



INTERNATIONAL UNION OF GEOLOGICAL SCIENCES  
**INTERNATIONAL COMMISSION ON STRATIGRAPHY**



Chair

Prof. Stanley FINNEY, Department of Geological Sciences, California State University at Long Beach, Long Beach, CA 90840, USA  
 TEL: 1-562-985-8637 (office); FAX: 1-562-985-8638; E-mail: [scfinney@csulb.edu](mailto:scfinney@csulb.edu)

Vice Chair

Prof. Shanchi PENG, Nanjing Institute of Geology & Palaeontology, Chinese Academy of Sciences, 39 East Beijing St., Nanjing 210008, China  
 TEL and FAX: 86-25-8328 2135; E-mail: [scpeng@nigpas.ac.cn](mailto:scpeng@nigpas.ac.cn)

Secretary General

Dr. Paul R. BOWN, Department of Earth Sciences, University College London, Gower Street, London WC1E 6BT, UK  
 TEL: 44-0-20-7504-2431 office; FAX 44-0-20-7388-7614; E-mail: [p.bown@ucl.ac.uk](mailto:p.bown@ucl.ac.uk)

## ANNUAL REPORT 2015

### 1. TITLE OF CONSTITUENT BODY

#### **International Commission on Stratigraphy (ICS)**

*Summary and compilation of subcommission reports submitted jointly by:*

**Chair:** Prof. Stanley C Finney

Department of Geological Sciences, California State University at Long Beach,  
 Long Beach, CA 90840, USA  
 Tel: 1-562-985-8637; Fax: 1-562-985-8638; E-mail: [scfinney@csulb.edu](mailto:scfinney@csulb.edu)

**Secretary General:** Dr. Paul R Bown

Department of Earth Sciences, University College London, Gower Street,  
 London, WC1E 6BT, UK  
 Tel: +44(0)20-7679-2431; E-mail: [p.bown@ucl.ac.uk](mailto:p.bown@ucl.ac.uk)

### 2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

#### **Objectives**

The International Commission on Stratigraphy (ICS) is a body of expert stratigraphers founded for the purpose of promoting and coordinating long-term international cooperation and establishing standards in stratigraphy. Its principal objectives are:

- (a) Establishment and publication of a standard global stratigraphic time scale and the preparation and publication of global correlation charts, with explanatory notes.
- (b) Compilation and maintenance of a stratigraphic data base center for the global earth sciences.
- (c) Unification of regional chronostratigraphic nomenclature by organizing and documenting stratigraphic units on a global database.
- (d) Promotion of education in stratigraphic methods, and the dissemination of stratigraphic knowledge.

- (e) Evaluation of new stratigraphic methods and their integration into a multidisciplinary stratigraphy.
- (f) Definition of principles of stratigraphic classification, terminology and procedure and their publication in guides and glossaries.

### **Fit within IUGS Science Policy**

The objectives satisfy the IUGS mandates 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 geology worldwide.
- Attracting competent students and research workers to the discipline.
- Fostering an increased awareness among individual scientists worldwide of what related programs are being undertaken.

In particular, the current objectives of ICS relate to three main aspects of IUGS policy:

- (a) Development of an internationally agreed scale of chronostratigraphic 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.
- (b) Promotion of international consensus on stratigraphic classification and terminology, which is essential for advancement of earth-science research and education.
- (c) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth.

## **3. ORGANIZATION**

ICS is organized in two types of constituent bodies: Subcommissions for longer-term study, and Executive Task Groups for more limited, shorter-term tasks. ICS is managed by the Executive Committee, which consists of elected and appointed officers. The current structure of ICS consists of the Executive Committee and 16 Subcommissions that deal with the major chronostratigraphic units and aspects of stratigraphic classification. The ICS Executive has initiated two new Executive Task Groups on geochronology and web-page development. The web-age task group has produced revisions to the ICS website and encouraged the rejuvenation of websites for several subcommissions. Members are being recruited for the geochronology task group.

### **Subcommissions:**

Quaternary	Permian	Ediacaran
Neogene	Carboniferous	Cryogenian
Paleogene	Devonian	Precambrian
Cretaceous	Silurian	Stratigraphic Classification
Jurassic	Ordovician	
Triassic	Cambrian	

The reports of each Subcommittee are appended to this ICS summary compilation.

The subcommissions of ICS together have more than 350 titular members. When the corresponding members of Subcommissions are added, several thousand stratigraphers worldwide participate in the activities of ICS, and several thousand more over the 45-year history of ICS. In addition, ICS maintains contacts with many national stratigraphic committees. The members of the Full Commission (i.e. the 3 members of the Executive and the chairs of the 15 Subcommissions) represent six countries: United Kingdom (6 members), Canada (4), Italy (3), USA (2), China (2), and Australia (1). Among all subcommission officers and the ICS executive, 15 countries are represented: United Kingdom (9 members), Canada (9), USA (8), China (7), Italy (6), Australia (3), Spain (2), Russia (2), Belgium (1), Czech Republic (1), Estonia (1), France (1), Germany (1), Sweden (1), Switzerland (1). The voting members of ICS, i.e. all voting members of all subcommissions including officers represent 40 countries: USA (58), China (37), United Kingdom (32), Russia (31), Canada (25), Germany (24), Italy (21), Australia (16), Spain (13), France (12), Japan (10), New Zealand (8), Argentina (7), Belgium (7), Netherlands (7), Brazil (6), Poland (6), Czech Republic (5), Denmark (5), Sweden (5), Switzerland (5), Hungary (4), India (3), Korea (3), South Africa (3), Tunisia (2), Austria (2), Estonia (2), Finland (2), Iran (2), Bulgaria (1), Colombia (1), Croatia (1), Greece (1), Lithuania (1), Namibia (1), Norway (1), Portugal (1), Turkey (1), and Ukraine (1).

