X. H., CAI, L.X., XU, H. H., YANG, N., LU, H. N., OUYANG, S., MARSHALL, J. E. A., PENG H.-P. & LIU, F. (2021). Late Devonian-Early Carboniferous palynology of the CSDP-2 Borehole in the southern Yellow Sea, China. - *Palaeoworld*; doi.org/10.1016/j.palwor.2021.04.001.

CM Hanna MATYJA

My last research has been mainly devoted to conodont biostratigraphy in several regions in Poland and has been focused on the Devonian/Carboniferous boundary. This is mainly related to the International Task Group (led by Markus ARETZ) on the redefinition of the Devonian/Carboniferous Boundary. The manuscript on the D/C boundary in various regions in Poland is published in the *Palaeobiodiversity and Palaeoenvironments* Special Issue on “Global review of the Devonian/Carboniferous Boundary”. This

multidisciplinary analysis of the D/C boundary interval in pelagic successions of the Holy Cross Mountains and Sudetes and the ramp successions in the Western Pomerania region, applied the results of new palaeontological and biostratigraphic studies, based mainly on conodonts, ammonoids, and palynomorphs. Biostratigraphic results interpreted earlier by different authors have been re-examined, and combined with geochemical and mineralogical characteristics, as well as with rock magnetic measurements. The paper illustrates and summarises the current knowledge on the uppermost Famennian to lowermost Tournaisian in these Polish regions, gives the correlation of the important stratigraphic markers for each region, and briefly correlates them outside the region.

Publications

- CORRADINI, C., SPALETTA, C., MOSSONI, A., MATYJA H. & OVER, J. D. (2017). Conodonts across the Devonian/Carboniferous boundary: a review and implication for the redefinition of the boundary and a proposal for an updated conodont zonation. - *Geological Magazine*, **154** (4): 888-902 (online May 2016); doi: 10.1017/S001675681600039X.
- MŁACZWESKI, L., WÓJCIK, K. & MATYJA, H. (2017). Dewon: mapa miejscowości skał w skali 1: 5 000 000 oraz profile stratygraficzno-litologiczne sukcesji dewońskich w Polsce. – In: NAWROCKI J. & BECKER A. (Eds.), *Atlas geologiczny Polski. Państwowy Instytut Geologiczny-Państwowy Instytut Badawczy*, Warszawa.
- RACKI, G., RACKA, M., MATYJA, H. & DEVELEESCHOUWER, X. (2017). Geochemical database, The Frasnian/Famennian boundary interval in the South Polish-Moravian shelf basins: Integrated event-stratigraphical approach.
- MATYJA, H. (2018). Litho- and biostratigraphy of the Upper Devonian. - In: MATYJA, H. (Ed.), *Unisław IG 1 borehole section, Wyniki badań litologicznych, stratygraficznych, sedimentologicznych i petrograficznych. Devonian. Profile Głębokich Otworów Wierniczych Państwowego Instytutu Geologicznego (Deep Boreholes of the Polish*

Geological Institute) [in Polish with English summary].

MATYJA, H., WORONCOWA-MARCINOWSKA, T., FILIPAK, P., BRAŃSKI, P. & SOBIEŃ, K. (2020). The Devonian/Carboniferous boundary interval in Poland: multidisciplinary studies in pelagic (Holy Cross Mountains and Sudetes) and ramp (Western Pomerania) successions. - Palaeobiodiversity and Palaeoenvironments, **101** (2): 421-472; doi:10.1007/s12549-020-00442-3.

CM Marek NARKIEWICZ

Main focus in the Devonian studies was on the ongoing project *Palaeoenvironmental records and causes of the global Kačák Episode in the late Eifelian (Middle Devonian)* funded by the Polish National Science Center and partly supported by the Polish Geological Institute statutory funds. During 2021, we completed the field work by measuring and sampling two sections in the Holy Cross Mts., Poland. In particular, the Skały Quarry section appears promising for our purposes as, recently, it has exposed the top of the Eifelian carbonate platform and overlying upper Eifelian-lower Givetian deeper shelf marly strata. With respect to Moroccan, French and Czech sections, the conodont work continued while microfacies and geochemical studies commenced. The final results of the Belarusian Kačák project are now published in “*Palaeo x3*” (M. NARKIEWICZ et al. 2021). They include a hypothesis for the causal mechanisms that probably led to the Kačák Episode, with a particular emphasis on the role of climate-controlled expansion of arborescent plants. This hypothesis will be further tested in the course of the current project.

The conodont results of the joint Polish-Uzbek-Italian group on the DCB in the Kule Section (Kitab reserve, Uzbekistan) have been published in *Geological Quarterly* (K. NARKIEWICZ et al. 2021). They include new data on the position of the DCB, the conodont biofacies study and some taxonomic remarks.

Regarding recently initiated Polish projects of interest to the Devonian workers it can be

mentioned that the Polish Geological Institute is planning to publish in 2024 the two-volume monograph summarizing geology of Poland. The volume on stratigraphy will include the Devonian chapter co-authored by Marek and Katarzyna Narkiewicz, and the work on the text and illustrations just started.

Publications

NARKIEWICZ, M., NARKIEWICZ, K., KRUCHEK, S. A., BELKA Z., OBUKHOVSKAYA, V. Y. & PLAX, D. P. (2021). Late Eifelian Kačák Episode in the epeiric Belarusian Basin: Role of terrestrial-marine teleconnections. - Palaeogeography, Palaeoclimatology, Palaeoecology, **562** (110106); <https://doi.org/10.1016/j.palaeo.2020.110106>.

NARKIEWICZ K., CORRADINI C., ABDIEV N. & NARKIEWICZ M. (2021). Conodont biostratigraphy and biofacies across the Devonian-Carboniferous boundary in the Kule section (Uzbekistan). - Geological Quarterly, **65** (1): 17; doi: <http://dx.doi.org/10.7306/gq.1588>.

