



International Commission on Stratigraphy
Subcommission on Cambrian Stratigraphy

ANNUAL REPORT 2017

1. TITLE OF CONSTITUENT BODY

International Subcommission on Cambrian Stratigraphy

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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.

3. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2017

3.a. ISECT 2017, Newfoundland, Canada, 15–29 June 2017

The Cambrian Subcommission held its annual meeting in association with the Ediacaran Subcommission (ISES) in June 2017 in St. John's, Newfoundland. The conference was entitled *International Symposium on the Ediacaran–Cambrian Transition 2017* (ISECT 2017). Chief organizers for the conference were Alex Liu, Duncan McIlroy, Guy Narbonne and Marc Laflamme. The Subcommission sponsored one day-long session and one morning session devoted to Cambrian geology and stratigraphy. Several talks were devoted to primarily toward the base and lower part of the Cambrian System. Most of the major Cambrian stratigraphic issues remaining to be solved are in the lower half of the system, and the sessions were partly aimed at addressing potential solutions. Subcommission members also delivered talks or posters on other topics dealing with Cambrian stratigraphy. An abstract volume, edited by D. McIlroy, and five field guides were published. A theme issue of *Canadian Journal of Earth Sciences* containing papers resulting from presentations at the meeting is in progress.

3.b. ISCS Webpage

The Cambrian Subcommission's webpage was updated in 2017. The webpage accounts for the many important changes that have occurred with respect to global chronostratigraphy of the Cambrian System, and includes updated contact information, lists of important publications, and other essential information.

3.c. Cambrian Stage 5

A proposal for the Wuliuan Stage (formerly provisional Stage 5) and the Miaolingian Series (formerly provisional Series 3) was overwhelmingly approved within the ISCS in 2017 (balloting in October–November) and will soon be forwarded to ICS for approval. The base of the Wuliuan Stage and the Miaolingian Series coincides with the FAD of the oryctocephalid trilobite *Oryctocephalus indicus*, and the proposed GSSP section, the Wuliu-Zengjiayan section, is at Balang Village in the Miaoling Mountains, eastern Guizhou, China.

3.d. Cambrian Stage 3

The base of Cambrian Stage 3, which is conterminous with the base of Cambrian Series 2 (provisional), is expected to be placed at a horizon close to the first appearance of trilobites. The boundary position and levels that provide potential for intercontinental correlation have been widely discussed in recent years. Potential levels and problems surrounding the definition of Cambrian Series 2 and Stage 3 were reviewed in a paper by Zhang et al. (2017: Challenges in defining the base of Cambrian Series 2 and Stage 3. *Earth-Science Reviews* 172, 124–139).

3.e. Problems encountered

The principal difficulties encountered in 2017 were: 1, obtaining funding to support basic research on key stratigraphic intervals (potential GSSP horizons and sections); and 2, obtaining funding to support travel. A modest increase in funding for the coming year would be of great benefit to members of some of the Working Groups on key horizons who have limited access to funding through nationally competitive research grants.

4. OBJECTIVES AND WORK PLAN FOR NEXT YEAR (2018)

In 2018 the Cambrian Subcommittee will continue work toward defining GSSPs for its remaining provisional stages. The general plan is to arrive at a decision on how to define Stage 10 in 2018; then to arrive at decisions on stages 2, 3, and 4 in subsequent years. In addition, the Subcommittee will continue examining issues surrounding definition of the Cambrian GSSP.

Specific GSSP Foci for 2018

The Cambrian Subcommittee has finalized a decision on the GSSP of provisional Stage 5 (and Series 3), and expects to submit a proposal to ICS for ratification in early 2018.

In 2018, the Subcommittee hopes to make significant progress toward a decision on provisional Stage 10.

