SILURIAN TIMES

NEWSLETTER OF THE INTERNATIONAL SUBCOMMISSION ON SILURIAN STRATIGRAPHY (ISSS)

(http://silurian.stratigraphy.org)

INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS)

No. 30 (for 2022)

Edited by David Ray

CONTENTS

Cover photo: Dolomites of the Wenlock-Ludlow transition in the Soeginina Cliff section, Saaremaa Island, Estonia. Vesiku and Soeginina Beds, Rootsiküla Formation (Courtesy of Tõnu Meidla).

Silurian Times 30 for 2022 distributed April 2023.

IUGS statement on the Russian Federation's invasion of Ukraine

To the leaders of all IUGS committees, commissions, and activities:

The International Union of Geological Science (IUGS) has published its statement in reaction to the invasion of Ukraine by the Russian Federation. Our statement requires that active involvement of scientists from Russian institutions in IUGS groups and activities should cease until further notice. This includes withdrawing the offer to host the International Geological Congress in St. Petersburg, Russia in 2028.

The scientific community in Russia provides highly valuable contributions to the commissions and publications of IUGS. We note that an impressive number of Russian scientists have distanced themselves for their governments decision and we are proud of their courage. Our actions at this time are not personally directed towards our colleagues, but we must firmly oppose the aggressive actions of the Russian government.

This statement was agreed by the IUGS executive in Paris, France on the 18th March 2022.

Professor John Ludden CBE, FRSE, MEA, RAS President of IUGS

SILURIAN TIMES Number 30 (for 2022)

CHAIRMAN'S CORNER

Dear Silurian Colleagues,

The limited activities of the Subcommission focused in 2022 on the long-time intended replacement of previously ratified but currently inadequate basal stratotypes of selected Silurian stages. Two of our three working groups were expected to submit their official proposals for new GSSPs for the Aeronian and Telychian stages at the 36th IGC in Delhi in March 2020. Neither of these proposals, nor the Geological Congress itself have materialized, nonetheless some important progress has been made in the study of these GSSPs.

The first ISSS business meeting, after several years of silence, will be held in the frame of a thematic session (SC13 – New stratigraphic insights into the Silurian story) organized at 4th International Congress on Stratigraphy (STRATI2023, 11th-13th July) in Lille, France (https://strati2023.sciencesconf.org/). See Table 1 for the details of the preliminary program. In addition, please, send me your comments, suggestions, and proposals regarding the upcoming business meeting and, in turn, stay tuned to receive further details in due time.

The Aeronian working group has focused its activities on a candidate section for a new base Aeronian GSSP in Wales, UK, and has recently published a restudy of the Rheidol Gorge section in Lethaia (Melchin *et al*. 2023). A Czech candidate section, the Hlásná Třebaň section in the Barrandian area has also been subject to a comprehensive study (Štorch *et al*. 2018), and will be supplemented by chitinozoan data provided by A. Butcher and J. Vodička. These two proposals will be presented to the ISSS members in Lille. Work on a Chinese candidate section in Yuxian, Sichuan Province, is also in progress. It is hoped that the details of this candidate will also be presented for consideration to the ISSS body in Lille.

The working group for the base Telychian GSSP has focused upon a single candidate; the El Pintado Reservoir section in the Seville province of Spain (Loydell 2019). The Aeronian/Telychian boundary and lower Telychian part of the El Pintado succession has been described in detail (Loydell *et al*. 2015), and has been supplemented by a brief summary on the Aeronian part of the section, which was presented to the ISSS in the frame of the Silurian thematic session at STRATI 2019 in Milano (Štorch *et al*. 2019). A complete proposal will be presented to the ISSS audience in Lille.

Apart from this formal program, some efforts to find good tools for the subdivision of the Pridoli Series into two stages were made again in the type area of this unit. The results have been recently published in Newsletters on Stratigraphy (Manda *et al*. 2023). A potential candidate for a GSSP and proposed marker horizon for the base of the upper stage will be presented and discussed in the frame of the ISSS meeting and thematic session in Lille.

The further search for sections suitable for a new GSSP for the Wenlock Series has continued in Llandovery/Wenlock boundary successions available from drill-cores in Gotland, Sweden, as reported by B. Cramer. Another promising section has been recently examined near the classical locality of Vyskočilka in Prague, Czech Republic. Based upon this new research it is time to reactivate the temporarily silenced base Wenlock working group.

Last but not least, we should also discuss the creation of a Homerian working group, in order to restudy the Homerian GSSP. Czech colleagues have been working in advance on a richly

fossiliferous, black-shale dominated Sheinwoodian-Homerian boundary section exposed in the Kosov Quarry, Bohemia, Czech Republic.

1	Tanya Koren‘ Award ceremony.
2	Detailed information about the upcoming ISSS online ballots on new base Aeronian and base Telychian GSSPs.
3	Other inadequate GSSPs of Silurian stages and series in need of replacement – Homerian Stage and Wenlock Series/Sheinwoodian Stage. Discussion and possible formation of working groups.
4	Proposed division of Přídolí Series in Jarovian and Radotinian stages. Discussion.
5	Potential application of Standard Auxilliary Boundary Stratotypes in the Silurian System. This category was formally recognized by the ICS in October 2022. Discussion.
6	Next field meeting of the Silurian Subcommission after covid pause. Discussion about date and place.
7	New executive of Silurian Subcommission – new chair, vice-chair and secretary. Discussion around proposals, upcoming online election, and time-line.

Table 1. Preliminary program of the ISSS business meeting in Lille.

As it seems likely that due to probable absence of many titular members in Lille, we may also have to organize a further ISSS discussion online before the ultimate ISSS decision about the base Aeronian and base Telychian GSSP proposals. August 2023 is a deadline for online ballots, beyond which the formal proposals of the winning Aeronian and Telychian GSSPs will be submitted to ICS by the end of 2023.

In other news, significant updates to the list of corresponding members and Silurian experts have been made by David Ray. We are looking to reduce the number of corresponding members to those who have made a recent contribution to the Silurian Times (at least once in the last three years). Please, check the address list at the end of the annual report and send changes and pending updates on David’s email address (daveray01@yahoo.com). We would greatly appreciate this help which will also indicate your willingness to participate on present and future activities of the subcommission.

It is hoped that we will be finally able to improve and update our homepage, which is contained upon the ICS website. This long-time needed refurbishment will be conducted by our webperson Huang Bing in cooperation with ICS webperson Nick Car.

Last but not least, present chair and vice-chair of the subcommission have served their second term and have to be replaced by a new executive in 2024. In addition, the secretary of the subcommission David Ray will be stepping down after a single term. Please, think about the new ISSS executive and send me your nominations in advance.

Finally, I wish to thank secretary David Ray and vice-chair Carlo Corradini for their permanent collaboration. In particular, David’s hard work on the Silurian Times is appreciated very much.

References

Loydell, D.K. 2019. The base of the Telychian: is the El Pintado section, Spain suitable as a replacement GSSP? 3rd International Congress on Stratigraphy (STRATI 2019), ISSS business meeting, Milano, Italy., Lecture, July 2, 2019.

Loydell, D.K., Frýda, J. and Gutiérrez-Marco, J.C. 2015. The Aeronian/Telychian (Llandovery, Silurian) boundary, with particular reference to sections around the El Pintado reservoir, Seville Province, Spain. Bulletin of Geosciences, 90, 743–794, https://doi.org/10.3140/bull.geosci.1564.

Manda, Š., Slavík, L., Štorch, P., Tasáryová, Z. and Čáp, P. 2023. Division of Přídolí Series in Central Bohemia: graptolite and conodont biostratigraphy, faunal changes, and geochemical record. Newsletters on Stratigraphy, 56, 89–123, https://doi.org/10.1127/nos/2022/0695.

Melchin, M.J., Davies, J.R., et al. 2023. Integrated stratigraphic study of the Rhuddanian-Aeronian (Llandovery, Silurian) boundary succession at Rheidol Gorge, Wales: A proposed GSSP candidate for the Base of the Aeronian Stage. Lethaia, 56, 1–23, https://doi.org/10.18261/let.56.1.8.

Štorch, P., Manda, Š., Tasáryová, Z., Frýda, J., Chadimová, L. and Melchin, M.J. 2018. A proposed new global stratotype for Aeronian Stage of the Silurian System: Hlásná Třebaň section, Czech Republic. Lethaia, 51, 357–388, https://doi.org/10.1111/let.12250.

Štorch, P., Loydell, D.K., Frýda, J. and Gutiérrez-Marco, J.C. 2019. The Aeronian succession of the El Pintado section (proposed replacement GSSP for the base Telychian), Seville Province, Spain. 3rd International Congress on Stratigraphy (STRATI 2019), Session ST3.3, Milano, Italy., Lecture, July 2, 2019.

International Commission on Stratigraphy

Subcommission on Silurian Stratigraphy

ANNUAL REPORT 2022

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

Subcommission on Silurian Stratigraphy (ISSS)

Submitted by:

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2. OVERALL OBJECTIVES AND FIT WITHIN IUGS SCIENCE POLICY

Mission statement

The objectives of the Subcommission relate to three main aspects of IUGS policy:

(1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs at Series and Stage levels and related to a hierarchy of units (Substages, Standard Zones, Subzones etc.) to maximize relative time resolution within the Silurian Period;

(2) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Silurian Period;

(3) Working towards an international policy concerning conservation of geologically important sites (such as GSSPs, global and regional stratotype sections, etc.).

Goals

- Rationalization of Global chronostratigraphical classification

- Intercalibration of fossil biostratigraphies, integrated zonations, and recognition of global datums
- Establishment of magneto- and chemo-stratigraphic scales
- Redefinition of stage boundaries and restudy of global boundary stratotype sections
- Correlation of Silurian rock successions and events, including marine and non-marine
- Application of astronomically tuned cyclostratigraphy integrated with radiometric data and biostratigraphy

3. ORGANISATION - interface with other international projects / groups

Organisation

The ISSS is a Subcommission of the International Commission on Stratigraphy. The Subcommission is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommission. In the Subcommission elected for 2020-2024 there are twelve other Voting Members. One member was suspended in accord with IUGS policy about Russian aggression against Ukraine. Broad network of Corresponding Members has first of all a responsibility for communication in both directions between the Subcommission and researchers on Silurian topics in their region. Secondly, they represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Silurian rocks are extensively studied in relation to fundamental and/or applied geological research.

