



International Commission on Stratigraphy
Subcommission on Cambrian Stratigraphy

ANNUAL REPORT 2016

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 2016

3.a. Palaeo Down Under 2, Adelaide, South Australia, 11–15 July 2016

The Cambrian Subcommission held its annual meeting in association with the Palaeo Down Under 2 Meeting in Adelaide, Australia (organised by the Association of Australasian Palaeontologists). The Subcommission sponsored one day-long session and two afternoon sessions devoted to Cambrian geology and palaeontology. Several talks were devoted to primarily toward the 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.

3.b. ISCS Webpage

The Cambrian Subcommission's webpage was updated in 2016. 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

Following the Working Group's recommendation (in 2015) to use the FAD of the oryctocephalid trilobite *Oryctocephalus indicus* as the primary marker for provisional Stage 5, two GSSP proposals were submitted to ISCS in 2016. One proposal is from the Split Mountain Section, Nevada, USA, and the other one is from the Wuliu-Zengjiayan Section at Balang Village, eastern Guizhou, China.

3.d. Problems encountered

The principal difficulties encountered in 2016 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 (2017)

In 2017 the Cambrian Subcommission will continue work toward defining GSSPs for its remaining provisional stages. The general plan is to finalize Stage 5 and arrive at a decision on how to define Stage 10 in 2017; then to arrive at decisions on stages 2, 3, and 4 in subsequent years. In addition, the Subcommission will examine issues surrounding definition of the Cambrian GSSP.

Specific GSSP Foci for 2017

The Cambrian Subcommission is finalizing a decision on the GSSP of provisional Stage 5 (and Series 3), and expects to submit a proposal to ICS for ratification in 2017.

In 2017, the Subcommission hopes to make significant progress toward a decision on provisional Stage 10.

5. SUMMARY OF EXPENDITURES IN 2016

INCOME

Carried forward from 2015	\$ 73.69
ICS Allocation	\$ 3000.00
SUBTOTAL 2016 income	\$ 3073.69

EXPENDITURE FROM 2016 BUDGET

Contribution to officer's travel expenses (actual travel expenses exceeded the budget slightly)	\$ 3073.69
SUBTOTAL 2016 expenditures	\$ 3073.69

To be carried forward to 2017 \$ 0.00

6. BUDGET REQUESTS AND ICS COMPONENT FOR 2017

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 2017 because of the need for Voting Members of the Subcommittee to be present at the ICS field meeting in Newfoundland, where we will have the opportunity to examine and discuss the problems surrounding the base of the Cambrian GSSP. The Newfoundland meeting will also provide an opportunity to examine key sections in the uppermost part of the Cambrian. 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 2016	\$ 0.00
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PLANNED EXPENDITURES FOR 2017

Preparation for the 21st Cambrian Stage Subdivision	\$ 1000.00
Working Group Conference on Newfoundland	
Executive and VMs travel costs, Cambrian	
Subcommittee field meeting	\$ 3000.00
Support for two young scientists to attend the field meeting	\$ 2000.00
General office expenses	\$ 100.00
TOTAL 2017 PLANNED EXPENSES	\$ 6100.00

ICS 2017 BUDGET REQUEST \$ 6100.00

APPENDICES

7. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2011–2015)

- From 2012 to 2016 the Cambrian Stage Subdivision Working Group has made four reconnaissance visits to sections in association with international field conferences. Areas visited are Guizhou, China (2012), Scandinavia (2013), Morocco and South China (2014), and South Australia (2016).
- 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).
- 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 (2017–2020)

- The principal objective of the Subcommission for 2017 is to narrow possibilities for horizons and GSSP stratotypes for the remaining undefined stages, which are provisionally identified as stages 2, 3, 4, 5, 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, provisional Stage 5 is expected to be defined.
 - 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, Sweden) babcockloren@gmail.com

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, and Lund, Sweden babcockloren@gmail.com
- 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, Darwin, 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 2016, the Cambrian Subcommission held its annual meeting in association with the Palaeo Down Under 2 conference in Adelaide, South Australia. The congress and the ISCS

meeting attracted numerous Cambrian researchers, and more than 60 talks and posters dealing with Cambrian stratigraphy and paleontology were presented during the conference.

The *IGCP Project 591 Closing Meeting: A Combined Data-model Approach to Understand the Early to Middle Paleozoic Revolution* was held in Ghent, Belgium, 6–9 July 2016. Given that deep-time data-model comparison requires a profound understanding of the stratigraphy, this was a joint meeting of the Cambrian, Ordovician, Silurian, and Devonian Subcommissions.

In 2017, the Cambrian Subcommission will hold its annual field meeting Newfoundland, Canada, 10-29 June, in association with the International Subcommission on Ediacaran Stratigraphy (ISES). Alex Liu, Guy Narbonne, and others are organising 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.

The Cambrian Subcommission is involved jointly with the Ordovician Subcommission in IGCP Project 653, and has recently co-sponsored a field meeting (South Australia, 2016) with the Ediacaran Subcommission and IGCP 587.