

International Subcommittee on Cambrian Stratigraphy (ISCS)  
Business Meeting, Xi'an, China, 15 August 2018

1. Thank you to organizers and field trip leaders of the ICECS meeting in China (Xingliang Zhang, Yaoping Cai, Jian Han, Hong Hua, Kangjun Huang, Gianni Liu, Zhife Zhang, and the secretaries, Dongjing Fu, Chao Chang, and Wei Liu, and all the field trip leaders). Thanks, too, to all the sponsors and organizations that have worked to organise this extremely successful meeting. Thank you to all who have made this meeting possible, and who have made us welcome here.
2. Introduction of officers and Voting Members (for term ending 2020): Loren Babcock (Chair), Per Ahlberg (Secretary), and Xingliang Zhang (Vice-Chair); additional VMs who are here: Gerd Geyer, Shanchi Peng, Michael Steiner, and Maoyan Zhu.
  - 2.1. Chairs of Working Groups:
    - Terreneuvian: Maoyan Zhu (present)
    - Stage 2: Michael Steiner (present)
    - Stage 3: Xingliang Zhang (present)
    - Stage 4: Jim Jago
    - Stage 10: Per Ahlberg (present)
    - Web page: Malgorzata Moczydlowska-Vidal (Michael Streng, webmaster)
3. Current Voting Members (for the term 2016–2020):
  - 1, Per Ahlberg, Lund, Sweden [per.ahlberg@geol.lu.se](mailto:per.ahlberg@geol.lu.se)
  - 2, José-Javier Álvaro, Madrid, Spain [alvarobjj@cab.inta-csic.es](mailto:alvarobjj@cab.inta-csic.es), [jj.alvaro@csic.es](mailto:jj.alvaro@csic.es)
  - 3, Loren E. Babcock, Columbus, USA, and Lund, Sweden [babcock.5@osu.edu](mailto:babcock.5@osu.edu)
  - 4, Gabriella Bagnoli, Pisa, Italy [bagnoli@dst.unipi.it](mailto:bagnoli@dst.unipi.it)
  - 5, Duck K. Choi, Seoul, Korea [dkchoi@snu.ac.kr](mailto:dkchoi@snu.ac.kr)
  - 6, Olaf Elicki, Freiberg, Germany [elicki@geo.tu-freiberg.de](mailto:elicki@geo.tu-freiberg.de)
  - 7, Gerd Geyer, Germany [gerd.geyer@uni-wuerzburg.de](mailto:gerd.geyer@uni-wuerzburg.de)
  - 8, Rodolfo Gozalo, Valencia, Spain [rodolfo.gozalo@uv.es](mailto:rodolfo.gozalo@uv.es)
  - 9, James B. Jago, Mawson Lakes, Australia [jim.jago@unisa.edu.au](mailto:jim.jago@unisa.edu.au)
  - 10, Pierre D. Kruse, Adelaide, Australia [archaeo.kruse@gmail.com](mailto:archaeo.kruse@gmail.com)
  - 11, Linda B. McCollum, Cheney, Washington, USA [lmccollum@ewu.edu](mailto:lmccollum@ewu.edu)
  - 12, Malgorzata Moczydlowska-Vidal, Sweden [malgo.vidal@pal.uu.se](mailto:malgo.vidal@pal.uu.se)
  - 13, Elena B. Naimark, Moscow, Russia [naimark@paleo.ru](mailto:naimark@paleo.ru)
  - 14, Tatyana V. Pegel, Novosibirsk, Russia [pegel@mail.ru](mailto:pegel@mail.ru)
  - 15, Shanchi Peng, Nanjing China [scpeng@nigpas.ac.cn](mailto:scpeng@nigpas.ac.cn)
  - 16, Leonid Popov, Wales, UK [leonid.popov@museumwales.ac.uk](mailto:leonid.popov@museumwales.ac.uk)
  - 17, Brian R. Pratt, Saskatchewan, Canada [brian.pratt@usask.ca](mailto:brian.pratt@usask.ca)
  - 18, Matthew R. Saltzman, Columbus, Ohio, USA [saltzman.11@osu.edu](mailto:saltzman.11@osu.edu)
  - 19, Michael Steiner, Berlin, Germany [michael.steiner@FU-Berlin.de](mailto:michael.steiner@FU-Berlin.de)
  - 20, Alexei I. Varlamov, Moscow Russia [varlamov@vnigni.ru](mailto:varlamov@vnigni.ru), [info@vnigni.ru](mailto:info@vnigni.ru)
  - 21, Mark Webster, Chicago, Illinois [mwebster@geosci.uchicago.edu](mailto:mwebster@geosci.uchicago.edu)
  - 22, Xiangling Zhang, Xi'an, China [xzhang69@nwu.edu.cn](mailto:xzhang69@nwu.edu.cn)
  - 23, Maoyan Zhu, Nanjing, China [myzhu@nigpas.ac.cn](mailto:myzhu@nigpas.ac.cn)
  - 24, Anna Zylinska, Warsaw, Poland [anna.zylinska@uw.edu.pl](mailto:anna.zylinska@uw.edu.pl)