5. SUMMARY OF EXPENDITURES IN 2017

INCOME

Carried forward from 2016	\$ 0.00
ICS Allocation	\$ 3000.00
SUBTOTAL 2017 income	\$ 3000.00

EXPENDITURE FROM 2017 BUDGET

Contribution to officer's travel expenses	\$ 0.00
SUBTOTAL 2017 expenditures	\$ 0.00

To be carried forward to 2018 \$ 3000.00

6. BUDGET REQUESTS AND ICS COMPONENT FOR 2018

In order to accelerate the pace of work in establishing GSSPs within the Cambrian, we request a modest increase in funds from ICS as compared to previous years. This will be especially important in 2018 because of the need for Executive and Voting Members of the Subcommittee to be present at the ICS field meeting in China, where we will have the opportunity to examine and discuss the problems surrounding the base of the Cambrian GSSP. The meeting will also provide an opportunity to examine key sections in the lower part of the Cambrian, in both North and South China. The proposed increased funding is also targeted at field research on other key sections by Working Group members and young scientists.

INCOME	
Carry-over from 2017	\$ 3000.00
PLANNED EXPENDITURES FOR 2017	
Preparation for the 22nd Cambrian Stage Subdivision	\$ 1000.00
Working Group Conference in China	
Executive and VMs travel costs, Cambrian	
Subcommission field meeting	\$ 5000.00
Support for two young scientists to attend the field meeting	\$ 2000.00
General office expenses	\$ 100.00
TOTAL 2018 PLANNED EXPENSES	\$ 8100.00
ICS 2018 BUDGET REQUEST	\$ 5100.00

APPENDICES

7. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2013–2017)

- From 2013 to 2017 the Cambrian Stage Subdivision Working Group has made four reconnaissance visits to sections in association with international field conferences. Areas visited are Scandinavia (2013), Morocco and South China (2014), South Australia (2016), and Newfoundland (2017).
- In association with each of the field conferences, regional and/or global correlation charts have been published in technical papers.
- The Cambrian Subcommission has devised a plan for subdividing the Cambrian System into four series and 10 stages. The two lower series will embrace two stages each, and the upper two series will embrace three stages each. Through 2007, two series (Terreneuvian and Furongian) and four stages (Fortunian, Drumian, Guzhangian, and Paibian) had been ratified. Since that time, one stage, the Jiangshanian has been ratified (2011). The Wuliuan Stage (formerly provisional Stage 5) and the Miaolingian Series (formerly provisional Series 3) were approved within the ISCS in late 2017.
- Beginning with the Jiangshanian Stage, the Cambrian Subcommission has been interested in establishing ASSPs. An ASSP for the Jiangshanian was approved in 2012.

8. OBJECTIVES AND WORK PLAN FOR NEXT FOUR YEARS (2018–2021)

- The principal objective of the Subcommission for 2018 is to narrow 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 GSSPs. The plan is:
 - 1) Within the next year, the Wuliuan Stage (formerly provisional Stage 5) and the Miaolingian Series (formerly provisional Series 3) are expected to be ratified by the ICS and IUGS.
 - 2) Provisional Stage 10 is expected to be defined next, but a decision on a GSSP is likely to be at least one or two years away.
 - 3) Following a decision on Stage 10, provisional stages 2, 3, and 4, are expected to be defined in rapid succession. A decision on the preferred GSSP horizon of any one of the 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.
 - 4) A more long-term objective is re-examination of the Cambrian System (Terreneuvian Series, Fortunian Stage) GSSP. 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 (see Babcock, L.E. et al. 2014: Proposed reassessment of the Cambrian GSSP. *Journal of African Earth Sciences* 98, 3–10). A decision on how to proceed with the Cambrian GSSP is expected to be made following ratification of GSSPs for stages 2, 3, and 4.

9. ORGANIZATION AND SUBCOMMISSION MEMBERSHIP

9.a. Names and Addresses of Current Officers and Voting Members

Subcommission officers (2016–2020)