ICS and its subcommissions maintain websites; the URLs of the websites are as follows:

#### **Websites:**

ICS main site	<a href="http://www.stratigraphy.org">www.stratigraphy.org</a>
Quaternary	<a href="http://www.quaternary.stratigraphy.org">www.quaternary.stratigraphy.org</a>
Neogene	<a href="http://www.geo.uu.nl/SNS">www.geo.uu.nl/SNS</a>
Paleogene	<a href="http://wzar.unizar.es/isps/">wzar.unizar.es/isps/</a>
Cretaceous	<a href="http://www.univ-brest.fr/geoscience/?ISCS/">www.univ-brest.fr/geoscience/?ISCS/</a>
Jurassic	<a href="http://www.jurassic.stratigraphy.org">www.jurassic.stratigraphy.org</a>
Triassic	<a href="http://paleo.cortland.edu/sts/">paleo.cortland.edu/sts/</a>
Permian (newsletter)	<a href="http://www.permian.stratigraphy.org">www.permian.stratigraphy.org</a>
Carboniferous	<a href="http://www.stratigraphy.org/carboniferous/">www.stratigraphy.org/carboniferous/</a>
Devonian	<a href="http://www.unica.it/sds/">www.unica.it/sds/</a>
Silurian	<a href="http://www.silurian.stratigraphy.org">www.silurian.stratigraphy.org</a>
Ordovician	<a href="http://www.ordovician.stratigraphy.org">www.ordovician.stratigraphy.org</a>
Cambrian	<a href="http://www.palaeontology.geo.uu.se/ISCS/ISCS_home.html">www.palaeontology.geo.uu.se/ISCS/ISCS_home.html</a>
Ediacaran	<a href="http://www.paleo.geos.vt.edu/Ediacaran/">www.paleo.geos.vt.edu/Ediacaran/</a>
Cryogenian	<i>being established</i>
Precambrian	<a href="http://www.precambrian.stratigraphy.org">www.precambrian.stratigraphy.org</a>
Stratigraphic Classification	<a href="http://users.unimi.it/issc">http://users.unimi.it/issc</a>

#### **ICS Executive Officers for 2012-2016:**

Chair: **Stanley Finney** (California, USA)

Vice-Chair: **Shanchi Peng** (Nanjing, China)

Secretary: **Paul Bown** (London, UK)

**ICS Subcommittee officers:**

A full listing of current officers (with addresses, telephones, e-mails) is at the end of this main ICS report. The individual subcommission reports include a listing of all voting members (typically 20 in each subcommission).

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

In 2013, ICS was awarded a grant for \$75,000 (\$25,000/year for 3 years) from the U.S. National Sciences Foundation. Furthermore, it was awarded another \$50,000 grant in 2015 for the purpose of supporting a joint ICS-NSF workshop "Archiving the Stratigraphic Record". This workshop was held in Graz, Austria in conjunction with STRATI 2015 - 2nd International Congress on Stratigraphy. With it ICS has taken the lead role in developing a decades long project to archive stratigraphic information, both new and historical, in an internet-based, readily accessible database. Only a few of the subcommissions have formal financial contributions from external sources other than IUGS (through ICS), and these are very limited and listed in the individual reports. Some activities that are associated with ICS goals, such as distributing charts of the Geologic Time Scale and placing this information onto public websites, have received some support from private companies and professional organizations. Informally, every officer and member of ICS donates their own time, office space, institutional facilities, and other components to the activities of the organization. No officer or executive receives any salary compensation from IUGS or other ICS funds. Indeed, most officers personally contribute toward their own travel and operational expenses.

#### **5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS**

Active and highly fruitful interfaces with many international organizations and geo-projects are a standard feature of ICS activities. ICS maintains a strong link with the International Quaternary Association (*INQUA*) Commission on Stratigraphy regarding the stratigraphy of the Quaternary, and with the Commission for the Geological Map of the World (*CGMW*) in Paris regarding standardization of chronostratigraphy and its color scheme on charts, as well as producing the *ICS International Chronostratigraphic Chart*. ICS officers consult with national stratigraphic commissions/committees on matters of standardization. In addition, ICS is collaborating with the IUGS Commission on Geoscience Information (CGI) as it develops GeoSciML as an interchange format for geoscience data. ICS subcommissions are traditionally affiliated with a considerable number of **IUGS** and **IGCP** activities. For example, ICS members lead or participate in numerous, active IGCP projects: 572, 575, 580, 587, 591, 596, and 599, and others serve on IGCP national committees and the scientific board. ICS members maintains active links with international research groups, including The Micropalaeontology Society (**TMS**), the North American Micropaleontology Society (**NAMS**), International Nannoplankton Association (**INA**) and the Association of American Stratigraphic Palynologists (**AASP**), and international paleontological research groups on Graptolites, Conodonts, Ammonites, Radiolarians (**Interrad**), Nannofossils, Foraminifers, etc., and many ICS members serve on national stratigraphic commissions and as editors of journals. There are close links between many ICS stratigraphers and the International Ocean Drilling Project (**IODP**). ODP cores routinely test the global correlation potential of a great number of bio-events since the Jurassic, and this record is vital to develop integrated timescales at several scales of resolution, and global paleo-climate models. The designation of GSSPs necessitates close interaction with local and international groups

concerned with conservation, such as **UNESCO** (Geoparks Program), **IUGS** (Geosites Program) and **ProGEO** (Geosites and Geoparks initiatives).

## **6. CHRONOSTRATIGRAPHIC STAGE AND SERIES NAMES AND DEFINITIONS ESTABLISHED IN ICS**

Quaternary:

- Base Holocene Series
- Base Calabrian Stage
- Base Gelasian Stage (= Base Pleistocene Series and Base Quaternary System)

Neogene:

- Base Piacenzian Stage
- Base Zanclean Stage (= Base Pliocene Series)
- Base Messinian Stage
- Base Tortonian Stage
- Base Serravallian Stage
- Base Aquitanian Stage (= Base Miocene Series and Base Neogene System)

Paleogene:

- Base Rupelian Stage (= Base Oligocene Series)
- Base Lutetian Stage
- Base Ypresian Stage (= Base Eocene Series)
- Base Thanetian Stage
- Base Selandian Stage
- Base Danian Stage (= Base Paleocene Series and Base Paleogene System)

Cretaceous:

- Base Maastrichtian Stage
- Base Santonian Stage
- Base Turonian Stage
- Base Cenomanian Stage (= Base Upper Cretaceous Series and Base Cretaceous System)

Jurassic:

- Base Bathonian Stage
- Base Bajocian Stage
- Base Aalenian Stage (= Base of Middle Jurassic Series)
- Base Toarcian Stage
- Base Pliensbachian Stage
- Base Sinemurian Stage
- Base Hittangian Stage (= Base Lower Jurassic System and Base Jurassic Series)