4. Request for updated contact information (especially email addresses) from all VMs, Honorary Members, Corresponding Members; also alternate rapid contact (fax, etc.).
5. In 2013–2014, the new ISCS webpage was introduced and modified. Recent information is posted there, and we will strive to keep the webpage updated. In the next few weeks we hope to post the names of specialists who have agreed to serve in the various Working Groups.
6. ISCS sponsored/co-sponsored meetings this year:
  - 6.1. ICECS 2018 (this meeting)
7. Announcement of upcoming meetings.
  - 7.1. STRATI 2019 will be held in Milan, Italy, 2–5 July 2019. We are planning to have a Cambrian theme session.
  - 7.2. NAPC in Riverside, California (University of California Riverside)
  - 7.3. If other meetings of our interest are announced we will put links to them on our web page.
8. Discussion of progress toward publication of stage and series names.
  - 8.1. Ratified boundaries defined by GSSPs:
    - 8.1.1. Furongian Series/Paibian Stage – 2004, Lethaia.
    - 8.1.2. Drumian Stage – 2007, Episodes.
    - 8.1.3. Terreneuvian Series/Fortunian Stage – 2008, Episodes.
    - 8.1.4. Guzhangian – 2009, Episodes.
    - 8.1.5. Jiangshanian – 2011; GSSP, Episodes (2012); ASSP, Episodes 2013.
    - 8.1.6. Miaolingian Series/Wuliuan Stage – ratified in July 2018, publication in Episodes in preparation (expected publication 2019).
9. Discussion of work toward defining remaining stage-level GSSPs. We want to remind members of the Cambrian community that the face-to-face discussions we have concerning progress on GSSP definition takes place at our annual meetings, normally within the business meetings, but also occasionally in additional gatherings. This year we have set aside time for a separate meeting to discuss Stage 10, which is the next stage that we hope to see ratified.
  - 9.1. Stage 10 (*Lotagnostus americanus* level). Alternate possibility for level: *Eoconodontus notchpeakensis* level. Possibilities for a GSSP section: Siberia, South China, Kazakhstan, Utah, etc. We plan to send out a questionnaire to voting members this year asking them for their opinions on the practicality of using one level or the other as the base of Stage 10. In 2005, the voting members voted overwhelmingly in favour of using the *Lotagnostus trisectus* (= *L. americanus*) as the primary marker for the stage base. Subsequently the *E. notchpeakensis* level has been advanced as an alternative. Both levels have advantages for global correlation. One additional option is to subdivide the stage into lower and upper substages, both with GSSPs. We envision as a longer-term strategy each of the stages to be subdivided into formal substages, and Stage 10 could serve as the model to define substages. Other subcommissions have already begun the process of formally defining substages.
  - 9.2. Stage 2: Possible levels: *Watsonella crosbyi* or *Aldanella attleborensis*. Possibilities for a GSSP section: Siberia, South China, etc.
  - 9.3. Stage 3 (approximately FAD trilobites): The earliest trilobites known seem to be *Profallotaspis jakutensis* in Siberia, *Hupetina antiqua* in Morocco and *Fritzaspis* in

Laurentia. Potential markers of small shelly fossils: FAD of *Pelagiella subangulata*, *Microdictyon effusum* or *Mobergella radiolata*. If the level is to be identified principally through biostratigraphic means, its position also needs to be recognizable using non-biostratigraphic means.

- 9.4. Stage 4 (approximately FAD *Olenellus/Redlichia*): ISCS favors placing stage base at FAD of a single trilobite species. Possibilities: a species of *Olenellus* (s.l.), *Redlichia* (s.l.), *Arthrocephalus chauveaui*, *Oryctocarella duyunensis*, *Judomia*, *Bergeroniellus*, or the *Triangulaspis-Serrodiscus-Hebediscus attleborensis* band. Such a position would be at a level roughly corresponding to the base of the Dyeran Stage of Laurentia, the base of the Duyunian of South China, and the base of the Botoman Stage of Siberia.
- 9.5. We plan to send out a questionnaire to voting members asking for their opinions on the relative acceptability of each of the potential levels that have been identified as primary markers for the bases of stages 2, 3, and 4. After that we hope to narrow the choices for horizons to study most intensively, so that we can proceed with the process of defining GSSPs of these stages as quickly as practical.
- 9.6. Cambrian/Terreneuvian/Fortunian GSSP. The Cambrian Subcommittee is working in collaboration with the Ediacaran Subcommittee to better understand this boundary position. In the last couple of years tremendous progress has been made toward understanding correlation tools related to the position of the Cambrian GSSP, and it now appears that the horizon can be identified with a reasonable level of precision in many areas of the world. Work is continuing and it may turn out that we ultimately prefer to use a primary correlation tool for the horizon that is different from *T. pedum*, but nevertheless the horizon itself seems to be a practical one (and a good one in retrospect) for intercontinental correlation. There is new information about the succession (Ara Group) in Oman and Gerd Geyer would like to speak about it.

## 10. Proposal to define formal substages of the Cambrian.

- 10.1. The ISCS would like to open discussion on the desirability of defining and formalising substages of each of the Cambrian stages. A working model will be presented.

## 11. Other matters.