Current research activities and future plans are communicated through publication of the annual ISSS newsletter, *Silurian Times*, distributed as an email attachment and a web release. Website: http://silurian.stratigraphy.org/ is currently undergoing a long-time overdue reorganisation.

Interface with other international projects / groups

Collaboration will be developed with stratigraphically neighbouring subcommissions on Ordovician (ISOS) and Devonian (SDS) stratigraphy depending on subsequent revival of international meetings and conferences.

3a. Current Officers for 2020-2024 period:

Chair: **Petr Štorch** (second term)

Vice-Chair: **Carlo Corradini** (second term)

Secretary: **David Ray** (first term)

Webperson: **Huang Bing** (first term)

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

National/regional support has been provided to active members of Aeronian, Telychian and Wenlock GSSP working groups to facilitate their work.

5. CHIEF ACCOMPLISHMENTS IN 2022 (including any publications arising from ICS working groups)

- Silurian Times No 29 was edited by the secretary, David Ray, and distributed in April, 2022, posted on the web site for the ISSS, and circulated as an email attachment to all titular, corresponding and interested members of the Subcommission. It contained the reports on previous meetings, announcements of planned meetings, the latest news and recent publications on Silurian research.
- The restudy of the Rheidol Gorge section submitted for publication in *Lethaia* by Melchin *et al*. is currently in print (now published by Melchin *et al*. 2023).
- Chinese working group conducted extensive geochemical studies on samples from the Aeronian GSSP candidate section at Yuxian section, Sichuan Province.

Melchin, M.J., Davies, J.R., et al. 2023. Integrated stratigraphic study of the Rhuddanian-Aeronian (Llandovery, Silurian) boundary succession at Rheidol Gorge, Wales: A proposed GSSP candidate for the Base of the Aeronian Stage. Lethaia, 56, 1–23, https://doi.org/10.18261/let.56.1.8.

6. SUMMARY OF EXPENDITURE IN 2022:

Expenditures	US$ 0
Total	US$ 0

7. SUMMARY OF INCOME IN 2021:

Carried forward from 2022	US$ 3,500
ICS Allocation	US$ 0
Total	US$ 3,500

Balance	(carried forward from 2022)	US$ 3,500

8. BUDGET REQUESTED FROM ICS IN 2023

Requested ICS Allocation	US$ 0

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

- Two ISSS groups working on restudy of the base of the Aeronian GSSP and base of the Telychian GSSP will be hopefully able to complete their work by submission of the formal proposals of the candidate sections (Štorch *et al*., Hlasna Treban, Czech Republic and Melchin *et al*., Rheidol Gorge, UK for Aeronian GSSP and David Loydell *et al*., El Pintado Reservoir, Spain, for Telychian GSSP).
- Planning of the ISSS bi-annual business meeting and thematic session "New stratigraphic insights into the Silurian story" to be held at the 4th STRATI congress in Lille, France (July 2023). ISSS discussion will be followed by online formal voting on the Aeronian and Telychian GSSP replacement candidate sections. Potential subdivision of the Přídolí Series into two stages will be discussed in response to submitted proposal by Manda *et al*. (2023).
- Update of the website for Silurian Subcommission by Webperson Huang Bing. We gratefully acknowledge this work and the support provided by the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences.

Manda, Š., Slavík, L., Štorch, P., Tasáryová, Z. and Čáp, P. 2023. Division of Přídolí Series in Central Bohemia: graptolite and conodont biostratigraphy, faunal changes, and geochemical record. Newsletters on Stratigraphy, 56, 89–123, https://doi.org/10.1127/nos/2022/0695.

Potential funding sources external to IUGS

Most of the costs of preparing Silurian Times and research activities of the working groups will be met by local support from host institutions and participation by individuals through national research grants and travel grants from their own authorities. Minor expenses may be covered from budget carried forward from 2022.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD 2020-2024

- Principal work will be devoted to GSSP-related research activities – restudy of some previously ratified but currently inadequate basal stratotypes. Delayed formal proposals of the Aeronian and Telychian GSSP replacement candidates will be completed in early 2023 to be discussed by the ISSS business meeting in July 2023. New stratotypes will be chosen by means of subsequent online ballot. We aimed to vote on these candidate sections in 2019 in Milano but the deadline had to be postponed due to delayed work on some of the candidate sections.
- ISSS bi-annual business meeting and thematic session "New stratigraphic insights into the Silurian story" is planned at 4th STRATI congress in Lille, France for July 2023.
- Homerian working group will be established and restudy of the Homerian GSSP will join the program, along with further search for sections suitable for new GSSP of the Wenlock Series. One promising section was recently found in Prague-Malá Chuchle.
- Subdivision of the Přídolí Series into two stages will be reconsidered in response to published proposal by Manda *et al*. (2023).
- We will take part in further development of databases that would bring together and make available information from all sources associated with the Silurian researchers. One such database, operated by the Nanjing Institute of Geology and Palaeontology (Geobiodiversity Database, GBDB) is the official database of the ICS.

APPENDIX (Names and Addresses of Current Officers and Voting Members)

Nominated officers

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Working group leaders

Base of Aeronian GSSP Restudy Working Group
Leader **Petr Štorch**

Base of Telychian GSSP Restudy Working Group
Leader **Michael J. Melchin**

Base of Wenlock GSSP Restudy Working Group
Leader **David K. Loydell**

REPORTS OF ACTIVITIES IN 2022

The 5th International Conodont Symposium (ICOS 5), Wuhan, China

Dates: June 24th to 27th 2022.

Venue: Hybrid meeting

Website: The ICOS 5 Abstract Book and Program, and partial oral presentation video records approved by the speakers can be viewed at the following link:

https://dxy.cug.edu.cn/dxyen/THE_PANDER_SOCIETY/News_and_Events.htm

Description: The 5th International Conodont Symposium (ICOS 5), was a hybrid meeting held online and on the campus of China University of Geosciences (CUG), Wuhan, China (June 24th to 27th 2022). Note the meeting was postponed in 2021 due to the COVID-19 pandemic. ICOS 5 was organized by State Key Laboratory of Biogeology and Environmental Geology (CUG) and School of Earth Sciences (CUG). The symposium contained several Silurian related presentations, three scientific sessions and a business meeting of the Pander Society.

Organisers: Professor Xulong Lai, Vice President of China University of Geosciences (Wuhan).

Session 1: Beyond biostratigraphy: Conodont matters in evolving planetary scenarios.

Chair: Guillermo Albanesi and Annalisa Ferretti.

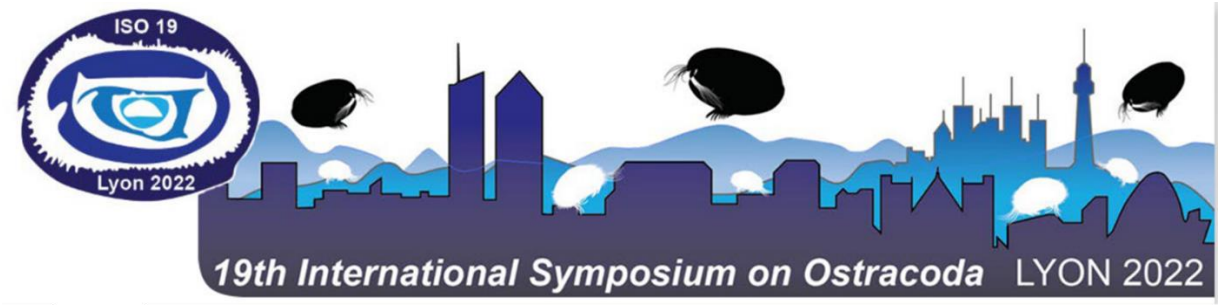
A thematic issue "Beyond biostratigraphy: Conodont matters in evolving planetary scenarios", is to be published in Marine Micropaleontology, and will include Silurian studies.

Session 2: The Evolution and extinction of Upper Permian to Triassic Conodonts.

Chair: Charles Henderson, Manuel Rigo and Haishui Jiang

Session 3: Conodont morphology: from development to systematics

Chair: Emilia Jarochowska and Przemysław Świś



19th International Symposium on Ostracoda, Lyon, France

Dates: July 18th to 22nd 2022

Venue: Lyon, France

Website: The 19th International Symposium on Ostracoda Abstract Book, Circulars and Field Trip Guides can be viewed at the following link: http://iso2022.univ-lyon1.fr/en

Description: The French Ostracodologists' Group and the International Research Group on Ostracoda (IRGO) held the 19th International Symposium on Ostracoda in Lyon at the University Claude Bernard Lyon 1 from July 18th to 22nd 2022. The symposium consisted of workshops, field excursions, an IRGO business meeting, and over 100 presentations (oral and poster), a few of which related to the Silurian:

- Perrier, V., Perrichon, G., Nesme, F., Lorenzo, S. and Gutiérrez-Marco, J.C. 2022. Ecological diversification of early planktonic ostracods in the upper Silurian.
- Rinkevičiūtė, S., Spiridonov, A. and Meidla, T. 2022. Ultra-high resolution ostracod data as a tool for a deeper understanding of the Mulde/ *lundgreni* event (lower Silurian).
- Siveter, D., Perrier, V. and Williams, M. 2022. Silurian myodocopes display adaptations for a nektobenthic lifestyle: the paleobiological evidence.

Organising Committee: Vincent Perrier, Marie-Béatrice Forel and Sylvie Crasquin

ANNOUNCEMENTS OF MEETINGS AND ACTIVITIES IN 2023

4th International Congress on Stratigraphy STRATI 2023, Lille, France

Dates: July 11th to 13th 2023

Venue: Lille, France. The indoor sessions with keynote talks and regular lectures (partly scheduled online) will take place in the new Congress Centre of Lille University 'Lilliad' on the Campus of the Cité Scientifique (Science Campus) at Villeneuve d'Ascq (15 minutes by metro from Lille city centre). In addition, several pre- and post-conference excursions and one-day field trips are scheduled to take place before and after the indoor meeting.

Website: https://strati2023.sciencesconf.org/

Description: Following the 1st congress in Lisbon (Portugal) in 2013, and additional congresses organized in Graz (Austria) in 2015 and Milan (Italy) in 2019, the 4th International Congress on Stratigraphy STRATI 2023 will be held in Lille, France, 11th to13th July 2023.