CM Atike NAZIK and the Turkish Group

I continue on Devonian ostracods of different sections from NW Anatolia, and the Central and Eastern Taurides in Turkey. In addition, I study Devonian ostracods of shallow-water sections from Iran together with Dr. Peter KÖNIGSHOF (Senckenberg-Research Institute and Natural History Museum). I participated in a Workshop on Geoheritage of Adana, Turkey, and gave a presentation dealing with Devonian fossiliferous levels (lobolith, ostracod and crinoid bearing levels) as paleontological heritage.

Dr. Emine ŞEKER from Çukurova University is investigating Devonian ostracods from Kozan and Adana (Southern Turkey).

Dr. Gülnur SAYDAM-DEMIRAY from the MTA- Ankara focuses on Devonian conodonts in MTA (Mineral Research and Exploration) projects.

Associate Prof. Dr. Ayşe ATAKUL-ÖZDEMİR (Van Yüzüncü Yıl University) focuses on conodont biostratigraphy.

Dr. Recep ÖZKAN from TPAO-Ankara is interested in Devonian parathuramminid foraminifers from the Taurides, southern Turkey.

Tuba Aydin ÖZBEK from TPAO continued her PhD thesis titled “*Palynostratigraphy of the Middle Devonian-Lower Carboniferous Successions in Central and Eastern Taurides, Turkey*” (Supervisor: Prof. Dr. Sevinç ÖZKAN-ALTINER - Middle East Technical University).

Publications

Journal papers

NAZIK, A., KÖNIGSHOF, P., ARIUNTOGOS, M., WATERS, J. A. & CARMICHAEL, S. K. (2021). Late Devonian ostracods (Crustacea) from the Hushoot Shiveetiin gol section (Baruunhuurai Terrane, Mongolia) and their palaeoenvironmental implication and palaeobiogeographic relationship. - Palaeobiodiversity and Palaeoenvironments, **101**: 689–706.

MUNKHJARGAL, A., KÖNIGSHOF, P., HARTENFELS, S., JANSEN, U., NAZIK, A., CARMICHAEL, S. K., WATERS, J. A., GONCHIGDORJ, S., CRÔNIER, C., YARINPIL, A., PASCHALL, O. & DOMBROWSKI, A. (2021). The Hushoot Shiveetiin gol section (Baruunhuurai Terrane, Mongolia): sedimentology and facies from a Late Devonian island arc setting. - Palaeobiodiversity and Palaeoenvironments, **101**: 663–687.

OKAY, A., ATAKUL-OZDEMIR, A. & OKAY, A. (2020). A pelagic Upper Devonian sequence in Sarigerme, Istanbul. - Turkish Journal of Earth Sciences, **29**: 5, 785-797.

ATAKUL-OZDEMIR, A. (2017). Conodont zonation and the Devonian/Carboniferous (Famennian/Tournaisian) boundary in the Naltas section, eastern Taurides, Turkey. - Journal of Asian Earth Sciences, **134**: 94-102.

Abstracts

AYDIN ÖZBEK, T., ALTINER, D., ALTINER, S., ATAKUL-ÖZDEMIR, A. & ÖZKAN, R. (2021). Palynostratigraphy of Upper Devonian-Mississippian Deposits in The Central and Eastern Taurides, - In: 73. Geological Congress of Turkey: 883-884.

ŞEKER ZOR, E. & NAZIK, A. (2021). Devonian Ostracods From The Eastern Taurides (Adana, Kayseri, Southern Turkey) and Their Palaeoecology. – In: 73. Geological Congress of Turkey: 877-878.

NAZIK, A., HAUDE, R., SCHINDLER, E. & YALÇIN, M.N. (2021). Paleontological Geosite Proposals in the Silurian/Devonian Transition and Middle Devonian Sequences of the Halevikdere Section (Eastern Taurides). - In: Workshop on Geoheritage of Adana, Abstract book: 25-27.

ÖZDEMİR, A., ALTINER, D. & ŞAHİN, N. (2017). Doğu Toroslar'da Üst Devoniyen/Alt Karbonifer Karbonatlarının Konodont Biyostratigrafisi ve Fasiyes Tipleri. – In: Türkiye Jeoloji Kurultayı, Ankara, Turkey: 626-627.

ÖZDEMİR, A., ALTINER, D. & OZKAN-ALTINER, S. (2015). Devonian-Carboniferous boundary succession in Eastern Taurides, Turkey. - EGU 2015: 8461); Vienna.

TM Grzegorz RACKI and colleagues from the University of Silesia

In addition to several palaeoecological and palynological contributions from the research group of the University of Silesia, the scientific achievements of the high-budget MAESTRO project, ended in 2018, are still being published. In particular, a tephra-rich cherty-clayey Famennian succession is studied by RACKI et al. from a multidisciplinary perspective in the Bardo Unit, Central Sudetes. It is interpreted as a unique record of the lost ocean later incorporated into the Variscan orogenic belt. Noteworthy, the Hangenberg Black Shale has been identified in the oceanic setting based on its characteristics described worldwide, including mercury enrichments. On the other hand, the model of extended arc-volcanism for this global event was consequently developed by RAKOCÍŃSKI et al., who reported extreme Hg anomalies (up to 5825 ppb) from the South Tian Shan (Uzbekistan), together with a correlation using conodont biostratigraphic data.