Triassic:

- Base Carnian Stage (= Base Upper Triassic System)
- Base Ladinian Stage
- Base Induan Stage (= Base Triassic System)

Permian:

- Base Changhsingian Stage
- Base Wuchiapingian Stage (= Base Lopingian Series)
- Base Capitanian Stage
- Base Wordian Stage
- Base Roadian Stage (= Base Guadalupian Series)
- Base Asselian Stage (= Base Cisuralian Series and Base Permian System)

Carboniferous:

- Base of Bashkirian Stage (= Base Lower Pennsylvanian Series and Base Pennsylvanian Subsystem)
- Base Visean Stage

Base Tournaisian Stage (= Base Lower Mississippian Series and Base Mississippian Subsystem and Base Carboniferous System)

Devonian:

Base Famennian Stage

Base Frasnian Stage (= Base Upper Devonian Series)

Base Givetian Stage

Base Eifelian Stage (= Base Middle Devonian Series)

Base Emsian Stage

Base Pragian Stage

Base Lochkovian Stage (= Base Lower Devonian Series and Base Devonian System)

Silurian:

Base Pridoli Series

Base Ludfordian Stage

Base Gorstian Stage (= Base Ludlow Series)

Base Homerian Stage

Base Sheinwoodian Stage (= Base Wenlock Series)

Base Telychian Stage

Base Aeronian Stage

Base Rhuddanian Stage (= Base Llandovery Series and Base Silurian System)

Ordovician:

Base Hirnantian Stage

Base Katian Stage

Base Sandbian Stage (= Base Upper Ordovician Series)

Base Darriwilian Stage

Base Dapingian Stage (= Base Middle Ordovician Series)

Base Floian Stage

Base Tremadocian Stage (= Base Lower Ordovician Series and Base Ordovician System)

Cambrian:

Base Jiangshanian Stage

Base Paibian Stage (= Base Furongian Series)

Base Guzhangian Stage

Base Drumian Stage

Name Terreneuvian Series

Base Fortunian Stage (= Base Terreneuvian Series and Base Cambrian System)

Neoproterozoic:

Base Ediacaran System

## 7. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2015

### Full Commission

- Sponsored STRATI 2015 - 2nd International Congress on Stratigraphy, which was held in Graz, Austria, 19-23 July 2015, and co-sponsored with SEPM (Society of Sedimentary Geology). 361 participants from 47 nations; 7 keynote presentations; 267 oral presentations; 165 poster presentations. Awarded the Digby McLaren Medal to Andrew Miall of University of Toronto, Canada, and the ICS Stratigraphy Medal to Aitor Payros of the University of the Basque Country, Spain.
- Selected Milano, Italy as the site of STRATI 2019 - 3rd International Congress on Stratigraphy. Dates yet to be selected. The attraction of Italy, its scientific contributions to stratigraphy, and its varied stratigraphic successions for field excursions will generate far

greater interest and attendance than STRATI 2015 and will establish the International Congress on Stratigraphy as the premier, international venue for meetings of stratigraphers.

- Awarded \$37,000 from U.S. National Science Foundation grant to ICS as follows: \$7000 to Quaternary Subcommittee for travel of two Italian experts to attend field meeting in Japan; \$4000 to Paleogene for field investigations of GSSP for Bartonian Stage; \$4000 to Permian Subcommittee members to visit potential stratotype sections in Russia; \$6000 to Devonian Subcommittee to support field investigations in Uzbekistan for the Emsian GSSP; \$6000 to Silurian Subcommittee for field investigation two potential GSSPs in the Czech Republic; \$4000 to Ordovician Subcommittee to support travel to Ordovician Symposium of those from young scientists and those from under-represented regions; and \$4000 to the Ediacaran Subcommittees for field visits to candidate GSSP sections.
- With the award of a \$50,000 grant proposal from the U.S. National Science Foundation organized and held a joint ICS-NSF workshop titled "Archiving the Stratigraphic Record". The workshop was held in conjunction with STRATI 2015. It concluded with the Geobiodiversity Database at the Nanjing Institute of Geology and Palaeontology (Chinese Academy of Sciences) identified as the primary database on which to begin the process of archiving stratigraphic data as it is produced from today forward.
- Dedicated the GSSP for the base of the Santonian Stage (Cretaceous).
- Dedicated the GSSP for the base of the Katian Stage (Ordovician).
- Approval of the Albian Stage GSSP proposal by the Subcommittee on Cretaceous Stratigraphy and the International Commission on Stratigraphy
- 2015 version of ICS Chronostratigraphic Chart, which includes revised numerical ages, was posted on the ICS website.
- Translations of the 2015 version of the ICS Chart into Chinese, Japanese, Norwegian, and Spanish were posted on the ICS website.
- The ICS Chair was interviewed by journalists of several different publications and documentary film makers regarding consideration of the "Anthropocene Epoch" by ICS.
- Several authors, university professors and other educators, and professional societies were granted permission to use and reproduce the ICS International Chronostratigraphic Chart in their productions.
- Elected Chair and Vice-Chair of International Commission on Stratigraphy for the term 2016-2020. The new officers are Chair - David Harper (U.K.), Vice-Chair - Brian Huber (USA); Secretary-General - Philipp Gibbard (U.K.); Past-Chair - Stan Finney (USA).

### **Quaternary Subcommittee**

- 19th INQUA Congress, Nagoya, Japan, July 27 – August 2, 2015. A full-day symposium "The Early–Middle Pleistocene transition: local records, global correlations; Business meeting of the SQS ; Invited plenary address by M. J. Head, the Chair of SQS, entitled: "The Quaternary System and its official subdivision: past, present, and future"; Post-Congress field excursion to the Chiba section, Japan, a candidate stratotype section for the Lower–Middle Pleistocene boundary.
- SQS / INTIMATE Working Group submitted to the SQS Executive a proposal for the subdivision of the Holocene into Lower, Middle, and Upper Holocene subseries and their corresponding stages. This proposal is currently under discussion by SQS and voting is expected to commence in a few weeks.
- The Anthropocene Working Group presented evidence for epoch status of the Anthropocene at the STRATI 2015 Congress at Graz, Austria and at the 19th INQUA Congress, Nagoya,

Japan. The Working Group is currently examining the two options for defining the boundary, i.e. via GSSA or GSSP, and considering possible GSSPs.