General scientific themes will be mostly organized as plenary sessions, but parallel sessions will also be scheduled, as well as poster sessions. The following scientific sessions have been proposed covering a wide range of stratigraphic topics.

Subcommission Sessions

SC1: Time-scale calibration

SC2: The Anthropocene: stratigraphical concepts and evidence

SC3: Developments in Quaternary chronostratigraphy

SC4: SNS Neogene stratigraphy and palaeoceanography

SC5: Advances in Paleogene research

SC6: Integrated stratigraphy and GSSPs of the Cretaceous System

SC7: Cretaceous palaeoceanography, palaeogeography, biota, climate change and critical events

SC8: The Jurassic: events, correlation and timescale

SC9: Triassic integrated stratigraphy, GSSPs, and extreme climatic, environmental and biotic events

SC10: Correlation of glacial events and extinctions: the Permian and beyond

SC11: Stratigraphy of the Carboniferous world

SC12: Devonian palaeoenvironments and time

SC13: New stratigraphic insights into the Silurian story (for details see CHAIRMAN'S CORNER pages 4-6 and page 21)

SC14: Ordovician: correlation of events

SC15: Cambrian stratigraphy, palaeontology and depositional dynamics

SC16: Tonian to Cryogenian stratigraphy, palaeobiology and Earth system change

SC17: The Early Precambrian: a chronology of invisible time

General Plenary Sessions

GP1: Advances in cyclostratigraphy – reconstructing geological time, palaeoclimate, and the Solar and Earth-Moon systems

GP2: From rock to time: evolutionary lineages and the calibration of the Chronostratigraphic Scale (for further details see page 22).

GP3: Quantitative stratigraphic analysis using databases

GP4: Palynology as a tool in multidisciplinary research: advances and applications (Aramco – CIMP sponsored session)

GP5: Integrated stratigraphy: methods and concepts

GP6: Ecostratigraphy vs. biostratigraphy vs. sequence stratigraphy

GP7: Miscellaneous session

Plenary lectures

The program of the plenary lectures will be available on the congress website in May 2023.

Workshops

WS1: OneStratigraphy Database and Constrained Optimization (CONOP) analysis

WS2: Radio-isotopic dating

Excursions

Pre-excursion 1: British Classics - Hutton's Unconformity, Palaeozoic of Northumberland & Jurassic of the Yorkshire Coast (5 days), from and to Newcastle, UK

Pre-excursion 2: Cretaceous of SE France - classical Mesozoic successions of the Vocontian Basin, containing several GSSPs (3 days), from and to Lyon, France

One-day field trip: Upper Jurassic coast of northern France (1 day), from and to Lille, France

One-day field trip: Belgian Palaeogene (1 day), from and to Lille, France

Post-excursion 1: Belgian Classics - Devonian-Carboniferous of southern Belgium and northern France (3 days), from and to Lille, France

Post-excursion 2: Ordovician of Estonia (4 days), from and to Tallinn, Estonia

Organisers: The Organizing Committee is composed by members of the CNRS-Univ.Lille research unit "UMR 8198 Evo-Eco-Paleo" and of the French geological society "Société

Géologique de France": Thomas Servais (chair); Catherine Crônier (vice-chair); Solange Chaimbault. See website for full list.

Important dates:

Distribution of the final circular with programme: May 1st 2023

Registration: cost savings up to May 1st 2023, but on-site registration is available

New stratigraphic insights into the Silurian story, Lille, France

(Subcommission Session SC13)

Dates: July 11th to 13th 2023

Venue: Lille, France. The indoor sessions will take place in the new Congress Centre of Lille University 'Lilliad' on the Campus of the Cité Scientifique (Science Campus) at Villeneuve d'Ascq (15 minutes by metro from Lille city centre).

Website: https://strati2023.sciencesconf.org/

Description: This will be the first ISSS business meeting, after several years of silence. The details of the preliminary program are as follows:

- Tanya Koren' Award ceremony.
- Detailed information about the upcoming ISSS online ballots on new base Aeronian and base Telychian GSSPs.
- Other inadequate GSSPs of Silurian stages and series in need of replacement – Homerian Stage and Wenlock Series/Sheinwoodian Stage. Discussion and possible formation of working groups.
- Proposed division of Přídolí Series in Jarovian and Radotinian stages. Discussion.
- Potential application of Standard Auxilliary Boundary Stratotypes in the Silurian System. This category was formally recognized by the ICS in October 2022. Discussion.
- Next field meeting of the Silurian Subcommission after covid pause. Discussion about date and place.
- New executive of Silurian Subcommission – new chair, vice-chair and secretary. Discussion around proposals, upcoming online election, and time-line.

In addition, please, send Petr Štorch (storch@gli.cas.cz) your comments, suggestions, and proposals regarding this business meeting and, in turn, stay tuned to receive further details in due time. For further details see CHAIRMAN'S CORNER herein (pages 4-6).

Organisers: Petr Štorch, Carlo Corradini and David Ray

Important dates:

Distribution of the final circular with programme: May 1st 2023

Registration: cost savings up to May 1st 2023, but on-site registration is available

4th International Congress on Stratigraphy

strati 2023

11th -13th July 2023, Lille, France

From rock to time: evolutionary lineages and the calibration of the Chronostratigraphic Scale, Lille, France (General Plenary Session GP2)

Dates: July 11th to 13th 2023

Venue: Lille, France. The indoor sessions will take place in the new Congress Centre of Lille University 'Lilliad' on the Campus of the Cité Scientifique (Science Campus) at Villeneuve d'Ascq (15 minutes by metro from Lille city centre).

Website: https://strati2023.sciencesconf.org/

Description: The Chronostratigraphic Scale has been under construction for more than 200 years. By the integration of multidisciplinary high-resolution studies, and the correlation of pervasive markers, the chart has evolved through times aiming to follow a global process of standardization. However, what we see is the result of different subcommissions specifically focused on the different systems of the Phanerozoic. As such, specialists of definite temporal frames hardly go beyond their time slice. The proposed session aims to bring together apparently unrelated diverse lines of investigation on diverse fossil groups of different time frames in order to define, discuss, combine and compare through a long time slice the potential of evolutionary lineages in the fine tuning of the Chronostratigraphic Scale.

The general session title is intended to be broadly interpreted by researchers on evolutionary biology, biostratigraphy and chronostratigraphy to contribute to an integrated understanding of the geological time. Our intention is to publish a collection of papers resulting from the proposed session as a special issue of a peer-reviewed journal with a high impact factor. We hope that such a high-profile session will culminate by uniting researchers with various backgrounds and that the resultant publication will provide the necessary impetus to continue or embark on new research and to encourage future collaborations among colleagues.

IF YOU ARE INTERESTED IN CONTRIBUTING, PLEASE CONTACT US!

Organisers: Annalisa Ferretti (ferretti@unimore.it), Marco Balini and Thomas Servais

Important dates:

Distribution of the final circular with programme: May 1st 2023

Registration: cost savings up to May 1st 2023, but on-site registration is available

14th International Symposium on the Ordovician System, Tallinn, Estonia

Dates: July 15th to 26th 2023.

Venue: The scientific sessions will take place at the Astra Building of Tallinn University, located in Tallinn City Centre, Estonia.

Website: http://isos14.org/

Description: The 14th International Symposium on the Ordovician System will be held from July 19th to 21st 2023, at Tallinn University (Estonia) in conjunction with the 3rd annual meeting of IGCP 735 (Rocks and the Rise of Ordovician Life). A pre-conference field excursion (July 15th to 18th) will explore Ordovician sections of Estonia. The post-conference field excursion (July 23rd to 26th) will examine classic sites in Sweden. **It is expected that the Ordovician-Silurian boundary strata and correlations of the lower boundary of the Silurian System will be addressed in the scientific sessions and during the field excursions**.

Organisers: Tõnu Meidla (chairman of organising committee); Olle Hints (vice chair/pre-conference excursion); Jan Ove Ebbestad (post-conference excursion); Oive Tinn (conference secretary).

Important dates:

Deadline for short papers and abstracts, plus paying the regular conference fee (late registration is possible): April 1st 2023

Distribution of the Third Circular: June 2023

Obituary: Alain Blieck (1949-2022)

Our esteemed colleague and friend, Alain Robert Maurice Blieck-Cazeau of Haubourdin, former CNRS senior scientist, and professor emeritus of the Université des Sciences et Technologies de Lille, Campus de Villeneuve d'Ascq, succumbed to COVID-19 in early February.

Alain, a true northern Frenchman with Dutch/Belgian/Walloon connections, conducted research on a wide range of topics including evolutionary biology, palaeobiology and systematics (taxonomy, nomenclature, phylogeny), palaeoecology, biostratigraphy, and palaeobiogeography. His main focus was the earliest vertebrates and, in particular, the Palaeozoic jawless Pteraspidomorphs that are known from the Ordovician to the Devonian, but he also contributed on Palaeozoic microvertebrates, and sharks to tetrapods. He was in the vanguard of cladistics applied to early vertebrates.

Alain made major contributions to the biodiversity, biostratigraphy and palaeobiogeography of Devonian pteraspidomorphs. These included heterostracans from western Europe and organising important conferences on western European palaeogeography. Alain's body of work spans nearly 50 years. His last as his first is on heterostracans pteraspidomorphs and is in press. He brought new rigor to understanding of early vertebrates, especially their first appearance in the early/mid-Ordovician and the Early Devonian faunas from the Old Red Sandstone Continent (Spitsbergen, Arctic Russia and Canada, Europe, USA). He was one of the first to press that the vertebrates are a group fundamental to the biostratigraphy of the Middle Palaeozoic.

Alain was both a field man in the classic style, with expeditions as far afield as Spitsbergen and Iran, an active member of geological societies in France and further afield; a teacher who fostered many students, taking field courses on the NE French coast and elsewhere. He was most generous to many visiting researchers and students.

'Papa' Blieck (as he became known after this label was placed on his group table in a French restaurant during our final IGCP conference in 1995) worked on several international projects, especially on mid-Palaeozoic geological problems related to vertebrates and notably

UNESCO:IUGS IGCP 328, when we were co-leaders from 1993 to 1996, which was voted one of the best projects by the Earth Sciences Division and Board of IGCP. During the latter, he hosted a major field excursion across northern France and Belgium, fittingly finishing in a Champagne cave near Reims. We edited together several conference proceedings, such as the Gross Symposium series and the Final report for IGCP 328. I was honoured to referee his final contribution (Blieck In press).