Hence, no wonder that I polemic in ‘Science Advances’ with the surprising conclusion of MARSHALL et al. that increased UV-B radiation indicates an ozone hole caused by

extraordinarily lethal global warming (but without a volcanic stimulus!) during the D-C extinction. As an alternative to this time-specific model, aspects of the commonly applied volcanic greenhouse scenario are outlined, highlighting the poorly known chronology of the magmatic activity in the terminal Devonian interval. This data limitation precludes any ad hoc rejection of volcanic causation. On the other hand, there appears to be a probable lag-time correlation between major volcanic and biotic events (as predicted by George MCGHEE), pointing to the possibility that other than Large Igneous Provinces, lesser-known magmatism varietes (arc and intra-oceanic activities?, carbonatite and kimberlite eruptions?) may have played a key role. The concept of a similar multiphase volcanism-driven global cataclysm was previously tested for the Kellwasser Crisis, and summarized in an updated chapter of Wiley's 'Encyclopedia of Life Sciences'.

Publications

- RACKI, G., MAZUR, S., NARKIEWICZ, K., BARDZIŃSKI, W., KOŁTONIK, K., SZYMANOWSKI, D., FILIPIAK, P. & KREMER, B. (2021 accepted). A waning Saxothuringian Ocean evidenced in the Famennian tephra-bearing biosiliceous succession of Bardo Unit (Central Sudetes, SW Poland). - Geological Society of America Bulletin.
- RAKOCIŃSKI, M., PISARZOWSKA, A., CORRADINI, C., NARKIEWICZ, K., DUBICKA, Z. & ABDIYEV, N. (2021). Mercury spikes as evidence of extended arc-volcanism around the Devonian-Carboniferous boundary in the South Tian Shan (southern Uzbekistan). - Scientific Reports, **11** (1), 5708: 1-15
- RACKI, G. (2021). Comment on "UV-B radiation was the Devonian-Carboniferous boundary terrestrial extinction kill mechanism" (eLetter). - Science Advances: 1-3, <https://www.science.org/doi/10.1126/sciadv.aba0768>
- MCGHEE, G. R. & RACKI, G. (2021). Extinction: Late Devonian Mass Extinction. - In: Encyclopedia of Life Sciences, **2**: 1-8 (Wiley).

KONDAS, M., FILIPIAK, P. & BREUER, P. (2021 in press). *Teleostomata rackii* gen. et sp. nov.; an acritarch from the Devonian (Givetian) of the south-central Poland. - Palynology, **198**: 2788.

MATYJA, H., WORONCOWA-MARCINOWSKA, T., FILIPIAK, P., BRAŃSKI, P. & SOBIEŃ, K. (2021). The Devonian/Carboniferous boundary interval in Poland: multidisciplinary studies in pelagic (Holy Cross Mountains and Sudetes) and ramp (Western Pomerania) successions. - Palaeobiodiversity and Palaeoenvironments, **101** (2): 421-472.

FILIPIAK, P., GRAHAM, L. E., WAWRZYNIAK, Z. & KONDAS, M. (2021). Filamentous eukaryotic algae from the Lower Devonian, Bukowa Góra (Holy Cross Mountains, Poland). - Review of Palaeobotany and Palynology, **288**: 104411.

KONDAS, M. & FILIPIAK, P. (2021 in press). Organic tentaculitoids from the Kowala Formation (Devonian) of the Holy Cross Mountains, Poland. - Palynology, **190**: 1-13.

FILIPIAK, P., KONDAS, M., DI PASQUO, M., RICE, B. J., DOUGHTY, P. T., GRADER, G. W. & ISAACSON, P. E. (2021). New colonial acritarch *Involusphaeridium gutschickii* gen. et sp. nov. from the Lower Sappington Formation (Upper Famennian), western Montana, USA. - Review of Palaeobotany and Palynology, **284**: 104344.

ZATOŃ, M., HU, M., DI PASQUO, M. & MYROW, P. T. (2021 in press). Adaptive function and phylogenetic significance of novel skeletal features of a new Devonian microconchid tubeworm (Tentaculita) from Wyoming, USA. - Journal of Paleontology, 15 pp.

ZATOŃ, M. & WRZOŁEK, T. (2020). Colonization of rugose corals by diverse epibionts: dominance and syn vivo encrustation in a Middle Devonian (Givetian) soft-bottom habitat of the Holy Cross Mountains, Poland. - Palaeogeography, Palaeoclimatology, Palaeoecology, **556**: 109899.

CM Eberhard SCHINDLER

Scientific work in 2020 was greatly influenced by the Corona pandemic. Everything outside came mostly to a halt (fieldwork, meetings) and even meeting colleagues in person was very rare. So, I was mainly working in home office wrapping up a number of (partly long-lasting) projects and bringing papers forward.

One of these “well-hung” issues is a paper on latest Eifelian ostracodes from the Moroccan Anti-Atlas together with Helga GROOS-UFFENORDE and other colleagues. The paper has been submitted.

The preparation of manuscripts with results from our Turkish-German cooperation projects continued (e.g., with Reimund HAUDE and other colleagues on the first scyphocrinoids found in Turkey). Further papers are in preparation.

As a side effect, my first longer paper in Turkish language has been published on the German ‘Lahn Marble’, which can be found in some stations along the famous “Bagdad Railway” (see YALÇIN et al.).

Work on the Eifel area continued.

As a result from the find of a probable Ediacaran leftover in Lower Devonian rocks of the Mosel area (work is still ongoing), an “excursion” into the latest Precambrian is under way. Together with Simon DARROCH (Vanderbilt University, Tennessee) and a bunch of other colleagues, studies have been undertaken on original material from Namibia as well as experimental studies were carried out and a manuscript is in preparation.

Together with Uli JANSEN an article about the Hunsrück area is in preparation for a book on the Variscides.

Publication

YALÇIN, M. N., WEDEL, A., SCHINDLER, E. & ER, S. (2020). Haydarpaşa ve Adana Gar Binalarındaki Lahn Mermerleri. – *Mimar.ist*, **68**: 101-108.