Chairman: Loren E. Babcock (USA) babcock.5@osu.edu

Vice-Chair: Xingliang Zhang (China) xzhang69@nwu.edu.cn

Secretary: Per Ahlberg (Sweden) per.ahlberg@geol.lu.se

List of Voting Members (including officers) for 2016–2020

- 1) Per Ahlberg, Lund, Sweden per.ahlberg@geol.lu.se
- 2) José-Javier Álvaro, Villeneuve d'Ascq, Spain alvarobjj@cab.inta-csis.es, jj.alvaro@csic.es
- 3) Loren E. Babcock, Columbus, Ohio, USA babcock.5@osu.edu
- 4) Gabriella Bagnoli, Pisa, Italy bagnoli@dst.unipi.it
- 5) Duck K. Choi, Seoul, Korea dkchoi@snu.ac.kr
- 6) Olaf Elicki, Freiberg, Germany elicki@geo.tu-freiberg.de
- 7) Gerd Geyer, Germany gerd.geyer@uni-wuerzburg.de
- 8) Rodolfo Gozalo, Valencia, Spain rodolfo.gozalo@uv.es
- 9) James B. Jago, Mawson Lakes, Australia jim.jago@unisa.edu.au
- 10) Pierre D. Kruse, Adelaide, Australia archaeo.kruse@gmail.com
- 11) Linda B. McCollum, Cheney, Washington, USA lmccollum@ewu.edu
- 12) Malgorzata Moczydlowska-Vidal, Sweden malgo.vidal@pal.uu.se
- 13) Elena B. Naimark, Moscow, Russia naimark@paleo.ru
- 14) Tatyana V. Pegel, Novosibirsk, Russia pegel@mail.ru
- 15) Shanchi Peng, Nanjing, China scpeng@nigpas.ac.cn
- 16) Leonid Popov, Wales, UK leonid.popov@museumwales.ac.uk
- 17) Brian R. Pratt, Saskatchewan, Canada brian.pratt@usask.ca
- 18) Matthew R. Saltzman, Columbus, Ohio, USA saltzman.11@osu.edu
- 19) Michael Steiner, Berlin Germany michael.steiner@FU-Berlin.de
- 20) Alexey I. Varlamov, Moscow, Russia varlamov@vnigni.ru, info@vnigni.ru
- 21) Mark Webster, Chicago, Illinois, USA mwebster@geosci.uchicago.edu
- 22) Xingliang Zhang, Xi'an, China xzhang69@nwu.edu.cn
- 23) Maoyan Zhu, Nanjing, China myzhu@nigpas.ac.cn
- 24) Anna Zylinska, Warsaw, Poland anna.zylinska@uw.edu.pl

9.b. List of Working (Task) Groups and their officers

1. WG on Stage 10 GSSP, chaired by Per Ahlberg (Sweden)
2. WG on Stage 5 GSSP, chaired by Linda B. McCollum (USA)
3. WG on Stage 4 GSSP, chaired by James B. Jago (Australia)
4. WG on Stage 3 GSSP, chaired by Xingliang Zhang (China)
5. WG on Stage 2 GSSP, chaired by Michael Steiner (Germany)

9.c. Interfaces with other international projects

In July 2017, the Cambrian Subcommission held its annual meeting in association with the Ediacaran Subcommission (ISES) in St. John's, Newfoundland. The conference and the ISCS meeting attracted numerous Cambrian researchers and 75 talks and posters dealing with Cambrian stratigraphy, geochronology and palaeontology were presented.

The *Dayangcha International Workshop on the Cambrian-Ordovician boundary* (DIWCOB) was held in Changchun, NE China, in 20–25 September 2017. The meeting covered all aspects of research on the Cambrian-Ordovician boundary, as well as research on the uppermost Cambrian (Stage 10) and lowermost Ordovician. It was partly organized by the National Commission on Stratigraphy of China (NCSC) and attracted several Cambrian researchers.

The Cambrian Subcommission is involved jointly with the Ordovician Subcommission in *IGCP Project 653: Filling the gap between the Cambrian Explosion and the GOBE*. IGCP Project 653 held its annual meeting in Yichang, China, 8–12 October 2017. The GSSPs of the Guzhangian and Paibian stages in Hunan were visited during the post-conference field excursion.

In 2018, the Cambrian Subcommission will hold its annual meeting in Xian, China, 11–21 August, in association with the International Subcommission on Ediacaran Stratigraphy (ISES). Xingliang Zhang, Yaoping Cai, Jian Han, and others will organize the meeting.

The Cambrian Subcommission is working jointly with the Ediacaran Subcommission on restudy of the Cambrian base. Members of both subcommissions comprise the membership of the Terreneuvian/Fortunian Working Group.