- Head, M.J., Gibbard, P.L. and van Kolfschoten, T. (eds.), 2015. The Quaternary System and its formal subdivision. *Quaternary International*, 383: 1–208. This is the outcome of an SQS-sponsored full-day symposium on the formal subdivision of the Quaternary held at the STRATI 2013 Congress in Lisbon. It includes many articles by members of SQS and its constituent working groups.
- Head, M.J., and Gibbard, P.L., 2015. Formal subdivision of the Quaternary System/Period: Past, present, and future. *Quaternary International*, 383: 4–35.
- Waters, C.N., Syvitski, J.P.M., Gałuszka, A., Hancock, G.J., Zalasiewicz, J., Cearreta, A., Grinevald, J., McNeill, J.R., Summerhayes, C. and Barnosky, A. 2015. Can nuclear weapons fallout mark the beginning of the Anthropocene Epoch? *Bulletin of the Atomic Scientists*, 71(3), 46-57.
- Election of officers for term 2016-2020.

### **Neogene Subcommittee**

- A subcommittee business meeting was held during STRATI 2015, and it included a workshop focused on the two remaining GSSPs to be chosen for the Neogene - those of the Budigalian and Langhian Stages. Also discussed was whether or not formal subseries/subepochs should be recognized for the Mioene and Pliocene.
- Election of officers for term 2016-2020.

### **Paleogene Subcommittee**

- Created a new website and loaded it with information on subcommittee activities and on Stages and GSSPs for the Paleogene.
- Organized successful sessions dedicated to the Paleogene and the Bartonian Stage at STRATI 2015.
- Approved a GSSP proposal for the base of the Chattian Stage, which will be forwarded to ICS in 2016.
- Held a field excursion to the classical Barton area in Southern England in order to make progress on selection of a GSSP for the Bartonian Stage.
- Election of officers for term 2016-2020.
- Several important publications on Paleogene stratigraphy (see Subcommittee report).

### **Cretaceous Subcommittee**

- Dedicated the GSSP for the base of the Santonian Stage (Cretaceous)
- Approval of the Albian Stage GSSP proposal by the Subcommittee on Cretaceous Stratigraphy and the International Commission on Stratigraphy
- Organized two sessions at STRATI 2015, one on the Cretaceous GSSPs, another on the search for a GSSP for the Jurassic/Cretaceous boundary.

### **Jurassic Subcommittee**

- Base Kimmeridgian Workshop, Polish Geological Institute, Warsaw. Agreement reached that a satisfactory GSSP definition was now achievable.

- Publication in *Volumina Jurassica* of *Reprot of the base-Oxfordian field workshop, Redcliff, Dorset, June 2014*.
- Agreed to establish a means of honoring exceptional contributions to Jurassic Stratigraphy.
- Held Subcommittee business meeting at STRATI 2015.
- Launch of a new website for the subcommission.
- Election of officers for term 2016-2020.

### **Triassic Subcommittee**

- Successful session on Triassic Stratigraphy at STRATI 2015.
- Subcommittee business meeting at STRATI 2015.
- Proposal of an innovative second proposal for the GSSP for the Rhaetian Stage.
- Successful 2nd Boreal Triassic Conference 2015 Svalbard and 12th International Workshop on the Permo-Triassic, Svalbard August 27 - September 1, 2015.
- *Albertiana*, n. 42, dedicated to the Rhaetian Stage.
- Election of officers for term 2016-2020.

### **Permian Subcommittee**

- 18th International Congress on the Carboniferous and Permian, Kazan, Russia, August 2015.
- Workshop on GSSPs for Sakmarian and Artinskian Stages at 18th ICCP lead to agreement by Russian Stratigraphic Committee to excavate candidate stratotype sections and to organize a field excursion to them in 2016 to investigate their potential.
- Field excursion to the Guadalupian Series in West Texas to further document biostratigraphy and integrate it with high-resolution geochemical analyses. In addition, seven ash beds were sampled in order to obtain numerical ages.
- Election of officers for term 2016-2020.

### **Carboniferous Subcommittee**

- 18th International Congress on the Carboniferous and Permian, Kazan, Russia, August 2015 with 165 participants from 33 countries.
- Following focused discussions at STRATI 2015, at the 18th ICCP, and at a meeting of IGCP 596, the working group on the reappraisal of the Devonian-Carboniferous Boundary GSSP concluded that the conodont *Protognathodus kockeli* (Bischoff) has good potential for boundary definition, the geochemical signature of the multi-phase Hangenberg Event is well known, and the base of the Hangenberg Black Shale has substantial potential for international correlation.
- Several studies published in 2015 documented the biostratigraphy of ammonoids across the D-C boundary at several sections in Europe and Canada/USA as well as detailed lithostratigraphy and geochemistry through sections representing the global Hangenberg Crisis.
- Publication of several important biostratigraphic studies in sections worldwide (see subcommission report) that are the fundamental for selection of boundary markers for Viséan, Serpukhovian, Moscovian, and Kasimovian stages.
- Session on marine-non-marine Carboniferous and Permian Correlation was held at 18th ICCP.
- Selected Cologne, Germany and summer 2019 for the XIX ICCP.
- Field Meeting in northern England, in conjunction with members of the Yorkshire Geological Society, to visit several potential stratotype sections for Carboniferous substages.
- Publication of volume 32 of *Newsletter on Carboniferous Stratigraphy*.
- Election of officers for term 2016-2020.

### **Devonian Subcommittee**

- The joint SDS/Uzbekistan/RAS field expedition to Zinzilban George, Uzbekistan to resample and redefine the base Emsian GSSP using multiproxy criteria. The SDS members collected samples for conodonts and these have been shipped to their laboratories.
- Annual Business Meeting, jointly with IGCP 596 in Brussels, Belgium (September 2015). Pre and Post-conference fieldtrips to Belgium and Germany.
- Organising a Symposium in July at STRATI 2015 on *Devonian Events, Correlation and Time*
- Contributed to *Devonian-Carboniferous boundary* Symposium and technical discussions at STRATI 2015
- Editorial work for a volume on *Devonian Climate, Sea Level and Evolutionary Events* as a Special Publication of the Geological Society of London, edited by Becker, Brett & Königshof.
- Publication of SDS Newsletter 30.
- Update of SDS homepage (pdf files of former SDS Newsletters and new GSSP illustrations).
- Supporting the IGCP application *From a full understanding of Magnetic susceptibility to cyclostratigraphy: generating the next generation of Palaeozoic time scales*.
- Election of officers for term 2016-2020.