TM Ladislav SLAVÍK and CM Aneta FORMÁČKOVÁ

During 2021 I went back to several projects that were put off for technical reasons related to various limitations that started in 2020. Apart from Devonian activities, it applies particularly to the late Silurian project “Přídolí Series in the Prague Synform - proposal for chronostratigraphic subdivision”, where I acted as a team leader of the research team with members from the Institute of Geology of the Czech Academy of Sciences (P. ŠTORCH, A. FORMÁČKOVÁ - formerly HUŠKOVÁ) and from the Czech Geological Survey (Š. MANDA, Z. TASÁRYOVÁ, P. ČÁP). This project has been accomplished and in summer we have submitted a final comprehensive manuscript with a proposal for the two-fold subdivision of the series.

In autumn 2020, I have started a new project focused on the gathering of new geo-chemo-physical and biostratigraphical data from the Praha Formation (Fig. 1) that formerly had to represent the original Pragian stage before the current GSSP definition. Following the SDS decision, we have to submit alternative proposals to the current basal Emsian stratotype. The project is partly supported from the SDS budget but mostly by the Czech Science Foundation. In the initial stage, we focussed on several sections (potential candidates). Now we are completing sampling for geochemical proxies using isotope studies and Instrumental Neutron Activation Analysis (INAA). Almost finished is the sampling for microfacies study, sampling for biostratigraphy, and macrofauna. At the same time, Gamma-Ray Spectrometry (GRS) and Magnetic susceptibility (MS) logging is in progress. Our team consist of CM Jindra HLADIL, Tomáš WEINER and Hedvika WEINEROVÁ from our Institute.

Together with my PhD student CM Aneta FORMÁČKOVÁ, we have finished a paper on Silurian-Devonian boundary ozarkodinids (conodonts). Now she is finishing her PhD

thesis that is going to be defended probably late in 2021.

In Summer 2021, a large team lead by Katarína HOLCOVÁ, in which I took part, has

submitted a manuscript on Early Palaeozoic microboring organisms. The study includes also Devonian environment and various substrates.



Fig. 1. Upper parts of the Praha Formation in the Špička Quarry in the Praha–Radotín.

Publications

Journal papers

HUŠKOVÁ, A. & SLAVÍK L. (2021). Morphologically distinct P1 elements of *Zieglerodina* (Conodontata) at the Silurian-Devonian boundary: review and correlation. - Bulletin of Geosciences, **96** (3): 327–340.

WEINEROVÁ, H., BÁBEK, O., SLAVÍK, L., VONHOF, H., JOACHIMSKI, M. M., HLADIL, J. (2020). Oxygen and carbon stable isotope records of the Lochkovian-Pragian boundary interval from the Prague Basin (Lower Devonian, Czech Republic). - Palaeogeography, Palaeoclimatology, Palaeoecology, **560** (10036): 1-17..

HUŠKOVÁ, A. & SLAVÍK, L. (2020). In search of Silurian/Devonian boundary conodont markers in carbonate environments of the Prague Synform (Czech Republic). – Palaeogeography, Palaeoclimatology, Palaeoecology, **549** (109126): 1-17.

MACHADO, G., SLAVÍK, L., MOREIRA, N., FONSECA, P. E. (2020): Prasinophyte bloom and putative fungi abundance near the Kačák event (Middle Devonian) from the Odivelas Limestone, Southwest Iberia. - Palaeobiodiversity and Palaeoenvironments, **100**: 593–603.

SLAVÍK, L. & HLADIL, J. (2020). Early Devonian (Lochkovian–early Emsian) bioevents and conodont response in the Prague Synform (Czech Republic). - Palaeogeography, Palaeoclimatology, Palaeoecology, **549** (109148): 1-14.

SUTTNER, T. J., KIDO, E., ARIUNCHIMEG, Y. SERSMAA, G., WATERS, J. A., CARMICHAEL, S. K., BATCHELOR, C. J., ARIUNTOGOS, M, HUŠKOVÁ, A., SLAVÍK, L., VALENZUELA-RÍOS J. I., LIAO, J.-C. & GATOVSKY, Y. A. (2020). Conodonts from Late Devonian island arc settings (Baruunhurai Terrane, western Mongolia). - Palaeogeography, Palaeoclimatology, Palaeoecology, **549** (109099): 1-20.

Abstract

WEINEROVÁ, H., BÁBEK, O., SLAVÍK, L., VONHOF, H., JOACHIMSKI, M. M. & HLADIL, J. (2021). The Lochkovian-Pragian boundary interval of the Barrandian area – discussion of oxygen and carbon isotope data. - In: BÁBEK, O. & VODRÁŽKOVÁ, S. (Eds.), 35th IAS Meeting of Sedimentology, Virtual Meeting, Prague, Czech Republic, 21.–25. June 2021, Book of Abstracts. Palacký University Olomouc: 461–462; Olomouc.

TM Claudia SPALETTA

My main research topic still concerns biostratigraphy and taxonomy of Middle-Late Devonian and Early Carboniferous conodonts, mainly from the Carnic Alps. A second main research subject is focused on lithostratigraphy of the Devonian-Carboniferous units of the Carnic Alps. The final aim of this research – carried out in collaboration with several colleagues – is the understanding and reconstruction of the original relationship between reef and basinal facies disrupted by tectonic events related to both the Variscan and the Alpine orogeny. In this context the timelines acquired by conodont biostratigraphy are an essential tool for correlation.