Alain's generosity, intellect, his sense of fun will be missed by colleagues and friends. Alain Blieck was supported throughout his career by his partner Dr Edmonde Razafimahaleo and their two sons and family.

By Susan Turner

Blieck, A. In press. Interpreting ecological niches of heterostracans (Vertebrata: Pteraspidomorphi). Geologica Belgica.

Obituary: Michael Gwyn Bassett (1943-2023)

It is with deep sadness and sorrow that we inform you of the passing of Professor Michael Gwyn Bassett on Sunday 15th January 2023, following a long illness. He would have been 80 years old on 31st March 2023.

Professor Bassett was born in the town of Barry, South Wales and was educated locally. He went on to study at the University of Wales, where he graduated with a BSc Honours degree. He continued his education at University College, Swansea where he gained his PhD for the monographic study on the Silurian (Wenlock) stratigraphy and brachiopods of Wales and the Welsh Borderland in 1968.

Shortly before that, in October 1967, he joined the National Museum of Wales in Cardiff. He worked there for the next 40 years, firstly as the Assistant Keeper of Geology and subsequently as the Senior Keeper and Head of the Geology Department, until his retirement in 2008. For a number of years he was an Honorary Professor and Lecturer at Cardiff University and also spent extended research stays abroad, in particular at the Natural History Museum, Oslo, and in Sweden, working on Gotland and at Uppsala University and the Swedish Museum of Natural History.

He also served as the Secretary General and First Vice Chairman of the International Commission on Stratigraphy, IUGS. At that time, he made significant contributions to the development of the International Geochronological Scale and, especially, subdivision of the Silurian System.

Michael Bassett in the field at Kyrshabakty River, southern Kazakhstan, 2006.

Professor Bassett was amongst the brightest researchers of his generation, working mainly on the palaeontology and stratigraphy of the Lower Palaeozoic. He was widely known as an outstanding expert on Palaeozoic brachiopods, biostratigraphy and facies developments worldwide, but particularly in the U.K. and Scandinavia. He also made important contributions to the study of brachiopod palaeobiology, especially their early ontogeny and phylogeny.

During his long scientific career, Professor Bassett received a number of awards and recognitions related to his research. In particular, he was awarded an Honorary Doctorate from Uppsala University in 2000 and in December 2006 he was appointed for two years as the President of The Palaeontological Association, one of the world's leading societies in palaeontological studies.

During his time as Keeper of Geology, he significantly raised the profile of the National Museum of Wales as an internationally recognised research centre, creating strong research links, not only in North American and European countries, but also with Argentina, China and developing countries such as Kazakhstan, Iran and Uzbekistan. He also played a key role as the organiser of a number of highly successful exhibitions, such as the ground-breaking 'Dinosaurs from China' (1986-1987), 'Mammoths and the Ice Age' (1991–1992), and 'Flight' (2001). The highly popular, award-winning 'Evolution of Wales' exhibition is his long-lasting legacy.

Following retirement, Professor Bassett actively continued his research, dedicated to such topics as geotourism highlights of Gotland, description of a new group of the Late Ordovician Silurian chileide brachiopods, biogeography of the Ordovician linguliforms and craniiforms, taxonomy and early ontogeny of the Silurian craniide brachiopods from Gotland. The last paper authorised by him was published in 2017. It was dedicated to the early ontogeny of the Silurian brachiopod *Coolinia*.

He was a true giant within his field. He now lives in our memory as a bright scientist and a great friend. We send our deepest condolences to his family and friends.

By Lars E. Holmer, Leonid Popov and Mansoureh Ghobadi Pour

Obituary: L.R.M. "Robin" Cocks (1938-2023)

Robin Cocks was arguably the world's most distinguished student of brachiopods, and his death on February 5th deprives the scientific world of a lifetime of expertise and scholarship. During his many years at the Natural History Museum, he rose to become Keeper of Palaeontology (1986-1998), but never lost his enthusiasm for science – indeed, he was still working on new papers a few weeks before he died. It seems unlikely that his equal will be seen again.

February 1992 (to celebrate G.A. Coopers's 90th birthday); left to right Ellis Owen, Robin Cocks and Howard Brunton.

Robin was of the generation that was young during WW2. After a gruelling time in a preparatory school he was educated at Felstead School. He was obliged to do National Service in the years that followed. He served his time in Malaysia, with the Royal Artillery, where the fierce sun took its toll on his typically English fair complexion (this may be implicated in the skin cancers he suffered from later in life). Oxford followed, and after gaining a first-class honours degree in geology he completed a DPhil (1965) on Silurian rocks and faunas supervised by Stuart McKerrow, who later became a friend and colleague. When he was appointed in the same year to the British Museum (Natural History) (as it was then) as Scientific Officer, Howard Brunton was also taken on to the staff. Apparently, they were such outstanding candidates that both were employed, which seems unimaginable today. Brunton was assigned the Upper Palaeozoic brachiopods and Cocks the Lower Palaeozoic. Robin was promoted to Senior Scientific Officer and then Principal Scientific Officer as his career progressed, and Ellis Owen completed the brachiopod 'team' with his expertise in Mesozoic species. It is sad to reflect that the brachiopods once had three full time specialists in the "BM" (as it was known) where now there are none.

From his appointment onwards, a steady stream of systematic papers on brachiopods were published from Robin's hand that continued until last year. By the mid-1990s he had become as expert on Ordovician as Silurian brachiopods, and eventually claimed to have named a new genus for every letter of the alphabet. His compass extended globally, from a secure base in the Silurian (Llandovery) of Britain, to a series of papers on the Ordovician of Kazakhstan with his long-time collaborator Leonid Popov. Such monographs may not be the height of fashion, but they will endure. At the same time, Robin was always anxious to describe himself as a geologist, and he enjoyed sorting out the stratigraphy of the Silurian rocks in Britain. He and McKerrow spent summers in Newfoundland attempting to apply the relatively new science of plate tectonics to the complex geology of that island, where the story of the vanished ocean Iapetus is preserved. Robin later became a central figure in the debate about exactly where to draw the boundary between the Silurian and Devonian Periods. A definitive volume of papers of the 'BM Bulletin' edited by Robin in 1990 helped secure the international retention of the British names of the standard chronostratigraphic Silurian subdivisions.

A recurring theme in Robin's research became the reconstruction of ancient geography when it became clear that continental distributions were very different in the Palaeozoic from those at the present day. This research burgeoned in the 80s and 90s in conjunction with the present writer, since brachiopods and trilobites taken together allowed new insights into the 'signatures' of ancient continents and their margins. After Robin reached the mandatory retirement age in 1998 he continued this theme, particularly with Professor Trond Torsvik in Norway, whose computer modeling permitted a more sophisticated treatment of ancient geography. Many new continental reconstructions were published during the first decade of the 21st century. The collaboration was summarized in a book published in 2017 by Cambridge University Press that has already become indispensable to palaeontologists and tectonic geologists around the world.

During Robin's time as Keeper of Palaeontology in the Natural History Museum he maintained a generally light touch, preferring to let his best scientists pursue their own line of research without his intervention, so long as they produced the 'goods', mostly in the form of published papers. Judging by external recognition it could be said that the Palaeontology Department at that time was at the zenith of its reputation, for example, having two Fellows of the Royal Society (later three) elected from the staff, which was previously unequalled. As an administrator, Robin liked to get the official stuff out of the way quickly – so that he could return to his beloved brachiopods. This business-like approach sometimes resembled brusqueness, and his deputies the ammonite specialists H. G. Owen or M. K. Howarth occasionally had to tactfully intercede. Despite his administrative burden Robin somehow managed to make huge contributions to the Brachiopoda for the Treatise on Invertebrate Paleontology – at that time edited by the forceful Sir Alwyn Williams. This was a testament to his organizational skills as well as his scholarly command and extraordinary memory. Over many years he had gathered specimens of the type species of brachiopod genera that came together in this definitive summary, which is likely to remain current for the foreseeable future.

Robin Cocks served many academic societies and international committees. On the palaeontological front he is the only person who has been president of all the appropriate British learned societies. He was president of the Palaeontological Association (1986-1988), a group with which he was concerned from its early days, and helped towards its current status as the leading organization of its kind in Europe. He was president of the Palaeontographical Society (1994-1998), which published several of his major papers on brachiopods. The pinnacle of his service to the geological community was arguably as president of the Geological Society of London (1998-2000), where he had previously been responsible for important decisions on the

independent future of its publishing arm that made a vital contribution to the survival of the Society. Finally, he presided over the Geologist's Association (2004-2006). On the international level he was a voting member of Silurian Subcommission of the IUGS for many years, and was a Commissioner of the International Commission on Zoological Nomenclature for two decades (1982-2002).

Robin had to cope with health problems that might have deterred a lesser soul. He had successful treatment for a facial cancer in 1984, but the radiotherapy from the procedure inadvertently 'killed' his jawbone, and in 2006 he was given an operation to replace it with an artificial substitute. Unfortunately, the nerves serving to enervate one side of his face were irretrievably damaged during the operation, paralyzing this area. Many secondary problems arose from this unfortunate accident, not least with voice projection, all of which he ignored with great courage. To his friends, he seemed indestructible during his 'retirement' years, when he did not allow any health impediment to interfere with his research: if anything, the brachiopods and palaeogeography served to keep him going.

Robin's contribution to science was recognized by the Geological Society by the award of their Coke Medal in 1995, the Dumont Medal of Geologica Belgica in 2003, and the Lapworth Medal of the Palaeontological Association in 2010. He was awarded an OBE in 1999. Away from his work, he was a devoted family man. He is survived by his wife Elaine (née Sturdy) whom he married in 1963, his three children and eight grandchildren.

By Richard Fortey, Lars Holmer and Leonid Popov

The type Wenlock team at Lower Hill Farm borehole, Wenlock Edge in 1973; left to right Mike Bassett, Robin Cocks, Charles Holland, Barrie Rickards, and Peter Warren.

SILURIAN RESEARCH 2022

NEWS FROM THE MEMBERS

(in alphabetical order)

B. Gudveig Baarli

Department of Geosciences, Wachenheim Science Center,18 Hoxsey Street, Williamstown, MA, USA.

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I am continuing with atrypid phylogeny and am also working with brachiopod associations from the Ordovician/Silurian boundary in the Oslo Region.

