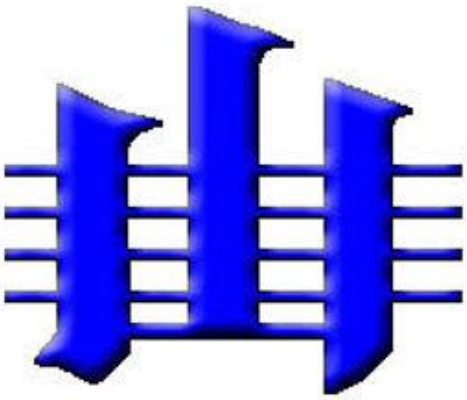

International Commission on Stratigraphy

ANNUAL REPORT 2024

Appendix 1

Reports by all Subcommissions

International Commission on Stratigraphy
Subcommission on Quaternary Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Quaternary Stratigraphy (SQS)
Submitted by: ***Adele Bertini, Chair SQS***

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY
1. Chronostratigraphic subdivision of the Quaternary System/Period facilitated by the intercalibration of biostratigraphies, construction of integrated zonations, and recognition of global datum points, allowing correlation worldwide and between terrestrial and marine sequences.

2. Definition of Series/Subseries/Stage and, where appropriate Substage, boundaries through the selection of recommended GSSPs.

3. Promoting SQS's activities within the wider Quaternary geoscience community through publications, symposia, and the SQS website, and creating opportunities to study and compare stratigraphic sections by means of field meetings.

4. The objectives satisfy the IUGS mandate of fostering international agreement on nomenclature and classification in stratigraphy; facilitating international co-operation in geological research; improving publication, dissemination, and use of geological information internationally; encouraging new relationships between and among disciplines of science that relate to Quaternary geology world-wide; attracting competent students and research workers to the discipline; and fostering an increased awareness among individual scientists world-wide of those related programs being undertaken.

3. ORGANIZATION – Interfaces with other international projects/groups
SQS works closely with the International Union for Quaternary Research (INQUA), which represents and serves the interests of Quaternarists worldwide. INQUA provides advice and crucial feedback on the stratigraphic needs of the wider Quaternary community. Prof. Maria Sánchez-Goñi, a voting member of the SQS and Vice-President of INQUA, ensures direct and effective communication on stratigraphic matters. This collaboration is further strengthened by Prof. Helen Roberts, also an SQS voting member and Vice-President of INQUA's SACCOM Commission, and Prof. Adele Bertini, Chair of the SQS and Vice-President of SACCOM. To enhance information exchange, an account of SQS progress and future plans will be published in the INQUA Newsletter, (Quaternary perspectives) with further initiatives planned to commence in 2025.

3a. Current Officers for 2024-2028:

Chair: Professor Adele Bertini
Vice-Chair: Professor Liping Zhou
Secretary: Professor Fabienne Marret-Davies

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

INQUA provides valuable feedback and guidance on SQS activities. Its Stratigraphy and Chronology Commission (SACCOM) potentially offers modest financial support through its grants program, aiding the work of the SQS. Collaborative activities are planned with SACCOM in 2026 to provide updates on the 2023–2025 GELSTRAT initiatives (Gelasian GSSP; Monte San Nicola, Sicily) and to engage researchers studying sedimentary successions in other geographical regions for useful comparisons and correlations.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024

- Much of 2024 was dedicated to the **Anthropocene proposal**, which, once received (01.11.2023), was carefully analyzed and thoroughly discussed within the SQS, incorporating detailed evaluations and feedback from voting members. In March 2024, SQS voted on the formalization of a new Quaternary chronostratigraphic/geochronologic unit: Anthropocene series/epoch with associated Crawfordian stage/age. The AWG proposed formalizing the Anthropocene as series/epoch, terminating the Holocene Series/Epoch with a single Crawfordian stage/age. To support the GSSP, the AWG proposed three Standard Auxiliary Boundary Stratotypes (SABSs) and eight reference sections. The proposal, not having received at least 60% of the votes, was not approved (04.03.2024). The Anthropocene Working Group was automatically dissolved upon fulfilling and completing its objective.

- **Participation in Busan 2024 IUGS Congress**:

1. *Special sessions IGC 2024 sponsored by SQS*

Head, M.J., Caruso, A., **Bertini, A.**, Maiorano, P., Radmacher, W. (conveners), 2024. A global perspective on the Neogene–Quaternary (Pliocene–Pleistocene) boundary. Session T2.4. 37th International Geological Congress, August 25–31, BEXCO, Busan, South Korea.

Head, M.J., Zalasiewicz, J.A., **Bertini, A., Zhou, L.** (conveners), 2024. Current and future directions in Quaternary chronostratigraphy. Session T2.3. 37th International Geological Congress, August 25–31, BEXCO, Busan, South Korea.

2. *Business meeting of the ICS Subcommission Chairs Meeting (26.08.2024).* Participation (Adele Bertini and Martin Head).

3. *Business meeting of the ICS Subcommission on Quaternary* Stratigraphy (28.08.2024). Conveners: Martin J. Head, Liping Zhou, Adele Bertini. Adele Bertini presented an update of SQS activity

4. *Talks given at IGC 2024 in SQS-led sessions*:

Bertini, A., Niccolini, G., Tabbabi, H., 2024. Vegetation dynamics and climate changes during the Onset of Northern Hemisphere Glaciation: Insights from the Monte San Nicola Section (central Mediterranean). 37th International Geological Congress, Busan, South Korea, 25–31 August. 333-334.

Head, M.J., 2024. A ~426 ka Antarctic methane jump at the onset of MIS 11 could mark a prospective second stage for the Middle Pleistocene Subseries. 37th International Geological Congress, Busan, South Korea, 25–31 August.320-321.

Head, M.J., Addante, M., Bertini, A., Girone, A., Herbert, T.D., Maiorano, P., Marino, M., Niccolini, G., Radmacher, W., Roberts, A., Scopelliti, G., Tabbabi, H., Uchman, A., Caruso, A., 2024. Paleoenvironmental changes across the Neogene–Quaternary boundary at the Monte San Nicola GSSP, near Gela, Sicily – an update of the international program GELSTRAT. Keynote talk. 37th International Geological Congress, Busan, South Korea, 25–31 August.331-332.

Radmacher, W., **Head, M.J.**, Caruso, A., 2024. 'Nicola' bed deposition at the onset of the Quaternary ~2.58 Ma, Monte San Nicola, southern Sicily – geological background. 37th International Geological Congress, Busan, South Korea, 25–31 August. 329-330.

5. *Posters at IGC 2024 in SQS-led sessions*:

Addante, M., **Bertini, A.,** Girone, A., Maiorano, P., Marino, M., Niccolini, G., Scopelliti, G., Tabbabi, H., Caruso, A., 2024. Climate variability and biostratigraphic constraints at the Neogene–Quaternary boundary at the Monte San Nicola type-section, Sicily. 338-339.

- **Participation to the SEQS Meeting** - Quaternary stratigraphy and terrestrial carbonates: climate, tectonic and humans driven landscape changes Gavorrano, Italy, 28th September – 2nd October 2024. INQUA Funded Project 2444- EQ – European Correlation of Quaternary Stages Boundaries.
  Adele Bertini served on the Organizing and Scientific Committee and presented an update on the SQS Subcommission.

- SQS publications and conference abstracts:

(a) Published/submitted papers in thematic set on GSSP Gelasian:

Addante, M., Maiorano, P., Scopelliti, G., Girone, A., Marino, M., Trotta, S., Caruso, A. (2024). Climate- induced surface water variability at Monte San Nicola type-section (Sicily, southern Italy): New data across the Gelasian GSSP. *Palaeogeography, Palaeoclimatology, Palaeoecology, 634, 111907.*

Fasone, S., Scopelliti, G., Baudin, F., Caruso, A. (2024). Chemostratigraphy and mineralogical characterization of Piacenzian sapropels cluster A (2.75-2.57 Ma) in the Gelasian GSSP type-

section of Monte San Nicola (Sicily, Italy): paleoenvironmental and paleogeographic implications. *Marine and Petroleum Geology, 107131*.

Addante, M., Herbert, T. D., Girone, A., Caruso, A., Marino, M., Scopelliti, G., Maiorano, P. (2024). Monsoon variability and high latitude climate signals in the central Mediterranean at the Pliocene–Pleistocene transition: the Gelasian Stratotype Section (Monte San Nicola, Sicily). *Global and Planetary Change.* Under review. Manuscript number: GLOPLACHA-D-24-00736.

(b) Published/submitted papers in thematic set on Anthropocene:

Aquilina, L., Gaillardet, J., Magny, M., Roques, C. & Zalasiewicz, J. 2024. Non, les scientifiques de la Terre ne rejettent pas l'anthropocène. *Le Monde*, May 2, 2024.

Aquilina, L., Jeandel, C., Poirier, C., Roques, C., Grinevald, J., Zalasiewicz, J., Gaillardet, J., Head, M.J., Magny, M., Wallenhorst, N. and Turner, S. 2024. L'anthropocène, un objet frontière qui signifie plus qu'une tranche de temps géologique. *The Conversation*, October 28, 2024.

Edgeworth, M., Gibbard, P., Walker, M., Merritts, D., Finney, S., Maslin, M. 2024. The stratigraphic basis of the Anthropocene Event. *Quaternary Science Advances* Accepted Date: 9 May 2023 https://doi.org/10.1016/j.qsa.2023.100088

Ellis, E., Gibbard, P. 2024. Anthropocene stand does not reduce climate concern. *New Scientist* 3476, 31 January 2024. https://www.newscientist.com/letter/mg26134760-300-anthropocene-stand-does-not-reduce-climate-concern/.

Koster, E., Gibbard, P. & Maslin, M. 2024. The Anthropocene Event as a Cultural Zeitgeist in the Earth-Human Ecosystem", *Journal of Geoethics and Social Geosciences*, 1, 1–41. doi:10.13127/jgsg-43.

Koster, E. & Gibbard, P.L. 2024. The Anthropocene Event as a holistic context for Earth Governance. Abstract Submission #1531314 - AGU24.

Koster E. & Gibbard, P. 2024. Geology of Mankind to Transforming our World 2.0. Geoethics at the heart of geoscience: serving the public good. T39, Session 1: G, Abstract for the 37th International Geological Congress, August 2024.

Koster E. & Gibbard, P. 2024. The most consequential ethical decision for geoscience. *European Geoscience Union* | 24th General Assembly | Vienna | 14-19 April 2024.

Kuwae, M., Yokoyama, Y., Tims, S., Froehlich, M., Fifield, L.K., Aze, T., Tsugeki, N., Doi, H., & Saito, Y. 2024. Toward defining the Anthropocene onset using a rapid increase in anthropogenic fingerprints in global geological archives. *Proceedings of the National Academy of Sciences of the United States of America*, *121(41), e2313098121.* https://doi.org/10.1073/pnas.2313098121

Leinfelder, R., Thomas, J.A., Vidas, D., Williams, M. & Zalasiewicz, J. 2024. Geoethics and the Anthropocene: Five perspectives. Chapter 6 in Peppoloni, S. and Di Capua, G. (eds.) *Geoethics for the Future: Facing Global Challenges*. Elsevier, pp. 69-83.

Maslin, M., Edgeworth, M., Ellis, E.C. & Gibbard. P.L. 2024. Why it was right to reject the Anthropocene as a geological epoch 2024. *Nature* 629, 41 doi: https://doi.org/10.1038/d41586-024-01268-1

Summerhayes, C.P., Zalasiewicz, J., Head, M.J., Syvitski, J., Barnosky, A.D., Cearreta, A., Fiałkiewicz-Kożieł, B., Grinevald, J., Leinfelder, R., McCarthy, F.M.G., McNeill, J.R., Saito, Y., Wagreich, M., Waters, C.N., Williams, M. & Zinke J. 2024. The future extent of the Anthropocene epoch: a synthesis. *Global and Planetary Change* 242, 104568. https://doi.org/10.1016/j.gloplacha.2024.104568

Turner, S., Waters, C., Zalasiewicz, J. & Head, M.J. 2024. What the Anthropocene's critics overlook – and why it really should be a new geological epoch. *The Conversation*, March 12, 2024.

Zalasiewicz, J. 2024. Our mark on the planet. *New Scientist*, May 11, 2024, p. 21.

Zalasiewicz, J. & Wing, S. 2024. What myths about the Anthropocene get wrong. *The Smithsonian Magazine*, April 18, 2024.

Zalasiewicz, J., Head, M.J., Waters, C.N., Turner, S.D., Haff, P.K., Summerhayes, C., Williams, M., Cearreta, A., Wagreich, M., Fairchild, I., Rose, N.L., Saito, Y., Leinfelder, R., Fiałkiewicz-Kożieł, B., An, Z., Syvitski, J., Gałuszka, A., McCarthy, F.M.G., Ivar do Sul, J., Barnosky, A., Cundy, A.B., McNeill, J.R. & Zinke, J. 2024. The Anthropocene within geological time: A response to fundamental questions. *Episodes* 47(1), 65-83. https://doi.org/10.18814/epiiugs/2023/023025

Zalasiewicz, J., Thomas, J.A., Waters, C.N., Turner, S. & Head, M.J. 2024. What should the Anthropocene mean? *Nature* 632, 980-984.Waters, C. N., Turner, S., An, Z., Barnosky, A., Cearreta, A., Cundy, A., et al. (2024). Proposals by the Anthropocene Working Group: Executive Summary, Part 1, and Part 2. EarthArXiv https://doi.org/10.31223/X5VH70, https://doi.org/10.31223/X5MQ3C, https://doi.org/10.31223/X5RD71.

Walker, M. J. C., Bauer, A. M., Edgeworth, M., Ellis, E. C., Finney, S. C., Gibbard, P. L. & Maslin, M. 2024: The Anthropocene is best understood as an ongoing, intensifying, diachronous event. *Boreas*. https://doi.org/10.1111/bor.12636. ISSN 0300-9483.

Williams, M., Zalasiewicz, J., Barnosky, A.D., Leinfelder, R., Head, M.J., Waters, C.N., McCarthy, F.M.G., Cearreta, A., Aldridge, D.C., McGann, M., Hamilton, P.B., Summerhayes, C.P., Syvitski, J., Zinke, J., Cundy, A.B., Fiałkiewicz-Kożieł, B., McNeill, J.R., Kuwae, M., Rose, N.L., Turner, S.D., Saito, Y., Wagreich, M., Stegner, M.A., Yasuhara, M., Han, Y., Wrisdale, A., Holmes, R. and Berrio, J.C. 2024. *Earth-Science Reviews* 255, 104844. https://doi.org/10.1016/j.earscirev.2024.104844

Williams, M., Zalasiewicz, J., Wrisdale, M., Hadly, E.A. & Barnosky, A.D. 2024. Does the Anthropocene matter for the biosphere? *Palaeontological Association Newsletter* 116, 67-69.

Williams, M., Barnosky, A.D., Hadly, E. & Zalasiewicz, J. 2024. The fossils being formed today will show how humankind disrupted life on Earth. *The Conversation*, May 10, 2024.

Head, M.J., McNeill, J.R. & Zalasiewicz, J. In press. The Great Acceleration. In *Encyclopaedia of Ecology* (3rd. edition) Zalasiewicz, J., in press. Preface to (Bohle, M., Holzer, B., Sklair, L. and Will, F., eds) *The Anthropocene Working Group and the Debate Around a New Geological Epoch*. Springer.

Zalasiewicz, J., Head, M.J., Turner, S., Waters, C.N. & Williams, M. In press. A mid-20th century onset for the Anthropocene. *Encyclopaedia of the Anthropocene (2nd edition)*. Elsevier.

Zalasiewicz, J., Head, M.J., Waters, C.N., Summerhayes, C., Turner, S., Wagreich, M., Aquilina, L., Cearreta, A., Chakraborty, A., Gałuszka, A., Hajdas, I., Ivar do Sul, J., Leinfelder, R., Magny, M., McCarthy, F.M.G., McNeill, J.R., Park, B.S., Pöschl, U., Renn, J., Robin, L., Saito, Y., Sörlin, S., Thomas, J.A., Trischler, H., Williams, M., Wallenhorst, N. & Will, F., for submission. Reply to Edgeworth et al. 2024: The Anthropocene is a time interval, and more besides. Earth's Future.

6. SUMMARY OF EXPENDITURES IN 2024 (see also the attached table):

Adele Bertini attendance at IGC 37, Busan, Korea (CAN$ 2725,30)
Martin Head attendance at IGC 37, Busan, Korea (CAN$ 3114,12)
Liping Zhou attendance at IGC 37, Busan, Korea (CAN$ 1999,08)

6. SUMMARY OF INCOME IN 2024 (see also the attached table):

The following budget prepared by Martin Head was received on November 26, 2024

SQS funds carried over from 2023 (CAN$ -6 456,56)
SQS received US$ 4000 (on May 22, 2024) and 7000 (on July 3, 2024) from the ICS (CAN$ 14295,06)
SQS total fund in July 2024 (CAN$ 7 838,50)

8. BUDGET REQUESTED FROM ICS FOR 2025 (see also the attached table):

Adele Bertini attendance at:
- INQUA-SEQS Meeting 29.08.25 – 03.09.2025 in cooperation with SQS and IQUAME. Travel: 250 euro; Session meeting inscription and Hotel at Vienna: 500 euro; Excursion costs 300 euro. TOT: 1050 euro [**1107.19 $]**
- PAGES 7th Open Science Meeting, 21-24 May 2025 (Shanghai, China). Inscription 3000 CNY (394 euro); Travel 1500 EURO; Accommodation 500 EURO. TOT 2394 Euro [**2524.38 $]**

Liping Zhou attendance at:

- INQUA-SEQS Meeting 29.08.25 – 03.09.2025 in cooperation with SQS and IQUAME. Travel (partial): 350 euro; Session meeting inscription and Hotel at Vienna: 500 euro; Excursion costs 300 euro. TOT: 1150 euro **[1212.64 $]**

Fabienne Marret attendance at:

- INQUA-SEQS Meeting 29.08.25 – 03.09.2025 in cooperation with SQS and IQUAME. Travel: 350 euro; Session meeting inscription and Hotel at Vienna: 500 euro; Excursion costs 300 euro. TOT: 1150 euro **[1212.64 $]**

Justification for Funding Request to Attend Conferences

Participation in the INQUA-SEQS Meeting

Attendance at the Vienna conference is linked to the co-organization of the event, the coordination of a dedicated session on the Early and Middle Pleistocene, and its strategic role in fostering future integration and planning alongside SEQS. More broadly, these efforts aim to strengthen collaboration with INQUA and promote synergies within the international Quaternary science community. Thus, the meeting provides an opportunity to establish new connections, reinforce existing partnerships, and align with INQUA's strategic priorities.

Participation in the PAGES 7th Open Science Meeting

The participation focuses on presenting the progress of ongoing activities and outlining a forward-looking vision for the development of Quaternary research themes. This aligns with efforts to engage a global audience and inspire innovative approaches to Quaternary studies. Furthermore, Adele Bertini, along with L. Zhou, will be present at this event, ensuring robust collaboration.

Together, and with the involvement of SQS members, the goal is to advance at least two Quaternary themes (Communications) that align directly with the objectives of the SQS.

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025

- **GSSP for the Upper Pleistocene Subseries and its corresponding stage**. The last Upper Pleistocene Working Group (WG) will be dissolved, having been active for over 12 years, and will need to be reformed. We extend our gratitude to Martin Head and Thomas Litt for their roles as co-conveners and to all members for their contributions. By January 2025, the SQS aims to complete the normal voting procedures to confirm the new Working Group leaders. These leaders will also oversee the development of the election process for voting members of the new Upper Pleistocene WG, ensuring regional and methodological diversity.

- **Potential Second Stage for the Middle Pleistocene Subseries and new actions.** The WG on a potential second stage for the Middle Pleistocene Subseries will be dissolved, based on several key considerations: i) *Reevaluation of Priorities***:** introducing a second stage requires a broader review of all Pleistocene stages to ensure any changes align with the stratigraphic framework and provide clear, general value. ii) *Collaborative Context:* this proposal must be assessed within the larger stratigraphic framework, in collaboration with researchers focused on the Chibanian and the newly reformed Upper Pleistocene Working Group. iii) *Lack of Progress:* The group has yet to make substantive progress. Consequently, it is premature to move forward, and the matter will be expanded for discussion among the new SQS voting members before considering any renewed effort. This decision provides an opportunity for reflection and community input to ensure future initiatives are based on a solid scientific foundation and consensus. We thank Martin Head and Leszek Marks for their leadership and all members for their willingness to contribute. Their efforts remain a valuable foundation should the initiative be revisited in the future

- **Continuing re-investigation of the GSSP Gelasian (and lower Pleistocene Subseries, Pleistocene series, Quaternary System).** The GELSTRAT group has achieved significant progress over the past three years, particularly in isotopic stratigraphy and studies of marine calcareous microorganisms, with several important findings already published. By the end of 2025, further results are anticipated, including the completion of the pollen record and ongoing dinocyst analyses. Additionally, studies on Beryllium (Be) and paleomagnetism in the type-section are planned for 2025. The group's current status will remain unchanged for at least that year. The potential formation of a Working Group on the Gelasian GSSP will be evaluated based on the outcomes of these Be and paleomagnetic studies.

- **The SQS website**, currently requiring extensive organization of existing and new materials, is being updated under the direction of Secretary Fabienne Marret-Davies.

9a. Potential funding sources external to IUGS:

No other income in 2024

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Develop and submit a GSSP proposal for definition of the Upper/ Late Pleistocene and its respective Stage/Age.
- Complete re-investigation of the GSSP for the Gelasian Stage (and Lower Pleistocene Subseries, Pleistocene Series, Quaternary System) at Monte San Nicola, Sicily.
- Explore the possibility of additional stages for the Pleistocene.
- Continue to examine the fine-scale subdivision of the Quaternary
- Continue to develop/update detailed correlation charts for the Quaternary (Cohen & Gibbard, 2019, *Quaternary International*).

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Chair: Professor Adele Bertini
Dipartimento di Scienze della Terra
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Vice-Chair: Professor Liping Zhou
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Secretary: Professor Fabienne Marret-Davies
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Names and Addresses of Current Voting Members:

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Dr Barbara Wohlfarth
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106 91 Stockholm, Sweden
barbara@geo.su.se

Working groups and leaders

They are currently under development as part of a training process and are expected to be approved by the SQS during 2025.

Participants in the GELSTRAT Group*: Marina Addante, Adele Bertini, Antonio Caruso, Claudia Cosentino, Angela Girone, Martin Head, Timothy Herbert, Patrizia Maiorano, Maria Marino, Gabriele Niccolini, Wiestawa Radmacher, Andrew Roberts, Giovanna Scopelliti, Liping Zhou.*

Corresponding members

The list of corresponding members will also be finalized at the beginning of 2025.

International Commission on Stratigraphy
Subcommission on Neogene Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Neogene Stratigraphy (SNS)

Submitted by: Patrick Grunert, chair
Compiled by Patrick Grunert (chair) with contributions by David De Vleeschouwer (vice chair), Anna Joy Drury (secretary), Kennett Miller (chair 2020-2024), Elena Turco (vice chair 2020-2024), Marie-Pierre Aubry (secretary 2020-2024)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY
The SNS is the primary body responsible for providing optimum clarity and stability in the Neogene Chronostratigraphic Scale by selecting and defining Global Stratotype Sections and Points (GSSPs) for Series, Subseries, and Stages and promulgating information on major events of the Neogene.

3. ORGANIZATION – Interfaces with other international projects/groups
- The SNS is a subcommission of the ICS, founded in 1971. Reference is made to the annual report of 1995 for a brief historical resume of the SNS and to recent updates of the SNS website https://neogene.stratigraphy.org.
- Including the three executives (Chair, Vice Chair, and Secretary), the SNS currently has 19 voting members, in addition to 13 corresponding members (see Appendix for full list of officers and voting and corresponding members).
- ICS statutes necessitated the SNS to remove all members serving more than 12 years as voting members towards the end of the period 2020-2024. For a summary of cascading events following the vote on the Anthropocene and their impact on elections of the SNS officers, see contribution "*March Madness*" by Kennett Miller at the end of this section. To balance for the loss of leadership expertise, all voting members who rotated off in 2024 received an invitation to continue as corresponding members of the SNS.
- In reconstituting the SNS in 2024, we strove to include early career researchers and ensure international participation (with 12 countries represented). As of July 2024, none of the current voting members has served more than 4 years with the SNS.
- With the successful definition of a GSSP for the Langhian, and due to exceeding its term limit, the Working Group for defining the GSSPs for the Langhian and Burdigalian Stages, chaired by Frits Hilgen (University of Utrecht), is dissolved. A new Working Group on defining a GSSP for the Burdigalian will be constituted in 2025.
- The SNS web site is used for news release and contains the following sections: Home, News, Board, Members, Newsletters, GSSPs, and Links. The website has been progressively updated and we will continue this task through 2024 and into 2025.