Publications

SPALETTA, C., CORRADINI, C., FEIST, R., KORN, D., KUMPAN, T., PERRI, M. C., PONDRELLI, M. & VENTURINI, C. (2021). The Devonian-Carboniferous Boundary in the Carnic Alps (Austria and Italy). - *Palaeobiodiversity and Palaeoenvironments*, **101**: 487-505; doi.org/10.1007/s12549-019-00413-3

CORRADINI, C., MOSSONI, A., CORRIGA, M.G. & SPALETTA, C. (2021). The Devonian/Carboniferous Boundary in Sardinia (Italy). - *Palaeobiodiversity and Palaeoenvironments*, **101**: 507-514; doi.org/10.1007/s12549-019-00411-5,

PONDRELLI, M., CORRADINI, C., SPALETTA, C., SIMONETTO, L., PERRI, M. C. CORRIGA, M. G., VENTURINI, C. & SCHÖNLAUB, H. P. (2020). Geological map and stratigraphic evolution of the central sector of the Carnic Alps (Austria-

Italy). - *Italian Journal of Geosciences*, **139** (3): 469-484; doi.org/10.3301/IJG.2020.16

CM Thomas J. SUTTNER and Erika KIDO

In March 2021, we received our common annual FWF project rejection after having resubmitted the proposal on Middle Devonian Icriodontids and the reconstruction of tip wear reproduced via Arduino-controlled robotic arm system in autumn 2020. Now after several rejections during the past five years, we will not submit another proposal to the Austrian Science Fund and need to find another way of funding our research. - However, 2020 was quite productive!

Two manuscripts (CORRADINI et al. 2020 and SUTTNER et al. 2020) contributed to the GECKO special Issue edited by Annalisa FERRETTI and friends; they are included in the “Palaeo x3” volume 549. Together with Stana VODRÁŽKOVÁ (as she already announced in the 35th SDS Newsletter) a paper concerning the *P. pseudofoliatus* Group has been published in the Bulletin of Geosciences. That paper represents an important step towards proper correlation of the Jirásek quarry section from the Barrandian area with sections in the Carnic Alps, which performed the base of our paleotemperature study across the Late Eifelian Kačák Episode published this year in Scientific Reports (<https://rdcu.be/ct8ws>).

Another paper that was published by Erika and me in 2020 concerns the basal body of conodonts and its decay. Erika’s study on the Middle Devonian rugose corals from the Carnic Alps progressed a lot. Nearly all of the specimens she had started to work on are identified.

The study of Late Devonian sections together with our Mongolian friends is ongoing. Uuganaa, Ariuna and Manchuk extracted a small but very interesting latest Famennian conodont fauna from the Indert Formation in the Shine Jinst area. A manuscript on that fauna is in preparation.

Publications

- CORRADINI, C., PONDRELLI, M., CORRIGA, M. G. & SUTTNER, T. J. (2020). Conodonts across the Silurian/Devonian boundary in the Carnic Alps (Austria and Italy). – *Palaeogeography, Palaeoclimatology, Palaeoecology*, **549** (109097): 1-14.
- SUTTNER, T. J. & KIDO, E. (2020). Euconodont hard tissue: Preservation patterns of the basal body. – *Palaeontology*, **63** (1): 29-49.
- SUTTNER, T. J., KIDO, E., ARIUNCHIMEG, YA., SERSMAA, G., WATERS, J. A., CARMICHAEL, S. K., BATCHELOR, C. J., ARIUNTOGOS, M., HUŠKOVÁ, A., SLAVIK, L., VALENZUELA-RIOS, J. I., LIAO, J.-C. & GATOVSKY, Y. (2020). Conodonts from Late Devonian island arc settings (Baruunhuurai Terrane, Western Mongolia). – *Palaeogeography, Palaeoclimatology, Palaeoecology*, **549** (109099): 1-20.
- SUTTNER, T. J., KIDO, E., JOACHIMSKI, M. M., VODRÁŽKOVÁ, S., PONDRELLI, M., CORRADINI, C., CORRIGA, M. G., SIMONETTO, L. and KUBAJKO, M. (2021). Paleotemperature record of the Middle Devonian Kačák Episode. – *Scientific Reports*, (2021) **11**: 16559.
- VODRÁŽKOVÁ, S. & SUTTNER, T. J. (2020). Middle Devonian (Eifelian) conodonts of the *australis-ensensis* zones from the Jirásek quarry near Koněprusy (Barrandian area, Czech Republic) with special emphasis on *Polygnathus pseudofoliatus* Group and notes on environmental changes related to the Kačák Episode. – *Bulletin of Geosciences*, **95** (1): 81-125.

TM José Ignacio (Nacho) VALENZUELA-RIOS and CM Jau-Chyn (Teresa) LIAO

Activities during this period have, again, been greatly affected by the worldwide pandemic state, which has cancelled many envisaged meetings and other activities. Besides, the continuous changes from face to face to on-line and to “hybrid” teaching has forced us to invest a great amount of time to getting ready and, then, change to a new way.

As in previous years, the main activities of Nacho and Teresa have been focused on Lower, Middle and Upper Devonian conodont

biostratigraphy, Middle Devonian conodont biofacies, and Lower and Middle Devonian microfacies analysis from selected Pyrenean sections. This year, Teresa has started a research stay in Greifswald working with Heiko HÜNEKE in a joint Devonian project, which implies the combined study of conodont biostratigraphy and sedimentology in Pyrenean sections and the identification of contourite deposits.

We keep processing samples and analysing sequences from the Pyrenees and the Iberian Cordillera. This year, the focus has been on Lockovian, Emsian, and Givetian sections. Regarding the latter, a paper is now in press (see below). Additionally, we have analysed a short interval regarding the F/F boundary in one Pyrenean section; a paper is now in press.

Two oral contributions are planned for the on-line Spanish Paleontological meeting to be held at the end of September. One of them analysed the conodont potential of two Pyrenean sections regarding the intended new base of the Emsian.

Cooperation with Raimund FEIST and Catherine GIRARD continues.

As mentioned in previous reports, both in the Spanish Central Pyrenees and in the Iberian Chains, multidisciplinary studies on Devonian sections and outcrops have started. Results have been presented in previous reports and we expect to continue this collaboration.

The long-term project of detail analysis of Bohemian conodont faunas around the S/D interval that started together with Mike MURPHY and the late Peter CARLS is in progress.