Publications: Baarli 2022; Baarli *et al.* 2022; Johnson and Baarli 2023

Chris Barnes

School of Earth and Ocean Sciences, University of Victoria, P.O. Box 1700, STN CSC, Victoria, BC V8W 2Y2, Canada.

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Chris Barnes, Canada, is slowly continuing Silurian conodont paleontology / stratigraphy / isotope geochemistry research. The main current projects being: a) Ordovician and Silurian conodont biostratigraphy, bioevents, eustasy, and thermal maturation (with Shunxin Zhang); and b) Early Silurian microvertebrate assemblages from the Cape Phillips Formation, Sheills Peninsula, Devon Island, Nunavut, Canada (with Susan Turner (Queensland Museum) and David Sprague (Calgary)).

Publications: Zhang and Barnes 2022

James E. Barrick

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“Retired” but still working on preparing finished Silurian projects for publication.

Publications: Barrick and Kleffner 2022

Carlton E. Brett

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In the past year, I continued working with several colleagues on Silurian sequence, chemo- and event stratigraphy and paleoecology of southern Laurentia and comparisons with other regions. Research relevant to the Silurian is divided into three project areas.

A) Research on Ordovician-Silurian Boundary Sequence and Chemostratigraphy:

With graduate student Cole Farnam, I am studying the Ordovician-Silurian boundary transition in eastern North America. We are studying the uppermost Cincinnatian (upper Katian) strata (Whitewater and Elkhorn formations) and have completed important new field study that further refined sea level, climatic and faunal changes that immediately preceded the great crash in biodiversity associated with latest Ordovician Hirnantian climate change and mass extinction.

In 2022, we were alerted to an undescribed section in Indiana by an outstanding amateur collector, Lincoln Shoemaker; our studies of the fauna and carbon isotopes show that this is a unique lentil of shale and limestone, probably equivalent to the Centerville Member in Ohio and is Hirnantian in age. This is the only fossiliferous Hirnantian section in the US east of the Mississippi River and its rich fossil assemblages, including corals, brachiopods, articulated crinoids, and trilobites, are under study. Dr. Jin Jisuo, (University of Western Ontario) is describing the brachiopods and Dr. Robert Elias (University of Manitoba) is studying the rugose corals. This exceptionally well preserved fossil assemblage, no doubt, includes several undescribed taxa and provides an important window into faunas that existed in eastern Laurentia in the immediate aftermath of the great Late Ordovician extinctions. The faunal assemblage is completely different from immediately underlying Cincinnatian (uppermost Katian) and similar to the Silurian faunas, which persist upward for some 5 million years. This is one of the most unique occurrences that I have studied in this area and will form a major component of the PhD dissertation of Cole Farnam in his final year of PhD studies. This assemblage will provide important insights into the post-extinction recovery in this critical interval.

The same outcrop sections also yield important new details on the Ordovician-Silurian boundary interval (Belfast Member) and lowest Silurian Rhuddanian Brassfield Formation through Aeronian so-called “Golden Brassfield” Formation (actually correlative with Oldham of Kentucky), which overlies a major regional unconformity that locally cuts out the Brassfield, Belfast and “Centerville” faunas. We are attempting to test the hypothesis that these units are preserved in a Hirnantian paleovalley in the limited region of eastern Indiana.

The chemostratigraphy, conodont biostratigraphy and faunas of these units are also being re-studied in collaboration with Chris Waid of the Ohio Geological Survey. Chris and I have continued to extend Upper Ordovician and Silurian correlations through the Ohio subsurface into New York, Ontario and other adjacent regions. We jointly presented a core-outcrop workshop for the Geological Society of America North-Central/Southeastern section meeting in Cincinnati, April 2022 and will do a somewhat similar workshop for the 60th Anniversary meeting of American Institute of Professional Geologists in Covington, KY in September 2023.

B) Ordovician-Silurian Echinoderm Faunas and Paleoecology: Dr. James Thomka (SUNY at Plattsburgh) and I are continuing study of the Paleoecology and organism interactions involving pelmatozoan (stalked) echinoderms. We continue to work on using crinoid stems to better assess the biodiversity and relative abundance of crinoid populations (using the weight [mass] of disarticulated columns of distinct species sorted from bulk collections). We are also working on manuscripts dealing with evolution of parasitic interactions in Ordovician to Silurian "cystoids"; the oldest definite parasitic interactions in the fossil record.

C) Stratigraphic Nomenclature: As At-large member of the North American Commission on Stratigraphic Nomenclature (NACSN), I worked with Dr. Robert Scott (retired from Amoco Corp), Ed Landing (NY State Geological Survey), and others on completing an entirely new portion of the Code dealing with Chemostratigraphy. We produced a revised proposal for chemostratigraphic units, which was voted in by a majority of the Commission, we have a paper, with the revised amendment to the North American Code of Stratigraphic Nomenclature, in press in the journal Stratigraphy; once done the code will be amended to include language on formal Chemostratigraphic units and procedures for establishing them.

Publications: Thomka and Brett 2021; Oborny *et al.* 2022

Xu Chen

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Publications: Chen *et al.* 2022b, 2023c

Carlo Corradini

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My work on Silurian conodonts and biostratigraphy continues. Most of the researches were devoted to the Carnic Alps, where I am investigating the Pre-Variscan Sequence (Upper Ordovician-lower Carboniferous). Studies on Silurian and Lower Devonian mainly focus on "Orthoceras limestones" and calcareous levels within black shales sequences, both studying new sections and updating data from classical localities.

A paper on a still poorly explored Silurian and basal Devonian sequences of SW Sardinia was published (Corriga *et al.* 2022). A summary on conodonts across the Silurian/Devonian boundary in Peri-Gondwana regions was published (Ferretti *et al.* 2022). The study of conodonts from Turkey is in progress (with F. Luppold and others).

Publications: Corriga *et al.* 2022; Ferretti *et al.* 2022

Maria G. Corriga

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I am working on conodont taxonomy and biostratigraphy across the Silurian-Devonian boundary mainly in the Carnic Alps and other North Gondwana regions.

In the Carnic Alps, researches mainly focus on the Silurian and Lower Devonian in various sectors of the chain, some of the results of which were presented at the European Conodont Symposium (ECOS), Utrecht 2022 (Corradini, Corriga and Pondrelli 2022. On the age of the Cardiola Formation (Ludlow) in the Carnic Alps (Austria and Italy): https://arts.units.it/handle/11368/3031058). A Pridoli sequence in Turkey is in study (with F. Luppold and others). In Sardinia a paper on the sequences cropping out in Perda S'altari area was published (Corriga *et al.* 2022). Also, a review paper on conodonts across the Silurian/Devonian boundary in Peri-Gondwana regions, and other areas was published (Ferretti *et al.* 2022).

Publications: Corriga *et al.* 2022; Ferretti *et al.* 2022

Bradley D. Cramer

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Our lab group continues to work on all things Silurian, including continuing to work on the Altajme drill core from Gotland, Sweden, that was drilled in 2015. We now have the first of several manuscripts out with data from the drill core with several more in the pipeline to come. Specifically, we are still working on the Ireviken and Mulde events from the core and will have a range of new data soon including more isotope geochemistry as well as some new radioisotopic dates from the core as well. Conodont and graptolite biostratigraphy of the core will also be along shortly.

Publications: Oborny *et al.* 2022; Shohel *et al.* 2022; Mills *et al.* 2023; Stolfus *et al.* 2023

G. Susana de la Puente

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I continue to work on chitinozoans and stratigraphy of Paleozoic basins from Argentina, including the Central Andean Basin and Precordillera. I have submitted a publication on Ordovician-early Silurian chitinozoans (under revision), and have been working more widely on Silurian chitinozoan results. In addition, I have been working on projects focusing on palynology and stratigraphy of Patagonia and Tandilia regions, in collaboration with paleontologists and sedimentologists. Furthermore, I have advised three undergraduate students during 2022, and started with three new students. Finally, I have been closely involved with the creation of the Doctorate in Geosciences at the National University of Comahue (https://fainweb.uncoma.edu.ar/index.php/carreras/posgrados/doctorado-en-geociencias/).

Annalisa Ferretti

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My Silurian research continues to be focused on the biosedimentology and paleoecology mostly of the Austrian Carnic Alps.

A global synthesis on the conodont occurrences along northern Gondwana at the Silurian/Devonian boundary was completed (Ferretti *et al.* 2022) to offer an efficient tool for locating the boundary level in carbonate facies.

Publications: Ferretti *et al.* 2022

Mansoureh Ghobadi Pour

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My work on rich early Aeronian trilobite, brachiopod and bryozoan faunas from the Derenjal Mountains, North-Eastern Central Iran and from Saluk Mountains of Southern Kopet-Dagh is still ongoing in cooperation with Caroline Buttler, Robert Owens and Leonid Popov. There is a considerable progress in work on the late Silurian (Ludlow – Pridoli?) brachiopod fauna of the Derenjal Mountains in the Tabas Region. It will be completed by the end of the year.

Publications: Ghobadi Pour *et al.* 2022; Álvaro *et al.* 2022

Volodymyr Grytsenko

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During 2022 I was involved in the revision of Silurian Cnidarians collections of the Podillian slope of the East-European Platform. The results described part of the collection which includes the finds from boreholes and outcrops in Podillian plate (west slope of Ukrainian Shield). A paper is now under revision by two specialists and will be published in the next volume of "Geo et Bio" (Transaction of National Museum of Natural History). Below is a summary of this research:

"Volodymyr Grytsenko started the collection in 1966 and is now ready to summarize the results. In the last fifty-five years he has accumulated a large collection of fossil Cnidarians from the Silurian, which resulted from long-term field geological expeditions involving the study of outcrops, cores of boreholes, and collecting fossils. The study involved more than fifty outcrops and one hundred boreholes on the territory of outcropped Podillian region and of the covered west slope of Ukrainian Shield from Volyn to the Zmeiny (Snake) Island. The collection consists of near ten thousand samples and six thousand thin sections of Cnidarians. Total number of studied samples with representatives of *Heliolitoidea* is 19 from 9 outcrops and 120 from cores of 37 boreholes. The described samples represent 3 orders, 1 superfamily, 8 families, 2 subfamilies, 16 genera, 20 species (9 new), and 1 new subspecies".