### **Silurian Subcommittee**

- Silurian Times No. 22 produced and distributed and posted on ISSS website
- The 5th International Subcommittee on Silurian Stratigraphy was held jointly with IGCP Project 591 in Québec, Canada, July 8-11, with 68 participants from 11 countries. There were pre-meeting and post-meeting field trips to Gaspé Peninsula and Anticosti Island, respectively.
- Work proceeds on the restudy of potential GSSP candidate sections for the Wenlock Series and the Aeronian and Telychian stages. The working group on the base-Aeronian GSSP held a field workshop to visit a proposed candidate stratotype section in the Czech Republic and another section that may be considered in a restudy of the GSSP for the base of the Homerian Stage.
- The subcommittee established an award to be given at the ISSS, which meets every four years, to honor outstanding research contributions by young Silurian researchers. The award is named in honor of Dr. Tatiana Koren' and was presented at the 5th ISSS in Quebec to Dr. Emilia Jarochovska.
- Election of officers for term 2016-2020.

### **Ordovician Subcommittee**

- Ordovician News No. 32 was produced, distributed and posted on the Subcommittee website. [www.ordovician.stratigraphy.org](http://www.ordovician.stratigraphy.org).
- The 12th International Symposium on the Ordovician System was held in Harrisonburg, Virginia, USA in June 2015, attended by 80 delegates from 15 countries, and included several pre- and post-meeting field excursions in the Appalachians Mountains and in the Arbuckle and Ouachita Mountains of Oklahoma.
- Dedication of GSSP for Katian Stage at Black Knob Ridge, Oklahoma.
- Election of officers for term 2016-2020.

### **Cambrian Subcommittee**

- At STRATI 2015 the subcommission held its annual meeting and sponsored a day-long session devoted primarily toward the lower part of the Cambrian System.
- The subcommission webpage was updated.
- The Working Group on Cambrian Stage 5 provided its recommendation on which stratigraphic horizon (of five options) to be used to mark the base of the stage. The base of provisional Stage 5 is likely to be selected at the FAD of the oryctocephalid trilobite *Oryctocephalus indicus*.
- A theme issue of *Annales de Paléontologie* (Volume 101, Issue 3, 2015), containing papers resulting from presentations at the ISCS Subcommission meeting in Morocco (2014), was published
- Election of officers for term of 2016-2020.

### **Ediacaran Subcommission**

- The third annual newsletter of the Subcommission was disseminated in February 2015.
- The Subcommission established two working groups to focus on the second stage and the terminal stage of the Ediacaran System.
- The Subcommission organized a symposium “Precambrian Stratigraphy” at STRATI 2015.
- An open meeting and a business meeting were held at STRATI 2015.
- Election of subcommission officers for the term of 2016-2020.
- A white paper on Ediacaran subdivision and correlation has been completed by subcommission and working group officers, and will soon be submitted to *Episodes* for review and publication.
- Recognizing the importance of integrative stratigraphy in the investigation of the Ediacaran System, members of the Ediacaran Subcommission actively participated in the GRIND workshop (*Geological Research through Integrated Neoproterozoic Drilling*) to develop an ICDP proposal to acquire drill cores across the Ediacaran-Cambrian transition in South China and Brazil.
- Geological Society of America Annual Meeting Pardee Symposium P3 “Earth-Life Systems at the Dawn of Animals” and Topical Session T152 “Geobiology of Critical Transitions: Integrating Fossils, Proxies, and Models”
- 35th IGC symposium proposal “The Dawn of Animals: Cryogenian to Cambrian” was submitted.
- Ediacaran research in South Australia has continued with further excavations at the National Heritage Listed Ediacara Fossil Site at Nilpena, a new site in the northern Flinders Ranges of South Australia, and for the first time, at the historic discovery site in the Ediacara Conservation Park.
- More than 100 publications on Ediacaran paleontology, stratigraphy and Earth history (see Subcommission report).

### **Cryogenian Subcommission**

- The second Cryogenian Subcommission field workshop was held in Death Valley, California, December 12-14<sup>th</sup>.
- Following discussions at the Death Valley workshop, it was concluded that the most appropriate criterion for defining the base of the Cryogenian GSSP is the lowermost occurrence of unambiguously glaciogenic strata. In this regard, the best candidate for the GSSP might be in South China, where the onset of glaciation is recorded in apparently continuous deep-water sediments. Although the onset of glaciation is likely to vary from region to region, glacial influence was argued to be the most reliable way to establish a

recognizable and consistent system boundary, with strata below unambiguously belonging to the Tonian, and strata above belonging to the Cryogenian. Email discussions continued thereafter among the entire voting membership.

- Election of officers for term 2016-2020.

### **Precambrian Subcommittee**

- No annual report submitted.

### **Stratigraphic Classification Subcommittee**

- ISSC organized the session SSP2.1.1 Earth Systems History – the Need for Integrated Stratigraphy at the EGU General Assembly 2015 (12–17 April 2015, Vienna, Austria).
- A new working group was established to produce an article on Biostratigraphy to be published in Newsletters on Stratigraphy, as a result of retirement/commitments of previous members.
- ISSC Newsletter nos. 20 was produced and distributed.