Cooperation with paleobotanics, which already started in the Lower Devonian strata of the Iberian Chains, continues. We want to augment the palaeontological characterization of Lower Devonian strata in the Iberian Chains by adding to the already rich invertebrate and vertebrate data base, the paleopalynological record. This on-going project extends to the Middle and Upper Devonian strata of the Iberian Chains. New Upper Devonian records

are in preparation and prove the first evidence for land plants in the Frasnian of the Iberian Chains.

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

Teresa continues the Middle and Upper Devonian joint project with Susana GARCÍA-LÓPEZ (University of Oviedo) on selected localities of the Cantabrian Mountains. She is focussing now on the Kačák Event in several Spanish sections.

The cooperation we started with the late and lovely friend CHEN Xiuquin (Suzi) and with her/our former PhD. student LU Jianfeng continues to produce results, mainly regarding Pragian and Emsian outcrops in South China. They represent the first steeps in the envisaged long-term Chinese-Spanish cooperation.

A presentation on the Spanish-Portuguese Devonian results regarding IGCP 652 was held on the occasion of the Xth Spanish Geological Congress.

Regarding Heritage protection actions, we are involved in a project affecting Devonian outcrops in the Spanish Pyrenees. A company has launched a proposal of extending the current sky-resort near Cerler connecting two valleys. As this action implies, the construction of a new road at high elevation (over 2.200 m), where Devonian rocks crop out, we were called to analyse the impact of this road. Preliminary results prove the presence of Pragian, Emsian, Givetian, and Frasnian rocks. We have reported the need of preserving such outcrops and the company and the government have accepted our proposal; the road will be deviated in order not to affect the outcrops and we were able to obtain a variety of Devonian microfossils, including conodonts. We expect to publish scientific reports in the next years.

Nacho will supervise a German student from University of Hamburg under the DAAD-supported RISE-worldwide program. She will

be engaged in a short-term Devonian project next fall.

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, together with other Spanish colleagues (Miguel PARDO and Esperanza FERNÁNDEZ). This project entails large field-campaigns and mapping in rough areas.
- 2) Keep going in the long-term collaboration started 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 publishing large monographies 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 has started his Ph.D. under this cooperation.

Publications

Journal papers

LIAO, J.-C. & VALENZUELA-RÍOS, J. I. (2021). Upper Eifelian and Givetian (Middle Devonian) Conodont sequence at Renanué (Aragonian Pyrenees, Spain). A relevant section for Givetian Chronostratigraphy. - *Historical Biology*; doi:10.1080/0891 2963.2021.1962853.

LU, J. F., VALENZUELA-RÍOS, J. I., KÖNIGSHOF, P., LIAO, J.-C., WANG, Y., QUIE, W.-K. & SU, H. H. (2021). Emsian (Lower Devonian) Conodonts from the Dalian tang Formation at Dalian tang (eastern Yunna, China). – *Palaeoworld*; doi.org/10.1016/j.palword.2020.11.003.

SIVÉRIO, G., VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2021 accepted). Upper Frasnian and lower Famennian conodonts of the CP section (Spanish Central Pyrenees). - *Spanish Journal of Paleontology*.

VALENZUELA-RÍOS, J. I. (2021). El Programa Internacional de Geociencias (PICG-UNESCO) en España: 45 años sirviendo al desarrollo de la Geología. - GEO-TEMAS, **18**: 1088-1091.

Abstracts

LIAO, J.-C. & VALENZUELA-RÍOS, J. I. (2021). El Proyecto Internacional de Geociencias-UNESCO, PICG 652 y la aportación española en el contexto transnacional. – In: X Congreso Geológico de España. GEO-TEMAS, **18**: 1078.

VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2021). El Proyecto Internacional de Geociencias-UNESCO, PICG 596 y la internacionalización de la Ciencia Española. – In: X Congreso Geológico de España. GEO-TEMAS, **18**: 1092.

VALENZUELA-RÍOS, J. I. & LIAO, J.-C. (2021). La diversidad cultural y el diálogo internacional para un mundo en PAZ: La aportación del PICG. – In: X Congreso Geológico de España. GEO-TEMAS, **18**: 1092.

CM Chuck VER STRAETEN

Most of my work over the last year remains writing, revising and editing chapters for the coming *Devonian of New York* volume, to be published in Bulletins of American Paleontology, by the Paleontological Research Institution in hard cover. The volume and accompanying stratigraphic correlation chart will be available in both print and digital formats. The lengthy volume consists of a Preface, Dedication, and 12 chapters, examining many aspects of the Devonian geology and paleobiology in New York, and often with comparisons beyond the state. The volume will also include a poster-size graphic of the Devonian Period in New York, using current data toward a Devonian time scale.

Not being in an academic position during covid, I was able to concentrate on the volume much of the time, as I could work mostly at home with many less distractions (March 2020 to mid-August 2021).

My writing for the volume presents an overview of the Devonian in New York and North America, and additional chapters on the Pragian-Emsian, Eifelian-lower Givetian (with

SDS members Carl BRETT, Gordon BAIRD, Jeff OVER and Alex BARTHOLOMEW), Givetian marine strata in eastern New York (2nd author, with A. BARTHOLOMEW), and a large text on the Devonian terrestrial system in New York and in general, along with the Preface and Dedication. The volume is dedicated to Lawrence V. RICKARD, formerly of the New York State Museum/Geological Survey, who created two previous Devonian correlation charts for New York.

We have set up a symposium about the volume for the March 2022 Northeastern Section meeting of the Geological Society of America. The lead author of each chapter will give a presentation on it, preceded by an overview talk. Our plan is to release the *Devonian of New York* volume at the meeting.

Following up on a suggestion from Jeff OVER, we plan release pdfs of the 1981 and 1997 Subcommission on Devonian Stratigraphy New York volumes, prior to the 2023 New York SDS meeting. These will be downloadable, again, through the Paleontological Research Institution (PRI) in central New York. We will visit PRI during the 2023 SDS meeting.