Before the war we expected to organize a field meeting in 2022 in cooperation with representatives of Ivan Ogienko National Pedagogical University and National Natural Park "Podillian Tovtry" in Kamianets-Podilsky town. But the Russian aggression was reason for delaying of any meetings owing to the danger of rocket and drone attacks in Ukraine.

Publications: Borisenko *et al.* 2022

Kathleen Histon

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I continue my studies on Silurian cephalopods, sea-level changes, oceanic cycles and biotic response in relation to use of the migrational pathways of pelagic faunas as a tool for timing of open seaways and microterrane position along the North Gondwana margin. At the moment working on papers related to the systematics of collections from the Graz Palaeozoic (Austria).

Bing Huang

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In 2022 I conducted extensive research on the phylogenetic evolution, morphospace variation, and ontogeny of Ordovician-Silurian brachiopods, including strophomenides, atrypides, and trimerellides, as well as Devonian ostracods, in collaboration with my colleagues and students. These researches resulted in the publication of five related papers that tell interesting stories about the evolution of brachiopods (and ostracods), including a rare case of a speciation process and the origin and early evolution of denticles, which is unique to brachiopod articulation. Additionally, I also collected brachiopod fossils from two new sections in Yunnan, South China, which provide information on the recovery and radiation of brachiopods after the LOME. Most of the brachiopod specimens have been identified, alongside graptolites containing key information on the horizon. During the year, I managed and reviewed 11 manuscripts for Acta Palaeontologica Sinica, completed a chapter for a popular science book, and wrote and revised over 80 items on brachiopods for a dictionary. As a result of my guidance, Wang Qian, my MSc student, graduated and received his degree. Chen Di, my PhD student, has almost completed the thesis and is scheduled to defend it soon.

Publications: Baarli *et al.* 2022; Wang and Huang 2022; Chen *et al.* 2023a, b

Markes E. Johnson

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After an interval of restricted travel during the covid-19 pandemic, fieldwork on the Lower Silurian of southern Norway was commenced in August 2022 and a manuscript was completed by the end of the year regarding an unusual occurrence of an enormous population of Stricklandia lens lens (brachiopods) preserved in growth position at Sandvika (west of Oslo). The paper will appear in the first issue of the Journal of Norwegian Geology for 2023 (Johnson and Baarli 2023). After a considerable delay for re-editing, my book-length manuscript under the title Islands in Deep Time – Ancient Landscapes Lost and Found is expected to be published by Columbia University Press in 2023. The book contains detailed descriptions of paleoislands from the Upper Ordovician on Canada's Hudson Bay as well as island paleogeography from the Upper Silurian of Inner Mongolia among other examples drawn from the entire Phanerozoic. Stay tuned for details.

Publications: Johnson and Baarli 2023

Dimitri Kaljo

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Dimitri Kaljo continued some studies on the Silurian bio- and chemostratigraphy of Baltica as an emeritus member at the geology department of the Taltech. The Covid pandemic slowed down different projects of cooperation with colleagues, so did last year military action, but we are looking forward to see a quick stabilization soon again. Podolian outcrops deserve that. My personal studies were devoted to the bio- and chemostratigraphy of the Lower Silurian of easternmost Latvia (a project led by O. Hints). Hopefully we can present our manuscript in a few months.

Last year I reported about an in press paper by myself et al., this has now been published (Kaljo *et al.* 2022) and is correctly cited here in.

Publications: Kaljo *et al.* 2022

Stephen Kershaw

Retired but with an honorary position at Brunel University, UK (please contact me by e-mail).

E-mail: Stephen.kershaw@brunel.ac.uk

Continuing research on Silurian stromatoporoids and reefs, with principal focus on writing up data from prior years.

The two online Figshare atlases given below (Kershaw 2022a, b) are provided as comprehensive resources published under Creative Commons licences that can be utilised by other researchers under Creative Commons rules.

Publications: Jeon *et al.* 2022a, b; Kershaw 2022a, b, c; Neuweiler *et al.* 2022

Tarmo Kiipli

Retired from the Department of Geology, Tallinn University of Technology, Ehitajate 5, 19086 Tallinn, Estonia.

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I am retired now. During the year 2022 I worked with topics not completed during employment time and posted three preprints in ResearchGate. Two preprints deal with volcanic ash beds and their sources. The third preprint discusses processes that caused carbon isotope excursions in the Paleozoic.

Publications: Kiipli 2022a, b, c

Anna Kozłowska

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I have been continuing my research on evolution, phylogeny and construction of tubaria of the retiolitids based on isolated material from Poland and Arctic Canada.

Further progress was made in the paper edition of the Treatise Chapter 26: Family Retiolitidae: Introduction, Morphology, and Systematic Descriptions in collaboration with Alf Lenz, Denis Bates and Jörg Maletz.

I continued work with Denis Bates on a paper about the retiolitid lineage *Paraplectograptus*. The paper is based on the detailed study made by Nancy Kirk and Denis Bates in the last century, as well as the more recent studies based on my well-preserved specimens from Poland. The best preserved, three dimensional specimens from Arctic Canada were donated by Alf Lenz. The paper is already published in Palevol (Bates *et al.* 2023).

Together with Alf Lenz and Mike Melchin I continue a project about the exceptionally well preserved membranes in retiolitids(Graptolithina) based on the best preserved, upper Homerian *Spinograptus* from the Arctic Canada and Poland.

During 2022 I was involved in a project on some extraordinary coexistence of possible dendroid graptolite with algae, Ludlow, Podolia. New manuscript “Coexistence of algae and a graptolite-like problematicum: a case study from the late Silurian of Podolia (Ukraine)” co-authored with Skompski S., Kozłowski W. and Łuczyński P. will be published this year in Acta Geologica Polonica.

Publications: Bates *et al.* 2023

Qi-jian Li

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Qi-jian Li is mainly working on Palaeozoic reefs and hypercalcified sponges (e.g., calathids, stromatoporoids and sphinctozoans). In 2022, I continued my sedimentological and paleoecological research on Ordovician-Silurian reefs. Apart from the colleagues in Nanjing, I am now working on Early Silurian reefs of South China with Prof. Axel Munnecke, Dr Stephen

Kershaw and Dr. Andrej Ernst. I also continue my collaborations focused on quantitative paleoecological analyses of reefs at the Ordovician-Silurian transition with several colleagues.

Publications: Guo *et al.* 2022; Mao *et al.* 2022

Steve LoDuca

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Work continues on the taxonomy, phylogeny, paleoecology, and taphonomy of early Paleozoic macroalgae, including description of a new species of noncalcified dasycladalean alga from the Silurian of Michigan. The next frontier is to examine whether compression fossils of early Paleozoic macroalgae might preserve some remnants of the original biomolecules, and it is hoped that work in this regard, which will include Silurian specimens, will commence soon.

Publications: LoDuca *et al.* 2022

David K. Loydell

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Again, teaching duties, etc. left limited time for research in 2022. Most research time was spent contributing biostratigraphical data to various geochemically oriented projects and refereeing papers. 2023 promises, at last, to offer more time for research activity – a return to looking at graptolites.

Publications: Sproson *et al.* 2022

Peep Männik

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I continue to work on evolution, taxonomy and palaeoecology of conodonts, conodont-based high-resolution stratigraphy, bioevents and palaeogeography. I am also interested in sequence stratigraphy, palaeoclimatology and evolution of sedimentary basins. Joint studies together with colleagues from Estonia, Czech Republic, Germany, Poland, Sweden, U.K. and USA on

evolution and high-resolution stratigraphy of the Early Palaeozoic faunas and sedimentary basins on different palaeocontinents are going on.

Publications: Hints *et al.* 2022; Yan *et al.* 2022b

Christopher M. McCauley

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I am currently working on Middle Silurian (Ludlow, Pridoli) - Early Devonian (Lochkovian) biostratigraphy and taxonomy of agglutinated foraminifera from South-Central Oklahoma. The agglutinated foraminiferal tests are abundant in many samples, showing a diverse fauna that changes significantly between the Middle Silurian and Lochkovian. A first goal is to identify and describe distinct foraminiferal assemblages that may be useful in biostratigraphy. A second goal is to investigate how agglutinated foraminifers rebounded following the Lau Event and Klonk Event. A third goal is to update the taxonomy of Silurian - Devonian agglutinated foraminifera found in the samples. The foraminiferal fauna may also be compared with the fauna of the underlying Wenlock-aged Clarita Formation.

In 2022, with the help of Merlynd and Galina Nestell, I had an article published on transmitted light observations of foraminifera in which six Ludlow and Pridoli agglutinated foraminifera were illustrated, as well as foraminifera from other periods.

Publications: McCauley *et al.* 2022

Tõnu Meidla

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I am teaching several courses related to historical geology and palaeontology at the University of Tartu, Estonia, and continue working on several aspects related to the Silurian System: regional stratigraphy, stable isotopes and events. I have also several projects in progress on ostracod taxonomy, distribution and biostratigraphy in the Silurian. We are continuing an integrated study of several Lithuanian and Latvian core sections in cooperation with S. Radzevičius, A. Spiridonov and S. Petrukonė. Together with O. Hints and P. Männik, I have an overview paper on the Silurian stratigraphy of Estonia in progress.

Publications: Rinkevičiūtė *et al.* 2021; Meidla *et al.* 2023; Radzevičius *et al.* 2023

Michael Melchin

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I officially retired in June, 2022, but I remain active as a Senior Research Professor at my university. I am currently working on several projects related to graptolite biostratigraphy and biodiversity, as well as chemostratigraphy through the Late Ordovician and Early Silurian, particularly in North America, China, and Europe, collaborating with Zongyuan Sun, Junxuan Fan, Charles Mitchell, Chris Holmden, Gordon Love, and others. I completed a paper proposing Rheidol Gorge, Wales, as a potential GSSP for the base of the Aeronian Stage, which was published in early 2023, with Jerry Davies, Jan Zalasiewicz, Thijs Vandenbroucke and others. I am collaborating with Erik Sperling on Ordovician to Lower Devonian graptolite biostratigraphy and chemostratigraphy in Yukon, Alaska, and Arctic Canada. I am also working with Petr Štorch and others on several projects related to morphologic and phylogenetic analyses of early Silurian graptolites. However, my main retirement projects relate to describing the many collections of graptolites that are in my lab that have not yet been fully described.