- The SNS has tight interfaces with the Neogene and Quaternary Planktonic Foraminifera Working Group.
- *March Madness* (contributed by former chair Kennett Miller). In early 2024, the SNS was planning for elections of the executive, the ICG, and our primary focus on the Burdigalian GSSP. These plans were abruptly interrupted by the Anthropocene Incident that first broke in the New York Times on March 5, 2024 (https://www.nytimes.com/2024/03/05/climate/anthropocene-epoch-vote-rejected.html?searchResultPosition=1). This was the first communication of the SQS vote on this topic and it was pointed out by SNS Chair Miller to the ICS on that date. The drama associated with the vote being called by the SQS second Vice Chair, the refusal of the Chair and Vice Chair of the SQS to accept the vote on the grounds that SQS members who served more than 12 years voted, cascaded into other ICS subcommissions. We were advised by the ICS Chair David Harper to remove all members with terms exceeding 12 years. We agreed to do so with possible exceptions, but SNS Chair Miller maintained that in other international organizations (IODP, ICDP, etc.) that terms of the Executive Members were extended for the duration of the executive position (typically 3-4 years).
  In consultation with the ICS Chair David Harper on April 19, 2024, Miller noted *"... as Officers under 9.1 we have term limit of "...period between two IGCs, normally four (4) years" and thus Elena and I are eligible to accept the reappointment for a second 4-year term. My reading is that Officers are a special category of Voting Members. Most boards follow the procedure that if elected as an officer, their terms follow those of Officers, not ordinary board members, and thus are extended if necessary. My reading is that since there are separate sections (9.1 and 9.2) given for Officers and Voting members in our statutes, that we implicitly follow this rule. I suggest that this be made clear by statute since there are other Chairs in the ICS who disagree with this interpretation and have suggested that Elena and I are ineligible since we have served over 12 years. It is critical to make a decision now since it is the incoming chair who should choose the new members."* Miller was referring to ICS Statutes 2017 (https://stratigraphy.org/statutes) Article 9.
  The ICS agreed to allow the vote on the SNS Executive to go forward, advising that that the IUGS might not accept this interpretation. The vote was held, and Miller and Turco were unanimously re-elected for a second four-year term by the SNS Voting Members. ICS was apprised of the vote in April 2024.
  On the advice of the ICS Chair, Miller, Turco and Aubry then reconstituted the SNS thanking members over 12 years for their service (requesting extension of Frits Hilgen due to his critical role in the Burdigalian) and asking those rotating off as Voting Members to serve as Corresponding Members. New members were chosen carefully for a balance of expertise, international balance, gender, and career stage, with an eye toward Early to Mid-Career researchers. The slate was sent by ICS to IUGS for approval on April 26, 2024. On July 9, 2024, the ICS Chair reported "*IUGS EC did not approve yourself, Elena and Fritz. You and Elena have 1-2 years grace to reorganise the executive.*"
  We did so immediately. We asked Patrick Grunert who had accepted the appointment as Secretary of the SNS to stand for election as Chair. We asked David De Vleeschouwer to stand for election as Vice Chair. Both were unanimously elected, and they selected Anna Joy Drury as Secretary. Minor additions were needed to replace Hilgen and others who did not accept invitations to serve as Voting Members. The final slate was forwarded to ICS on Aug. 13, 2023. On Sept. 13, 2024, outgoing ICS Chair Harper advised *"...composition of all the*

subcommissions was approved at the IUGS council meeting in Busan." A welcome address to all subcommission chairs has been issued by the new ICS Executive Board on Nov. 14, 2024. In hindsight, we find the decision to complete vacate all positions with over 12 years understandable considering the issues raised, though we disagree with the terminations of duly elected Chairs and Vice Chairs. The ICS Statutes 2017 (https://stratigraphy.org/statutes) Article 9 are silent on the issue of extending the terms of the Executive Members as noted. The Chairs and Vice Chairs of several subcommissions had served only one of two 4-year terms allowed under Article 9 and should have been allowed to continue if the vote of the subcommissions warranted it. We also suggest that exceptions to the rule should be allowed in exceptional cases. The loss of leadership expertise in ICS has been stultifying. It should be noted that throughout this process the ICS Chair David Harper and Secretary Phil Gibbard were extremely civil, encouraging, and helpful.

3a. Current Officers for 2024-2028:

Chair: Prof. Patrick Grunert, Institute of Geology and Mineralogy, University of Cologne, Otto-Fischer-Straße 14, 50674 Cologne, Germany, Tel.: +49 470 221 76319, pgrunert@uni-koeln.de
Vice Chair: Prof. David De Vleeschouwer, Institute of Geology and Paleontology, University of Münster, Corrensstraße 24, 48149 Münster, Germany, Tel.: +49 251 83-33962, ddevlees@uni-muenster.de
Secretary: Dr. Anna Joy Drury, School of Geography, Geology and the Environment, University of Leicester, University Road, LE1 7RH Leicester, United Kingdom, Tel.: +44 116 252 3624, a.j.drury@leicester.ac.uk

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

None.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- Following the ratification of the GSSP for the Langhian stage in 2023, the accompanying paper documenting the GSSP has been published in *Episodes* vol. 47: Turco E., Hilgen F., Raffi, Di Stefano A., Foresi L.M, Holbourn A., Iaccarino S.M., and Lirer F., *The Global Stratotype Section and Point (GSSP) of the Langhian Stage and of the Middle Miocene Subseries*. https://doi.org/10.18814/epiiugs/2023/023024
- The RCMNS interim colloquium "*Towards a process-based understanding of the Mediterranean Neogene*" was announced, honoring Frits Hilgen, former SNS chair and chair of the Working Group on the Burdigalian and Langhian GSSPs. Organized by Agata di Stefano (University of Catania), Wout Krijgsman (University of Utrecht), Isabella Raffi (IRSPS, University of Chieti), and Fabrizio Lirer (University "La Sapienza" of Rome), the symposium will be held from Sept. 29–Oct. 4, 2025 at the University of Catania.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Balance in Nov 2023	**USD**	$4175.95
Received in 2024:		$0

Expenses in 2024: Wire transfer fees	**EUR**	€ 14.42
Balance in Nov 2024	**EUR**	€ 3680.03

The budget of the SNS has been transferred from former chair Kennett Miller to current chair Patrick Grunert in October 2024. Wire transfer fees amounted to € 14.42.

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):
None.

8. BUDGET REQUESTED FROM ICS FOR 2025
We plan to request additional funds of € 3000 (estimate for flights and accommodation based on current prices) to support the executive officers of SNS (Chair, Vice Chair, Secretary) to travel to Catania and attend the RCMNS interim colloquium "*Towards a process-based understanding of the Mediterranean Neogene*" (Sept. 29–Oct. 4, 2025).

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)
The main action item for 2025 will be the constitution of a new Working Group with the task to identify a suitable outcrop section or drill core representing the GSSP and, if needed, SABS for the Burdigalian stage. Potential members of the Working Group are currently identified by the executives. A kick-off meeting of the Working Group is expected in the first half of 2025.

9a. Potential funding sources external to IUGS:
None.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)
The following initial objectives have been identified for the period 2024-2028:
- Identification of a GSSP and, if needed, SABS for the Burdigalian stage. A new Working Group with the task to identify a suitable outcrop section or drill core will start their work in 2025.
- Discussion and evaluation of defining climatic events such as the Miocene Climate Optimum and the Miocene Climate Transition.
- Renewed exchange with the Subcommission on Paleogene Stratigraphy on formalization of subseries in the Cenozoic.

APPENDICES

Names and Addresses of Current Officers for 2024-2028:
Chair: Prof. Patrick Grunert, Institute of Geology and Mineralogy, University of Cologne, Otto-Fischer-Straße 14, 50674 Cologne, Germany, Tel.: +49 470 221 76319, pgrunert@uni-koeln.de
Vice Chair: Prof. David De Vleeschouwer, Institute of Geology and Paleontology, University of Münster, Corrensstraße 24, 48149 Münster, Germany, Tel.: +49 251 83-33962, ddevlees@uni-muenster.de

Secretary: Dr. Anna Joy Drury, School of Geography, Geology and the Environment, University of Leicester, University Road, LE1 7RH Leicester, United Kingdom, Tel.: +44 116 252 3624, a.j.drury@leicester.ac.uk

Names and Addresses of Current Voting Members:

1. De Vleeschouwer, David [vice chair; 2024-]
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2. Drury, Anna Joy [secretary; 2021-]
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3. Flores, José-Abel [2020-]
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4. Gladenkov, Andrey [2020-] (currently suspended; IUGS requirements related to Ukraine)
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6. Hodell, David [2024-]

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7. Holbourn, Ann [2020-]
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12. Lirer, Fabrizio [2020-]
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14. Quillévéré, Frédéric [2020-]
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15. Robinson, Marci [2020-]
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16. Triantaphyllou, Maria [2020-]
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17. Vallejo, Felipe [2020-]
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18. Warne, Mark [2024-]
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19. Woodhouse, Adam [2024-]
School of Earth Sciences
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Working groups and leaders

None.

Corresponding members (simple list of names as known)

Aubry, Marie-Pierre
Di Stefano, Agata
Drinia, Hara
Edwards Lucy E.
Hilgen, Frits
Janssen, Ronald
Miller, Kennett
Nishi, Hiroshi
Piller, Werner
Raffi, Isabella
Rook, Lorenzo
Stoykova, Kristalina
Tian, Jun
Turco, Elena

International Commission on Stratigraphy

Subcommission on Paleogene Stratigraphy

ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY

Subcommission on Paleogene Stratigraphy

Submitted by: Laia Alegret (Chair)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The ISPS is the primary body for facilitation of international communication and scientific cooperation in Paleogene Stratigraphy. In order to better understand the evolution of the Earth during the Paleogene Period, its first priority is the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units, which provide the framework for global correlation. Its primary goals are:

a) to agree on an international set of stages and series for the Paleogene.

b) to formally define basal boundary stratotypes (GSSPs) of the Paleogene stages and series.

c) to encourage research into the Paleogene by setting up and supporting Working Groups and Regional Committees to study and report on specific problems.

d) to organise symposia and workshops on subjects of Paleogene stratigraphy.

e) maintain a website informing on progress in Paleogene stratigraphy (http://www.paleogene.org).

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

1) Establishment of an internationally agreed scale of chronostratigraphic units, defined by GSSPs.

2) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Paleogene Period.

3) Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs. This relates to, inter alia, the IUGS Geosites Programme and the UNESCO Geoparks Programme.

3. ORGANIZATION – Interfaces with other international projects/groups

Members of the Paleogene Subcommission interface with the International Ocean Discovery Program, the International Subcommissions on Cretaceous and Neogene Stratigraphy, Int. Geoscience Programme (IGCP), ProGEO, Geosites and Geoparks Initiatives, UNESCO World Heritage Sites, and the TIMES program.

The ISPS consists of 20 Voting Members elected for their expertise and experience and about 100 Corresponding Members, who have a responsibility for communication in both directions between the Subcommission and researchers on Paleogene topics in their region. Voting and Corresponding Members are selected regionally to provide expertise in the Paleogene

stratigraphy of each major area and according to their speciality to cover the main fields of stratigraphic tools used in the Paleogene.

3a. Current Officers for 2024-2028:

Chair: **Laia Alegret**, Departamento de Ciencias de la Tierra, Universidad de Zaragoza, Calle Pedro Cerbuna, 12, E-50009 Zaragoza, Spain. Tel+34 876553465 laia@unizar.es

Vice-Chair: **Aitor Payros,** Dept. Estratigrafía y Paleontología, University of the Basque Country (UPV/EHU), Apd. 644 P.K., E-48080 Bilbao, Spain. Tel.+34 946015427 a.payros@ehu.eus

Secretary: **Claudia Agnini,** Dipartimento di Geoscienze Universita' degli Studi di Padova Via Giovanni Gradenigo, 6 - I-35131 - Padova – Italy Tel. +390498279187 claudia.agnini@unipd.it

Webperson: Gabriele Scaduto, Università di Firenze, Museo di Storia Naturale. Via La Pira 4 Firenze 50121 Italy gabriele.scaduto@unifi.it

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

The ISPS board and the voting members get support from their own universities/institutes (facilities and staff), and have financial support for Paleogene research from their own research grants, mainly funded by national science agencies.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

• Twelve out of twenty voting members of the Subcommission were renovated, almost reaching parity (45% female, 55% male).

• All working groups were disbanded because they had finished their tasks or were inactive. A new Working Group was appointed to work on a proposal for the GSSP of the Bartonian, the last stage of the Paleogene pending formal definition.

• The Bartonian WG submitted a formal proposal to ISPS to define the GSSP for the base of the Bartonian, the only stage of the Paleogene pending formal definition. The proposal was distributed among the voting members of ISPS, and a ballot was organized after the 1-month discussion period. The deadline for the vote was November 26th 2024, and the proposal was not approved by ISPS. The results of the vote were: 5 votes supporting the proposal, 14 votes against the proposal, and 1 abstention.

• An Immersive virtual experience was created with 3D models of some of the most significant outcrops of the Paleogene GSSPs. This project was presented during the IGC24 meeting (Monechi, Alegret, Payros, Agnini, Scaduto, *Immersive virtual experience: a new "look up" to the GSSPs*).

• To address some questions raised about the reliability of the GSSPs for the bases of the Lutetian and Ypresian Stages, integrated studies are being carried out.

Selection of the most relevant publications of subcommission work:

Benedetti A., Papazzoni C.A., Bosellini F.R. (2024). Unparallel resilience of shallow-water tropical calcifiers (foraminifera and scleractinian reef corals) during the early Paleogene global warming intervals. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 651, 112393.

Bryłka K., Witkowski J., Bohaty S.M. (2024). Biogenic silica accumulation and diatom assemblage variations through the Eocene-Oligocene Transition: A Southern Indian Ocean versus South Atlantic perspective. *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, 636, 111971.

Burkett, A., Huber, B.T., Young, J.R., Katz, M.E., Borrelli, C., Fung, M.K., De Mello, R., Kochann, K.G.D., Dameron, S.N., Thomas, E., Alegret, L. 2024. BForams@Mikrotax: an online database for deep-sea benthic foraminiferal taxonomy. *Journal of Foraminiferal Research*, 54 (4): 394-403.

Crouch E.M., Clowes C.D., Raine J.I., Alegret L., Cramwinckel M.J., Sutherland R. (2024). Latest Cretaceous and Paleocene biostratigraphy and paleogeography of northern Zealandia, IODP Site U1509, New Caledonia Trough, southwest Pacific. *New Zealand Journal of Geology and Geophysics*, 67 (1), 20 – 44.

De Entrambasaguas, J., Westerhold, T., Jones, H.L., Alegret, L. (2024). Transient micropaleontological turnover across a late Eocene (Priabonian) carbon and oxygen isotope shift on Blake Nose (NW Atlantic). *Journal of Micropaleontology*, 43: 303–322.

Dong Y., Gachetti A., Wu Q., De Palma M., Hu X., Brachfeld S., Yang Z., Wang J., Jiang S., Cui Y. (2024). Paleoenvironment reconstruction of the eastern Tethys during the pre-onset excursion preceding the PETM. *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, 647, 112234.

Kaminski, M.A., Korin, A., Hikmahtiar, S., Alegret, L., Waskowska, A. (2024). Paleocene and Eocene deep-water benthic foraminifera at IODP Site U1511, Tasman Sea: Part 2. *Micropaleontology*, 70 (3): 271-285, http://doi.org/10.47894/mpal.70.3.06

Kaminski, M.A., Korin, A., Hikmahtiar, S., Alegret, L., Waskowska, A. (2024). The global extent of Paleocene to Eocene deep-water agglutinated foraminiferal acmes. *Stratigraphy*, 21 (4): 1-8, https://doi.org/10.47894/stra.21.4.00

Kocken I.J., Nooteboom P.D., van der Veen K., Coxall H.K., Müller I.A., Meckler A.N., Ziegler M. (2024). North Atlantic Temperature Change Across the Eocene-Oligocene Transition From Clumped Isotopes. *Paleoceanography and Paleoclimatology*, 39 (3), e2023PA004809.

Lu, Z., Fan, J., … Wade, B.S., … Alegret, L., … Improving the temporal resolution of middle Eocene-early Miocene biomagneto-chronology: Insights from CONOP and chronologic significance of biotic events. *Palaeogeography, Palaeoclimatology, Palaeoecology*, in review.

Mariani E., Kender S., Hesselbo S.P., Bogus K., Littler K., Riding J.B., Leng M.J., Kemp S.J., Dybkjær K., Pedersen G.K., Wagner T., Dickson A.J. (2024). Large Igneous Province Control on Ocean Anoxia and Eutrophication in the North Sea at the Paleocene–Eocene Thermal Maximum. *Paleoceanography and Paleoclimatology*, 39 (4),. e2023PA004756.

Merle D., Goldstein D.H., McKinney M.L. (2024). First evidence of cannibalism in *Crassimurex* (s. s.) *calcitrapa* (Lamarck, 1803) (Gastropoda, Muricidae) from the Lutetian of the Paris Basin (France). *Geodiversitas*, 46 (13), 457 – 470.

Meunier M., Danelian T. (2024). New middle Eocene radiolarian species (Rhizaria, Polycystinea) from Blake Nose, subtropical western North Atlantic Ocean. *Jour. Paleontol.*, 98 (3), 331–353.

Monechi, S., Alegret, L., Payros, A., Agnini, C., Scaduto, G. 2024. Immersive virtual experience: a new “look up” to the GSSPs. *International Geological Congress 2024*, Busan (Corea del Sur) 25-30/08/2024. Abstract T37.

Peñalver-Clavel, I., Agnini, C., Westerhold, T., Cramwinckel, M.J., Dallanave, E., Bhattacharya, J., Sutherland, R., Alegret, L. (2024). Integrated record of the Late Lutetian Thermal Maximum at IODP Site U1508, Tasman Sea: The deep-sea response. *Marine Micropaleontology* 191 (2024) 102390. https://doi.org/10.1016/j.marmicro.2024.102390

Schnetler K.I., Madsen H., Śliwińska K.K., Heilmann-Clausen C., Ulleberg K. (2024). A late Oligocene molluscan fauna and Oligocene coastal outcrops from Vilsund, NW Denmark. *Bulletin of the Geological Society of Denmark*, 73, 1 – 40.

Sigismondi, S., Luciani, V., Alegret, L., Westerhold, T. 2024. Evaluating planktic foraminiferal resilience during the Middle Eocene Climatic Optimum (MECO) in the Atlantic Ocean. *Palaeogeography, Palaeoclimatology, Palaeoecology*, in review.

Pujalte V., Payros A., Rodríguez-Tovar F.J., Orue-Etxebarria X., Martínez-Braceras N. (2024). Linked evolution of Paleocene sea floor relief and deep marine currents in the Subbetic Zone, southern Spain. *Sedimentary Geology*, 466, 106648.

Viganò, A., Dallanave, E., Alegret, L., Westerhold, T., Sutherland, R., Dickens, G.R., Agnini, C. (2024). Calcareous nannofossils and paleoclimatic evolution across the Eocene-Oligocene Transition at IODP Site U1509, Tasman Sea, Southwest Pacific Ocean. *Paleoceanography and Paleoclimatology*, 39, e2023PA004738. https://doi.org/10.1029/2023PA004738

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

1) Early bird registration to the International Geological Congress 2024 in Busan, S Korea, for one member of the ISPS board USD 722
2) Attendance of one member of the board to the IGC 2024 (airfare 1783 USD+ accommodation 680.6 USD+ transportation to airport 50.3) = USD 2513.9
3) Inspection of the Alano outcrop for the future dedication ceremony of the GSSP of the Priabonian. (1 person, 2 days travel + per diem = 266 euros) USD 287.66

TOTAL ---------- **USD 3523.56**

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

3158.09 euros (ca. 3419 USD) were transferred to the Subcommission´s bank account

8. BUDGET REQUESTED FROM ICS FOR 2025

1) Support for analyses and fieldwork related to the last GSSP pending definition (the base of the Bartonian). USD 1100
2) Organization of a Workshop on the Bartonian GSSP during the Annual Meeting of The Micropaleontological Society in Pisa: partial support for attendance of 2 members of the Bartonian WG who do not have financial support to attend the workshop (500 USD/person) USD 1000
3) Visit to organize the logistics of the official GSSP ceremony of the Priabonian (2 persons, 3 days transport + per diem) = USD 800

TOTAL USD 2900

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- Full support will be given to studies (including fieldwork in several Italian and Spanish sections and lab. analyses) related to the Bartonian GSSP, the only Paleogene Stage pending definition.
- Organization of a Workshop on the Bartonian GSSP during the Annual Meeting of The Micropaleontological Society in Pisa.
- An *ad hoc* working group will evaluate sections of the base of the Ypresian from different paleogeographic areas and depositional settings as potential auxiliary sections.
- Members of ISPS will collaborate in the activities of the TIMES project, including roles as participants in some of the WGs, primarily the one focused on biostratigraphy, and also in coordination roles.

9a. Potential funding sources external to IUGS:
Most of the research that is currently being done by the ISPS members is financially supported by their home countries´ research grants.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

•To find a suitable section and agree on the criteria for the formal definition of the base of the Bartonian, and submit a GSSP proposal to the Paleogene Subcommission voting members and ICS.
•Prepare the report on the Bartonian GSSP proposal to be submitted to the ICS and the IUGS.
•Celebrate the official ceremony to place the Golden Spike at the GSSP for the base of the Priabonian in Alano di Piave section, Italy.
•Produce an updated version of an integrated Paleogene Time Scale.
•Support studies for the completion of the Paleogene astronomical time scale.
•Contribute to the TIMES project, a new initiative to establish and coordinate a new international network to synchronize age models of scientific ocean drill cores and outcrops spanning the last 100 million years; the Time Integrated Matrix for Earth Sciences – TIMES.
•To revisit existing GSSPs and, if necessary, define new ones and/or ASSPs to better characterise the Thanetian/Ypresian, Danian/Selandian, Selandian/Thanetian boundaries and the base of the Rupelian.

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

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Working groups and leaders

Bartonian GSSP WG. Chairman: Rodolfo Coccioni, Italy, rodolfo.coccioni@uniurb.it

Corresponding members (simple list of names as known)

Abels Hemmo;Agnini Claudia;Aguilar Teresita;Akhmetiev Michail;Alegret Laia;Aleksandrova Galina N.; Anemone Robert L.;Apellaniz Estibaliz;Archibald Bruce;Augé Marc;Baceta Juan Ignacio;Baczynski Allison;Backman Jan;Badiola Ainara;Bartol Miloš;Bayona German;Beamud Elisabet;Beard Christopher;Beavington-Penney Simon J.;Beerling David J.;Bellosi Eduardo S.;Benjamovski Vladimir;Benjamini Chaim;Berggren William;Bernecker Michaela;Berning Björn;Berreteaga Ana;Bijl Peter;Birch Heather;Blokhina Nadezhda;Bonnemaison Monique;Bord David;Bornemann André;Boscolo Galazzo Flavia;Bowen Gabriel;Bown Paul;Brinkhuis Henk;Brückl Ewald;Bush Rosemary;Caballero Fernando;Cabrera Lluis;Carlini Alfredo Armando;Caus Esmeralda;Cerepi Adrien;Charles Adam;Checa Soler Lluís;Chira Carmen;Cieszkowski Marek;Clechenko Elizabeth R.; Clemmensen Anne;Clyde William;Coccioni Rodolfo;Coe Angela;Cohen Anthony;Collinson Margaret;Contreras Lineth;Coric Stjepan;Cosovic Vlasta;Cotton Laura;Coxall Helen;Cramer Benjamin;Crouch Erica;Cui Da-fang;Currano Ellen;Dallanave Edoardo;Darga Robert;Dašková Jiřina;De Ceukelaire Marleen;De Man Ellen;Dickens Gerald;Dinarès-Turell Jaume;Domingo Martínez Laura;Douglas Peter;Draxler Ilse;Drobne Katica;Dupuis Christian;Dybkjaer Karen;Edgar Kirsty;Egger Hans;Eggins Stephen;Esmat Abd El Hamid Keheila;Evans David;Faris Mahmoud;Feng Xinxin;Fenner Juliane;Ferràndez-Cañadell Carles;Firth John;Fluegeman Richard;Forcher Karl;Foreman Brady;Fornaciari Eliana;Frieling Joost; Fricke Henry;Galal Galal;Gale Andy;Galeotti Simone;Garel Sylvain;Gasinski Adam;Gavrilov Yuri;Gebhardt