PRI has a long record of Devonian interests and collections, and is situated on Lower Frasnian siliciclastics (Ithaca Formation). In recent years they've added a large collection of Devonian fossil and rock material from the research collections of Carl BRETT and Gordon BAIRD.

Much of my research continues to focus on the lower Givetian to mid or upper Frasnian terrestrial rocks in the Catskill Mountains region of eastern New York. Little fieldwork happened in 2020 and 2021, as we try to finish up the *Devonian of New York* volume, but will resume in 2022.

Publications

Journal papers

VER STRAETEN, C. A., OVER, D. J. & BAIRD, G. C. (2020). Arc-to-craton: Devonian air-fall tephras in the eastern United States. In: The Appalachian Geology of John M. DENNISON: Rocks, People,

and a Few Good Restaurants along the Way. Geological Society of America Special Paper, **545**; doi.org/10.1130/SPE545.

HE, R., LU, W., JUNIUM, C. K., VER STRAETEN, C. A. & LU, Z. (2020). Paleo-redox context of the Mid-Devonian Appalachian Basin and its relevance to biocrises. - *Geochimica et Cosmochimica Acta*, **287**: 328-340.

Abstracts

VER STRAETEN, C., OVER, D. J., WOODROW D.L., EBERT, J. R., BOYER D. L. & COLOSIMO, A. (2021). Devonian Of New York: A New, Extensive Volume on the North American Standard Section. Northeastern Section. - Geological Society of America, Meeting March 2021 [see also Geological Society of America Meeting, October 2021].

BARTHOLOMEW, A. & VER STRAETEN, C. (2022). Middle Hamilton Group Strata (Lower Givetian) of the eastern outcrop belt in New York State. - Geological Society of America. Meeting October 2021.

BRETT, C. E., BAIRD, G. C., VER STRAETEN, C., OVER, D. J., WITZKE, B. & BOYER, D. L. (2021). Paleobathymetry of Widespread Devonian Black Shales: Going Deeper, But Not That Deep. - Geological Society of America, Meeting October 2021.

CM Stanislava VODRÁŽKOVÁ

In 2020 we started a bilateral project on Devonian and Devonian/Carboniferous microbial sediments together with Tomas KUMPAN, Jiří KALVODA, Jiří FRÝDA, and Axel MUNNECKE. We are currently working on ferruginous coated grains from the Lower Devonian Řeporyje Limestone (VODRÁŽKOVÁ et al. 2021).

We also continue our work of Palaeozoic red beds together with Ondřej BÁBEK and his team. In 2020 we focused on the Dalejian Třebotov Formation in the Prague Basin (Třebotov and Suchomasty limestones), trying to understand the fluctuation of the redox potential (BÁBEK et al. in press).

Together with Tom SUTTNER and his team we focused on $\delta^{18}\text{O}$ analysis of conodont apatite

across the Kačák event in the Prague Basin, Czech Republic (Jirásek quarry in Koněprusy area) and Carnic Alps (Austria, Italy). The results were published just recently.

Otherwise I was deeply occupied with work in organizing committee of the IAS Meeting of Sedimentology that took place in 2021.

Publications

BÁBEK, O., VODRÁŽKOVÁ, S., KUMPAN, T., KALVODA, J., HOLÁ, M. & ACKERMAN, L. (in press): Geochemical record of the subsurface redox gradient in marine red beds: A case study from the Devonian Prague Basin, Czechia. – *Sedimentology*; doi:10.1111/sed.12910

SUTTNER, T. J., KIDO, E., JOACHIMSKI, M.M, VODRÁŽKOVÁ, S., PONDRELLI, M., CORRADINI, C., CORRIGA, M. G., SIMONETTO, L. & KUBAJKO, M. (2021). Paleotemperature record of the Middle Devonian Kačák Episode. - *Scientific Reports* **11** (16559).

VODRÁŽKOVÁ, S., VODRÁŽKA, R., KUMPAN, T., KALVODA, J., MUNNECKE, A., FRÝDA, J., KOUBOVÁ, M. & HOLÁ, M. (2021). Ferruginous coated grains in the Lower Devonian Řeporyje Limestone (Prague Basin, Czech Republic). – In: BÁBEK, O. & VODRÁŽKOVÁ, S. (Eds.), 35th IAS Meeting of Sedimentology, Virtual Meeting, Palacký University Olomouc. Prague: 453.

CM Gavin YOUNG

Research continues on early vertebrates in the Dept. of Applied Mathematics, Research School of Physics, ANU (Gavin YOUNG, Bob DUNSTONE, Yuzhi HU). Applied Maths developed and houses XCT scanning and 3D printing facilities that form a key part of our recent research. Ongoing research with various colleagues from other institutions (Jing LU and You-an ZHU, IVPP Beijing; Carole BURROW, Queensland Museum; John LONG, and Brian CHOO, Flinders University) includes placoderm skulls and braincases from the Burrinjuck Early Devonian limestones, new material from the Early Devonian Cravens Peak limestone in the Georgina Basin (compared with the enigmatic *Palaeospondylus* from the Scottish Middle Devonian), and antiarchs (*Remigolepis*) and

large sarcopterygians from the Upper Devonian of the NSW south coast (Eden Project).

The Eden Project progressed with further excavation at Boyds Tower (the type locality for *Edenopteron* YOUNG et al., 2013). A late Famennian age for this site, as indicated by the fossil fish assemblage, is supported by minor marine interbeds near the top of the Worange Point Formation type sections that contain rare acritarchs shared with the late Famennian Fairfield Group in the Canning Basin.

Edenopteron keithcrooki is the largest Devonian lobe-finned fish known by articulated remains, with lower jaw length of the holotype nearly half a meter long.