Publications: Koch *et al.* 2022; Sun *et al.* 2022; Melchin *et al.* 2023

Giles Miller

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I continue, slowly, to work up the conodonts from the Ludfordian-Gorstian stratotype section at Sunnyhill Quarry, Ludlow. The Natural History Museum have recently acquired a collection of Silurian conodonts from the University of Leicester that represents the research collection of the late Prof. Richard Aldridge. This is available to study for anyone interested. I hope to publish a listing on our data portal in the next couple of years.

Publications: Williams *et al.* 2023

Silvio Peralta

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In the period 2020 to 2022 I carried out the Research Project "Estudio estratigráfico y bioestratigráfico de Alta Resolución del límite Ordovícico-Silúrico en la Precordillera Central

y Oriental de San Juan, Argentina. Implicancias Paleoambientales, Paleoclimáticas y Paleogeográficas". This project was funded by the National University of San Juan (UNSJ), Argentina. Associated research was presented at Goldschmidt 2022 (Sial et al. 2022. Late Ordovician–early Silurian transition recorded in the Argentine Precordillera: insights from C, N, Hg isotopes and enhanced-Hg chemostratigraphy.
http://cbg2017anais.siteoficial.ws/st13/ID6054_110650_52_Sial_et_al.pdf).

In addition, I was the advisor Professor of the Ph.D. Thesis "Estratigrafía de Alta Resolución de la transición Ordovícico-Silúrico de la Precordillera de San Juan, Argentina", defended by Geologist Jessica Gómez Sánchez in November 16 -2022.

Publications: Gómez *et al.* 2022

Ian Percival

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Much of my available time in 2022 was taken up with co-editing a major global synthesis of the Ordovician System for two forthcoming Special Publications of the Geological Society of London, and contributing several chapters to this. These necessarily involved looking beyond the Ordovician into the early Silurian. The volumes are currently in press and are due to be published in mid-2023, so I will include these contributions next year. In the second half of 2022 I collaborated with Yong Yi Zhen (Geological Survey of NSW) in a multi-author project compiling the palaeontology of the southern Cobar Basin in central New South Wales, the stratigraphy of which spans the Ordovician and late Silurian to mid Devonian. The report was completed in January 2023, so again will be reported in next Year's Silurian Times.

Publications: Yan *et al.* 2022a

José Manuel Piçarra d´Almeida

LNEG - (Laboratório Nacional de Energia e Geologia / Portuguese Geological Survey). Unidade de Geologia, Hidrogeologia e Geologia Costeira. Ap. 14, 7601-909 Aljustrel, Portugal.

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I am retired, but still collaborating with the LNEG (Portuguese Geological Survey).

Publications: Silvério *et al.* 2021

Leonid Popov

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My Silurian studies are focused on the Llandovery brachiopod faunas of Kazakhstan and Iran. This year I pay main attention to the study of the Ludlow – Pridoli? brachiopod fauna from the Shirgesht Region of Central-East Iran.

Publications: Ghobadi Pour *et al.* 2022; Álvaro *et al.* 2022

Sigitas Radzevičius

Department of Geology and Mineralogy, Institute of Geoscience, Vilnius University, M.K. Čiurlionio 21/27, LT-03101, Lithuania.

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I am working on the taxonomy, stratigraphic distribution, diversity, disparity, and phylogeny of Silurian graptolites. Most of my research is concentrated on the construction of high-resolution Silurian time scales by means of integrated (bio-, chemo-, cyclo-) stratigraphy. I'm integrating stratigraphic models, taxonomic data, geochemical, and geophysical proxies in order to understanding the drivers of Silurian global extinction and turnover events.

Publications: Rinkevičiūtė *et al.* 2021; Želvys *et al.* 2022; Whittingham *et al.* 2022; Grendaitė *et al.* 2023; Radzevičius *et al.* 2023

David Ray

Honorary position at the University of Birmingham, UK (please contact me by e-mail).

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During 2022, my research that touched upon the Silurian was focused upon the creation of a Phanerozoic eustatic sea level curve, involvement in the publication of a stratigraphical techniques text book, and research into the Telychian and Sheinwoodian of the Midland Platform, UK. The details of these projects are given below:

A) Industry-led (Halliburton) research into Phanerozoic eustasy.

I have recently completed an industry-led, and decade-long, review of Phanerozoic long- and short-term sea level change. An outline of the workflows and results of this project was presented by Mike Simmons at a meeting on Sea-Levels: Past, Present & Future, held at the Geological Society of London: -

(https://www.researchgate.net/publication/366500507_Building_a_eustatic_sea-level_curve_from_the_rocks_up). Note I will be leaving Halliburton in April 2023, but I remain active as an Honorary Research Fellow at the University of Birmingham.

B) Involvement in the publication of a stratigraphical techniques text book.

My only major publication of the year was a chapter on sequence stratigraphy, which included a Silurian Case Study, and was co-authored with Angela Coe. The wider text book (Deciphering Earth's History: the Practice of Stratigraphy) is designed for a wide audience ranging from advanced level undergraduates to professional practitioners wishing to understand and use a range of stratigraphical techniques (https://www.geolsoc.org.uk/GIP001).

C) Research into the Telychian and Sheinwoodian of the Midland Platform, UK.

I have been collaborating with Alan Thomas, Ken Ratcliffe and Jane Veevers to complete a study of the late Llandovery Coralliferous Formation of SW Wales. A notable feature of this study is the identification of a marked paleotopography, which is transgressed during the Telychian, and thereby provides an estimate of the magnitude of sea level rise. More broadly, I continue to research the transgression of the Midland Platform during Telychian and Sheinwoodian times with the aim of establishing a sequence stratigraphic framework and relative sea level curve.

Publications: Coe and Ray 2022; Ray and Dlubak 2022

Jiayu Rong

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Publications: Chen *et al.* 2023a

Mike Rosenbaum

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Covid has continued to restrict activities but I've been able to provide a contribution to a substantial volume on the natural history of Downton Gorge just north of Ludlow. Appendix 1 is based on the LRG excursion led by the late Charles Holland in 1982 and was published with the permission of the current Chair.

Publications: Rosenbaum 2022

Thomas Servais

UMR 8198 Evo-Eco-Paleo CNRS-University of Lille. Cité Scientifique, F-59655Villeneuve d'Ascq, France.

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Thomas Servais continues work on the early Palaeozoic marine and terrestrial radiations. The biodiversity dynamics of the Palaeozoic phytoplankton, including the Silurian, was published by Kroeck et al. (2022). Based on these datasets, we now work on the spatial distribution of the middle and late Palaeozoic phytoplankton (Silurian to Permian), in the frame of the PhD project of Eiver Manzano. The diversity of land plants, from its origins in the Ordovician, are studied as well, with two publications on the diversity of Silurian-Devonian land plants (Capel *et al.* 2022, 2023).

Publications: Capel *et al.* 2022, 2023; Kroeck *et al.* 2022

David Siveter

School of Geography, Geology & the Environment, University of Leicester, Leicester, LE17RH, UK.

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Continued work on a range of species from the Herefordshire Lagerstatte (with colleagues Derek Siveter, Derek Briggs and Mark Sutton) and Silurian ostracods, especially myodocopes, world-wide.

Publications: Siveter 2022; Williams *et al.* 2023

Ladislav Slavík

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In 2022 most activities were concentrated on Mid-Palaeozoic global correlation and late Silurian - early Devonian conodont biostratigraphy. A manuscript summarizing conodont indexes around the S-D boundary in Northern Gondwanan areas has been finished and published, as well as paper proposing the subdivision of the Přídolí Series. The official proposal

for the Přídolí subdivision is in preparation. Conodont sampling of several sections of Wenlock age in the Prague Synform in cooperation with Petr Štorch continued.

Publications: Ferretti *et al.* 2022; Manda *et al.* 2023

Petr Štorch

Department of Palaeobiology and Stratigraphy, Institute of Geology of the Academy of Sciences of the Czech Republic. Rozvojová 269, Prague, CZ 165 00, Czech Republic.

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Studies related to Aeronian, Telychian and Homerian GSSP replacement candidate sections and proposed division of the Přídolí Series continued in the frame of a three-year project focussed on biostratigraphy and faunal dynamics of Silurian pelagic biota in the Prague Basin. A comprehensive study on graptolite biostratigraphy and biodiversity dynamics in the Silurian System of the Prague Synform has been published online in Bulletin of Geosciences. Work on black-shale dominated Sheinwoodian-Homerian succession exposed in the Kosov Quarry, carried out with Š. Manda, L. Slavík and Z. Tasáryová continued and a joint paper is under preparation. A paper devoted to Gorstian graptolites and other pelagic macrofauna of the Prague Basin, co-authored by Š. Manda and Z. Tasáryová, is nearly complete. Collaboration with J. Roqué Bernal, Z.Y. Sun, M.J. Melchin and D.K. Loydell continued in the frame of several informal projects related to Silurian graptolites and stratigraphy. Another project, led by J. Bek and dealing with the earliest land plants from Silurian volcanic islands of the Prague Basin, is in progress. I am supervising Zuzana Strossová in her PhD project on lower Telychian graptolites and high-resolution stratigraphy.

Publications: Bek *et al.* 2022; Sun *et al.* 2022; Štorch 2022; Manda *et al.* 2023

Alan Thomas

Earth Sciences (GEES), University of Birmingham, Birmingham, B15 2TT, UK.

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Alan has been collaborating with Dave Ray, Ken Ratcliffe and Jane Veevers to complete a further study of the late Llandovery Coralliferous Formation of SW Wales. The integration of chemostratigraphical, sedimentological and faunal data facilitate the recognition of a series of changes in relative sea-level that occurred during the flooding of this part of the Welsh Basin margin in late Llandovery times. Relief on the unconformity surface allows the overall magnitude of sea-level rise to be estimated.

Petra Tonarová

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In 2022, I returned to fulltime position in the Czech Geological Survey in Prague. We have published a paper on Wenlock palynomorphs from the Prague Basin. The samples were from a locality where the oldest vascular plants were found (Bek *et al.* 2022). I, together with my colleagues, continued also to work on a study concerning a change in the scolecodont assemblage below and above the Lau Event (Ludlow) in the Prague Basin (paper in progress).