Holger;Genise Jorge;Geukens Ferdinand;Gibbs Samantha;Gingerich Philip;Giusberti Luca;Gladenkov Andrey;Gladenkov Yuri;Godinot Marc;Goin Pacho;Goolaerts Stijn;Gradstein Felix;Gramann Franz;Greenwood David;Grimes Stephen;Grimm Kirsten;Grothe Arjen;Gruber Gabriele;Guasti Elisa;Gullentops Frans;Gürs Karl;Habash El-Nady;Hancock Haidi;Hardenbol Jan;Harrington Guy;Hart Malcolm;Hatem Hassan;Heilmann-Clausen Claus;Hendy Austin;Hesse Reinhard;Hilding-Kronforst Shari;Hilgen Frits;Hinojosa Luis Felipe;Hofmann Christa;Hollis Chris;Holroyd Patricia A.; Hooker Jerry;Hooyberghs Herman;Houben Alexander;Huber Brian;Huber Matthew;Hull Pincelli;Huysmans Marijke;Iakovleva Alina;Ibrahimpašić Haris;Iturralde-Vinent Manuel;Ivany Linda;Jacay Javier;Jacobs Patric;Jamieson Rachel;Janssen Ronald;Jaramillo Carlos;Jin Jianhua;Jin Meng;Joachim Christian;Jyotsana Rai;Karoui-yaakoub Narjess;Kender Sev;Khoroshilova Margarita;Khozyem Hassan;King Christopher;Kirtland Sandy;Koch Paul;Kogler Markus;Kocsis László;Koeberl Christian;Kopaevich Ludmila;Koukal Veronika;Kouwenhoven Tanja;Kosir Adrijan;Krassilov Valentin;Kraus Mary J.;Krause Marcelo;Krishnan Srinath;KROBICKI Michal;Laenen Ben;Laga Pieter;Large David J.;Larrasoana Juan; Lauretano Vittoria;Laurie Ewan;Lawa Fazil;Lenz Olaf;Less György;Light Melissa;Lindner Dutra Tania;Lourens Lucas;Louwye Stephen;Lovelock Elizabeth;Lukashina Nadezhda;Luciani Valeria;Lutz Herbert;Madden Richard;Mahmaoud Faris;Malata Eva;Mancini Ernest A.;Manners Hayley;Martin Chivelet Javier;Martínez-;Hernández Enrique;Marzoqi Mohamed;Mathewes Rolf;McCarren Heather K.;McGowran Brian;Melchor Ricardo;Menkveld-Gfeller Ursula;Mertens Jeroen;Miguel Sergio;Missiaen Pieter;Monechi Simonetta;Montanari Alessandro;Moorkens Thierry;Morsi Abdel-Mohsen M;Munsterman D.K.;Murru Marco;Musatov Vladimir;Mutti Maria;Muttoni Giovanni;Nañez Carolina;Neubauer Franz;Nichols Douglas J.;Nicolo Micah J.;Nocchi Marisa; Norris Richard;Oberhaensli Hedi;Ochoa Diana;Orabi H. Orabi;Oreshkina Tatiana V;Ortiz Silvia;Orue-Etxebarria Xabier;Ottner Franz;Özcan Ercan;Ozsvárt Péter;Pagani Mark;Pälike Heiko;Pancost Rich;Papazzoni Cesare;Pardo Andres;Pares Josep M.;Parras Ana;Payros Aitor;Pea Laura;Pearson Paul;Pécheux Martin;Pekar Stephen;Penman Donald;Pereda Superbiola Javier;Pfersmann Clemens;Pignatti Johannes;Piller Werner;Pimentel N.L.V.;Pirkenseer Claudius;Planke Sverre;Podobina Vera;Polling Marcel;Premec Fucek Vlasta;Premoli Silva Isabella;Pross Jörg;Pujalte Victoriano;Quaijtaal Willemijn;Quattrocchio Mirta;Quesnel Florence;Radionova Eleonora P.;Raigemborn Maria Sol;Ramos;Guerrero Emilio;Rashmi Srivastava; Re Guillermo;Rea David K.;Reich Mike;Renema Willem;Rio Domenico;Roche Emile;Rögl Fred;Röhl Ursula;Rui.da-Gama;Ryabokon Tamara;Saad Kamel M. A. Kamel;Samir Ashraf Mohamed;Santo Bains;Scheibne Christian;Schenk Bettina;Schiøler Poul;Schmitz Birger;Schnyder Johann;Schulte Peter;Seddighi Mona;Sessa Jocelyn;Sewal Jacob O.;Sexton Philip;Sghibartz Cristina;Shcherbinina Ekaterina;Sille Nick;Silva Tamayo Juan Carlos;Sloan Lisa C.;Slotnick Benjamin;Sluijs Appy;Smith Francesca A.;Smith Krister T.;Smith Richard;Smith Thierry;Soták Ján;Speijer Robert;Spicer Bob;Stassen Peter;Steart David;Steurbaut Etienne;Stickley Catherine;Stidham Thomas;Stradner Herbert; Strait Suzanne G.;Stucky Richard K.;Suyin Ting;Svábenická Lilian;Tambareau Yvette;Tantawy Abdel Aziz;Tateo F.;Taylor Kyle;Thomas Ellen;Thomsen Erik;Ting Suyin;Toffanin Federica;Tori Flavia;Torres-Silva Ana I.;Tripati Aradhna;Uchman Alfred;van Couvering John;van der Wal Stefan;Vandenberghe Noël;Van Eetvelde Yoann;Van Geet Maarten;Vanhove Daan;Van Itterbeeck Jimmy;Van Marcke Philippe;van Mourik Caroline;Van Simaeys Stefaan;Varrone Dario;Vasileiadou Katerina;Vassilyeva Olga N.;Vecchio Enrica;Vellekoop Johan;Venturati Alberto;Verbeek Joost;Verducci Marina;Verhaeghe Jona;Vestegaard Laursen Gitte;Villasante Marcos Victor;Volkheimer Wolfgang;Vucetich Maria Guiomar;Wade Bridget;Wagreich Michael;Wan

Xiaoqiao;Wappler Torsten; Warnaar Jeroen;Waszczak Ron;Weinbaum-Hefetz Menahem;Weiss Wolfgang;Werner Winfried;Westerhold Thomas;Wigforss-Lange Jane;Wilde Volker;Wilf Peter;Willumsen Pi Suhr;Wing Scott;Witkowski Jakub;Woody Daniel T.;Wouters Karel;Wouters Laurent;Yakovishina Elena V.;Yang Hong;Yang Johan;Yans Johan;Youssef Mohamed;Zachos James;Zakrevskaya Elena;Zamagni Jessica;

International Commission on Stratigraphy (ICS)
Subcommission on Cretaceous Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Cretaceous Stratigraphy (SCS) *https://cretaceous.stratigraphy.org*
Submitted by: Ian Jarvis, Chair; Francesca Falzoni, Vice-Chair; Zofia Dubicka, Secretary
22 November 2024

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY
•To establish a standard global stratigraphic subdivision and nomenclature for the Cretaceous, as part of the ICS standard global stratigraphic scale.
•To produce a stratigraphic table displaying agreed subdivisions to stage and substage level, marking boundaries that are defined by a GSSP, supplemented by SABS where appropriate.

3. ORGANIZATION – Interfaces with other international projects/groups
SCS maintains links to important international Projects such as IODP, IGCP, Mesozoic Planktonic Foraminiferal Working Group, ICDP (International Continental Scientific Drilling Project), TIMES (Time Integrated Matrix for Earth Sciences), and the Deep-time Digital Science Program. Significant IGCP projects are: IGCP 710 Western Tethys meets Eastern Tethys (2020–24, Project Leader Prof. Michał Krobicki, Poland); IGCP 739 The Mesozoic–Palaeogene hyperthermal events (2021–25, Project Leader Prof. Xiumian Hu, China).

3a. Current Officers for 2024–2028:
Chair: Ian Jarvis; **Vice-Chair**: Francesca Falzoni; **Secretary**: Zofia Dubicka
Ian Jarvis had served as a voting member for 8 years, Francesca Falzoni was Secretary for 8 years, Zofia Dubicka has not previously served in the Subcommission.

Voting Members are 16, from most continents:
- *continuing members*: Sietske Batenburg, Paul Bown, Bruno Granier, Eduardo Koutsoukos, Josep Moreno Bedmar, Maria Rose Petrizzo, Bilal Sari, Brad Singer, Markus Wilmsen, Dangpeng Xi.
- *members starting in 2024*: James Crampton, Delphine Desmares, Polina Pavlishina, Shin-Ichi Sano, Jean Marie Self-Trail, Reishi Takashima.
Corresponding Members: Ismar de Souza Carvalho, Miguel Company, Bruno Galbrun, Takashi Hasegawa, Brian Huber, Brad Sageman, Michael Wagreich, Irek Walaszczyk.
The Stage Working Groups of the SCS in 2024 are: Berriasian, Valanginian, Aptian, and Maastrichtian. Over 150 Cretaceous scientists from all over the world and in many different disciplines belong to one or more of the Stage Working Groups and to the Kilian Group (Lower Cretaceous Ammonite Working Group).
Chairs of the Working Groups: Jacek Grabowski (Berriasian WG), Stéphane Reboulet (Valanginian WG and Kilian Group), Elisabetta Erba and Helmut Weissert (Aptian WG), Silke Voigt (Maastrichtian WG). WG Chairs are also Corresponding Members of the Subcommission.

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

Funds from the DFG (German Research Foundation) have been secured by Silke Voigt for a 2-year project (2023–25), supporting stable isotope and elemental analysis costs for Maastrichtian GSSP samples. José Manuel Castro Jiménez and Ginés A. de Gea (Aptian WG) have been funded by Ministry of Science, Innovation and Universities/State Investigation Agency (AEI) (Spain) for a Barremian–Aptian project (2024–27) that includes study of the Cau section, the candidate Aptian GSSP.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024

- WORKING GROUPS HAVE PROGRESSED THE DEFINITION OF GSSPs

Chairs and updated memberships of each WG are available at http://cretaceous.stratigraphy.org/working-groups/ Memberships are updated continuously by inviting active scientists who are willing to collaborate to the WG activities.

MAASTRICHTIAN WORKING GROUP

The current GSSP definition, ratified in 2001, is based on the level of an arithmetic mean of 12 biostratigraphic marker levels in the Tercis les Bains section of SW France, and most closely approximated by the LO of the ammonite *Pachydiscus neubergicus*. No primary marker has been designated. The LO of the marker ammonite is now known to be highly diachronous. Its position in the stratotype is likely not an FAD. Biostratigraphic markers are compromised by poor preservation of calcareous fossils and included HOs that also display inconsistent levels in multiple study sections. No magnetostratigraphy is available. The current definition of the boundary level was discussed during the SCS Business Meeting in Warsaw (11th Cretaceous Symposium) and a new WG was appointed in October 2022.

New research during the last 15 years (e.g., Voigt et al., 2012) has established a coherent carbonate carbon isotope stratigraphy spanning the Campanian – Maastrichtian boundary, the CMBE, at Tercis and elsewhere. This includes 5 levels, CMBE 1 – 5, that have been recognized at multiple sites in Europe and in deep-sea cores from the major ocean basins. Carbon isotope stratigraphy offers potential to establish a primary marker, e.g., the base of CMBE4 which is close to the base of Chron 31r, for defining the stage boundary.

The WG chaired by Silke Voigt is undertaking a detailed re-examination of the stratigraphy in the GSSP section at Tercis les Bains. In March 2023, WG members sampled the Tercis-les-Bains section, which is located in a Regional Natural Reserve, requiring a permit for any geological fieldwork and sampling. About 500 samples were taken along a 70-m interval with a resolution of 20 – 40 cm to establish modern biozonations for calcareous nannofossils, planktonic and benthic foraminifera, inoceramids and palynomorphs. Additional samples were collected to determine the mineralogical composition and microfacies of the lithologies, to resolve orbital cyclicity, and to improve the resolution of carbon isotope stratigraphy (Voigt et al., 2023)

A new high-resolution carbonate C isotope curve has been completed along with a cyclostratigraphic analysis of the stable isotope, magnetic susceptibility and XRF elemental records. A coherent cyclostratigraphic signal has been extracted from the proxy time series that enables potential correlation to previously studied Campanian – Maastrichtian boundary sections at Bidart, Sopela and Zumaia that have precise microfossil event data. Correlation will enable calibration of the CMBEs to astronomical time scales. This work is in progress. Biostratigraphic work on Tercis is proving challenging. Extraction of carbonate microfossils and nannofossils is difficult due to silicification of the sediments. Poor preservation of extracted material compromises

accurate biostratigraphic determinations. Acetic acid methods have proven unsuccessful. Other extraction methods are being assessed. Palynological studies are in progress.
The German Research Foundation DFG granted a research proposal to S. Voigt in August 2023 that will support some analytical work. The collected samples will provide students an opportunity to perform master thesis projects.

Voigt, S. et al. 2012. Global correlation of Upper Campanian - Maastrichtian successions using carbon-isotope stratigraphy: development of a new Maastrichtian timescale. NoS 45, 25–53.
Voigt, et al. 2023. Reassessment of the base of the Maastrichtian Stage at the GSSP locality Tercis-les-Bains (SW France); sciencesconf.org:strati2023, 457796.

APTIAN WORKING GROUP

The base of the Aptian Stage had been informally taken at the base of the M0 magnetic Chron for the last 20 years. This is now rejected due to new ammonite records and difficulties in placing the magnetic reversal in key sections.
Steady progress had been made by the WG chaired by Helmi Weissert and Elisabetta Erba on a redefinition of the base Aptian. The negative carbon isotope excursion associated with OAE1a has been selected to provide the primary marker – the onset of the major negative CIE identified at the C2/C3 boundary in all carbon archives, with secondary criteria provided by ammonites, planktonic foraminifera, calcareous nannofossils, other biostratigraphic data, and magnetostratigraphy.
Selection of a GSSP at Cau, SE Spain, has been agreed following two rounds of voting. Five sites were considered in Round 1 with the following votes: Cismon, Italy (13 votes), Gorgo a Cerbara, Italy (7 votes), La Bedoule, France (6 votes), Cau, Spain (13 votes), El Pui, Spain (9 votes). In Round 2 the two sites with the largest number of votes, Cau and Cismon received 17 and 9 votes, respectively. Cau was accordingly selected as the candidate GSSP.
High-quality core and adjacent outcrop sections are available from Cau with highest resolution data obtained to date from the core (Castro et al., 2021). Core is archived at Jaén University, Spain. Selection of the outcrop as the GSSP is preferred. Cismon and potentially other sites are to be considered for inclusion as SABS in the GSSP proposal. José Manuel Castro Jiménez was funded in 2024 by the Ministry of Science, Innovation and Universities/State Investigation Agency (AEI) for further study of the Cau section. A GSSP proposal is currently being written by WG members. Completion during early 2025 is planned.

Castro et al., 2021. High-Resolution C-Isotope, TOC and Biostratigraphic Records of OAE 1a (Aptian) From an Expanded Hemipelagic Cored Succession, Western Tethys: A New Stratigraphic Reference for Global Correlation and Paleoenvironmental Reconstruction. Paleoceanography and Paleoclimatology. https://doi.org/10.1029/2020PA004004

BERRIASIAN WORKING GROUP

The base of the Berriasian, representing the base of the Cretaceous, is the last remaining System boundary to lack a GSSP. A new WG chaired by Jacek Grabowski was set up in 2021 to address the impasse that had been reached by the previous WG with no progress towards establishment of a GSSP.
The new WG is making swift progress. In 2023, the WG completed a discussion on which level should be the best choice for the global J/K boundary definition. Three options for placing the boundary were considered: (1) moving the boundary downward into the traditional top Tithonian to the M19r/M20n1r Chron boundary (base *Crassicollaria* Zone, base *Cr. intermedia* Subzone, base NJT17 (*N. globulus minor* nannozone); (2) placing the boundary at the calpionellid ‘Alpina’

acme event; (3) placing the boundary higher, in the traditional 'mid-Berriasian', between base M17r and base M16r (base *C. elliptica* Subzone, base *S. occitanica* Zone, base Ryazanian, prominent climate event).
The 'Alpina event', a level promoted by members of the previous WG, was rejected. This is an ill-defined acme level not an LO or HO of a taxon. Independent specialists were unable to provide consistent placement of the level in sections. The level would potentially be highly diachronous if employed as the primary GSSP criterion.
Selection of a high 'upper Tithonian' level of the magnetic reversal is favoured, with a clear majority of votes by WG members during 2 voting rounds. The chosen level approximates to the Portland/Purbeck boundary traditionally adopted in the UK, with a small offset. It corresponded to a major aridification event and marked marine regression. Many fossil groups underwent rapid evolution at this time and offer potential secondary levels. Radiolaria are being re-investigated.
Sections at Torre de Busi in the Lombardy Basin (currently most favoured) and the Bosso Valley of the Apennine Basin, Italy, are being considered as potential GSSPs. A SABS in the Neuquén Basin of Argentina is likely. A special issue of Cretaceous Research is planned to publish results of new studies on the stratigraphy of the candidate sites https://www.sciencedirect.com/journal/cretaceous-research/about/call-for-papers#jurassic-cretaceous-boundary-interval-global-correlation-and-palaeoenvironmental-background. These will guide final site selection.
Additional work is still required, with boundary criteria and sites to be further evaluated in 2025. A GSSP proposal is projected to be completed within 2 years.

- GSSP CEREMONIES HAVE BEEN SUCCESSFULLY COMPLETED

BARREMIAN GOLDEN SPIKE CEREMONY

The golden spike ceremony for the Barremian GSSP was held in Caravaca SE Spain on the 9th November 2024 and was organized by the Chair of the WG - Miguel Company.
The GSSP of the base of the Barremian Stage [at the base of bed 171 of the Rio Argos section, near Caravaca, SE Spain (Company et al., 2024), marked by the first appearance of the ammonite *Taveraidiscus hugii*], was ratified by IUGS in March 2023. Secondary criteria include: bioevents (foraminifera, calcareous nannofossils), C-isotope stratigraphy, sequence stratigraphy, and astrochronology. A new calibration of the Hauterivian/Barremian boundary against the magnetostratigraphic scale is proposed. The protection of the Río Argos section is ensured by the municipality of Caravaca, and its recognition at the regional and national level is being progressed. *Company et al., 2024. Episodes 47, 335–379.*

HAUTERIVIAN and ALBIAN GOLDEN SPIKE CEREMONIES

The golden spike ceremony for the Hauterivian and Albian GSSPs was held on June 29th 2024 in Arnayon and La Charce in southeast France.
The GSSP that defines the base of the Hauterivian Stage was ratified by IUGS in December 2019 (Mutterlose et al. 2021). The GSSP is placed at the base of bed 189 of the La Charce section, Drôme, southeast France (Vocontian Basin). This level is marked by the FAD of the ammonite genus *Acanthodiscus*, which defines the base of the *Acanthodiscus radiatus* Zone. Complementary data include 13 ammonite and nannofossil events, and magnetostratigraphic and C-isotope events.
The GSSP that defines the base of the Albian Stage was ratified by IUGS in April 2016 (Kennedy et al. 2017). The base of the Albian Stage is defined at the FAD of the planktonic foraminifera *Microhedbergella renilaevis* at a level 37.4 metres above the base of the Marnes Bleues Formation and 40 cm above the base of the Niveau Kilian marker bed in the section SSE of the Col de Pré-Guittard, Arnayon, Drôme, France. The LO of *Microhedbergella renilaevis* is placed within a 100-

m section of argillaceous sediments with 28 secondary markers including calcareous nannofossils, planktonic foraminifera, an inoceramid bivalve, ammonites, stable carbon isotopes, and local marker beds.
Mutterlose et al., 2021. Episodes 44, 129–150; Kennedy et al., 2017. Episodes 40, 177–188.

- THE VALANGINIAN GSSP PROPOSAL WAS APPROVED

A GSSP proposal to define the base of the Valanginian in the Vergol section (Drôme, SE France) with a SABS at Cañada Luenga (Cehegín, Spain) was unanimously approved by the Cretaceous Subcommission on the 15th August 2024. The proposal was voted by 95% of the eligible voters (19/20, one member did not cast a vote) and received the 100% agreement (19/19 of "yes" votes). The International Commission on Stratigraphy unanimously approved the Valanginian GSSP proposal on the 8th November 2024. The result was 17 votes in favour, 0 against, and 3 abstentions. The base of the Valanginian stage is defined at a point indicated by the FAD of the ammonite species *"Thurmanniceras" pertransiens*. The site met all criteria required for a GSSP. An age of 137.05 Ma was proposed for the boundary based on cyclostratigraphy – astrochronology age modelling. The GSSP proposal has been submitted to the IUGS Executive for ratification. If approved, a GSSP golden spike ceremony will be scheduled for summer 2026.

6. SUMMARY OF EXPENDITURES IN 2024:

Contribution to the Berriasian, Aptian, Maastrichtian Working Groups for fieldwork and analysis of GSSPs	1250.00 Euro
Contribution attendance cost to Albian and Hauterivian GSSP ceremonies in France, travel and accommodation for 5 members (Petrizzo, Falzoni, Jarvis, Gale, Mutterlose)	1959.00 Euro
Contribution attendance cost to Barremian GSSP ceremony in Spain, travel and accommodation for 3 members (Jarvis, Petrizzo, Falzoni)	928.42 Euro
Contribution for secretarial work	400.00 Euro
Contribution for updating the website	67.54 Euro
Bank fees for bank transfer	5.00 Euro
TOTAL expenditure in 2024 =	4609.96 Euro

7. SUMMARY OF INCOME IN 2024:

ICS Subvention for 2024	US dollars 5000.00 = 4609.96 Euro

8. BUDGET REQUESTED FROM ICS FOR 2025:

Contribution to Stage Working Groups for fieldwork, analysis and meetings	1500 Euro
Contribution for the organization of the Valanginian GSSP ceremony, meetings with local authorities (France)	800 Euro
Contribution, attendance costs at Cretaceous Subcommission WGs and General Meeting at the 12th Cretaceous Symposium, Hannover, 31 Aug – 5 Sept 2025	1500 Euro
Contribution for secretarial work and updating of the website	500 Euro

TOTAL budget request from ICS in 2025 = 4300 Euro

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025

- submission of the Aptian GSSP proposal to SCS with subsequent voting (early 2025) and approval.
- ratification of the Valanginian GSSP (end 2024/early 2025), submission of *Episodes* article (April 2025), planning for golden spike ceremony to be held during summer 2026.
- research activities toward selection of the J/K System boundary criteria and site identification – fieldwork, sample collection, processing, analyses and data acquisition, critical appraisal and interpretation. Consideration of large-scale climatic events and trends and their correlation potential will be continued, as well as possible identification of the VOICE C-isotope event in Tethyan records. Dating of volcanic rocks is planned, and possibilities for astrochronological calibration of the J-K boundary interval.
- research activities toward revision of Maastrichtian stage boundary criteria – sample processing, analyses and data acquisition, critical appraisal and interpretation of the GSSP. A second part of the work plan deals with data compilation for the development of SABS for correlation. Potential candidates are the Vistula and Kronsmoor sections (Poland, Germany), Gubbio (Italy), and the stratigraphic record of ODP Site 1210 (Pacific Ocean).
- meeting of the Cretaceous WGs: – 12th Cretaceous Symposium, Hannover (Germany), August 31 – September 5, 2025 with submission of papers to international scientific journals, including *Cretaceous Research*. A dedicated session '*Integrated stratigraphy and refining the Cretaceous time scale*' convened by the Subcommission officers will solicit papers on Cretaceous GSSPs and SABS. The congress will include a mid-symposium field trip to the several nearby Cretaceous outcrops, including the Coniacian GSSP.
- initiation of new WGs on selected Cretaceous substage boundaries. Initial discussion via email and online workshops. WGs to be confirmed following in-person meeting at the Hannover Cretaceous meeting.

9a. Potential funding sources external to IUGS:

The SCS does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources. Individual WG members may be allocated limited funds from their host institutions and/or their personal research funds. Funding have been secured by Voigt and Castro Jiménez to contribute to analyses of the Maastrichtian and Aptian GSSPs, respectively.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- finalization of the GSSP proposal for the Aptian base, vote within the WG and SCS and ratification.
- selection of a Berriasian (J/K) GSSP and subsequent approval and ratification.
- finalization of the GSSP proposal for the Maastrichtian base, voting within the WG and SCS and ratification.
- establishment of selected Substage WGs to progress the subdivision of major intervals of Cretaceous time.
- research activities toward the selection of the Cretaceous substages boundary criteria, particularly for longer stages such as the Albian and Campanian, with the identification of reference sections.

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International Commission on Stratigraphy

Subcommission on Jurassic Stratigraphy

ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY

International Subcommission on Jurassic Stratigraphy

Submitted and reported by Angela L. Coe, Subcommission Chair, in consultation with ISJS executive and voting members.

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The International Subcommission on Jurassic Stratigraphy is the primary body for facilitation of international communication and scientific co-operation in Jurassic stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of the evolution of the Earth during the Jurassic.

Objectives

1. The unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphical units that provide the framework for global correlation.
2. Provide an inclusive, diverse and supportive international community to facilitate global research and associated activities on Jurassic stratigraphy.
3. Advance understanding of the evolution of the Earth system during the Jurassic including palaeogeography, palaeoclimate change, evolution of life, and sea-level change.
4. Improve the resolution and correlation of the integrated stratigraphy for the Jurassic.
5. Facilitate communication on Jurassic stratigraphy for both specialist and non-specialist audiences.

Fit within IUGS Science Policy

The objectives of ISJS relate to two main science objectives of IUGS policy:

- 'The development of an internationally agreed scale of chronostratigraphical units, fully defined by Global Stratotype Sections and Points (GSSPs) where appropriate and related to a hierarchy of units to maximize resolution throughout geological time'
- 'Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth'.

Our new high-resolution stratigraphy working group will liaise with others working on the following objective:

- 'Promotion of international consensus on stratigraphic classification and terminology, which is essential for advancement of Earth-science research and education.'

3. ORGANIZATION – Interfaces with other international projects/groups

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3b. Interface with other international, regional and national projects

International Continental Drilling Program (Early **J**urassic **E**arth System and **T**imescale (JET)). This International Continental Scientific Drilling Programme project, led by Stephen Hesselbo and that cored and analysed 630 m of Norian to Pliensbachian strata finished this year. A special session was held at the Geological Society of America conference in Los Angeles in September 2024 entitled 'Mesozoic Timescale and Earth System' in which there were 24 presentations. It is likely that this themed session will be proposed again for the 2025 meeting. Many further publications arising from this project are in progress.

International Continental Drilling Program (ICDP) funded workshop (Middle Jurassic Earth System and Timescale (M-JET)). Following on from the successful JET project (see above), members of the community have been invited to a workshop in Portugal about the proposed drilling of the Middle Jurassic section in the northern Lusitanian Basin in Portugal in June 2025. The workshop will explore research questions and drilling targets.

IGCP project 739 The Mesozoic-Palaeogene hyperthermal events. This project is investigating the major hyperthermal events and their associated environmental responses. Episodes of Jurassic warmth (Triassic-Jurassic boundary and Toarcian Oceanic Anoxic Event) are a focus of the project. The project involves 149 researchers from 41 countries. ISJS voting members David Kemp and Micha Ruhl are co-leaders.

UNESCO World Heritage Sites. ISJS liaises with the management group of the UNESCO East Devon and Dorset Coast World Heritage Site and engages in debates and promotional activities. See https://jurassiccoast.org/.

Geoheritage. We have links through a voting member and working group members with international and national governmental and non-governmental authorities and advisory groups including the International Commission on Geoheritage, the Geoheritage Specialist Group of the World Commission for Protected Areas and ProGEO. We've appointed one ISJS voting member to specifically advise the subcommission on geoconservation matters.

Stratigraphy Commission of the Geological Society, London. Angela L. Coe, is chair of

Stratigraphy Commission of The Geological Society, London. The Commission are currently working to raise the profile of Jurassic GSSPs in the UK and they have two stratigraphy books in production: *A correlation of Jurassic rocks of Britain and Ireland and contiguous offshore areas* and *A revised correlation of the Cretaceous rocks of the British Isles.* The latter is at proof stage and will be printed in 2025.