Significant new information on this taxon was published in the *Australian Journal of Earth Sciences* in 2019. Fieldwork involved much drilling and use of the product *expando* (technique developed by co-authors Bob DUNSTONE and Peter OLLERENSHAW) to extricate the large blocks containing bone remains. These were all back-packed out of the Ben BOYD National Park, and prepared and reassembled in the lab. The species name commemorates sedimentologist, the late **Dr Keith CROOK** (1933-2020). Keith CROOK instigated the ANU student field mapping program for the Devonian of the far south coast of New South Wales that lasted some three decades, during which significant fossil fish faunas of ?Givetian-Famennian age were discovered.

Sadly, Keith died on 18th February 2020 at the age of 86, traumatized by evacuation from Eden during the devastating bush fires (see below), from which he never recovered. Since his first paper (1961) on the Lower-Middle Devonian Tamworth Group, Keith CROOK contributed very significantly to stratigraphic and structural understanding of the Australian Devonian. Keith's son, co-author Baz CROOK, built the scientifically accurate life-size model of *Edenopteron* illustrated in Figure 1 of our 2019 paper.

In November 2019 we excavated another site further south in the coastal cliffs of Ben

BOYD National Park (Hegartys Bay). This site was discovered by Dr Anne WARREN (Latrobe University) in 1986, and first visited by Dr Alex RITCHIE (Australian Museum) in 1988. In 1996 RITCHIE organised a joint Australian Museum/National Parks excavation, with NP helicopters used to lift out the material. A TV documentary was produced to make known this significant discovery (only a few other places in the world produce complete bodies of Devonian lobe-fins, including the World Heritage Miguasha site).

Some fossils were breaking up and could not be removed in 1996, so were covered over for security and protection, until a future excavation could be organised. This never eventuated, and in fact the first published description from the large amount of material collected by the Australian Museum in 1996 was an *Edenopteron* skull we described in our 2019 paper.

An extreme weather event in June 2016 caused severe damage along the SE coast of Australia. R. DUNSTONE and P. OLLERENSHAW investigated the Hegartys Bay site in 2017, to find the entire fossil bed washed clean, exposing at least 12 separate lobe-finned fish impressions, all new to science. To rescue this fossil material a major excavation was undertaken 1-7 November 2019, with funding support from a Chinese Academy of Sciences Research Grant to Dr Jing LU (IVPP) for a helicopter liftout planned for early 2020. In January-February 2020 a devastating bushfire crossed the Victorian border, caused evacuation of the Eden township, and burnt out the entire southern section of Ben BOYD National Park. Our fossil site could not be accessed again until 24 June 2020. The fossil stockpile was found still intact, but with samples exposed to weathering. Our recent fieldwork (11-14 June 2021) was the first opportunity to continue this excavation after the bushfire delays and the ongoing Covid-19 pandemic. An additional four lobe-finned fish bodies were exposed on the bedding plane, and future excavation and helicopter lift-out is hopefully planned for later

in 2021 (subject to termination of current Covid-19 lockdowns in ACT and NSW).

Ms Yuzhi HU successfully defended her PhD oral exam on 6 July 2021, and is now revising her thesis for final submission. Her research being prepared for publication includes denticle structure in Early Devonian placoderms in relation to recent ideas about the evolution of teeth. Other research progressing towards publication concerns *Palaeospondylus* from Scotland and Australia, a new sarcopterygian from the late Middle Devonian of central Australia, and *Remigolepis* from the NSW south coast.

Publications

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- YOUNG, G. C., & LU, J. (2020). Asia-Gondwana connections indicated by Devonian fishes from Australia: palaeogeographic considerations. - Journal of Palaeogeography; doi.org/10.1186/s42501-020-00057-x.
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LU, J., YOUNG, G. C., HU, Y. Z., QIAO, T., ZHU, M. (2019). The posterior cranial portion of the earliest known Tetrapodomorph *Tungsenia paradoxa* and the early evolution of tetrapodomorph endocranial. - Vertebrata Palasitica; doi.org/10.19615/j.cnki.1000-3118.

CM James J. ZAMBITO

Over the past year I have been active in a variety of Devonian projects. The first is co-authoring two chapters on Middle Devonian stratigraphy with TM Carlton BRETT (University of Cincinnati), CM Gordon BAIRD (SUNY College Fredonia), and CM Alex BARTHOLOMEW (SUNY New Paltz) for a *Bulletins of American Paleontology* volume on New York State Devonian, edited by CM Charles VER STRAETEN (New York State Geological Survey) and TM Jeff OVER (SUNY Geneseo). The full volume will be published in early 2022.

The second project aims to understand how the evolution of forests changed the global carbon cycle and the organic matter composition of marine black shale. This project focuses on latest Middle Devonian strata of the North American Appalachian, Illinois, and Michigan Basins and utilizes an integrated litho-, chemo-, bio-, and sequence stratigraphic approach to constrain regional black shale compositional changes within a high-resolution stratigraphic framework. This project is currently in year two of three, and is funded by the American Chemical Society Petroleum Research Fund (#60525-UR2).

The third project involves work with Drs. Patrick MC LAUGHLIN (University of Indiana, project lead) and Carlton BRETT on sampling Devonian phosphatic beds in Tennessee, Kentucky, and New York State this past summer; the goal is to characterize their rare earth element content.

I was also recently involved in a project that analyzed the Osmium isotopic composition of sulfides in Eifelian and Givetian shale in order to better understand magmatic-hydrothermal systems.

Publication

SAINTILAN, N., SPROSON, A., SELBY, D., ROTTIER, B., CASANOVA, V., CREASER, R., KOUZMANOV, K., FONTBOTÉ, L., PIECHA, M., GEREKE, M., and ZAMBITO, J. (2021). Dynamics of fluid-rock interaction and fluid mixing controlling sulphide deposition in magmatic-hydrothermal systems: A perspective from osmium isotopes in the epithermal environment. - *Chemical Geology*, 564; doi.org/10.1016/j.chemgeo.2020.120053.