Publications: Bek *et al.* 2022

Susan Turner

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Dr Susan Turner is working on Silurian thelodonts and other microvertebrates such as early ‘sharks’ from sites in Australia, Canada, Morocco, Pakistan, UK, USA (Pennsylvania, Wisconsin). In co-operation with colleagues Carole Burrow (Australia) and Mike Murphy (USA), a paper on Late Silurian vertebrates from Birch Creek II section, Roberts Mountains, Nevada is now in press with Paleobios. With David Sprague and Chris Barnes (Canada), she is working on Early Silurian microvertebrates from the Cape Phillips Formation, Sheills Peninsula, Devon Island, Nunavut. She is describing thelodont scales from Ireland and W Scotland in conjunction with Jason Noble, who found scales on Kerrera, and Martin Simpson (Durham University). Sue is still working on in partnership with Carole Burrow (QM) and Pat Conaghan (MUCEP), on the vertebrate microfossils in sediments from the late Silurian to Middle Devonian in the Mossgiel-DDH1 core from the Darling Basin, western NSW.

She went to her first online conference for the International Symposium on Early/Lower Vertebrates in Valencia in June where she prepared a poster on Ordovician, Silurian and Devonian thelodont scales. Sue attended the Memorial day of Hommage for Professor Emeritus Dr Alain Blieck in Villeneuve d’Ascq in September organised by his colleagues at the Société géologique du Nord. Here she gave a talk entitled “Alain Blieck and the vertebrates. Memories of Sue Turner; the day’s proceedings will be put online."

Publications: Turner 2022; Burrow *et al.* In press

Thijs R. A. Vandenbroucke

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Thijs Vandenbroucke remains interested in reconstructing the Silurian palaeoclimate and palaeo-environment. Julie De Weirdt and Tim De Backer are finalizing their PhD research projects with me at UGent. Julie focusses on geochemistry and palynology of the Upper Ordovician - lower Silurian in N. America while Tim uses similar methods in the upper Silurian and Devonian. Carolina Klock continues her PhD project focussing on the palynology of the Silurian Mulde event, currently using material from the USA Midwest. Iris Vancoppenolle started her PhD project focussing on the palynology of the Ireviken event, with a focus on Gotland. Nick Van Faals joined the lab to pursue a PhD project on chitinozoan ecology and will partly be working on Silurian sections. These are projects in collaboration with Poul Emsbo (USGS), Patrick McLaughlin (Illinois Geol. Survey), Mikael Calner (ULund), Alyssa Bancroft (UIowa), Mark Williams (ULeicester) and André Desrochers (UOttawa). Mathilde Bon is a joint PhD student between UGent and ULille, co-supervised by Kevin Lepot, and investigates the organic geochemistry of, amongst others, Silurian palynomorphs. MSc student Daan De Vos works on limestone-marl rhythmites from Gotland, co-supervised by Axel Munnecke (UErlangen). The other members of the lab, including PhD student Cristiana Esteves and postdoc Dr. Thomas Wong Hearing pursue their interests in the Cambrian-Ordovician, but remain involved in various Silurian side projects. MSc student Rosalia Alba Vittiglio investigates the palynology of the Hirnantian of Missouri. PhD student Joana Rosin focusses on the Triassic-Jurassic, co-supervised by Bas van de Schootbrugge (UUtrecht).

Our HFSP (The Human Frontier Science Program) funded project is a collaboration between my lab, Bas van de Schootbrugge (UUtrecht), Barry Lomax (UNottingham) and Cindy Looy (UC Berkeley), continues into 2023, and focusses on teratology in microfossils as a proxy for understanding mass-extinctions through time. 2022 saw the start of an FWO (Research Foundation Flanders) that is a collaboration between myself, Poul Emsbo (USGS) and Patrick McLaughlin (Illinois Geol. Survey) focussing on Silurian biogeochemical events. A second and new FWO grant just started in 2023, between the UGent lab, Poul Emsbo and Appy Sluijs (UUtrecht) and will focus on stable carbon isotope geochemistry in the Ordovician and Silurian. We will be recruiting two new PhD students on this grant in 2023.

Publications: Melchin *et al.* 2023

Jacques Verniers

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In 2022 most activities were concentrated on:

Revision of the PhD of Jan Mortier (2014) for the Memoirs of the Geological Society of Belgium (submitted jan 2022);

Review of the Silurian in Belgium after 20 years of research for Geologica Belgica (working title);

Revision of the Silurian lithostratigraphic units, 2022, Belgium for Geologica Belgica (working title).

Olev Vinn

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I have been working on the evolution of symbiosis, predation, bioerosion and encrustation in the Silurian. I am also working on the palaeontology of problematic calcareous tubeworms from the Palaeozoic (e.g., cornulitids, tentaculitids, microconchids etc.) and evolution of tubeworm biomineralization. My other research interests include trace fossils of the Silurian of Estonia and beyond.

Publications: Borisenko *et al.* 2022; Jeon *et al.* 2022b; Thomka *et al.* 2022; Vinn 2022; Vinn *et al.* 2022

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In 2022, one paper was completed and published online, concerning a revised stratigraphy of the Ordovician-Silurian boundary strata in the western Yangtez region, South China. I will continue to work on the Late Ordovician-early Silurian rugose corals.

Publications: Wang *et al.* 2022b

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Due to the impact of the epidemic in 2022 the energy of my Ordovician-Silurian research group was mainly contributed to the compilation and publication of a Chinese stratigraphic lexicon (Early Paleozoic) and to inhouse research and fossil identification. A small amount of field work focuses on graptolite bearing black shales of the Longmaxi Formation (Lower Llandovery) in the eastern Yangtze Gorges area and west Hunan.

Publications: Wang *et al.* 2022a

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I was working mainly on the Ordovician stratigraphy and brachiopods, but, together with my domestic and international colleagues, I also conducted some Silurian related investigations in 2022. One of the major achievements we had in 2022 is the publication of a monograph <<Stratigraphical Golden Spikes--Critical Points in the Evolution of the Earth>>. Within this book, there is a chapter that is particularly on the Silurian GSSPs. In this chapter, all seven Silurian GSSPs are introduced in great detail including not only the academic contents, but also all related stories as well as those key problems of each GSSP. Some suggestions to solve these problems are given as well in the book.

Publications: Yan *et al.* 2022b; Zhan *et al.* 2022

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Yuandong Zhang is continuously working on:

(1) Systematic palaeontology and biostratigraphy of the late Katian to Rhuddanian sponges and graptolites (Anji Biota) in Anji, Northwestern Zhejiang Province, SE China. This work has been financially supported by President's International Fellowship Initiatives program (PIFI) and a grant from NSF of China (2018-2021). In the Anji area, a complete graptolite succession has been revealed based on a big collection of specimens obtained in the past years, including *Dicellograptus complexus*, *Paraorthograptus pacificus*, *Metabolograptus extraordinarius*,

Metabolograptus persculptus, *Akidograptus ascensus*, and *Parakidograptus acuminatus* biozones. A highly diverse (over 100 species), deep-water sponge-dominated community of latest Hirnantian age has been recovered, shedding lights on the survival dynamics in the aftermath of the End-Ordovician mass extinction. This work was jointly carried out with Drs. Joseph Botting and Lucy Muir from UK.

(2) Systematic palaeontology of Silurian (Telychian, Ludlow and Pridoli) graptolites from limited outcrops around Junggar Basin, Xinjiang, northwestern China, together with Chen Xu and some other Chinese colleagues from NIGPAS and China University of Geosciences (Wuhan). A palaeontological study of some graptolites from the basin has turned out as a manuscript for Journal of Paleontology in early 2023, while more studies are still ongoing. A palaeontological study of the Silurian (Telychian) graptolites from Xainza area, Tibet, based on specimens collected in the summer, 2021, during a 4-week excursion to Tibet, is ongoing.

Publications: Muir *et al.* 2021; Chen *et al.* 2022a; Jeon *et al.* 2022a; Zhang *et al.* 2022

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In 2022, together with my colleagues in IVPP, CAS, I was mainly working on the Siluro-Devonian vertebrate paleontology and relative stratigraphy, supported by the National Natural Science Foundation of China and the Strategic Priority Research Program of the Chinese Academy of Sciences. Two fossil fish repositories in the early Silurian strata in southeastern Chongqing and northeastern Guizhou have been discovered. The placoderm *Xiushanosteus mirabilis* and the chondrichthyan *Shenacanthus vermiformis* from southeastern Chongqing represented the oldest complete jawed vertebrates from the early Silurian of China, which reveal a previously unseen diversification of jawed vertebrates in the early Silurian and provide detailed insights into the whole-body morphology of the jawed vertebrates of this period. The chondrichthyans *Fanjingshania renovata* (based on the remains of a chondrichthyan, including the dermal plates, scales and fin spines) and *Qianodus duplicis* (based on the isolated tooth whorls) were extracted from bone bed samples of the Rongxi Formation at Shiqian, northeastern Guizhou. The former provided the strongest support yet for a proposed early Silurian radiation of jawed vertebrates before their widespread appearance in the fossil record in the Lower Devonian series, and the latter represented the oldest gnathostome teeth. My other academic activities during 2022 can be represented by the study on the Chinese armoured jawless vertebrates and their biostratigraphy together with my colleagues in IVPP, CAS. Three of the oldest eugaleaspiform fishes from the lower Telychian (Llandovery, Silurian) Qingshui Formation in Jiangxi Province of South China were described. *Qingshuiaspis junqingi*, *Anjiaspis ericius* and *Jiangxialepis jiujiangensis* represent the oldest and most primitive fossil occurrences of Eugaleaspiformes (Galeaspida, Agnatha) in the marine Lower Red Beds (LRBs) of the Silurian in South China. Combined with all the Silurian fossil fishes and fish-bearing

beds in South China, we mainly discussed the subdivision, correlation and geological age of the Silurian LRBs in the Yangtze Region.

Publications: Andreev *et al.* 2022a, b; Shan *et al.* 2022a, b, c; Zhu *et al.* 2022a, b

RECENT PUBLICATIONS

Please note that a few publications are from 2021 or even earlier, as they were not included previously in the Silurian Times. In addition, some papers are dealing with Ordovician and Devonian topics by members of ISSS. There are also a few papers in the list that are in press or online.

Álvaro, J.J., Ghobadi Pour, M., Sánchez-García, T., Kebria-ee Zadeh, M.-R., Hairapetian, V. and Popov, L.E. 2022. Stratigraphic and volcanic signatures of Miaolingian-Late Ordovician rift pulses in the Alborz Mountains, northern Iran. *Journal of Asian Earth Sciences*, **233**, 105240, https://doi.org/10.1016/j.jseaes.2022.105240.

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