## **8. CHIEF PROBLEMS ENCOUNTERED IN 2015**

### **Full Commission**

- Some subcommittees appear to be making no progress developing GSSP proposals. For some subcommittees this is due to a global shortage of qualified experts. For others it is due to inadequate leadership of the officers. Fortunately, the terms of the ineffective subcommittee chairs end in 2016, and newly elected chairs show good leadership potential.
- The Subcommittee on Precambrian Stratigraphy is basically dead. Nothing has been done. The subcommittee chair rarely participates in ICS activities. The annual report has not been received in two of the past three years. The Chair has failed to establish working groups for boundaries. The ICS executive has approved the motion that the Precambrian Subcommittee be dissolved, and requests that the IUGS Executive Committee approve this dissolution in order that the subcommittee can be rebuilt with new leaders and new voting members before the 35th IGC.
- Some boundary task group leaders have been inactive; some boundary task groups need rejuvenation. Subcommittee Chairs, especially those newly elected, will be directed when they take office at the 35th IGC that all boundary task groups need to be re-examined and the leadership evaluated.
- Webpages of several subcommittees are very out of date and lack information on GSSPs.
- Lack of funding from national research councils greatly limits investigations of potential GSSPs. The grant to ICS from the U.S. National Science Foundation is partially relieving this problem, but 2016 is its final year.
- Controversy has arisen between and within the Quaternary, Neogene and Paleogene Subcommittees on the recognition of formal subseries/subepochs (Lower/Early, Middle, Upper/Late) for the Paleocene to Holocene Series/Epochs.

### **Quaternary Subcommittee**

- The Working Group on the Upper Pleistocene Subseries Boundary, after five years of inactivity, is now beginning to make progress, with the proposal of a new candidate GSSP, the Fronte section, in Taranto, Italy, and a field trip to this section (see above). But finding such a recent GSSP (~130 ka) in marine deposits on land that do not display facies changes at

the boundary presents special challenges. Therefore a search for additional candidate GSSPs is underway.

- More time is needed, than previously thought, to complete necessary studies of the three candidate stratotype sections (Chiba, Japan, and Montalbano Jonico and Valle di Manche, Italy). Proposal submission is therefore delayed by one year.

### **Neogene Subcommittee**

- Lack of suitable sections in the Mediterranean for defining the Burdigalian Stage GSSP in an astronomically-tuned, deep-marine section. The newly reconstituted boundary working group will consider defining the boundary in (I)ODP cores or to highlight the problem of survival of the Burdigalian as a chronostratigraphic unit.

### **Paleogene Subcommittee**

- The current political situation in some N. African countries has significantly limited the accessibility to the GSSP sections for the bases of the Danian and Ypresian. This situation makes it extremely difficult for the Paleogene community to assess several scientific issues regarding these stratotypes. As a consequence, auxiliary sections need to be defined, and the subcommittee with need to dedicate efforts and additional funding to investigate and define potential auxiliary sections, including those in poorly studied areas from eastern Europe and Asian countries.

### **Cretaceous Subcommittee**

- Reinvestigation of candidate stratotype sections for several stages to document magnetostratigraphy, stable isotope stratigraphy, etc. and to integrate multiple stratigraphies has demonstrated that candidate sections for some boundaries are unsuitable as GSSPs. This means that new sections must be considered.
- Lack of funding in most countries for carrying out studies strictly stratigraphic for attending workshops and field conferences.

### **Jurassic Subcommittee**

- Problem with launching new website was resolved.

### **Triassic Subcommittee**

- The pressure on researchers to publish results in short time on journals with high Impact Factor, but the consequences on the Triassic community are much more severe than in other systems, because of the peculiarity of the Triassic, that is the only system in the Earth history that is bounded by two of the “big five” mass extinctions. Triassic scientists are then more attracted to study the Early Triassic recovery and the T/J mass extinction, than to study the rest of the Triassic.
- The problem of overlap of the program of the IGCP 630 and the mission of the STS duties, already highlighted in the STS annual report 2014, in 2015 has become a true conflict.

### **Permian Subcommittee**

- Discrepancies in conodont taxonomy and selection of the index species have halted progress on proposals for the base Sakmarian and base Artinskian GSSPs.
- The base Lopingian GSSP will be flooded after a dam to be completed in 5 years for electronic power in the downstream of the Hongshui River in Guangxi, South China. We

have extensively discussed with the local government and a detailed plan for searching the replacement of the GSSP section nearby the GSSP has been made.

### **Carboniferous Subcommission**

- The most significant issue confronting the SCCS has been the difficult and time-consuming task of locating suitable evolutionary lineages and first occurrences for boundary definition. Within the Carboniferous, the endemism of conodont, foraminiferal and ammonoid lineages between Eurasia and North America continues to hamper the choice of the boundary levels for the Viséan-Serpukhovian and Bashkirian-Moscovian boundaries. The problem is being overcome somewhat by correlating other fossil groups to bracket the boundary levels in major regions where the boundary-event taxa have not been found.
- Essentially all lineages being chosen for GSSP definition are conodont based and have the most utility in carbonate-dominant lower-slope and basin deposits containing few other taxa than ammonoids that are suitable for global correlations. The best of the known deeper water successions in terms of abundance and diversity of conodonts and continuity of outcrop are in southern China and the southern Urals. The direction the current work of the SCCS is advancing indicates all of the remaining GSSPs will be placed in south China and Russia.

### **Devonian Subcommission**

- The rarity of polygnathids at Zinzilban in the critical interval for a re-definition of the Emsian GSSP.
- Access to the base Emsian GSSP in Uzbekistan
- The still unpublished early siphonodellids from the Uppermost Famennian of Franconia/Thuringia
- The decline of Devonian stratigraphy in other countries (e.g., Canada, Australia) by the lack of replacement of retiring specialists by new active researchers.

### **Silurian Subcommission**

- There remains the old problem related to difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Subcommission. Applications are often given low priority by national grant-awarding agencies.
- A major problem is the lack of communication between experts from developed and developing countries on those key issues related with the regional and global correlations of Silurian rocks.

### **Ordovician Subcommission**

- Critical to the development of the research on the system is the improvement of regional chronostratigraphies, isotope curves, palaeogeographies and zonal schemes. The coming years will see an emphasis on renewed data collection and its integration with the global standard. But this will require global participation of all our regional groups. It is also clear that the system has few reliable, absolute dates.

### **Cambrian Subcommission**

- The principal difficulty encountered in 2014 was lack of funding to support basic research on key stratigraphic intervals (potential GSSP horizons and sections) and to support travel to field business meetings.
- A planned field meeting of the Cambrian Subcommission, to be held to Newfoundland, Canada, had to be cancelled due to unforeseen logistical problems.