Special volume to honour the work of the ex-chair of the Tithonian Working Group. The Journal of Iberian Geology is to publish issue 3 of volume 50 as a tribute to the contributions of Frederico Oloriz, this includes 11 papers on the Jurassic.

The German Subcommission on Jurassic Stratigraphy currently has 46 members. The 2024 annual meeting was held in Honau near Reutlingen (24 – 27 April 2024), lectures on a wide range of topics were followed by excursions to the Jurassic of the central Swabian Alb. The next annual meeting will be held in May 2025 in Eichstätt. An ongoing project of the German Stratigraphic Commission is a database of all lithostratigraphic units of Germany LithoLex: http://www.bgr.de/app/litholex/index.php. In addition, a monograph on the Jurassic of Germany is in progress. It is with great sadness to ISJS, but this group in particular that we heard of the death of Axel von Hillebrandt on the 3rd January 2024. Axel made many contributions to the advancement of Jurassic research, led several important geological expeditions into remote areas, published 130 papers and was instrumental in defining the Hettangian GSSP and hence the base of the Jurassic.

The Polish - Slovak Working Group of the Jurassic System The board comprises: Justyna Kowal-Kasprzyk (AGH University of Krakow); Marína Molčan Matejová (Comenius University in Bratislava), Błażej Błażejowski (Polish Academy of Sciences) and Tomáš Potočný (AGH University of Krakow). The team are currently organising the next meeting which will take place in Slovakia in 2025.

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

We gratefully acknowledge the continued support of the Polish Geological Institute - National Research Institute and Faculty of Geology, University of Warsaw, in editing and overseeing *Volumina Jurassica*, ISSN: 1731-3708, a peer-reviewed, open access journal supported by ISJS and devoted to publishing research papers on all aspects of the Jurassic System. The journal has a new editorial board this includes Jacek Grabowski and Ewa Głowniak who are ISJS voting members. The forthcoming issue is devoted to the memory of Professor Grzegorz Pieńkowski who sadly passed away in 2023 and was Vice Chair of ISJS.

The Geologic TimeScale Foundation and the Groupe Français d'Etude du Jurassique (through the French national research infrastructure, Récolnat), have both kindly provided funds to support research on uppermost Callovian and lowermost Oxfordian ammonites and their management together with further fieldwork to help in proposing an Oxfordian GSSP.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024

- **The Oxfordian Working Group:** Work is now focused on the two candidate sites chosen from over 60 sites. These are Redcliff Point, Weymouth, England; Thuoux, near Aspermont (05), SE France. It is clear that these two sites are complementary, and one will be put forward as the primary section and the other as the auxiliary. The working group have met online four times for at least two hours, these sessions have included presentations on all

aspects of both sections. New members with complimentary specialisms have joined the group. Further work has been done on the ammonites from both sections. Two field sessions focused on high-resolution sampling (every 2 cm) at Redcliff Point, Weymouth, England has been completed. New ammonite-rich levels have been discovered below and above the section previously studied. Pierre Pellenard has been appointed as co-chair of the working group (Section 2, objectives 1 and 3).

- **The Callovian Working Group:** In 2024 this group was dissolved according to the eight-year rule in the ICS statutes and is currently being reformed. The previous working group favoured the historic ammonite definition and the intensively studied Albstadt-Pfeffingen section in Germany with its excellent ammonite faunas but it is too condensed and not suitable for study of the depositional chemostratigraphy or magnetostratigraphical studies. Open access is also problematic. Recently, a well-exposed and expanded section with radio-isotopic dates has been identified in Argentina however here the endemism of the ammonites and possibly other fossil groups may be problematic, but this will be investigated by the new working group. New potential sections have also recently been identified in Kachchh, India by Dhiru Pandey and colleagues (Section 2, objectives 1 and 2).
- **The Tithonian Working Group:** The recently appointed chair, Verónica Vennari has had to step down for personal reasons. A new chair, Ana Bertha Villaseñor, has agreed to take on the role of chair and has been working with Frederico Olóriz (former chair). Work is now ongoing to finalise a new working group with suitable expertise and diversity. Work on the neighbouring Berrasian GSSP is proving helpful to understanding this tricky stratigraphical interval (Section 2, objectives 1 and 2).
- **ISJS Executive and voting members:** Analysis of the membership of ISJS, voting and approval of extension of term of office for the chair, appointment of two new vice chairs and replacement of six voting members. In electing the new members we have broadened the age demographic and continued to balance gender (was 43% female now 50%), ethnic origin, subject and geographical specialism (Section 2, objective 2).
- **Anthropocene:** Full engagement in the ICS part of the debate around the Anthropocene and ICS procedures.
- **12th Jurassic Congress:** Preparation continues for the 12th Jurassic congress that will be held at Exeter University, Exeter, UK from the 29th June to 3rd of July 2026. There will be pre- and post-conference field trips to the main Jurassic sites in the UK and a mid-conference, all delegate, field trip to the Hettangian to Pliensbachian strata at Lyme Regis and Charmouth. Discussions are underway with two publishers for the abstracts and field guide and a dedicated website is being constructed (Section 2, objectives 1 to 5).

6/7. SUMMARY OF INCOME and EXPENDITURES IN 2024

Item	**Income ($)**	**Expenditure/ committed ($)**
Opening balance	4600	
Transfer from ICS for 2024	2500	
Promotion and public engagement for the Kimmeridgian GSSP on the Isle of Skye (travel and graphics)		2000 committed
Advancement of the Oxfordian GSSP - contribution towards fieldwork (accommodation and travel)		840.96

Advancement of Oxfordian GSSP		1759.04 committed
Tithonian Working Group seed funding		2500 committed
Closing balance		0.00

8. BUDGET REQUESTED FROM ICS FOR 2025

We request $5000 to enable about five Jurassic researchers of low economic status and without access to other funds to attend the 12th Jurassic Congress in Exeter in 2026. This is in-line with objective 2 in Section 2. The amount will cover their registration ($300) and provide a substantial contribution to transport costs ($700). This is an average for transport costs; the exact amount will be allocated on a case-by-case basis. We are however aware that delegates of low economic status are most likely to come from the global south so transport costs will be high. We are requesting these this year so that we can set up an application process ahead of the congress in June 2026. We are also applying for funds to other 3rd parties (see 9a). This is our one priority, thus if it is not possible to award this amount we respectfully request funds to support the attendance of a lesser number of Jurassic researchers.

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025

- Preparation of one or two completed proposal documents for the Oxfordian GSSP for discussion within the Oxfordian working group and ISJS as required (Section 2, objectives 1, 3 and 4).
- A meeting of the High-Resolution Jurassic Stratigraphy working group to decide on objectives a modus operandi and assign tasks (Section 2, objective 4).
- Review work to date, gather new ideas and formulate and start to enact a plan in the newly formed Callovian and Tithonian working groups (Section 2, objective 1 and 2).
- Website setup and mailings sent advertising and preparing delegates for the 12th International Congress on the Jurassic (29th June to 3rd July 2026). Process for sifting applications for funding established. Plans in place for field trips and publishing (Section 2, objectives 2 and 5).
- Initiate an informal North Africa Jurassic group with the purpose of proposing some Jurassic geosites of international interest and raising the profile of work on the Jurassic in Africa (Section 2, objectives 2, 3 and 5).

9a. Potential funding sources external to IUGS

For GSSP activities: Geologic Timescale Foundation, IGCP, national funders.
For the 12th Jurassic congress: We have negotiated for Exeter University to provide conference facilities free of charge. Requests for sponsorship are in progress with the Jurassic Coast World Heritage Site together with Net Zero and Nuclear waste disposal companies.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Further publication of data relating to the candidate Oxfordian GSSPs and submission of an Oxfordian GSSP proposal to ICS.
- Complete or significantly advance the defining of the remaining Jurassic GSSPs (Callovian, and Tithonian) through the new working groups and facilitating progress by encouraging constructive collaboration and raising funds.
- Increase diversity and facilitate research aspirations at all career stages by championing representation through the new official positions, providing a diversity of opportunities, role models and subject specialist champions.
- Facilitate communication on the Jurassic for both specialist and non-specialist audiences, including promoting the Jurassic GSSPs. This will be achieved through meetings, workshops, publications including in *Volumina Jurassica*, outreach activities and maintaining an up-to-date and informative ISJS website.
- Facilitate a successful and inclusive Jurassic congress in Exeter, UK in 2026.
- Improve resolution and correlation of the integrated stratigraphy for the Jurassic.
- Further our understanding of the Earth system during the Jurassic especially palaeoclimate change.
- Provide support to the Middle Jurassic ICDP project and future IGCP projects related to the Jurassic.
- Work with the International Subcommission for Cretaceous Stratigraphy to help them define the base of the Berriasian and the Jurassic/Cretaceous boundary.
- Work with national and international bodies to protect Jurassic geological sites, assess and promote their natural capital.

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Chair: Professor Angela L. Coe, School of Environment, Earth and Ecosystem Sciences, The Open University, Milton Keynes, MK7 6AA, UK. Tel: +44 (0)1908652161; Email: Angela.Coe@open.ac.uk

Vice-Chairs: Professor Pierre Pellenard, Laboratory Biogéosciences, University of Burgundy, 21000 Dijon, France; Tel: +33 3 80 39 63 66; E-mail: Pierre.Pellenard@u-bourgogne.fr

and Professor Dhirenda Kumar Pandey, Department of Civil Engineering, Manipal Institute of Technology (MIT), Manipal Academy of Higher Education, Manipal-576104, India. Tel +919928369323; Email: dhirendrap@hotmail.com (non voting)

Secretary: Professor David B. Kemp, China University of Geosciences (Wuhan), 388 Lumo Road, Wuhan 430074, P.R. China; Tel: +86 27 67883001; Email: davidkemp@cug.edu.cn

Name and addresses of Current Voting Members

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Ana Bertha Villaseñor, Departamento de Paleontología, Instituto de Geología, Primer piso, Cubículo y Laboratorio de invertebrados, C.P. 04510, Ciudad de México, México; +52 (55) 56-22-42-80 Ext. 182; anab@unam.mx
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Working groups and leaders

Callovian Working Group
We are currently in the processes of appointing a chair and secretary.

Oxfordian Working Group
Co-chairs: Kevin Page, Honorary Senior Research Fellow, Camborne School of Mines, University of Exeter, UK, Tel: +44 (0)1363 775354, kevinnpage@gmail.com and Professor Pierre Pellenard, Laboratory Biogéosciences, University of Burgundy, 21000 Dijon, France; Tel: +33 3 80 39 63 66; E-mail: Pierre.Pellenard@u-bourgogne.fr
Secretary: Ewa Głowniak, Faculty of Geology, Department of Geology of Sedimentary Basins, University of Warsaw, Warsaw, Poland (+48 22) 55 40 429 eglownia@uw.edu.pl

Tithonian Working Group
Chair: Ana Bertha Villaseñor, Departamento de Paleontología, Instituto de Geología, Primer piso, Cubículo y Laboratorio de invertebrados, C.P. 04510, Ciudad de México, México; +52 (55) 56-22-42-80 Ext. 182; anab@unam.mx
Secretary: Verónica Vennari, Instituto de Evolución, Ecología Histórica y Ambiente (IDEVEA, UTN-CONICET) Av. J.J. Urquiza 314, 5600 San Rafael, Mendoza, Argentina; Tel: +54 9 0260 442 1078; vvennari@mendoza-conicet.gob.ar

High-Resolution Jurassic Stratigraphy Working Group
We are currently in the processes of appointing a chair and secretary.

Corresponding members

Emanuela Mattioli: ex ISJS Vice Chair
Stephen Hesselbo: ex ISJS Chair
Eckhard Mönnig: ex Callovian Working Group Chair
Jóseph Palfy: ex ISJS Chair

International Commission on Stratigraphy
Subcommission on Triassic Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Triassic System

Submitted by:
Prof. Zhong-Qiang Chen, Chairman
State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences (Wuhan), 388 Lumo Road, Hongshan District, Wuhan 430074, China
Tel: 86-27-67883068; E-mail: zhong.qiang.chen@cug.edu.cn

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

- Definition of stage boundaries and selection of GSSP sections.
- Rationalization of chronostratigraphic classification for the Triassic.
- Inter-calibration of all stratigraphic tools and promoting globally data to achieve this.
- Establishment of physical, cyclostratigraphic, magento- and chemo-stratigraphic scales.
- Correlations of Triassic successions and extreme events from marine to non-marine.

The objectives satisfy the IUGS mandate of fostering international agreement on nomenclature and classification in stratigraphy; facilitating international co-operation in geological research; improving publication, dissemination, and use of geological information internationally; encouraging new relationships between and among disciplines of science that relate to Triassic geology world-wide; attracting competent students and research workers to the discipline; and fostering an increased awareness among individual scientists world-wide of what related programs are being undertaken.

3. ORGANIZATION – Interfaces with other international projects/groups

The STS is a Subcommission of the International Commission on Stratigraphy, with 3 executive officers and 20 voting members of the STS and about 110 corresponding members.
The editor of the online journal *Albertiana* is also appointed, and he also manages the web site and posts for STS announcements and task group discussions. The *Albertiana* editor is supported by an editorial team of ten drawn from the voting and corresponding members.

3a. Current Officers for 2024-2028:

Chair: Zhong-Qiang Chen, State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences (Wuhan), Wuhan, China

Vice-Chair: Sofie Lindstrom (Female), Geological Survey of Denmark and Greenland; University of Copenhagen, Denmark
Secretary: Yadong Sun, China University of Geosciences (Wuhan), Wuhan, China
Webperson and *Albertiana* Editor: Christopher A. McRoberts, Geology Department, SUNY, Cortland, New York, USA

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

All publications and research costs by TST members were sponsored by their research grants.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

A total of 96 papers that are related to stratigraphy and extreme biotic, environmental and climatic events within the Triassic have been published by STS members in 2024 (see Appendix).

- **New achievements in O-A boundary**: Four candidates for GSSP of OAB: the Wantou section and Guandao section in South China, the Desli Caira section in Romania and Kcira section in Albania. Balini et al. (2024) described systematically ammonoid faunas across the O-A boundary of the Deşli Caira section in northern Dobrogea, Romania. These authors found that the most significant turnover in the history of Triassic Ammonoidea occurs within a 1.1-m-thick interval. Ammonoid stratigraphic range, together with magnetostratigraphy and conodont chronostratigraphy, provides a nearly coincidence of the ammonoid turnover position with the base of magnetochron MT3. They considered that the Deşli Caira section offers the best record of ammonoid assemblages across the OAB, and that combination of ammonoid zonation and the base of MT3 is the best marker defining the GSSP of OAB. Golding et al. (2024) reconstructed multielement apparatus of the conodont *Gladigondolella tethydis* (Huckrede) from Desli Caira. In 2023, Golding (2023, oral) reported preliminary studies on conodont biostratigraphy of OAB from Desli Caira, and conodont zone is bit confused at the study section. Horacek and Gradinaru (2023) reported a high-resolution $\delta^{13}C$ curve to aid the correlation of OAB at the Deşli Caira section. They found that two different levels for OAB based on turnovers of conodont, ammonoid and foraminifera species associated with a maximum in $\delta^{13}C$ excursion. However, a correlation between detailed ammonoid biostratigraphy (reported by Balini et al., 2024) with the OAB $\delta^{13}C$ excursion of Horacek and Gradinaru (2023) is essential for integrated stratigraphic correlations of OAB worldwide. In contrast, Chen *et al*. (2023) updated multi-proxies of biostratigraphy, magnetostratigraphy, and chemostratigraphy constraining the OAB of the Wantou section and recommended the FAD of conodont *Chiosella timorensis* senso stricto (at Bed 15e; 9.16 m) as the ideal marker, which is consistent with other proxies: 1) the peak of $\delta^{13}C$ positive excursion and 2) base of normal polarity prior to the normal polarity dominated interval. As a result, a STS workshop is organized in Romania to discuss the advance of the definition of OAB and selection of this GSSP in late May of 2025 (see attached Meeting Anouncement).

  Primary publications: Balini, M., Lacatus, A., Gradinaru, E., Lazar, I., 2024. Aegean ammonoids from the Anisian (Middle Triassic) GSSP candidate section Desli Caira (northern Dobrogea, Romania). *Rev. It. Palaeontol. Strat*. 130(3), 711-759. Golding, M.L., Kiliç, A.M., 2024. Reconstruction of the multielement apparatus of the conodont *Gladigondolella tethydis* (Huckrede) using multivariate statistical analysis: implications for taxonomy, stratigraphy,

and evolution. *Riv. It. Paleontol. Strat*. 130, 1-18. Horacek, M., Gradinaru, E., 2023. The Spathian-Anisian (Lower-Middle Triassic) boundary in the candidate GSSP section at Desli Caira, Romania: Review of existing data, new findings, and comparison with other candidates. *Palaeogeogr. Palaeoclimatol. Palaeoecol.* 613, 111612. Chen, Y., *et al*., 2023. An updated of conodonts biostratigraphy at the Wantou section (South China)-A potential candidate of GSSP for base of Anisian.

- **New achievements in I-O boundary**: Wu et al. (2024) reported the *Neospathodus pakistanensis* Zone, the *Novispathodus waageni eowaageni* Subzone, the *Novispathodus waageni waageni* Subzone, the *Neospathodus yangtzeensis-Novispathodus shani* Zone and $\delta^{13}C_{carb}$ excursion across the IOB from the Zuodeng section of Guangxi, South China, further confirming that *Nv*. ex gr. *waageni* occurs at or slightly below the peak of the positive $\delta^{13}C_{carb}$ excursion. A symposium associated with two field excursions is planning to be held joint with the 5th International Conference of Geobiology in Wuhan, China during 13-15 June, 2025. The IOB working group will be invited to participate this indoor meeting and field trip in 2025.

  Primary publications: Wu, S.L. *et al*., 2024. Lower to Middle Triassic conodont biostratigraphy and carbonate carbon isotope chemostratigraphy of the Zuodeng area, Guangxi, South China, and its relevance for stratigraphic correlation from the Induan to the Anisian. *Palaeogeogr. Palaeoclimatol. Palaeoecol.* 636, 111965.
- **Updates for the Upper Triassic stratigraphy**: After a formal voting procedure within the working group, the Pizzo Mondello section was selected as the GSSP for the base of the Norian. A team led by Dr. Marco Bolini is preparing a formal proposal for the GSSP of CNB for the ratification within voting members of STS. Regarding the GSSB for NRB, two candidates are the Pignola Abriola in Italy and Steinbergkogel in Austria, which both utilize the FO of conodont *Misikella posthernsteini* as a proxy for the boundary. No new works have been updated. However, abundant calcareous nannofossils (Demangel et al., 2024; Holcova et al., 2024), conodonts (Du et al., 2024; Luy et al., 2024; Wu et al., 2024) and strontium isotope stratigraphy (Chen et al., 2024) have been reported from the integrated stratigraphy of Upper Triassic.
- **One indoor meeting and one business meeting**: **1)** $T_{19}S_3$: **Mid-Phanerozoic mass extinctions, recovery, extreme environmental events and integrated stratigraphic correlations** (August 30th, 2024, Busan, Korea), with 50 participants. This one-day session has attracted 18 abstracts which are the highest number of papers presented among all sessions of stratigraphy at the 37th IGC. This symposium offered a great platform for STS members to communicate the advanced results on various GSSPs and stratigraphy of Triassic as well as associated mass extinction, recovery and extreme environmental events. Presenters present their new progresses on Triassic (including various GSSPs) biostratigraphy and chemostratigraphy and some boundaries have been hotly debated. **2) STS business meeting** (August 30th, 2024, Busan, Korea): 1) summarizing STS works in 2024 by Chair; 2) elections of STS Executive and Voting members; 3) working progress reports on GSSPs (task completed and future plan); 4) collecting activity information for 2015.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Total 2,500 USD was planned to sponsor STS session and business meeting joint with the 37th International Geological Congress, 25-31 August, 2024, including 6 junior researchers/students × 400 USD/person (=2,400 USD) plus a cost of 100 USD for STS business meeting.

Unfortunately, this fund has not arrived successfully to STS bank account yet.

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

Total 2,500 USD was allocated for STS activities in 2024, but the fund has not arrived to the bank account that STS indicated.

8. BUDGET REQUESTED FROM ICS FOR 2025

Total **2,500** USD is budgeted for organizing two major events in 2025: 1) The Olenekian-Anisian Boundary Field Workshop 2025, Romania, May 27th-30th, 2025; 2) The STS Symposium and field excursion in South China joint with the 5th International Conference of Geobiology, 13th to 15th of June, 2025, Wuhan, China.

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- Organizing the **STS Workshops:** The Olenekian-Anisian Boundary Field Workshop 2025, Romania, May 27th-30th, 2025 in which STS business meeting is held, progresses on GSSP for OAB are reported.
- Organizing The STS Symposium and field excursion in South China joint with the 5th International Conference of Geobiology, Wuhan, China, during 13th to 15th of June, 2025, in which STS business meeting is held, progresses on GSSPs for IOB, OAB, CNB, and NRB are reported.
- **GSSPs**: The plan is to move towards a vote on the GSSP for **CNB** in 2025 within STS. The IOB and OAB GSSPs move towards preparing a discussion document among the working group members, as a prelude to moving towards a vote on the candidate markers and sections.

9a. Potential funding sources external to IUGS:

Research grants of STS members obtained from various funding agents of various countries.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

Total **2** international symposia, **3-5** STS sessions, **1** thematic issue, significant progresses on **4** GSSPs (two of them can be ratified are anticipated to be achieved):

- STS session joint with IGC: **Mid-Phanerozoic mass extinctions, recovery, extreme environmental events and integrated stratigraphic correlations** (August 30th, 2024, Busan, Korea).
- **The Olenekian-Anisian Boundary Field Workshop 2025**, Romania, May 27th-30th, 2025
- **STS Symposium and Field Excursion in South China** joint with the **5th International Conference of Geobiology**, Wuhan, China during 13th to 15th of June, 2025.
- **Triassic Integrated Stratigraphy session** joint with the **5th International Congress on Stratigraphy**, xxx, 2026?.
- STS sessions in major conferences, and journal special issues in 2025-28.
- **CNB GSSP**: is to move towards a vote in 2025. **IOB and Olenekian GSSPs**: Completing the proposal for ratification in 2025-28. **Rhaetian GSSP**: A task group is formed to re-start the works on this GSSP and complete a discussion proposal.

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Chair: Zhong-Qiang Chen, State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences (Wuhan), Wuhan, China; zhong.qiang.chen@cug.edu.cn
Vice-Chair: Sofie Lindstrom (Female), Geological Survey of Denmark and Greenland; University of Copenhagen, Denmark; sli@geus.dk
Secretary: Yadong Sun, China University of Geosciences (Wuhan), Wuhan, China; yadong.sun@cug.edu.cn

Names and Addresses of Current Voting Members:

Arnaud Brayard (France, male): University of Burgundy, France
Charles Henderson (Canada, male): University of Calgary, Canada
Martyn Golding (Canada, male): Geological Survey of Canada, Canada
Viktor Karádi (Hungary, male): Eötvös Loránd University, Hungary
Manuel Rigo (Italy, male): University of Padova, Italy
Ali Kiliç (Turkey, male): Balikesir University, Turkey
Jinyuan Huang (China, male): Chengdu Center, China Geological Survey
Rossana Martini (Switzerland, female): University of Geneva, Switzerland
Jennifer Botha (South Africa, female): National Museum; University of the Witwatersrand, South Africa
Cecilia Benavente (Argentina, female): The National University of Cuyo, Argentina
Sylvain Richoz (Sweden, male): Lund University, Sweden
Mark Hounslow (UK, male): Lancaster University, UK
Yadong Sun (China, male): China University of Geosciences (Wuhan), China
Zhengyi Lyu (China, male): China University of Geosciences (Wuhan), China
Tetsuji Onoue (Japan, male): Kyushu University, Japan
Lydia S Tackett (USA, female): North Dakota State University, USA
Giovanni Muttoni (Italy, male): Milan University, Italy
Edgar Nitsch (Germany, male): State Office for Geology, Freiburg, Germany
Christopher McRoberts (USA, male): State University of New York College at Cortland
David Ware (Germany, male): Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Germany

Working groups and leaders

Chair of the IOB working group: Charles Henderson
Chair of the OAB working group: Spencer Lucas
Chair of the CNB working group: Mark Hounslow
Chair of the NRB working group: Yadong Sun

Corresponding members (simple list of names as known)

See the attached File 2

Attached files including: 1) STS members' publication list in 2024; 2) Romania Workshop Announcement; 3) Corresponding member list

SUBCOMMISSION ON PERMIAN STRATIGRAPHY
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY

Subcommission on Permian Stratigraphy (SPS)

Submitted by: Liz Weldon, SPS Chair

School of Life and Environmental Sciences, Deakin University. 221 Burwood Highway, Burwood, Victoria 3125, Australia, Email: l.weldon@deakin.edu.au

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Subcommission Objectives: The Subcommission's primary objective is to define the series and stages of the Permian by means of internationally agreed GSSPs and establish a high-resolution temporal framework based on multidisciplinary (biostratigraphical, geochronologic, chemostratigraphical, magnetostratigraphical, etc.) approaches, and to provide an international forum for scientific discussion and interchange on all aspects of the Permian, but specifically on refined intercontinental and regional correlations.

Fit within IUGS Science Policy: The objectives of the Subcommission involve two main aspects of IUGS policy: 1) The development of an internationally agreed chronostratigraphic scale with units defined by GSSPs where appropriate and related to a hierarchy of units to maximize relative time resolution within the Permian System; and 2) the establishment of framework and systems to encourage international collaboration in understanding the evolution of the Earth and life during the Permian Period.

3. ORGANISATION - interface with other international projects / groups

3a. Officers for 2024-2028 period:

Dr Liz Weldon (SPS Chair)

School of Life and Environmental Sciences, Deakin University. 221 Burwood Highway, Burwood, Victoria 3125, Australia, Email: l.weldon@deakin.edu.au

Prof. Michael H. Stephenson (SPS Vice-chair)

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Prof. Yichun Zhang (SPS Secretary)

State Key laboratory of Palaeobiology and Stratigraphy. Nanjing Institute of Geology and Palaeontology, 39 East Beijing Road, Nanjing, Jiangsu 210008, P.R. China, Email: yczhang@nigpas.ac.cn

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

N/A

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- A new SPS Chair was elected and the composition of voting members was revised in order to follow the rules of the Statutes (see the appendices below). Three of the new voting members Neil Griffis, Hana Jurikova, Lorenzo Marchetti and Michael Read presented their Permian research at a webinar (https://permian.stratigraphy.org/interest). In addition, three honorary members were invited and joined the SPS: Lucia Angiolini, Charles Henderson and Shuzhong Shen.
- The paper "Redefinition of the Global Stratotype Section and Point (GSSP) and new Standard Auxiliary Boundary Stratotype (SABS) for the base of Wuchiapingian Stage (Lopingian Series, Permian) in South China" by Shen S, Yuan D, Zhang Y, Henderson CM, Zheng Q, Zhang H, Zhang M, Dai Y, Xu H, Wang W, Li Q, Wang Y, Wang X, Mu L, Ramezani J, Erwin DH, Angiolini L, Zhang F, Hou Z, Chen J, Zhang X, Zhang S, Wu Q, Pan Y, Stephenson M, Mei S. was published in *Episodes* 2024, 47:147-177.
- A field trip to the Rockland section (Nevada), the Kungurian-base GSSP candidate, was organized May 17 to May 25, 2024 (see report in *Permophiles* 77, p. 18).
- Two issues of *Permophiles* were published (SPS Newsletters *Permophiles* 76 and 77) and a compilation of selected papers published on Permian topics in 2023 was published online on the SPS website: https://permian.stratigraphy.org/Interests/2023. The Permian Time Scale https://permian.stratigraphy.org/gssps, and the SPS website were kept updated.

6. SUMMARY OF EXPENDITURE IN 2024

The financial assistance received from ICS was spent on literature compilation, for the Standard Pro Annual ZOOM license for SPS, and to partially support the field-trip expenses to the Rockland section (Nevada), Kungurian-base GSSP candidate. Part of the field expenses were also covered by the research funds of L. Angiolini and C. Henderson.

7. SUMMARY OF INCOME IN 2024

An amount of Euros 4111.65 euros was allocated from ICS in July 2024.

8. BUDGET REQUESTED FROM ICS FOR 2025

We request 6500 US$ from ICS for SPS activities in 2025. $3000 will be used to partially support the SPS Exec. to attend and chair a business meeting at the ICCP in Toulouse, France, and 2x $1500 will be made available to subsidize field costs for the base Roadian and base Wordian working groups. $500 to purchase a ZOOM license for hosting meetings and support an assistant to compile a literature list from selected Permian papers published in 2024.

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- We plan to have the proposal of the Rockland section, Nevada, USA, for the Kungurian-base GSSP published in *Permophiles* and voted on by SPS voting members.

- We plan to perform the revision of the Guadalupian base Roadian and base Wordian GSSPs. The revisions include: ascertaining if the boundary for the base Roadian in the Guadalupe Mountains, Texas, USA, needs to be moved higher in the section, and if so how high; preparing a proposal for a base Roadian SABS at Maweishan, China; restudying the original base Wordian GSSP at Getaway Ledge, Guadalupe Mountains, Texas, USA, for auxiliary markers to aid correlation; and searching for new candidates if this is not successful.
- We plan to support the activity of the working groups on correlation of marine and continental Carboniferous-Permian transition and correlation of Gondwana to Euramerican sections.
- We plan to organize several webinars and hold a face-to-face meeting at the ICCP in Toulouse, France.
- We plan to publish two issues of *Permophiles*.

9a. Potential funding sources external to IUGS:

N/A

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD 2024-2028

- Ratify the Kungurian-base GSSP.
- Revise the Permian timescale where it needs to be improved (Guadalupian stages) and ratify any changes that are necessary.
- Establish a robust paleogeographic framework for the Permian and focus on N-S correlations.
- Seek Deep-time Digital Earth (DDE) Big Science Program of IUGS -sponsored informatics support for biostratigraphic data management and paleogeographic reconstructions.
- Create 3D model outcrops of Permian GSSPs through the DDE outcrop group (https://outcrop3d.deep-time.org/), similar to the Silurian-Devonian example here: https://outcrop3d.deep-time.org/?model=26b3af24-ff8b-1f56-88b6-529727950904
- Organize webinars to increase the size, diversity and international coverage of the Permian Community.
- Publish at least two *Permophiles* issues each year.

APPENDICES

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Prof. Yichun Zhang (SPS Secretary)

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Working groups and leaders

Base-Kungurian Working Group
Leader: Prof. Charles Henderson

Base-Roadian Working Group
Leader: Prof. Charles Henderson

Base-Wordian Working Group
Leader: Prof. Shuzhong Shen

Correlation Between Marine and Continental Carboniferous-Permian Transition Working Group
Leader: Prof. Joerg Schneider

Gondwana to Euramerica Correlations Working Group
Leader: Prof. Mercedes di Pasquo

Corresponding members (simple list of names as known)

International Commission on Stratigraphy
Subcommission on Carboniferous Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Carboniferous Stratigraphy
Submitted by: Markus ARETZ

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Objective

The SCCS promotes and coordinates international cooperation among various geologic specialists for the purpose of defining standard global chronostratigraphic boundaries within the Carboniferous System and promoting regional and intercontinental stratigraphic correlation of Carboniferous. The principal SCCS goals are:

(a) to establish a standard global stratigraphic time scale and to select the best stage boundaries within the Carboniferous system,
(b) to establish high-resolution integrated stratigraphic frameworks at regional scale, and
(c) to facilitate global correlation in the system.

Fit within IUGS Science Policy

The current objectives of SCCS relate to the main aspects of IUGS policy:

(a) Establishment of a standard global stratigraphic time scale, defined by Global Stratotype Sections and Points (GSSPs).
(b) Development of internationally acknowledged chronostratigraphic units/or boundaries.
(c) Promotion of international cooperation in geological research.

3. ORGANIZATION – Interfaces with other international projects/groups

SCCS is composed of 17 voting members (3 officers, other 14 voting members) from 10 countries (Belgium (2), China (4), Czech Republic (1), France (1), Germany (1)**,** Ireland (1)**,** Japan (1)**,** Spain (2)**,** United Kingdom (2)**,** USA (2)). To this are added currently 134 corresponding members from 29 countries. (see appendix for details)

The membership, voting and corresponding, of 29 persons affiliated with Russian institutions are currently on hold, and they are suspended from all subcommssion's activities.

3a. Current Officers for 2024-2028:

Chair: Markus ARETZ, Université Toulouse III - Paul Sabatier, France
Vice-Chair: CHEN Jitao, Nanjing Institute of Geology and Palaeontology, China

Secreatry: Bernard MOTTEQUIN, Institut royal des Sciences naturelles de Belgique, Belgium

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

SCCS has no direct financial support from other sources. All members use their own resources to cover the expenses for the work related to the goals and activities of SCCS. If needed SCCS provides letters of support for project applications of members related to work on objectives of SCCS.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024

- **The Kasimovian-Gzhelian boundary**

The potential GSSP is defined at the Naqing section, Guizhou Province, South China. It is based on the detailed knowledge of the conodont lineage of the index taxon, fusulinid biostratigraphy, carbon, oxygen, strontium, and uranium isotopic stratigraphy, and cyclostratigraphy. Over the last year substantial progress has been made for the correlation of marine and non-marine facies. All data are now available and will be presented and synthesised in a GSSP proposal to be transferred to ICS in the first half of 2025 pending the formal approval of SCCS anticipated for early 2025.

- **The Devonian-Carboniferous boundary**

The working group for the revision of the base of the Carboniferous is finalizing a proposal for the new criterion and level for the revised boundary to be submitted to SCCS for validation by the end of 2024. This proposal includes revised biostratigraphic schemes for global correlation of major fossil groups in continental, neritic and pelagic depositional systems, which are correlated to other stratigraphic proxies (p.ex. chemostratigraphy) and major geological, biological and climatic events, which took place during the latest Famennian and earliest Tournaisian. It results in the establishment into an idealized calendar listing 20 different points in time in a chronological order. This standardized calendar, successfully tested in the last 2 years, forms the backbone of the global correlation and helps to place the boundary in different settings on different paleocontinents.

- **The Bashkirian-Moscovian boundary**

Two potential index taxon *Diplognathodus ellesmerensis* and *Declinognathodus donetzianus* have been recorded from multiple basins, and are the only taxa still being considered by the working Group. Both occur as minor components in the conodont assemblages in the boundary level. *Diplognathodus ellesmerensis* has a slightly longer range and a much wider distribution than that of *De. donetzianus*.

Outside of Eastern Europe, *De. donetzianus* is very rare, usually being represented by single specimens. It is entirely absent from the primary stable continent of North America (it only occurs in accreted terranes) and Asia. Even by adding the equivocal occurrences of *De. donetzianus* from North America and South America, the palaeogeographic distribution of *De. donetzianus* remains significantly more limited than that of the widespread *D. ellesmerensis*. The lineage *De. marginodosus–De. donetzianus* has been recorded in the Russian Platform, i.e., the Donets Basin, Volga region, and South Urals. However, the current BMB in the Russian Platform was not defined by the earliest evolutionary appearance of *De. donetzianus*.

The lineage *D. benderi–D. ellesmerensis* is known in South China and South Urals. In the former area, a morphocline of the lineage has been well recorded. In the latter area, *D. ellesmerensis* and *De. donetzianus* co-occur. In other areas, e.g., the Arctic, North America, and South America, the *D. benderi-D. ellesmerensis* lineage may also be tested due to both species were both recorded there. Currently, *D. ellesmerensis* has a higher potential for the BMB index fossil due to its global distribution, an abundance of supplementary marker species at similar stratigraphic levels, and the close stratigraphic proximity of the FAD to the traditional BMB, thus largely preserving the original concept for the base of the Moscovian Stage. In addition, a positive excursion of $\delta^{13}C$ and $\delta^{18}O_{apatite}$ has been recorded near the FAD of *D. ellesmerensis*, which offers extra correlation potential. Currently, the Naqing section, South China, and the Basu section, South Urals, Russia both are considered candidates for the boundary. A proposal for the official boundary marker has been drafted. The GSSP for the boundary should be settled in the following two years.

- **The two other remaining boundaries without a GSSP**

Work has been progressing for the Visean-Serpukhovian and Moscovian-Kasimovian boundaries. The working group of the Moscovian-Kasimovian boundary plans to submit a GSSP proposal based on the first occurrence of *I. heckeli* within the next two years. The work and progress on the VSB boundaries is due to personal initiatives, because the position of working group leaders is currently not filled. Despite the absence of a clear leadership progress has been made to better constrain the distribution of the considered conodont markers and their correlation to other stratigraphic tools.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Prepared by Xiangdong WANG (SCCS Chair 2020-24) (Accounts maintained in U.S dollar)

Preparing the 20th ICCP	$3000
The Kasimovian task group activity	$500
The Gzhelian task group activity	$550
Voting members attending 37TH IGC (Korea)	$480
TOTAL EXPENDITURE	$4530

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

Prepared by Xiangdong WANG (SCCS Chair 2020-24) (Accounts maintained in U.S dollar)

Funds carried forward from 2023	$ 60
ICS Grant of 2024	$4500
TOTAL INCOME	$4560

8. BUDGET REQUESTED FROM ICS FOR 2025

The 20th ICCP (International Congress on the Carboniferous and Permian) will be held in Toulouse, France, June 24-27, 2025. Numerous activities related to SCCS work will take place during and around the congress. The officers and voting members of SCCS will meet during the venue and discuss problems and progress on Carboniferous GSSPs. Since this should be the most important

face-to-face meeting for the entire subcommission during the term (2024-28), a maximum number of members should be present. Business meetings of all working groups will take place during the congress, including those with new leaders to be appointed. Additionally field work to advance on GSSPs (base Tournaisian, base Serpukhovian and maybe base Kasimovian) are planned before and after the congress in southern France and northern Spain. The idea is to benefit from the participation of numerous working group members at the ICCP in being already near side.
Hence the attendance of a maximum number of SCCS members is necessary to plan, initiate and continue the work for the remaining GSSPs to be established and other issues for global correlation. We request **5000 US$** from ICS to support attendance of SCCS members, which do not have sufficient own personal funds to attend the congress or extend the stay in Toulouse.

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025

- **Organization and relaunch of the subcommission work**

The priority for the first half of 2025 is the profound relaunch and restructure of the subcommission including the definition and establishment of new and clear workflows. This task is necessary due to the impact of the COVID pandemic and resulting delay in subcommission work, but also due to the suspension of the members from the Russian Federation (c. 20% of the members), any issue which has not been resolved so far.
The revision of the entire membership list is planned with the aim to increase the number of active and young members and also identifying new potential members, especially in countries SCCS is currently not and not well represented, notably in North Africa, South America and India.
We will review and adjust the composition of our current working groups, and appoint new leaders at the least for the Visean-Serpukhovian and Bashkirian-Moscovian boundaries working groups. We also plan to establish a pluri-annual work plan for all working groups including the definition of milestones to be reached in defined times. Overall, a clear order of priority tasks should allow to finish some tasks and also to accommodate better the shrinking number of critical biostratigraphic expertise in many Carboniferous fossil groups.
We also include into this task the complete revision of the totally outdated SCCS website. The transfer under the umbrella of ICS will be the necessary impetus to achieve this task, but also help to define the discussion about the channels and media SCCS use for communication (website, newsletter, etc.).

- **GSSP Proposal: base of the Gzhelian Stage**

The second priority task of SCCS is to submit a GSSP proposal to ICS in the first half of 2025. In charge of this proposal will be the working group for the definition of the Kasimovian and Gzhelian boundaries. Their remaining task for the Gzhelian is to demonstrate convincingly the correlation of the conodont-based boundary definition into nearshore and non-marine facies. A GSSP for the base of the Gzhelian Stage would be the first GSSP within the Pennsylvanian Subsystem.

- **Revision of the base of the Tournaisian Stage**

The working group for the revision of base of the Tournaisian Stage composed of specialists from SDS and SCCS should get the new boundary criterion approved by SCCS and then move onto the phase for formal investigations of potential GSSP section. The research of the last years have

already identified potential sections and facies, but the process has to be formally started. The aim is to submit a GSSP proposal to ICS latest in 2027.

- **All other stage boundaries**

Work on all other boundaries will continue. It is the aim to make continues progress and encourage the working groups to move forward for the formal definition of boundary criteria and the selections process for GSSP candidates. However, these works have to consider the limited resources and numbers of experts, and to not hamper the advance on the priority tasks for 2025 (base Gzhelian, base Tournaisian). Currently, the lowest priority has the work on the base of the Serpukhovian, since it seems to be the least advanced boundary for a future GSSP.

9a. Potential funding sources external to IUGS:

All members will continue to use their own resources to cover the expenses for the work related to the goals and activities of SCCS. So, the willingness and priorities of the national funding agencies or local institutions including universities, to finance projects, which will insure progress on SCCS work, will continue to be the most essential limiting factor for subcommission work. Unfortunately, many members report that it is becoming increasingly difficult, or even impossible, to get financial support for their stratigraphic work. Over the long term, the absence of continued funding of stratigraphic work in the Carboniferous is a clear threat for any success.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Progress on the Carboniferous GSSPs has been slow compared to other systems, and many stages still lack a globally defined base. Therefore, the SCCS's top priority for this term is to accelerate progress and establish as many of the remaining Carboniferous GSSPs as possible. It is reasonable to aim for submitting three proposals—covering the Gzhelian, Tournaisian, and either the Kasimovian or Moscovian stages—to ICS during this term. Work on a fourth proposal should be ready for submission by the end of the term, or at the beginning of the next term. Additionally, the establishment of the Serpukhovian base should become a priority for the SCCS, with a GSSP planned for the first half of the next term (2028-2030). Achieving these goals will require careful management of the limited human resources within SCCS.
- The second major objective of the SCCS is to improve global correlation of the regional stratigraphic subdivisions within the Carboniferous. While a wealth of detailed data is available, it has often been sidelined in the focus on defining GSSPs. The goal is to create better correlations between different paleocontinents and to improve the connection between pelagic, neritic, and continental facies, as well as temperate and tropical climatic realms. This enhanced correlation should not only strengthen the alignment of local and chronostratigraphic subdivisions but also raise the profile of SCCS work, potentially attracting new members to the subcommission.
- The third objective of SCCS is to improve its internal organization and to become more attractive for new and younger members. The focus is globally, so it not only includes countries SCCS is already well established/known, but also those countries, where rocks of the Carboniferous system crop out, but SCCS is not well represented or virtually unknown. SCCS will try to establish an online based outreach program, using it revised

wensite, multi-media channels, but also setting up a webinar series to get in touch and exchange with more people outside the traditional SCCS community.

APPENDICES

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Secretary: **Bernard Mottequin**, Royal Belgian Institute of Natural Sciences, O.D. Earth and History of Life, rue Vautier 29, B 1000 Brussels, Belgium, E-mail: bmottequin@naturalsciences.be

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Working groups and leaders

- Working group for the revision of the base of the Tournaisian Stage (base of the Carboniferous), leader: Markus ARETZ (Toulouse, France)
- Working group for the establishment of the base of the Serpukhovian Stage, leader: vacant
- Working group for the establishment of the base of the Moscovian Stage, leader: vacant (leader suspended)
- Working group for the establishment of the base of the Kasimovian and Gzhelian stages, leader: Katsumi UENO (Fukuoka, Japan)

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134 members from 29 countries; majority from Europe, East Asia and North America

Melikan AKBAS (Turkey), Thomas ALGEO (United States of America), Demir ALTINER (Turkey), Michael R. W. AMLER (Germany), K. F. T. ATIF (Algeria), Ondrej BABEK (Czech Republic), Milo BARHAM (Australia), James E. BARRICK (United States of America), Bernoit BEAUCHAMP (Canada), R. Thomas BECKER (Germany), Zdzislaw BELKA (Poland), Silvia BLANCO-FERRERA (Spain), Paul BRENCKLE (United States of America), Lewis M. BROWN (United States of America), Silvia CESARI (Argentina), Xiaolin CHANG (P.R. China), Bo CHEN (P.R. China), Zhong-qiang CHEN (P.R. China), D. R. CHESNUT (United States of America), Geoff CLAYTON (Ireland), Chirstopher J. CLEAL (United Kingdom), N. Rubin CUNEO (Argentina), Vladimir I. DAVYDOV (United States of America), Paulo Alves DE SOUZA (Brazil), Pamela G. DIAZ SARAVIA (Argentina), Michiel DUSAR (Belgium), Cortland EBLE (United States of America), Fritz EBNER (Austria), Brooks ELLWOOD (United States of America), Sarah ESTEBAN-LOPEZ (Germany), Yoichi EZAKI (Japan), Shirin FASSIHI Malaysia, Jerzy FEDOROWSKI (Poland), Robert GASTALDO (United States of America), Martin GIBLING (Canada), Martyn GOLDING (Canada), Enpu GONG (P.R. China), Carlos R. GONZALEZ (Argentina), Melissa GREY (Canada), Ethan GROSSMAN (United States of America), Luc HANCE (Belgium), Christoph HARTKOPF-FRÖDER (Germany), Philip H. HECKEL (United States of America), Charles HENDERSON (Canada), Hongfei HOU (P.R. China), Mark HOUNSLOW (United Kingdom), Hao HUANG (P.R. China), Xing HUANG (P.R. China), Masahiro ICHIDA (Japan),

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International Commission on Stratigraphy

Subcommission on Devonian Stratigraphy

ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy

Submitted by: Ladislav Slavík (Chair)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The past year was exceptional one because of the renewal of all subcommission officers and voting memberships (by new election and/or re-election). The main scientific activities in 2024 included the revision of the GSSPs (the basal Emsian and the Devonian-Carboniferous boundary). The efforts to redefine the Basal Emsian boundary continued in three key areas – the Prague Synform, the Spanish Central Pyrenees and Morocco. In spring 2024 was published the first proposal for the Basal Emsian redefinition. The proposal is based on biostratigraphy and supported by multiple chemo-physical proxies. The candidate section for the GSSP is in the Prague Synform and was presented both at the IGC 2024 and at the Joint ISSS and SDS meeting "Timeline of Silurian and Devonian environmental and biotic changes" in Sofia, Bulgaria, where all the main Devonian issues were discussed. The meeting included indoor sessions, regular Devonian subcommission Annual business meeting, and two days of field trips to the Paleozoic of the Svoge Unit and the Iskar Gorge in western Bulgaria. There were also numerous proposals for new CMs. Other SDS activities included the organization of the Devonian session at Geotolosa 2025, and the publication of the SDS Newsletter, which covers all major topics related to the Devonian. During the SDS meeting in Sofia, the SDS grant committee was established, and the SDS grant system for early-career Devonian workers was launched. The grants are supported by an external source.

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

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

3. ORGANIZATION – Interfaces with other international projects/groups

Actively supporting on-going IGCP programmes, national Committees for the IGCP projects. Interfaces with national science foundations supporting the GSSP revisions. Close cooperation with the ISSS and SCCS/ICS.

3a. Current Officers for 2024-2028:

Chair: Ladislav Slavík
Vice-Chair: José Ignacio Valenzuela-Ríos
Secretary: Ulrich Jansen
Webperson: Sofie Gouwy

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

University of Münster continue to support the staff costs of the SDS Newsletter production and the mailing. The IUGS support pays for the printing. The Newsletter has an ISSN and status as a publication. Since 2021 it is published and printed partly in colour, pdf version is published on the SDS web page hosted by the ICS web.

We have regular annual meetings (this year face to face again). SDS members support their own attendance at these.

The major part of SDS subprojects are supported from other sources (home institutes and national funding agencies).

SDS grant system for early-career Devonian workers was launched this year. It is financially supported by the University of Geneseo on a one-off basis. The funding provided is sufficient to finance the individual grants for several years.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- **Annual business meeting of the SDS** was held on September 14th in the framework of the Joint ISSS and SDS meeting "Timeline of Silurian and Devonian environmental and biotic changes", Sofia, Bulgaria. The joint subcommission meeting included field trips to the Paleozoic of the Svoge Unit and the Iskar Gorge in western Bulgaria. It was the most important event for our community. The joint meeting supported close cooperation between the Silurian and Devonian Commissions. It was very successful, perfectly organized, and both indoor sessions and fieldtrips were highly attended.
- **Publications**: SDS Newsletter No. 39 (120 pp), and an extensive volume on Rhenish Massive: Hartenfels, C. Hartkopf-Fröder & P. Königshof (Eds.) The Rhenish Massif: More than 150 years of research in a Variscan mountain chain, part II. Current issue September 2024: Palaeobiodiversity and Palaeoenvironment 104(3): 437-752. https://link.springer.com/journal/12549/volumes-and-issues/104-3

- **Formal election of the SDS executive** (officers and voting members) for 2024-2028. The elections took place in September and October 2023. During the SDS Business meeting, four new corresponding members were recruited from China.
- **Launch of the SDS grant system** for early-career Devonian workers. Two young Devonian specialists were awarded in 2024.

6. SUMMARY OF EXPENDITURE IN 2024 ($USD):

SDS Devonian meeting in Sofia, Bulgaria – travel costs:	
SDS Chair	500
SDS Vice-Chair	500
SDS Secretary	500
IGC Busan, South Korea – travel costs	
SDS Chair	500
SDS Newsletter	800
Bank Fees (total 2024)	50

7. SUMMARY OF INCOME IN 2024:

Total income from the ICS: $USD 2850

8. BUDGET REQUESTED FROM ICS FOR 2024

GeoTolosa 2025 - News from the Paleozoic Worlds – a joint International Congress covering Devonian, Carboniferous and Permian issues that will include also “Variscan meeting 2025“ is planned for June 2025 in Toulouse, France. The organization of the meeting is underway. This meeting will be a perfect opportunity for the Devonian Subcommission to hold a regular SDS business meeting there. The main focus will be the discussion on the submitted proposal(s) for redefinition of the Basal Emsian GSSP. Also a thematic Devonian Session: Life and Bioevents during Devonian time has already been proposed, SDS officers will be convenors.

We request contributions to travel costs for the above event.	
SDS Chair travel costs	$700
SDS Vice-Chair travel costs	$700
SDS Secretary travel costs	$700
In addition we request part support for production of the SDS Newsletter	$900
Total Sum requested from IUGS	$3000

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- Submission of further proposals or progress reports from key areas for the revision of the basal Emsian GSSP. One proposal has already been published. Formal proposal for the discussion within the SDS will be ready in 2025.
- Revision of the D/C boundary with the D/C Boundary Task Group in close collaboration with the Carboniferous Subcommission.
    - The regular SDS business meeting and Devonian symposium. Recruitment of new SDS members.

9a. Potential funding sources external to IUGS:

Possible funding of stratigraphic projects by national science agencies/foundations. Possible support from the scientific institutions and universities. Several projects have been submitted.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

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

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

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Working groups and leaders

Emsian Working Group (EWG)

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

Members
rotating presidency
LADISLAV SLAVÍK (CZECH REPUBLIC)
JOSÉ IGNACIO-VALENZUELA-RÍOS (SPAIN)
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ALEKSEY KIM (UZBEKISTAN)
TOMÁŠ WEINER (CZECH REPUBLIC)
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Devonian/Carboniferous Boundary Working Group (DCBWG)

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

Members
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International Commission on Stratigraphy
Subcommission on Silurian Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Silurian Stratigraphy

Submitted by:
Carlo Corradini (Chair)

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. ORGANIZATION – Interfaces with other international projects/groups

Organization

The ISSS is a Subcommission of the International Commission on Stratigraphy. The Subcommission is organized by an Executive consisting of Chairman, Vice-Chairman, Secretary, and Webperson who are all Voting Members of the Subcommission. In the Subcommission elected for 2024-2028 there are ten other Voting Members. Beside the officers, the Voting Members group has been largely changed with respect to the previous four-years term, as 7 voting members are new. 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: https://stratigraphy.org/subcommission-silurian/ contains newsletters, meeting announcements, discussion posting-boards, bibliography of Silurian articles, links to related sites, and other information.