**Ediacaran Subcommission**

- none

**Cryogenian Subcommission**

- The likely cost of subcommission field excursions to potential GSSP localities in Svalbard, NW Canada, Yukon and Greenland, as well as related logistic difficulties appears to make such excursions prohibitive for the near future. For this reason, the subcommission has so far focused on more easily accessible regions (Scotland (2013), China (2014), USA (2015) and Namibia (2017) and on consolidating new and existing data relevant to the Tonian-Cryogenian boundary.

**Precambrian Subcommission**

- No annual report submitted.

**Stratigraphic Classification Subcommission**

- The ICS budget allocation was very small, particularly given the overall importance and significance of the Subcommission.
- Progress is somewhat slow but sure, and headway is being made in the preparation of the three remaining chapters on facets of Stratigraphy

**9. SUMMARY OF EXPENDITURES IN 2015:**

In its 2014 Annual Report, the ICS Executive requested \$95,453, which was reduced from \$105,353 that included full amounts requested by Subcommissions. The ICS request was almost 50% more than its budget allocation of ~\$50,000 for the last several years. The IUGS Executive Committee awarded ICS a budget of \$50,000 for 2014, reducing significantly the requests of the subcommissions and the ICS Executive. However, \$40,000 was awarded from the ICS-NSF grant to the Quaternary, Paleogene, Triassic, Permian, Devonian, Silurian, Ordovician, Ediacaran, and Cryogenian Subcommissions. Thus, ~\$90,000 was available for ICS activities in 2015.

<b>Subcommission</b>	<b>ICS Allocation to Subcommissions &amp; Executive</b>	<b>Allocations from NSF Grant</b>	<b>Total Allocations</b>
Quaternary	800.00	7000.00	7800.00
Neogene	0	0	carryover 7500.00
Paleogene	1700.00	4000.00	5700.00
Cretaceous	0	0	carryover 7500.00
Jurassic	3035.00	0	3035.00
Triassic	3500.00	2000.00	7500.00
Permian	3500.00	4000.00	3500.00
Carboniferous	1500.00	0	1500.00
Devonian	2100.00	6000.00	8100.00
Silurian	5000.00	6000.00	11000.00
Ordovician	3000.00	4000.00	7000.00
Cambrian	4000.00	0	4000.00

Ediacaran	0	4000.00	4000.00
Cryogenian	2000.00	1000.00	3000.00
Precambrian	1000.00	2000.00	3000.00
Stratigraphic Classific.	3000.00	0	3000.00
ICS Executive (3)	7500.00	0	7500.00
Reserve	8000.00	0	8000.00
<b>Total</b>	<b>\$49,635.00</b>	<b>\$40,000.00</b>	<b>\$89,635.00</b>

## 10. WORK PLAN, CRITICAL MILESTONES, and ANTICIPATED RESULTS TO BE ACHIEVED FOR March 2016-February 2017:

### ICS Executive Committee

- The primary attention of the ICS Executive will be to promote progress on GSSPs by the Subcommissions. The ICS budget and the NSF grant will be allocated among Subcommissions to support those boundary-working groups that demonstrate the potential to make significant progress.
- Meeting of officers for 2016-2020 with those of 2012-2016 to facilitate the transition in the leadership of ICS.
- Dedication of GSSPs for Toarcian Stage (Jurassic) at Penice, Portugal, and for Aalenian Stage (Jurassic) at Fuentelsaz, Spain.
- The ICS Chair will represent ICS at the 100th Anniversary Celebration of the Geological Survey of Colombia in June 2016 and will give an invited, keynote lecture on the nature and value of national stratigraphic commissions/committees.
- Following discussions and votes in the Quaternary, Neogene, and Paleogene Subcommissions, ICS will consider formal recognition of the Subseries/Subepochs for the Paleocene to Holocene Series/Epochs.
- Initiation the dedicated process of archiving ICS-generated stratigraphic data on the Geobiodiversity Database.
- Accept proposals from Subcommissions for special initiatives to be supported by funds remaining from the NSF grant to ICS.
- Initiate consultations with the greater stratigraphic community as the first step in producing a new edition of the *International Stratigraphic Guide*.
- Maintain the permanent archive of the ICS global standards (GSSPs and the International Chronostratigraphic Chart) on the ICS website, [www.stratigraphy.org](http://www.stratigraphy.org).
- The ICS executive will work closely with the President of the CGMW (Commission on Geologic Map of the World) to produce regular updates and translations of the ICS International Chronostratigraphic Chart/Geologic Time Scale.
- Establish an ICS Executive Task Group on Geochronology and recruit experienced colleagues with expertise in a range of techniques to participate with the goal of providing ICS Executive and Subcommission Chairs on numerical ages to apply to the ICS International Chronostratigraphic Chart
- Determine those ratified GSSPs that are not marked by a plaque and work with relevant, national stratigraphic committees, geological surveys, governmental organizations, and private landowners to install plaques and, if possible, erect educational exhibits.

- Collaborate with the World Heritage Committee of UNESCO for recognition of all GSSPs as sites of the World Natural Heritage.

### **Quaternary Subcommission**

- Encourage the proponents of the three Middle Pleistocene candidate GSSPs to submit their proposals, hopefully before the end of 2016.
- Develop a case for using an Antarctic ice core as a GSSP for the Late Pleistocene. The cores are already analyzed, but theoretical aspects including global correlation and interhemispheric phasing will need to be considered.
- An SQS-sponsored special symposium “The Quaternary System: precision and reliability in global correlation” to be convened by M. J. Head has been submitted to the 35<sup>th</sup> International Geological Congress, Cape Town, in 2016. This should provide a forum for the latest research on the three Middle Pleistocene candidate GSSPs, and progress by working groups on the Late Pleistocene and Anthropocene.
- Submit the Holocene subdivision proposal to ICS, assuming it receives approval from SQS.