Interface with other international projects / groups
IGCP project no. 652 "Reading geologic time in Paleozoic sedimentary rocks" and "International Subcommission on Timescale calibration" under chairmanship of B.D. Cramer, titular member of the ISSS.
Collaboration will continue with stratigraphically neighbouring subcommissions on Ordovician (ISOS) and Devonian (SDS) stratigraphy.

3a. Current Officers for 2024-2028:

Chair: Carlo Corradini
Vice-Chair: Thjis Vanderbroucke
Secretary: Emilia Jarochowska
Webperson: Huang Bing

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 AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

The GSSP for Aeronian in the Hlásná Třebaň, section, Czech Republic, has been ratified by IUGS.

The GSSP for Telychian in the El Pintado I section, Spain, has been ratified by IUGS.

Joint ISSS-SDS conference with field-meeting and business meeting took place in September 12-17, 2024 in Sofia, Bulgaria, in collaboration with Geological Institute of Bulgarian Academy of Sciences and University of Mining and Geology, Sofia.

An online business meeting of Titular Members took place on October 21, 2024, to plan the work of the years 2024-2028. Two new working groups have been appointed: subdivision of the Pridoli Working Group and base Sheinwoodian Working Group.

Silurian Times No 31 was edited by the secretary, David Ray, and distributed in April, 2024, posted on the web site for the ISSS, and circulated as an email attachment to all titular and corresponding members of the Subcommission. It contained the reports on previous meetings, announcements of planned meetings, the latest news and recent publications on Silurian research.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Contribution to participation at Sofia ISSS-SDS congress for 1 persons	600 US$
Bank costs and bank fee for conversion in EUR	350 US$

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

Carried forward from 2023	1000 US$
Allocation from ICS	3500 US$

Since the money was transferred from ICS in late September, after the ISSS annual meeting, it was not possible spend it before the end of the year, and will be transferred to next year

BALANCE (carried to 2025)	3550 US$

8. BUDGET REQUESTED FROM ICS FOR 2025

1000 US$, to support the activities of the two Working Groups and the participation at the annual meeting, that will be organized in Spain in connection with the GSSP ceremony for the base of the Telychian Stage

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- ISSS Working Group on Sheinwoodian will start looking for potential GSSP section, upon agreement on the boundary definition timeline
- ISSS Working Group on the Pridoli will discuss the subdivision of the Series into Jarovian and Radotinian stages, as proposed by Manda et al. (2023). A formal proposal of the Hvížďalka section as a GSSP for the upper Přídolí unit - Radotinian Stage will be prepared, discussed and voted in the subcommission and possibly submitted to ISC for approval

before the end of the year. Also, the WG will look for possible SABS, both for the bases of Jarovian and Radotinian stages

- A field meeting, with indoor scientific sessions and business meeting, will be organized in September in Andalusia, Spain, in connection with the GSSP ceremony for the base of the Telychian Stage at El Pintado 1 section.
- Continuing updates of the website for Silurian Subcommission by webmaster Huang Bing

9a. 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. Some minor expenses may be covered from ISSS budget.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Principal work will be devoted to GSSP-related research activities – restudy of some previously ratified but currently inadequate stratotypes and search for sections suitable for auxiliary stratotypes.
- Pridoli working Group will formalize the subdivision of the Series into Jarovian and Radotinian Stages. The Hvížďalka section, in Czech Republic will be proposed as GSSP, possibly together of at least one SABS
- Base Sheinwoodian working group will focus on two candidate sections already in study, and possibly others, in order to propose the new GSSP, and possibly SABS.
- Establishment of working groups for the replacement base Gorstian GSSP and base Ludfordian GSSP
- Works on higher-resolution correlation of principal Silurian biozonations (graptolite, conodont, and chitinozoan) with carbon isotope excursions in the timeframe provided by presumed new radiometric data.

APPENDICES

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Working groups and leaders

Base of Sheinwoodian Working Group
Leader: Bradley D. Cramer

Přídolí Working Group
Leader: Carlo Corradini

Corresponding members (simple list of names as known)

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Živilė Žigaitė

International Commission on Stratigraphy
Subcommission on Ordovician Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Ordovician Stratigraphy (SOS)

Submitted by:
T. Servais & A. Ferretti

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

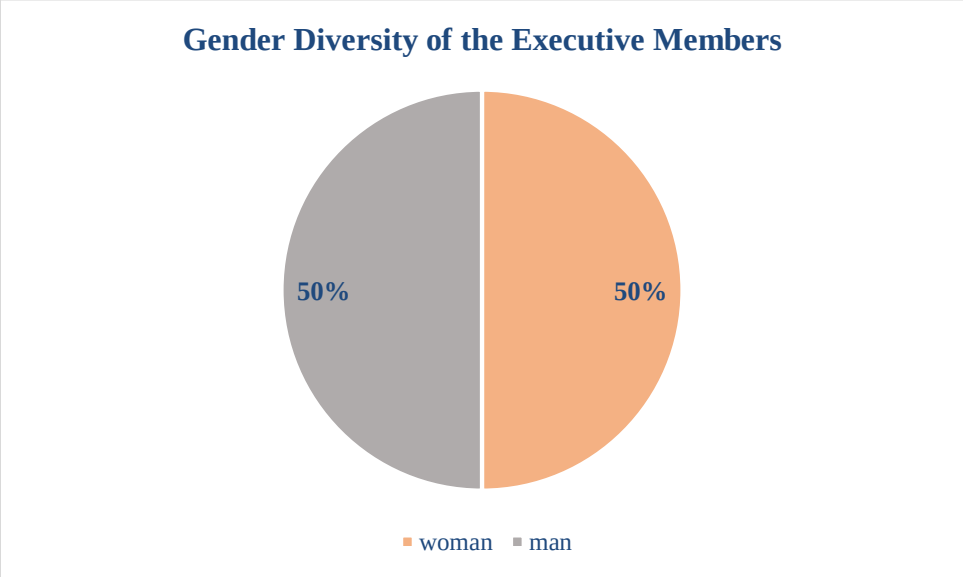
The Subcommission on Ordovician Stratigraphy promotes international cooperation on all aspects of Ordovician geology, specifically stratigraphy. The goal of the Subcommission is to provide a **high-resolution geological time scale** that will be a sound base for interdisciplinary research on the global Earth system during the Ordovician Period. The work is broadly based and must include specialists in palaeontology, all subdisciplines of stratigraphy (bio-, litho-, chemo-, and magneto-stratigraphy), sedimentology, geochemistry, and tectonics. With a large network including active participants from more than 25 countries, the Subcommission thus involves much of the global geological community. Its global network involves a large set of Members (about 600) from Academia, government institutions and industry.

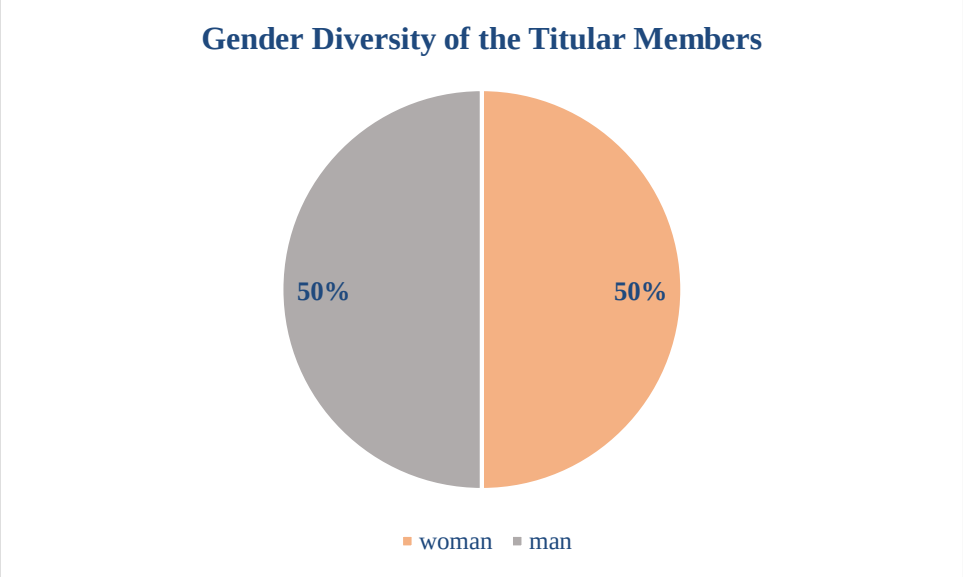
Specific objectives of the Subcommission are:

a. To delimit and subdivide the Ordovician System (and Period) as a part of the overall ICS mission to **establish and publish a standard global stratigraphic scale**. This work aims to establish/verify boundaries (GSSPs and ASSPs), correlation of major subdivisions (Stages and Series) globally and regionally, and to periodically review the effectiveness and utility of these decisions.
b. To promote **regular international meetings** on all aspects of Ordovician stratigraphy, especially those devoted to clarifying stratigraphic procedures, nomenclature and methods for use in establishing a unified global time scale and to prepare correlation charts with explanatory notes.
c. To **encourage, promote, and support interdisciplinary research on all aspects of Ordovician stratigraphy**, also through the proposal of **joint international research projects**, addressing topics that require high-resolution, global correlation and promoting new stratigraphic methods and their integration into a multidisciplinary stratigraphic approach.
d. To promote **education in stratigraphic methods**, and the **dissemination of stratigraphic knowledge**, by the publication of Thematic Issues strictly focused on diverse aspects of Ordovician stratigraphy, through the release of an annual newsletter (*Ordovician News*) and by a web page for promoting discussions and reporting results of this research.

3. ORGANIZATION – Interfaces with other international projects/groups

The Subcommission on Ordovician Stratigraphy (SOS) comprises an Executive (Chair, two Vice-Chairs, a Secretary, an Internet Officer and a Newsletter Editor), plus 14 other Voting Members and 550 Corresponding Members (in the SOS, all scientists receiving, and contributing to, Ordovician News are considered as Corresponding Members). Since August 2024 (International Geological Congress at Busan), the Subcommission includes, for the first time, an equal number of female and male representatives, both in the Executive (3:3) and for the other Voting Members (7:7). To our knowledge, the SOS is the first and only Subcommission of the ICS to achieve a perfect gender parity.





The Subcommission includes a broad national representation and coverage of key fossil groups as well as specialists in interdisciplinary fields such as geochemistry, sequence stratigraphy and sedimentology.

The Subcommission on Ordovician Stratigraphy closely cooperates with the **IGCP 735** project "***Rocks 'n' ROL (Filling knowledge gaps in the Early Palaeozoic Biodiversification)***" (2021-2026). The co-leaders of IGCP 735 include four Voting Members of the SOS. The fourth Annual Meeting of IGCP 735 was held in Córdoba, Argentina, in coordination and collaboration with the Ordovician Subcommission.

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

Other than time allowed by employers of the Executive and Voting Members to carry out their duties and attend conferences, the Subcommission receives no support from sources other than IUGS.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024

1. REPLACEMENT OF EXECUTIVE AND TITULAR MEMBERS OF THE SUBCOMMISSION 2024-2028

In accordance with ICS Rules, the SOS Executive started in late 2023 to prepare the replacement of the Voting Members. The objective to reach a perfect gender balance (initiated in 2020) and a best possible global coverage for the period 2024-2028 is now achieved. The number of Voting Members remained at 20. The Executive has been enlarged with an additional Vice-Chair.

2. INTERNATIONAL STRATIGRAPHIC ACHIEVEMENTS

The second Auxiliary Boundary Stratigraphic Section and Point (ASSP) for the base of the Ordovician System at Xiaoyangqiao (Northern China), has been accepted to be an official Standard Auxiliary Boundary Stratotype (SABS) by the Subcommission in 2023. The official inauguration of the stratotype took place on June 22-25, 2024, with about 60 scientists present.

3. INTERNATIONAL MEETINGS & PROJECTS

3.1. August 2024. The SOS was represented during the ICS business meeting at the IGC at Busan by the Vice-Chair, Zhan Renbin.
3.2. October 2024. The 4th Annual Meeting of the International Geoscience Programme (IGCP) 735 "*Rocks n' ROL (Filling knowledge gaps in the Early Palaeozoic Biodiversification)*", took place in Cordoba, Argentina, co-organised by the SOS. The international meeting will give rise to a thematic volume in the journal *Lethaia*. The new Vice-Chair Alycia Stigall chaired an official business meeting of the SOS.
3.3. November 2024. The 4th Virtual IGCP 735 took place in Prague, Czech Republic. Contributions to this international meeting will be presented in a special issue of the journal *Bulletin of Geosciences*.

4. SOS BUSINESS MEETINGS

4.1. Since the covid pandemic, online meetings of the titular members have been regularly organized. In 2023, two online business meetings of the titular membership (2020-2024) took

place, including a video conference on December 18th 2023, with the major objective to prepare the election of the new voting membership. A first meeting of the new Subcommission voting membership (2024-2028) takes place December 5th, 2024.

4.2. The Chair and Secretary (2020-2024) met during two days at Lyon, France, in July 2024, for regular SOS business.

4.3. The new Executive (2024-2028) met during three days at Lyon, France, in September 2024 (two members being present online during part of the meeting).

4.4. The next ISOS (International Symposium on the Ordovician System) will take place in Xi'an, China, in 2027, following the vote of the SOS voting membership in early 2024.

5. NEWSLETTER & WEB-PAGE

The official Newsletter *Ordovician News 41* (for 2023) was published in April 2024 and is available from the SOS webpage (http://ordovician.stratigraphy.org/).

6. PREPARATION OF GSL SPECIAL PUBLICATIONS VOLUME III

A major accomplishment of the SOS during the term 2020-2024 was the publication of two special volumes (532 and 533) of the *Geological Society Special Publication* series, covering over 1100 printed pages dedicated to a global Ordovician synthesis. After the publication on the synthesis of Ordovician rocks from Europe (volume 532) and all other parts of the world (volume 533), the major objective of the SOS for the term 2024-2028 is to publish a third volume or the *Geological Society Special Publication* series, dedicated to international correlation, including chapters on all major biostratigraphical groups, all boundary stratotypes and their correlation, etc. This third volume, strictly focused on Ordovician stratigraphy, will be co-guest-edited by Annalisa Ferretti (Secretary), David Harper (former Chair), Thomas Servais (Chair) and Wenhui Wang (Internet Officer). A first meeting of the editors took place in September 2024 in Lyon during the meeting of the Executive of the SOS.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Receiver	Date	Motivation	Costs (US $)
Thomas Servais (Chair)	July 2024	Lyon (France): business meeting Chair & Secretary (*transport, accommodation, food*)	750
Thomas Servais (Chair)	September 2024	Lyon (France): business meeting new SOS Executive + Editors meeting Geol. Soc. Special Publication (*transport, accommodation, food*)	1000
Annalisa Ferretti (Secretary)	September 2024	Lyon (France): business meeting new SOS Executive + Editors meeting Geol. Soc. Special Publication (*transport, accommodation, food*)	1000
Wang Wenhui (Internet Officer)	September 2024	Lyon (France): business meeting new SOS Executive + Editors meeting Geol. Soc. Special Publication (*transport, accommodation, food*)	2250
Alycia Stigall (Vice Chair)	October 2024	Cordoba (Argentina): business meeting at IGCP Annual Meeting (*transport, accommodation, food*)	1200
Bertrand Lefebvre (Newsletter Editor)	October 2024	Cordoba (Argentina): business meeting at IGCP Annual Meeting (*transport, accommodation, food*)	1800

TOTAL 8000

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

8000 (US $).

8. BUDGET REQUESTED FROM ICS FOR 2025

9000 (US $) detailed as follows:

Receiver	Date	Motivation	Costs (US $)
Thomas Servais (Chair)	March 2025	Lyon (France): business meeting Chair & Newsletter Editor (*transport, accommodation, food*)	1000
Annalisa Ferretti (Secretary)	June 2025	Lille (France): business meeting SOS Executive + Editors meeting Geol. Soc. Special Publication (*transport, accommodation, food*)	1000
Wang Wenhui (Internet Officer)	June 2025	Lille (France): business meeting SOS Executive + Editors meeting Geol. Soc. Special Publication (*transport, accommodation, food*)	2000
Bertrand Lefebvre (Newsletter Editor)	June 2025	Lille (France): business meeting SOS Executive + Editors meeting Geol. Soc. Special Publication (*transport, accommodation, food*)	1000
Thomas Servais (Chair)	October 2025	Changsha (China): business meeting at IGCP Annual Meeting (*transport, accommodation, food*)	2000
Alycia Stigall (Vice Chair)	October 2025	Changsha (China): business meeting at IGCP Annual Meeting (*transport, accommodation, food*)	2000

TOTAL 9000

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- 1. THIRD GSL SPECIAL PUBLICATION

Following the successful publication of two volumes (532 and 533) of the *Geological Society Special Publication* series, published as a main achievement of the SOS (2020-2024) and presented at STRATI2023 and at the International Symposium on the Ordovician System (ISOS) at Tallinn, Estonia, in July 2023, a third volume is planned by the SOS (2024-2028) to be published for the next ISOS in 2027. The "trilogy" aims to fully cover the knowledge on the Ordovician Period in a *continuum* between the SOS 2020-2024 and the SOS 2024-2028. While the first two GSL publications were focusing on the regional occurrences of the Ordovician (respectively 520 + 618 pp., 18 + 20 chapters, 99 + 105 authors), the third publication will be strictly related to Ordovician stratigraphy, so to revise all stratigraphic proxies and the validity of current stratigraphic boundaries. All major Ordovician specialists will be involved. After an initial meeting of the co-guest-editors in September 2024, the proposal will be launched by the Ordovician Subcommission in early 2025 in order to get the volume released in late 2026 (online) and in mid-2027 (print). The official presentation of the third GSL Ordovician Special Publication is scheduled at the 5th International Congress on Stratigraphy STRATI2027. An editorial meeting is scheduled at Lille (France) in June 2025 (including a possible business meeting at the Geological Society, London (UK).

• 2. INTERNATIONAL MEETINGS & PROJECTS

2.1. April 2025. 5th Annual regional IGCP 735 ("*Rocks and the Rise of Ordovician Life - Filling Knowledge Gaps in the Early Paleozoic Biodiversification*") meeting and field excursion in Kitab Natural Reserve. Shakhrisabz, Uzbekistan: Advances in studies of the Ordovician paleontology of Central Asia and the Middle East: faunal turnovers, biodiversity spots, migration pass ways.
2.2. October 2025. Closing meeting of the IGCP 735 organized by Central South University, Changsha (China); field excursions to the Ordovician of Hunan Province. Under the auspices of the SOS.
2.3. Date to be confirmed. 4th Virtual Annual IGCP 735 meeting in Bogotá (Columbia).
2.4. Laying the groundwork for the design of a new International Geoscience Programme (IGCP) proposal. To be discussed with the titular membership of the SOS during 2025.

• 3. SOS MEETINGS & NEWSLETTER & WEB-PAGE

Online meetings of the Titular Members and the Executive officers will be regularly organized. In 2025, a business meeting of the Executive officers is planned in Lille (June 2025) to schedule the state of advancement of main goals of the Subcommission. Data will be collected among all SOS Members in order to release the Newsletter *Ordovician News 42* (for 2024) in March 2025 at the SOS webpage (*http://ordovician.stratigraphy.org/*). A sound reorganization of the SOS webpage to better illustrate current activities, promote active participation of all SOS Members, and create public outreach to non-Ordovician people (especially young people) is planned with the introduction of a new Internet Officer.

9a. Potential funding sources external to IUGS:
None. Subcommission officers are mainly supported by their research projects for most of their activities.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024-2028)

As indicated above, a major achievement of the previous period (2020-2024) was the publication of the two first volumes of the *A Global Synthesis of the Ordovician System*, with a third volume being planned for the period 2024-2028.
All Ordovician GSSP's have been ratified during one decade, from 1997 to 2006, i.e., about 20 years ago. However, now is the time to think about the creation of possible Substages, but more importantly, about the correlation of the GSSP's at a global level. For further advancement and increased precision in correlation we need to focus on regional stratigraphy, regional scales and regional chronostratigraphic schemes. We recognize that many biotic, chemical and physical changes are not always synchronous, and that local and regional signals may vary from trends evident in global compilations. This is especially true for the Ordovician, where strong provincialism can mask biostratigraphic-based correlation. **Ordovician regional stratigraphy and geology** will therefore be the main goal for the period 2024-2028. This huge work task can be partly achieved by bringing together the community with the project of the special publication related to the topic.
To compile and publish an updated summary on Ordovician regional stratigraphy and geology, we therefore launch the third volume of *A Global Synthesis of the Ordovician System*. Special attention is paid to precise correlation of the Ordovician depositional sequences and sea-level curves as well as stable isotope and regional biodiversity curves. Chapters will include a review of biozonation

schemes of all major fossil groups, as well as review papers on all GSSP's and their global correlation.

APPENDICES

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International Commission on Stratigraphy
Subcommission on Cambrian Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY

Subcommission on Cambrian Stratigraphy

Submitted by: Prof. John Paterson, Chair, jpater20@une.edu.au

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

2.a. Mission Statement
The Subcommission is the primary body for facilitation of international communication and scientific cooperation on Cambrian stratigraphy.

2.b. Goals
The two principal goals of the Subcommission are:
1) To develop a global stage-level and series-level chronostratigraphic classification of the Cambrian System.
2) To complete and publish regional and global correlation charts for the Cambrian System.

2.c. Fit within IUGS Science Policy
The objectives of the Subcommission fall within three main areas of IUGS policy:
1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (stages and series), and related to a hierarchy of units (zones) to maximize relative time resolution within the Cambrian Period.
2) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the Cambrian Period.
3) Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs and Fossil-Lagerstätten.

3. ORGANIZATION – Interfaces with other international projects/groups

The Cambrian Subcommission is involved jointly with the Ordovician Subcommission in *IGCP Project 653: The onset of the Great Ordovician Biodiversification Event*.

The Cambrian Subcommission is working jointly with the Ediacaran Subcommission on restudy of the base of the Cambrian. Members of both subcommissions comprise the membership of the Terreneuvian/Fortunian Working Group. In recent years, joint meetings of the Ediacaran and Cambrian subcommissions have been organized.

3a. Current Officers for 2024-2028:

Chair: John Paterson (Australia) jpater20@une.edu.au
Vice-Chair: Jessica Creveling (USA) jessica.creveling@oregonstate.edu
Secretary: Marissa Betts (Australia) mbetts7@une.edu.au
Webperson: Michael Streng (Uppsala, Sweden), michael.streng@geo.uu.se

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

Not applicable.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- A new **Cambrian Stage 2** Working Group has been recently established, with Glenn Brock (Macquarie University, Australia) and Guoxiang Li (Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences) as co-leaders. The geographic balance of the membership covers all relevant Cambrian palaeocontinents and is in line with the view that any GSSP needs to be defined using multiproxy data, with current members having expertise across palaeontology, stratigraphy, chemostratigraphy, tectonics, chronostratigraphy and geochronology. Membership includes: Heda Agic (Durham University, UK); Javier Alvaro (Instituto de Geociencias (CSIC-UCM), Spain); Marissa Betts (University of New England, Australia); Fred Bowyer (University of Edinburgh, UK); Luis Buatois (University of Saskatchewan, Canada); Sebastien Clausen (Université des Sciences et Technologies de Lille, France); Robert Gaines (Pomona College, USA); Dmitriy Grazhdankin (Trofimuk Institute of Petroleum Geology and Geophysics, Russia); Thomas Harvey (University of Leicester, UK); Annette Hogström (University of Norway); Marta Rodríguez-Martínez (Universidad Complutense, Spain); and Ben Yang (Chinese Academy of Geological Sciences). The first meeting of the new group will take place by the end of 2024.
- A new Working Group for **Cambrian Stages 3 and 4** has been established, with Sara Pruss (Smith College, USA) and Mark Webster (University of Chicago, USA) as co-leaders. Membership was finalized in mid-2024, including: Gerd Geyer (Julius-Maximilians-Universität, Germany); Sarah Jacquet (University of Missouri, USA); Guoxiang Li (Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences); John Paterson (University of New England, Australia); Emmy Smith (John Hopkins University, USA); Michael Steiner (Freie Universität Berlin, Germany); and Andrey Zhuravlev (Lomonosov Moscow State University Leninskie Gory, Russia). The group has excellent international representation, gender balance, and expertise spread across various fossil groups and other stratigraphic data, and will consult with other experts in the field as needed. The new group first met via Zoom in August 2024 and established expectations for behavior and scientific integrity. It has also set up a MS

Teams platform for file sharing and discussion forums to progress matters relating to the definition of the bases of Stages 3 and 4.

- In April 2024, the Voting Members were sent a questionnaire to complete before meeting via Zoom to discuss the best way forward in defining the base of **Cambrian Stage 10**. The questionnaire and subsequent discussions focused on whether the FAD of the agnostid arthropod *Lotagnostus americanus* or the FAD of the conodont *Eoconodontus notchpeakensis* (just below the onset of the HERB/TOCE isotope excursion) would best define the base. Despite the results of previous ballots held by former members of the Subcommission, plus the considerable literature available for both options, the consensus amongst current Voting members was that a new Stage 10 Working Group, including specialists with expertise on agnostid and conodont taxonomy and biostratigraphy, should be established – a search for leaders and other members is currently underway. This working group will be responsible for synthesizing the available information and reporting back to the Subcommission Voting Members with their recommendations. Once this is done, the Subcommission will then arrange a formal ballot to decide on the Stage 10 marker. If a supermajority vote is reached, the Subcommission will then charge the Stage 10 Working Group with suggesting potential GSSP sites and call for proposals.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Since this year has been devoted to rebuilding the Working Groups of Cambrian Stages 2, 3, 4 and 10, and discussing the key issues of these undefined stages via Zoom meetings, there has been limited expenditure of the available funds. ISCS Chair, Prof. John Paterson, used some of the existing funds to attend the Geological Society of America Annual meeting in Anaheim, California in September 2024, where he presented at a dedicated Cambrian session and had informal face-to-face meetings with various Cambrian Subcommission Voting Members, as well as members of the Cambrian community at large.

Opening balance	$5900
2024 expenditure	$3491
To be carried forward to 2025	$2409

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

Carried forward from 2023	$5900
ICS Allocation	$2500
TOTAL 2024 income	$8400

8. BUDGET REQUESTED FROM ICS FOR 2025

In 2025, Cambrian Subcommission Secretary, Marissa Betts, will be chairing a tectonics session at the European Geosciences Union General Assembly (Vienna, Austria), with a focus on Cambrian tectonic reconstructions and intercomparisons. Funds are requested to cover:

- EGU registration: USD$553
- Flights from Armidale (Australia) to Vienna (Austria) return: USD$4000
- Accommodation in Vienna (Austria): USD$1600
- **TOTAL: USD$6153**

The money carried forward from 2024 (as per Section 6 above) will be saved to cover some costs relating to a field conference in the near future, most likely relating to visiting the best candidate GSSP for Cambrian Stage 10. At this field meeting, Subcommission members will have the opportunity to examine and discuss stratigraphic issues surrounding Stage 10 and the remaining undefined stages.

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement; 3-6 bullets)

The Cambrian Subcommission will continue work toward defining boundaries for its remaining provisional stages. The key objectives are as follows:

- Establish a new Cambrian Stage 10 Working Group that will make recommendations on how to define the base, then begin discussions on candidate GSSP sites, with the aim of naming and ratifying this stage over the next 12–18 months
- Working Groups for Stages 2 and 3/4 to have regular correspondence and meetings to discuss the best options for defining bases, with the possibility of organizing field conferences to potential boundary sites
- Suggest revised numerical ages (Ma) for Cambrian stage boundaries to the ICS to update the ‘International Chronostratigraphic Chart’ as new radiometric dates become available

9a. Potential funding sources external to IUGS:

Not applicable.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

The principal objective of the Subcommission is to recognize and scrutinize the possibilities for horizons and GSSP stratotypes for the remaining undefined stages, which are provisionally identified as Stages 2, 3, 4, and 10. The ISCS has developed a prioritized plan for formalizing definition of the remaining undefined stages and their GSSPs. The plan is as follows:

- Provisional Stage 10 is expected to be defined next, and a decision on a GSSP will likely be made in late 2025 or 2026.

- Following a decision on Stage 10, provisional Stages 2, 3, and 4 are expected to be defined in fairly rapid succession. A decision on the preferred GSSP horizon of any one of these three stages will restrict choices for the remaining two stages, so the ISCS is approaching work toward definition of the three stages as closely linked.
- A longer-term objective is to re-examine the basal Cambrian GSSP (Terreneuvian Series, Fortunian Stage). Imprecision in correlating the lower boundary of the Cambrian System has been encountered on all palaeocontinents, and the ISCS is now engaged in seeking a practical solution to remedy the problem, in collaboration with the Ediacaran Subcommission.

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Chair: John Paterson, Palaeoscience Research Centre, School of Environmental & Rural Science, University of New England, Armidale NSW 2351, Australia; Tel. +61 2 6773 2101; jpater20@une.edu.au

Vice-Chair: Jessica 'JC' Creveling, College of Earth, Ocean and Atmospheric Sciences, Oregon State University, 101 SW 26th Street, Corvallis, Oregon, USA 97331; Tel. +1 541 737 2112; jessica.creveling@oregonstate.edu

Secretary: Marissa Betts, Palaeoscience Research Centre & Litholab (LLUNE), School of Environmental & Rural Science, University of New England, Armidale NSW 2351, Australia; Tel. +61 2 6773 1714; mbetts7@une.edu.au

Names and Addresses of Current Voting Members:

1. Kristin Bergmann, MIT, USA; kdberg@mit.edu
2. Marissa Betts, University of New England, Australia; mbetts7@une.edu.au
3. Graham Budd, Uppsala University, Sweden; graham.budd@pal.uu.se
4. Sébastien Clausen, Université de Lille, France; sebastien.clausen@univ-lille.fr
5. Jessica 'JC' Creveling, Oregon State University, USA; jessica.creveling@oregonstate.edu
6. Nigel Hughes, University of California, Riverside, USA; hughesnc@ucr.edu
7. Sarah Jacquet, University of Missouri, USA; jacquets@missouri.edu
8. Sören Jensen, Universidad de Extremadura, Spain; soren@unex.es
9. Artem Kouchinsky, Swedish Museum of Natural History, Stockholm, Sweden; artem.kouchinsky@gmail.com
10. Gabriela Mángano, University of Saskatchewan, Saskatoon, Canada; gabriela.mangano@usask.ca
11. Silvia Menéndez, Museo Geominero, Instituto Geológico y Minero, Spain; s.menendez@igme.es
12. Arne Nielsen, University of Copenhagen, Denmark; arnet@ign.ku.dk
13. Tae-Yoon Park, Korea Polar Research Institute, Incheon, South Korea; typark@kopri.re.kr
14. John Paterson, University of New England, Australia; jpater20@une.edu.au
15. Sara Pruss, Smith College, Northampton, Massachusetts, USA; spruss@smith.edu
16. Eric Sperling, Stanford University, USA; esper@stanford.edu

17. Timothy Topper, Swedish Museum of Natural History, Stockholm, Sweden; timothy.topper@nrm.se
18. Franco Tortello, Universidad Nacional de La Plata, Argentina; tortello@fcnym.unlp.edu.ar
19. Ben Yang, Chinese Academy of Geological Sciences, China; benyang@cags.ac.cn, yangben8@foxmail.com
20. Samuel Zamora, Instituto Geológico y Minero de España, Spain; s.zamora@igme.es
21. Zhiliang Zhang, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China; zhiliang.zhang@nigpas.ac.cn

Working groups and leaders

Cambrian Stage 2 Working Group leaders:

- Glenn Brock, Macquarie University, Sydney, Australia; glenn.brock@mq.edu.au
- Guoxiang Li, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China; gxli@nigpas.ac.cn

Cambrian Stages 3/4 Working Group leaders:

- Sara Pruss, Smith College, Northampton, Massachusetts, USA; spruss@smith.edu
- Mark Webster, University of Chicago, USA; mwebster@uchicago.edu

Cambrian Stage 10 Working Group leaders: To be decided

Corresponding members (simple list of names as known)

Under revision.

International Commission on Stratigraphy
Subcommission on Ediacaran Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Ediacaran Stratigraphy

Submitted by:

Dr. Marc Laflamme, Chairman, (Associate Professor, Department of Chemical and Physical Sciences, University of Toronto Mississauga, 3359 Mississauga Road, Mississauga, ON L5L 1C6, Canada; marc.laflamme@utoronto.ca)

Dr. James D. Schiffbauer, Vice Chairman, (Associate Professor, Department of Geological Sciences and Director, X-ray Microanalysis Core, University of Missouri, 101 Geological Sciences Building, Columbia MO 65211, USA; schiffbauerj@missouri.edu)

Dr. Tara Selly, Secretary, (Research Assistant Professor; Assistant Director of the X-ray Microanalysis Lab, University of Missouri, 101 Geological Sciences Building, Columbia MO 65211, USA; sellyt@missouri.edu)

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission statement: The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Ediacaran stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of the evolution of the Earth and life during the Ediacaran Period (circa 635 – 539 Ma). Its first priority is the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units that provide the framework for global correlation.

Goals: The main goals of this Subcommission are: **(a)** to search for criteria useful in the subdivision and correlation of Ediacaran strata; **(b)** to define the basal boundaries of Ediacaran epochs (series) and ages (stages) through the establishment of global stratotype sections and points (GSSP's); and **(c)** to facilitate international collaboration in research on Ediacaran stratigraphy and Earth history through subcommission sponsored field trips, workshops, and meetings. In addition, the Subcommission is committed to further communication with a wider public through grassroots initiatives to conserve important Neoproterozoic geological sites, to support International Geoscience Program projects, and to encourage the wider dissemination of research findings on the internet or in popular science publications.

Fit within IUGS Science Policy: The objectives of the Subcommission relate to three main aspects of IUGS policy: **(a)** the development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (Series and Stages), and related to a hierarchy of units (Standard Zones, Subzones etc.) to maximize relative time resolution within the Ediacaran Period; **(b)** the establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the late Neoproterozoic interval, in particular, cooperating with the **Cryogenian Subcommission and the Cambrian Subcommission** to subdivide the late Precambrian to Early Cambrian transition; and **(c)** working towards an international policy concerning conservation of geologically and

paleontologically important sites such as GSSPs and important fossil localities. These relate to, *inter alia*, the IUGS Geosites Program.

3. ORGANIZATION – Interfaces with other international projects/groups

- ICDP GRIND-ECT (***G****eological* ***R****esearch through* ***I****ntegrated* ***N****eoproterozoic* ***D****rilling:* ***E****diacaran-****C****ambrian* ***T****ransition;* https://www.icdp-online.org/projects/world/global-coverage/grind-ect/details/) led by Anthony R. Prave (Univ. of St. Andrews), Kristin Bergmann (MIT), Simone Antonia Kasemann (Univ. of Bremen), Francis A. MacDonald (UC Santa Barbara), Catherine Victoria Rose (Univ. of St. Andrews), Garneth Shamaila (Geological Survey Of Namibia), Ricardo Ivan Ferreira Da Trindade (Universidade De Sao Paulo), and Maoyan Zhu (Chinese Academy Of Sciences)
- Interactions with ICS Subcommission on Cambrian Stratigraphy and ICS Subcommission on Cryogenian Stratigraphy: Several members are also active members of the ICS Subcommission on Cambrian Stratigraphy and/or ICS Subcommission on Cryogenian Stratigraphy.

3a. Current Officers for 2024-2028:

Chair: Marc Laflamme (University of Toronto Mississauga)
Vice-Chair: James D. Schiffbauer (University of Missouri)
Secretary: Tara Selly (University of Missouri)

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

none

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- The Subcommission undertook a joint Ediacaran/Cryogenian fieldtrip to Brazil in November 2023 The costs were $2100 USD per person ($3062 CDN). We produced a report on the trip and submitted to the journal Episodes, but we subsequently learned that they no longer publish subcommission field trip reports. As such, we will be posting it on our website.
- Website continues to grow: As part of the Executive transition, we wished to transfer the website to new ownership. We also solicited our colleague Dr. Tara Selly (secretary) to act as web-developer. http://ediacaran.stratigraphy.org/
- A special issue of the Journal of Paleontology (Volume 98 - Issue 2 - March 2024) with the executive members (Laflamme, Schiffbauer, Selly) and voting member (Liu) as guest editors is finally complete. All eight manuscripts have successfully gone through the peer review process.
- We held elections for new voting members. This resulted in a large turnover of voting members (10 new voting members, 5 returning members, and three returning executives).

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

EXPENDITURES - The Subcommission field workshop to examine terminal Ediacaran successions in Brazil scheduled for Nov. 19-27, 2023. The Ediacaran Subcommission covered the costs of Prof. Shuhai Xiao to attend as he did not have the funding to cover the costs, and his

presence was considered essential by the executive. There is an anticipated $800-900 USD (1,235 CDN) additional costs to be covered by the subcommission to cover the costs of the field trip leaders gas and supplies for their vehicles (expected to be about 2500km). This has not been charged to the SC yet.

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

Forwarded from 2023	**CDN$ 7947.06**
Additional field trip costs (rental cars for trip leaders)	**CDN$ -802.00**
Advance deposit on hotels Newfoundland	**CDN$ -600.00**
Bank returns	**CDN$ 0.73**
Total	**CDN$ 6,545.79**
Forwarding 2023	**CDN$ 6,545.79**

8. BUDGET REQUESTED FROM ICS FOR 2025

We would like to cover the field trip costs for the field trip leaders Guy Narbonne and Alex Liu. We are anticipating $2500 each. I believe we will be fine this year in terms of budget, but might require more next year as we are getting close to zero.

PROJECTED EXPENSES

Newfoundland field trip leader costs	CDN$ 5000
Total	CDN$ 5000

PROJECTED INCOME:

Carried over from 2024	**CDN$ 6,545.79**
BUDGET REQUEST	**CDN$ 0**

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- We have begun planning for our next field workshop at the Ediacaran sites in Newfoundland Canada to be led by Marc Laflamme (chair), Guy Narbonne (former voting member), and Alex Liu (voting member). Considering that this area has excellent exposure of the Gaskiers Glaciation (and cap carbonate), geochemical evidence of the Shuram negative excursion, abundant and diverse Ediacara biota, and U-Pb dates from the numerous volcanic ash beds throughout the succession, Newfoundland offers a unique opportunity to evaluate the criteria we might consider in defining an upper Ediacaran Series. Field trips to both the Bonavista Peninsula and the Mistaken Point Ecological Reserve are planned with a multi-part trip: A four-day trip to the Bonavista Peninsula, A one-day trip by boat to the Mall Bay to Drook succession at the Colinet Islands, and a A four-day trip to the Avalon Peninsula. Trip is currently scheduled for August 4-13 2025.
- Construction of a database of all known end-Ediacaran sections worldwide. This includes fact-finding searches concerning the geology, geochemistry, and paleontology of each section. This is currently underway and continues as new data arises and will be instrumental to the “white paper” listed above. This task was listed last year but we had residual difficulties at organizing the members following covid. Our most recent meeting at GSA represents the first one since 2020, and was viewed as a “relaunch” by the

executive. The past few years have been particularly difficult for members of the executive, especially in terms of being able to attend conference due to the high costs of these events. We hope to be able to have more in person events and meetings in 2025.

- Subcommission annual newsletter will be distributed in January 2025. Secretary Dr. Tara Selly will be leading the effort to compile and edit the annual newsletter.
- Creating three new working groups for the SES (Second Ediacaran Stage), TES (Terminal Ediacaran Stage), and UESr (Upper Ediacaran Series). We are still feeling the effects of our covid hiatus, but I have faith we will be able to reconstruct these working groups this year.

9a. Potential funding sources external to IUGS:

None at the moment.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- A vote will be called to decide what criterion or criteria will be the most useful in dividing the Ediacaran System into series and stages (particularly the second and terminal stages of the Ediacaran System). Our goal was to finalize the discussion on TES by 2024 (previously 2020), but we will require another year given the reshuffling of the voting members. This will be followed by votes for SES (Second Ediacaran Stage) and UESr (Upper Ediacaran Series).

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Chair	Marc Laflamme	University of Toronto Mississauga
Vice Chair	Jim Schiffbauer	University of Missouri
Secretary	Tara Selly	University of Missouri

Names and Addresses of Current Voting Members:

Alexander Liu	University of Cambridge
Emmy Smith	The Johns Hopkins University
Frankie Dunn	Oxford Museum of Natural History
Fred Bowyer	University of Edinburgh
Huan Cui	Kansas State University
Julia Arrouy	Instituto De Hidrologia De Llanuras
Justin Strauss	Dartmouth College
Ke Pang	Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences
Luis Buatois	University of Saskatchewan
Mary Droser	University of California, Riverside
Qing Ouyang	Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences
Sara Pruss	Smith College
Scott Evans	Florida State University

Simon Darroch	Senckenberg Forschungsinstitut und Naturmuseum Frankfurt
Veeru Kant Singh	Birbal Sahni Institute of Palaeosciences

Working groups and leaders

TBD

Corresponding members (simple list of names as known)

- Antcliffe Jonathan — University of Lausanne, Switzerland
- Boggiani, Paulo César — São Paulo, Brazil
- Butterfield, Nicholas — Cambridge, UK
- do Carmo, Dermval — University of Brasilia, Brazil
- Chen, Xiaohong — Wuhan
- Chumakov, Nikolay — Moscow, Russia
- Dermeval Aparecido Do Carmo — Brazil
- Erwin, Douglas — Smithsonian NMNH, USA
- Dunn, Frankie — Oxford University, UK
- Erdtmann, Bernd-D. — Germany
- Evans, David A.D. — Yale University, USA
- Fedonkin, Mikhail — Moscow, Russia
- Frimmel, Hartwig — Wuerzburg, Germany
- Gaucher, Claudio — Montevideo, Uruguay
- Hoffmann, Karl-Heinz — Windhoek, Namibia
- Hofmann, Mandy — Germany
- Jenkins, Richard — Adelaide, Australia
- Kenchington, Charlotte — Oxford University, UK
- Knoll, Andrew H. — Harvard University, USA
- Kochnev, Boris — Novosibirsk, Russia
- Leme, Juliana de M. — University of San Paolo, Brazil
- Linnemann, Ulf — Dresden, Germany
- Melezhik, Victor — Norway
- Nagovitsin, Konstantin — Novosibirsk, Russia
- Patricia Vickers-Rich — Monash University, Australia
- Pokrovskii, Boris G. — Russia
- Rainbird, Robert — Ottawa, Canada
- Semikhatov, Mikhail A. — Moscow Russia
- Sergeev, Volodya — Russia
- Smith, Emily — USA
- Sun, Weiguo — Nanjing, China
- Van Kranendonk, Martin — University of New South Wales
- Walde, Detef — Universidade de Brasília
- Walter, Malcolm — Sydney, Australia
- Wang, Xiaofeng — Wuhan

International Commission on Stratigraphy
Subcommission on Cryogenian Stratigraphy
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Cryogenian Stratigraphy

Submitted by:
Maoyan Zhu, Chair
Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, China; myzhu@nigpas.ac.cn
Carol Dehler, Vice-Chair
Department of Geology, Utah State University, USA; Carol.Dehler@usu.edu
Ying Zhou, Secretary
Institute of Geosciences, Johannes Gutenberg University Mainz, Germany; y.zhou@uni-mainz.de

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission statement
The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Cryogenian stratigraphy directed at better understanding Earth system evolution during the Cryogenian Period (c.720 – c.635 Ma). Its priority is the unambiguous definition, by means of global stratotype section and points (GSSP), of a hierarchy of chronostratigraphic units that provide the framework for correlation of Cryogenian strata.

Goals
The main goals of this Subcommission are:

- To establish for the first time a rock-based GSSP for the base of the Cryogenian that will also serve as the top of the underlying Tonian.
- To identify criteria useful in the subdivision and correlation of Cryogenian (and upper Tonian) strata.
- To define the basal boundaries of Cryogenian epochs (series) and ages (stages) through the establishment of GSSPs.
- To facilitate international collaboration in research on Cryogenian stratigraphy and Earth history through subcommission sponsored field trips, workshops, and meetings.

In addition, the Subcommission is committed to expanding communication to a wider public through grassroots initiatives to conserve important Neoproterozoic geological sites, to support International Geoscience Programme projects, and to encourage the wider dissemination of research findings on the internet, in popular science publications, and through public lectures.

Fit within IUGS Science Policy
The objectives of the Subcommission relate to three main aspects of IUGS policy:

- The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (Series and Stages), and related to a hierarchy of units (Standard Zones, Subzones etc.) to maximize relative time resolution within the Cryogenian Period.
- The establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the middle Neoproterozoic (*c.850-c.635 Ma*), in cooperation with the Precambrian and Ediacaran subcommissions.
- Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs and important fossil localities. This relates to, *inter alia*, the IUGS Geosites Programme.

3. ORGANIZATION – Interfaces with other international projects/groups

Members of the Cryogenian Subcommission are lead investigators and officers in a number of related international projects, including:

- IGCP 648 (*Supercontinent Cycles and Global Dynamics*).
- ICDP project GRIND ECT (*Geological Research through Integrated Neoproterozoic Drilling (GRIND): The Ediacaran-Cambrian Transition (ECT)); The Cryogenian-Ediacaran Transition*

3a. Current Officers for 2024-2028:

- **Chair:** Maoyan Zhu, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, China
- **Vice-Chair:** Carol Dehler, Utah State University, USA
- **Secretary and webmaster:** Ying Zhou, Institute of Geosciences, Johannes Gutenberg University Mainz, Germany

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

None

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- **14th-16th July MagellanPlus Workshop** in London, organized by previous submission chair and voting member Graham Shields and current corresponding member Elias Rugen. All the current officers, 7 previous and current voting members and more than 10 corresponding members attended the workshop.
- **Business meeting** after the MagellanPlus Workshop, resulted in agreed draft of final criteria for Tonian/Cryogenian boundary, now published on webpage: International Commission on Stratigraphy, and strategy and action plan for the Cryogenian Subcommission from late 2024 to mid-2026.
- **Field excursion to Scotland (17th to 20th July):** led by previous submission chair and voting member Graham Shields, and current corresponding members Elias Rugen and David Webster. **2 previous, 4 current new voting members and 3 corresponding members** joined the fieldtrip.

- Updated the **Subcommission webpage** with new voting members for 2024-2028 term, working goals and working plan.

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

The subcommission co-convened the two-day MagellanPlus Workshop and the fieldtrip to Scotland. Financial support for voting members' participation in these two events: ~4182GBP.

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

$6500 from the IUGS, which was transferred from the treasurer (Durham University, UK) to Ying Zhou (Secretary of Cryogenian subcommission).

The funds were then transferred in GBP, **£5070.**

8. BUDGET REQUESTED FROM ICS FOR 2025

- During 2024, the subcommission financially helped voting members to attend above mentioned events. The fund can be carried forward will be £3950 (~$5000). Existing funds will be used to support field trips planned for 2025. The subcommission plans to organize two major international fieldtrips during 2025.
- Supporting members to join the 5th International Conference of Geobiology in Wuhan June 2025, a business meeting will be held during the conference and a fieldtrip for the Ediacaran and Cryogenian subcommissions will follow the conference.
- A two-week joint international fieldtrip on Ediacaran and Cryogenian Stratigraphy in South China, June 2025.
- A joint international fieldtrip on Ediacaran and Cryogenian Stratigraphy in Namibia, end September to early October 2025.

Detailed plan please see the budget plan table and session 9. In total, for the organized two major field trips to South China and Namibia, plus supporting members joining the International Conference of Geobiology and the business meeting of the subcommission, we will need 5000+2000+5000+200 = $12,200. The fund we can carry over is ~$,5000, so we apply for another **$7,200**.

Planned Expenditures and meetings for 2025: $12,200

Purpose of expenditure	Planned time	Sum (USD)	Items	Expenditure (USD)
International Geobiology Conference and business meeting in Wuhan, China	Jun, 2025	2000	support (~$1000 each) up to 2 participants/core team's travel and accommodation to attend the Geobiology mtg in Wuhan	2000
South China field trip	Jun, 2025	5000	support (~$1250 each) up to 4 voting members' or corresponding members' (fieldtrip leaders) travel and accommodation for the fieldtrip	5000
Namibia fieldtrip	September, 2025	5000	support (~$1250 each) up to 4 voting members or corresponding members' (fieldtrip leaders) travel and accommodation for the fieldtrip	5000
others		200	bank transfer fees	200
Sum total				12200

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- **To finalize the criteria for basal Cryogenian GSSP type section** as an official document of the subcommission by 14th. March of 2024.
- **First call for full proposals** of the candidate of the **basal Cryogenian GSSP in June 2025**; and **final call for submission** of full proposal by **the end (31st Dec) of 2025**.
- 10th to 13th June 2025, in-person **business meeting** during the 5th International Conference of Geobiology in Wuhan, which will be followed by an international fieldtrip participated by subcommission members.
- 14th to ~30th June 2025**, South China field trip jointly sponsored by Cryogenian and Ediacaran subcommissions**, organized and led by voting members Maoyan Zhu, Chuan Yang and a few other colleagues. This two-week field trip will be held directly after the 5th International Geobiology Conference in Wuhan. Key sections cover critical intervals during the Tonian, Cryogenian and Ediacaran periods in the Hubei, Hunan, Guizhou and Guangxi provinces, South China, will be visited and it is a journey of more than 4000km.
- End September to early October 2025, a subcommission field trip to North Namibia organized by voting members Fred Bowyer, Mandy Zieger-Hofmann and Ying Zhou. The ca. 10 days excursion will focus on the classic Tonian-Ediacaran successions in northern Namibia.
- **Cryogenian Webinar Series.** During 2020 and 2021, the webinar series proven to be a great way to introduce the up-to-date research of the Tonian/Cryogenian records worldwide and offer good opportunities for discussion among researchers. Each time, we have up to 50 attenders. The subcommission decides to reactivate the webinar series during 2025 with the new set of voting members and aims to cover another 2 key Cryogenian groups. The webinar series will be organized by Ying Zhou.

9a. Potential funding sources external to IUGS:

The IUGS will only cover a small portion of funding needed to organize and run the fieldtrips to South China and Namibia. The rest of the funding needed will be covered by organisers and participants' own research funds.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Voting for criteria to define the base of the Cryogenian System (March 2025)
- Call for proposals for basal Cryogenian GSSP candidates (two calls, finish end of 2025).
- Voting and ratification of basal Cryogenian GSSP (2026).
- Establishment of working groups on Cryogenian subdivision (2026)
- Voting and ratification of Cryogenian series (2026-2027).
- Interface with other international projects / groups.
- Field trips planned: (1) Adelaide Rift Complex, Australia field trip, 2026 (organised by Jarred Lloyd and Ashleigh Hood); (2) Possibly a second fieldtrip to Namibia for working on Cryogenian series in 2027; (3) The US Cryogenian field trip, 2027 (organized by Carol Dehler and Nicholas Swanson-Hysell).

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

1) Chair: Maoyan Zhu, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, China; myzhu@nigpas.ac.cn
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3) Secretary: Ying Zhou, Institut für Geowissenschaften Johannes Gutenberg-Universität Mainz, J.-J.-Becher-Weg 21, D-55128 Mainz, Germany; y.zhou@uni-mainz.de

Names and Addresses of Current Voting Members:

1) Heda Agić, Department of Earth Sciences, Durham University, Durham, United Kingdom. heda.agic@durham.ac.uk
2) Fred T. Bowyer, School of GeoSciences, University of Edinburgh, James Hutton Road, Edinburgh EH9 3FE, UK. fred.bowyer@ed.ac.uk
3) Fabricio Caxito, Federal University of Minas Gerais, Brazil. facaxito@yahoo.com.br
4) Phoebe A. Cohen, Williams College Department of Geosciences, Williamstown, MA, USA. pac3@williams.edu
5) Ashleigh v. S. Hood, School of Earth Sciences, University of Melbourne, Parkville, Vic., Australia. ashleigh.hood@unimelb.edu.au
6) Mandy Zieger-Hofmann, Senckenberg Naturhistorische Sammlungen Dresden, Museum für Mineralogie und Geologie, Sektion Geochronology, Koenigsbruecker Landstrasse 159, D-01109, Dresden, Germany. mandy.hofmann@senckenberg.de
7) Dmitriy Grazhdankin, Trofimuk Institute of Petroleum Geology and Geophysics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, 630090, Russia. GrazhdankinDV@ipgg.sbras.ru
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20) Shihong Zhang, State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Beijing 100083, China; shzhang@cugb.edu.cn

Working groups and leaders

To be decided.

Corresponding members (simple list of names as known)

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International Commission on Stratigraphy

Subcommission on Pre-Cryogenian Stratigraphy

Annual Report 2024

1. Title of constituent body and name of reporter

International Subcommission on Pre-Cryogenian Stratigraphy
Report is respectfully submitted by Nora Noffke, chair of the subcommission

2. Overall Objectives and fit within IUGS Science Policy

The International Subcommission on Pre-Cryogenian Stratigraphy coordinates the study of selected stratigraphic sections worldwide that represent the Precambrian Earth ages before the Cryogenian. It organizes its presentation through the ICS website. The Subcommission's priority is to enable the international geoscience community to have stratigraphic information on the first ¾ of the geological record.

3. Organization

The Subcommission includes 43 members, which is an increase from 21 members since the Covid crisis. The membership is representative of almost all continents (see appendix). All members conduct active research and education on Hadean, Archean or Proterozoic Earth history.

Current Officers for 2022-2028 period (together with any changes in personnel):

Chair:	Nora Noffke
Vice-Chair(s):	Douglas Galante
Secretary:	Evelyn Sanchez
Web person:	ICS

4. Interfaces with other international projects and/or extent of support other than IUGS

The subcommission's work in 2024 has been supported in part by the funding agency FAPES in Brazil to collaborate on our project on Earth's oldest sedimentary successions in the Pilbara region, West Australia (Lead-PI FAPES: Douglas Galante). A new collaboration is in place with the Geological Survey of Western Australia, Perth.

5. Chief accomplishments for 2024

- We have succeeded in explaining to the other subcommissions the difficulties in establishing a stratigraphic record in absence of a continuous rock record. Phanerozoic-type stratigraphy fails in the Precambrian. For example, the 2.5 Ga Archean time is manifested by a mere 2.5 km of rock (mostly metamorphic and deformed), documenting that identifying stratigraphic units is exceptionally difficult.
- After having established the major boundary between the Hadean and the Archean, our subcommission is debating the Eoarchean and the Paleoarchean. It was first suggested to turn the term "Eoarchean" into an informal designation, and possibly include anything Eoarchean into a "Lower Paleoarchean". This is, however, a point of contention, on which we work on. There are two opposing opinions that need to be aligned: whether to keep or not the Eoarchean. This is not a simple matter of majority vote but needed careful evaluation in discussion with members of the community, also outsides of ICS, as well as field site visits. We like to ensure that a new designation (or a loss of the Eoarchean as formal designation) is actually accepted by the community and employed.
- The discussions are ongoing, but we expect to submit the proposal in 2025.
- Two papers are published with Episodes, author team lead by Jaana Halla and Humberto Reis.
- In 2023, Noffke, Smit and Nhleko had submitted a proposal for a paleontological IUGS Geoheritage site in South Africa on An Archean fossil site. In 2024, this proposal was evaluated positively by IUGS, but the final decision was postponed for a later point in time. We hope to receive a positive outcome in 2025.

6. Summary of expenditures in 2024 in US Dollar

Travel to South Africa:	
Flight Norfolk-Johannesburg	$ 2,175.00
Flight Johannesburg-Cape Town:	$ 80.00
Rental car:	$ 1,124.00
Room:	$ 93.37
Room 2:	$ 51.82
Total spent:	**$ 3,524.19**

Remaining budget from 2024: 1,475.81

7. Summary of Income 2024

We gratefully have received for 2024 the amount of $ 5,000 from IUGS. Because the original plan to visit West Australia did not work out due to unexpected scheduling problems by Dr. Heidi Allen, Geological Survey of Perth, West Australia, this trip was postponed. It will be taking place in 2025. Instead, Noffke visited potentially interesting Paleoarchean sites in South Africa. Due to this circumstance, our budget remains positive by the end of the year with 1,475.81 USD moved into 2025.

8. Budget requested from ICS for 2025

We request $5,300 for representative members of our subcommission to enable the originally planned 2024 field visit in Australia.

Flight Australia	ca. $ 3,400.00
Logistics Perth	ca. $ 300.00
Rental vehicle:	ca. $ 1,500
Total budget estimate:	**ca. $ 5, 300**

We also plan to attend the EGU meeting in Vienna 2025. For this conference, however, we will not request any funds, because we are able to use the remaining funds rolled over from last year.

The expenses would be:
Flight: USA – Vienna: $ 937
Logistics in Vienna: $ 125 x 5 = $ 625
Registration: $ 801.82 (exchange rate of 765 Euro)

Flight and logistics would be covered by the remaining funds, the registration fee the chair Noffke would be able to cover by herself.

9. Work plan, anticipated results, milestones, and communications to be achieved in 2025

- We proceed with the ICS vote on the Archean subdivisions, specifically the boundaries for the Paleoarchean. The final proposal for vote by our subcommission is in progress. There are two opposing opinions that need to be aligned, whether to keep or not the Eoarchean. This is not a simple matter of majority vote but needed careful evaluation in discussion with members of the community, also outsides of ICS. The Paleoarchean geology is best preserved in the Pilbara Craton, Western Australia [the Warrawoona Group], the Kaapvaal Craton in South Africa [the Onverwacht Group], and the Singhbhum Craton in India. All rock successions may have been deposited onto a supercontinent called Vaalbara. It is inferred from structural geological analyses that the sediments were deposited in consequence of a continental rifting. Field visits help clarifying such issues.

- We are in progress of approaching the younger parts of the Precambrian. We have established

two new focus groups:

1. The Mesoarchean/Neoarchean focus group, chaired by Jaana Halla.
2. TBD for the Neoarchean/Paleoproterozoic focus group.
3. The Paleoproterozoic/ Mesoproterozoic focus group, chaired by Linda Kah.

- Publication of a manuscript on the Paleoarchean discussion (proposal in progress).
- Present our work at the upcoming EGU in Vienna, Austria, 2025.

10. Key objectives and work plan for the next 4 years (2024 to 2028):

- Key objective for the final year 2028 is to have formally established the main Archean stratigraphy (Paleoarchean, Mesoarchean, Neoarchean).
- We hope to have made significant progress regarding the predominant Proterozoic subdivisions.
- We continue with the publication of scientific papers and abstracts.
- With respect to our membership, we will expand into the underrepresented Asia as well as Europe. We also have begun to invite more colleagues to serve committee members, who are predominantly working on the Meso- and early Neoproterozoic.
- We hope that we will be able to establish seeds for new subcommissions, each of which is designed for the major units of the Precambrian: the Hadean, the Archean, and the Paleo-, Meso- and lower Neoproterozoic.
- We strife to raise the awareness at the funding agencies that the Precambrian exists and that its many facets in lithology and paleoenvironments warrants funded, detailed research, even if climate change or the Anthropocene appear to be more fashionable research.

Appendix – Member of the Pre-Cryogenian Subcommission

Subcommission on Precryogenian Stratigraphy

International Commission on Stratigraphy

Chair: Nora Noffke | Vice-chair: Douglas Galante | Secretary: Evelyn Sanchez

LIST OF MEMBERS
November, 2024

Administration by Evelyn Sanchez

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International Commission on Stratigraphy
Subcommission on Stratigraphic Classification
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Stratigraphic Classification
Submitted by: Werner E. Piller, Jochen Erbacher

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY
The Subcommission represents a core business for the International Commission on Stratigraphy (ICS), the primary body for creating, discussing, publishing and disseminating an internationally agreed-upon guide to stratigraphic terminology and classification. Its immediate priorities are to advertise new developments in stratigraphic methods, verify that the procedures are carefully followed, monitor the application of the accepted rules, and encourage the teaching of basic stratigraphic principles and concepts to new generations of students and professionals. Its future goal is a revision of the International Stratigraphic Guide to ensure it remains up-to-date but also open (receptive) to new approaches.

3. ORGANIZATION – Interfaces with other international projects/groups
ISSC has always been directly or indirectly linked to big international projects such as deep-sea drilling (IODP) and deep continental drilling (ICDP) as well as International Geoscience Programme (IGCP). It has close ties to national stratigraphic commissions, which increasingly look beyond the borders of the parent countries. This is especially true with the North American Commission on Stratigraphic Nomenclature (NACSN). ISSC encourages other national bodies to harmonize their codes with each other and the International Stratigraphic Guide (ISG).

3a. Current Officers for 2024-2028:
Chair: Jochen Erbacher, erbacher@bgr.de, Stratigraphy and Collections, Federal Institute for Geosciences and Natural Ressources, Stilleweg 2, 30655 Hannover, Phone: +49-511 643-2795
Vice-Chair (non-voting): Werner E. Piller, werner.piller@uni-graz.at, Institute for Earth Sciences, NAWI Graz Geocenter, University of Graz, Heinrichstrasse 26, 8010 Graz, Austria, Phone: +43 699 11977719
Secretary: Stephanie Larmagnat, stephanie.larmagnat@canada.ca, Geological Survey of Canada, Adjunct Professor: INRS-ÉTÉ, 490 rue de la Couronne, Québec (Québec), G1K 9A9 CANADA, Phone: 418-654-1463/581-446-7433

4. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS
Most ISSC activities are linked to various programs and projects, such as IGCP, IODP, ICDP and a variety of national projects. ISSC activities are supported directly or indirectly by these international programs and affiliated national projects.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- Biostratigraphy: After the workshop 2022 (organizers and editors: Werner E. Piller, Jochen Erbacher) the first 3 papers were published in 2024 (see below).
- Chronostratigraphy: The working group established end of 2020 (core: Marie-Pierre Aubry, Martin Head, Werner E. Piller) is still active and will finish the manuscript in 2025.
- ISSC Business Meeting
  A business meeting with an in-depth report by the chair was held during IGC 2024 in Busan (S-Korea).
- Conference participation - ISSC co-organized the technical session (on-site presentations and posters) SSP2.1 "Integrated Stratigraphy - Recent advances in stratigraphic systems and age modelling." at EGU 2024 in Vienna (oral session: Tuesday, 16 April, 8:30 – 10:15; on site posters session: Tuesday, 16 April, 8:30 - 12:30; virtual posters session: Tuesday, 16 April, 8:30 – 18:00).

Štorch, P., Loydell, D.K., Melchin, M.J.; Goldman, D.: 2024: Graptolites in biostratigraphy: the primary tool for subdivision and correlation of Ordovician, Silurian, and Lower Devonian offshore marine successions. – Newsletters on Stratigraphy, DOI: 10.1127/nos/2024/0810

Corradini, C., Henderson, H., Barrick, J.E., Ferretti, A., 2024: Conodonts in Biostratigraphy. A 300-million-years long journey through geologic time. - Newsletters on Stratigraphy, DOI: 10.1127/nos/2024/0822

Petrizzo, M.R., King, D.J., Pearson, P.N., Huber, B.T., Wade, B.S., 2024: Planktonic foraminifera in biostratigraphy and biochronology. - Newsletters on Stratigraphy, DOI: 10.1127/nos/2024/0840

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

Expenditures in 2024: 4982.06 €
For participation and reporting of the chair at IGC 2024 in Busan (see details in appendix).

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

Income: 5464.09 €
Remaining amount: 482.03 €

8. BUDGET REQUESTED FROM ICS FOR 2025

ISSC Chair and Vice-Chair will attend EGU 2025 in Vienna and GSA 2025, San Antonio, USA. At EGU a session co-sponsored by ISSC will be held. During GSA 2025 the Chair, Vice-Chair and Secretary will attend the annual meeting of NACSC.
A number of meetings of the subcommission's working groups are planned to be held around EGU in Vienna (see list of working groups below) and GSA 2025 in order to proceed with the overview articles planned. The requested budget will be used to support the participation of officers, working group members and potential guests in these meetings.

Projected expenses:

Participation in EGU 2024(Vienna, Austria)	830.- US$
Travel expenses support for GSA 2025 (San Antonio, USA)	3800.- US$

Travel expenses for editorial work for Biostratigraphy volume NOS	1200.- US$
Travel expenses for workshop on Chronostratigraphy (3-5 persons)	2500.- US$
Total estimated expenditure	8,330.- US$

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- For the chapter *Biostratigraphy* 3 papers are already published, the remaining 5 manuscripts will be published in 2025. Final publication of the special volume in Newsletters on Stratigraphy is expected in late fall 2025.
- For the chapter *Chronostratigraphy* several meetings and workshops are planned. The manuscript should be ready in fall 2025.
- The chapters altogether represent the base for the new version of the International Stratigraphic Guide which will also be outlined during 2025.

9a. Potential funding sources external to IUGS:

The Subcommission does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources. Some financial support could be obtained by individual members from their host institutions and/or their personal research funds. There is, however, a considerable amount of in-kind funds supporting the activities of all ISSC members, including coverage of travel costs to our workshops etc.

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Publication of the chapters *Biostratigraphy* and *Chronostratigraphy* in Newsletters on Stratigraphy.
  The two chapters represent the finalization of a series of papers printed in Newsletters on Stratigraphy.
- Continue work on a new and updated version of the International Stratigraphic Guide.
  The final goal of ISSC is to update, upgrade and implement the International Stratigraphic Guide (Hedberg, 1976 [1st edition]; Salvador, 1994 [2nd edition]; Murphy and Salvador, 1999 [abridged edition] modified by Murphy et al., 2022). The ISG is a most important official document with a large distribution, which requires revisiting because of the fundamental advances of stratigraphy in the last 30 years. Finalization of the new version is expected during this period (2025-2028).
- ISSC will take the initiative to suggest special sessions and symposia at conferences that advance stratigraphic principles, in collaboration with other ICS subcommissions.
- ISSC will continue to participate in GSSP discussions with ICS subcommissions.
- ISSC will continue to interface with national stratigraphic commissions, although only in an advisory capacity.

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Chair: Jochen Erbacher, erbacher@bgr.de, Stratigraphy and Collections, Federal Institute for Geosciences and Natural Resources, Stilleweg 2, 30655 Hannover, Phone: +49-511 643-2795

Vice-Chair: Werner E. Piller, werner.piller@uni-graz.at , Institute for Earth Sciences (Geology and Palaeontology), University of Graz, Heinrichstrasse 26, 8010 Graz, Austria, Phone: +43 699 11977719
Secretary: Stéphanie Larmagnat, stephanie.larmagnat@canada.ca, Geological Survey of Canada, Adjunct Professor: INRS-ÉTÉ, 490 rue de la Couronne, Québec (Québec), G1K 9A9 CANADA, Phone: 418-654-1463/581-446-7433

Names and Addresses of Current Voting Members:

Jose Manuel Castro (Spain), jmcastro@ujaen.es
Carlo Corradini (Italy), ccorradini@units.it
Helen Coxall (Sweden), helen.coxall@geo.su.se
Jochen Erbacher (Germany), jochen.erbacher@bgr.de
Annalisa Ferretti (Italy), ferretti@unimore.it
John Flynn (USA), jflynn@amnh.org
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Emmy Smith (USA), efsmith@jhu.edu
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Weimu Xu (Ireland), weimu.xu1@ucd.ie
Christian Zeeden (Germany), Christian.Zeeden@leibniz-liag.de
Yang Zhang (Germany), zhangy@uni-bremen.de

Working groups and leaders

Biostratigraphy WG
- Chairs: Jochen Erbacher, Germany and Werner E. Piller, Austria
- Gerald Auer, Austria
- Carlo Corradini, Italy
- Dieter Korn, Germany
- Maria Rose Petrizzo, Italy
- Jörg Pross, Germany
- Philipp Stojakowits, Germany
- Petr Storch, Czech Republic

Chronostratigraphy WG
- Chair: Marie-Pierre Aubry, USA
- Martin J. Head, Canada
- Werner E. Piller, Austria

Corresponding members (simple list of names as known)

- Marie Pierre Aubry (USA), aubry@rci.rutgers.edu
- Martin J. Head (Canada), mjhead@brocku.ca

Manfred Menning (Germany), menne@gfz-potsdam.de
Werner E. Piller (Austria), werner.piller@uni-graz.at
Petr Štorch (Czech Republic), storch@gli.cas.cz

Travel expenses IGC Busan 2024, Werner E. Piller and account status

Flight tickets		2256.65 €
Taxi Graz – GRZ airport		41.00 €
Train ICN – Seoul City		6.79 €
Train Seoul – Busan		72,00 €
Taxi Busan train station – hotel		15.63 €
Conference Fee		580.97 €
Hotel Busan		1413.02 €
Taxi Hotel – railway station Busan		12.37€
Train Busan – Seoul		40.49 €
Train Seoul – ICN		7.84 €
Taxi GRZ airport - Graz		37.00 €
Daily allowance (a 45.3 €)	11 days	498.30 €
total		4982.06 €
Bank transfer by ICS		5494.20 €
Bank fees		-30.11 €
Total		5464.09 €
Remaining money		482.03 €

International Commission on Stratigraphy
Subcommission on Timescale Calibration
ANNUAL REPORT 2024

1. TITLE OF CONSTITUENT BODY
Subcommission on Timescale Calibration

Submitted by:

Brad Cramer – Chair
Mark Schmitz – Vice-Chair
Anne-Christine DaSilva – Secretary

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

In response to a growing movement of geoscientists who increasingly work at the intersection of time and stratigraphy, and in an effort to provide a platform for promoting integration between the traditionally stratigraphic communities of the ICS with the radioisotopic communities that historically have not been a central component of the ICS enterprise, we have created a new International Subcommission on Timescale Calibration (ISTC). The objective of this subcommission is not to 'certify' or 'approve' any particular numerical calibration of the International Chronostratigraphic Chart, but rather, to provide advice and counsel to existing ICS Subcommissions on geochronological issues, to delineate best practices and the role of inter-laboratory calibrations to chronostratigraphic and timescale problems, and to provide a venue for increasing collaboration between chronostratigraphic and geochronologic research.

3. ORGANIZATION – Interfaces with other international projects/groups

This subcommission became officially operational in 2020. The website is nearly completed and will include an interactive database of all radioisotopic dates utilized during the creation of the GTS2020 timescale. This will be a primary interface for the DDE to access the calibration data utilized in construction of the GTS2020. The preliminary website is completed and the interactive database is now complete and has been integrated into the cyberinfrastructure of the ISTC website and is awaiting final check of programming and will go live in early 2025.

3a. Current Officers for 2024-2028:

Chair: Bradley D. Cramer – University of Iowa
Vice Chair: Mark Schmitz – Boise State University
Secretary: Anne-Christine DaSilva - Université de Liège
Webperson: Bradley D. Cramer – University of Iowa

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

There has, as yet, been no additional support from sources other than IUGS.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2024 (bullet point each significant achievement; 3-6 bullets)

- Continued discussion and negotiations with publishers and co-authors about the future of the Geologic Time Scale (GTS) volumes
- Collaboration with the Geological Society of America (GSA) geochronology division regarding their publication of the GSA Timescale
- Work with Kim Cohen and the ICS EC regarding the updating of the ICS Chart to use the new dates in GTS2020 and beyond
- Initial planning for a Penrose Conference application to be submitted for a conference in 2026

6. SUMMARY OF EXPENDITURES IN 2024 (can be presented in a table):

None

7. SUMMARY OF INCOME IN 2024 (can be presented in a table):

None

8. BUDGET REQUESTED FROM ICS FOR 2025

None

9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN 2025 (bullet point each anticipated achievement anticipated; 3-6 bullets)

- Fully interactive database of dates used for calibration of GTS2020 to go live on the ISTC website
- Finalizing plans, timing, and publisher for the next iteration of the GTS volume (GTS2030)
- Development of By-Laws and Protocols for the ISTC as well as the updating of the ICS chart

9a. Potential funding sources external to IUGS:

Geological Society of America – Penrose Conference Support

10. OBJECTIVES AND WORK PLAN FOR THE PERIOD (2024–2028)

- Organizing and holding the first in-person meeting of the ISTC
- Completing the By-Laws and other protocol documents for the ISTC as well as how to update the dates on the ICS chart
- Initiate progress on the GTS2030 volumes
- Fill out the ISTC with corresponding members

APPENDICES

Names and Addresses of Current Officers for 2024-2028:

Executive Committee

Chair: Brad Cramer – University of Iowa, USA (Integrated Stratigraphy)
bradley-cramer@uiowa.edu

Vice Chair: Mark Schmitz – Boise State University, USA (U-Pb)
markschmitz@boisestate.edu

Secretary: Anne-Christine da Silva – Université de Liège, Belgium (Integrated Stratigraphy)
ac.dasilva@uliege.be

Names and Addresses of Current Voting Members:

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Christopher Bronk-Ramsey – University of Oxford, UK (Radiocarbon)
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Joice Cagliari – Universidade do Vale do Rio dos Sinos, Brazil (Integrated Stratigraphy/Geochronology)
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Mikael Calner – Lund University, Sweden (Integrated Stratigraphy)
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Dan Condon – British Geological Survey, UK (U-Pb)
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Junxuan Fan – Nanjing University, China (Computational Stratigraphy)
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Julie Fosdick – University of Connecticut, USA (U-Th/He)
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Linda Hinnov – George Mason University, USA (Astrochronology)
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Melanie Hopkins – American Museum of Natural History, USA (Paleontology/Paleobiology)
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Thijs Vandenbroucke – Universiteit Gent, Belgium (Biostratigraphy)
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Rachel Warnock – Smithsonian Institution, USA/ETH Zurich, Switzerland (Paleobiology)
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Working groups and leaders

None

Corresponding members (simple list of names as known)

None at present

Contributions to ICS annual report – Graphics Officer (Cohen) and Web/Informatics Officer (Car)

- The ICS Chronostratigraphic Chart, which included newly ratified GSSPs and revised numerical ages, was kept actual on www.stratigraphy.org, as was a changelog (LINK).
  - For most of 2024, the chart with date 2023/09 was the actual chart. For 19 languages besides English, translated charts were available. A version with IGC Busan logo added was shared with IUGS and congress organization.
  - A chart update is foreseen for 2024/11 (pending outcome of the Valanginian GSSP vote and ratification). Translated versions of the ICS chart are updated to the 2023/09 version.
- Seventeen subcommissions own websites within the new website system. The status of Subcommissions' website standardisations can be seen online (LINK).
- The Digital Officer continued data-remodeling work towards improved digital representation of the chart, in terms of structuring and accessibility. This makes use of the Semantic Web representation of the Chart (LINK), www.stratigraphy.org has featured demo's of this since 2020.
  - ***Major development on this took place in 2024.*** A change over from a situation where the graphic officer produced chart is leading (and digital representation follows it) to one where the digital chart is leading (and used to produce graphics) is being prepared. This will also consider the translated chart manifestations.
  - Co-authoring this remodeling with Nicholas Car is Steve Richard, one of the two main contributors of the Semantic Web form of the Chart. Improved representation of stratigraphic and temporal typologies has commenced with a new Knowledge Graph of Chart and related information being built at LINK.
- A manuscript for Episodes.org, giving overview of chart maintenance since 2013 with attention to the ongoing digital transformation. The reference also serves to update the aging Cohen et al. (2013) reference, regarding the ICS' chart and its maintenance procedures. The manuscript was submitted in July 2024. Authors are Cohen (Graphic Officer), Harper (past Chair), Gibbard (past Secretary General) and Car (graphics officer). Positive review was received, recommending to include a 2024 chart. The manuscript was shared with the incoming ICS-executive. Revisions have been prepared and resubmission is foreseen late November 2024 (pending ICS chart 2024/11).
- Cross-check of the numeric ages on chart ICS 2023/09 against GTS-2020 were carried out, following STATI-2023 ICS business meeting request to do so. In October 2024, the outcome was shared with ICS executive and the Time Scale Calibration subcommission.
  - For Quaternary, Jurassic, Ediacaran, Cryogenic and Precambrian: numeric ages are in sync.
  - For Neogene, Paleogene, Cretaceous, Permian, Cambrian: some stages are not in sync.
  - For Triassic, Carboniferous, Devonian, Silurian, Ordovician: many stages are not in sync.

For the upcoming years, points of attention and plans of the officers are:

- Keeping the ICS website up to date with chart status and downloads, ICS activities and news items, ICS output, ICS subcommission activities and content, stratigraphic guide text and downloads, statutes and annual report archives, and so on. Particulary:
  - Copyright / chart reproduction permission information on the website will be updated
- Further integrating the workflows that follow each IUGS ratification and ICS Executive requests to change chart content, namely
  - cross-check if with a new GSSP also the numeric age is wished to be amended
  - the updating of the chart PDF/JPEG (editing and exports from graphics software)
  - updating of the chart in Semantic Web representation
  - release of updated translations of the ICS Chart - to do this from the digital chart source will require testing.