### **Neogene Subcommission**

- Complete studies of candidate GSSP sections and levels for Langhian Stage, including a visit to the candidate section(s) by the boundary working group.
- Selection of most suitable section/ODP core and guiding criteria for defining the Burdigalian GSSP

### **Paleogene Subcommission**

- Complete and publish the GSSPs of the Paleogene.
- Submit the Chattian proposal approved by the Subcommission to ICS and possibly to *Episodes* for publication during 2016
- Submit the proposal of Priabonian and Bartonian GSSPs to the Paleogene Subcommission voting members, and then to ICS and possibly to *Episodes* for publication during 2016-2017.
- Support of the organization of the field workshops and meeting of the remaining GSSPs.
- Support the attendance at IGC 34 in South Africa.
- Produce an updated version of an integrated Paleogene Time Scale.
- Produce a state-of-the-art review of the stratigraphic tools used in the Paleogene.
- Preparation of standardized regional correlation charts and paleogeographic maps by the Regional Committees.
- Revise and find auxiliary sections to better characterize the: P/E boundary (i.e., Alamedilla, Caravaca and Zumaia in Spain, Forada and Contessa Highway in Italy, Polecat Bench in Wyoming); Danian/Selandian boundary (Contessa and Bottaccione in Italy; Caravaca and Sopelana in Spain); Selandian/Thanetian boundary (Contessa, Italy); Eocene/Oligocene (Monte Cagnero in Italy, Fuente Caldera in Spain, Landzhar in Armenia)

### **Cretaceous Subcommission**

- Vote on the Coniacian GSSP.
- Approval of a GSSP for the Albian Stage by ICS and submission to IUGS for ratification; followed by dedication of the GSSP.
- Submission of and vote on a GSSP proposal for the Hauterivian Stage.
- Decision on the criteria for identifying the base of the Berriasian Stage and the J/K boundary.

### **Jurassic Subcommission**

- Rapid progress expected on GSSP for base of Oxfordian Stage.
- Base-Kimmeridgian workshop in 2016.

### **Triassic Subcommittee**

- Field workshop in Logonegro, Italy in the Rhaetian boundary in April 2016 with extensive discussion on the two different GSSP proposals for the base of the Rhaetian Stage leading to a final decision and possibly a vote on a single proposal.
- 13th International Triassic Field Workshop, August 1-6, 2016, Xingyi, Guizhou, South China,
- Revision of Subcommittee voting membership.

### **Permian Subcommittee**

- Complete studies of candidate stratotype sections for the Sakmarian, Artinskian, and Kungurian stages.
- Complete GSSP proposal for the Sakmarian Stage for voting in 2016.

### **Carboniferous Subcommittee**

- Workshop on Devonian-Carboniferous boundary in France or Italy in summer 2016.
- Continued studies of biostratigraphy of D-C boundary intervals in Russia, China, western Canada, Morocco, and Belgium.
- Completion of GSSP proposal for Tournaisian-Visean boundary.
- Working group will prepare a proposal on the definition of the Visean-Serpukhovian boundary and will further evaluate the two candidate stratotype sections: Naqing in southern Guizhou Province, China and Verkhnyaya Kardailovka on the Ural River in southern Russia.
- Selection of a conodont lineage and taxon suitable for definition of the Bashkirian-Moscovian boundary and a continued search for suitable GSSP candidate sections particularly in South China, southern Urals, and the Donets Basin.
- Symposium titled “The Carboniferous World: Assembly of Pangaea and Onset of Late Paleozoic Glaciations” at the 35th IGC.
- International Conodont workshop in for members of boundary working groups in Saint Petersburg, Russia in 2016.

### **Devonian Subcommittee**

- Revision of the basal Emsian GSSP in Uzbekistan. Processing of conodonts, integration with isotope data and multi-spectral data to generate a multiproxy definition for the GSSP. Presentation of results at ICOS meeting, Valencia, 2017.
- Revision of the D/C boundary in the frame of the D/C Boundary Task Group (Chairman: M. ARETZ) and in close collaboration with the Carboniferous Subcommittee.
- Complete publication of volumes on Devonian stratigraphy, partly in co-operation with IGCP 596.
- Publish Brussels meeting presentations in *Palaeobiodiversity & Palaeoenvironments*.
- Compilation and distribution of SDS Newsletter 31.
- Annual Business Meeting in conjunction with the 35<sup>th</sup> IGC in Cape Town, South Africa.
- Sponsoring a symposium at the IGCP 591 Closing Meeting in Ghent, Belgium

### **Silurian Subcommittee**

- Regular updating of subcommittee website.
- Publication of Silurian Times Newsletter 22.

- The major meeting for the ISSS for 2016 will be held in association with the final annual meeting of IGCP 591, together with the ISCS, ISOS and ISDS. This will be held in Ghent, Belgium, July 6-9.
- The base-Aeronian boundary-working group is planning a trip to visit the third candidate section for this boundary, which is at Rheidol Gorge, Wales. The other two candidate sections were visited in 2015 (Prague region, Czech Republic) and 2014 (Shennongjia region, China).
- A detailed biostratigraphic and chemostratigraphic study of a GSSP candidate section for the base of the Telychian, which is in south-western Spain, is now in press and work continues on documentation of the other main candidate section for this boundary in the Shennongjia region, China.
- ISSS members continue to collaborate on the process of full integration of the various regional and global biostratigraphic, lithostratigraphic, sequence stratigraphic, and chemostratigraphic scales for the entire Silurian. This integration is essential for refinement of the Silurian time scale and high-resolution correlation of Silurian events. In addition, some ISSS members are focusing on generation of new, high-resolution radiometric dates that are well constrained within the Silurian time scale. This is essential to achieve better calibration of time scale, which has been a serious weakness for the Silurian System.
- Implement a new, innovative approach to consideration of GSSP candidate sections and improving correlation among sections. It is proposed that as the data from each candidate section are assembled, all of the biostratigraphic, chemostratigraphic, and other data useful for correlation, will be assembled into a database (the Geobiodiversity Database), along with data from other sections, globally. These data will then be studied using quantitative correlation methods, such as CONOP9 and Horizon Annealing. These methods allow for simultaneous correlation of many sections using a range of different types of stratigraphic data, producing a high-resolution correlation between all sections. This approach permits integration of data from different fossil groups that only rarely co-occur, as well as chemo- and lithostratigraphic and radiometric data, thus permitting correlation between different facies and paleogeographic regions. They also permit quantitative assessment of the precision with which particular levels at any given section can be placed within the composite succession. We feel that this may be a good approach to find a GSSP level that can be correlated globally with the highest level of precision and confidence.

### **Ordovician Subcommittee**

- Execution of a programme of radiogenic dating of key Ordovician horizons (using Pb-Pb isotopes) making use of the state-of-the-art StarPlan laboratory in the University of Copenhagen.
- Stimulate where relevant the production of revised regional correlation charts on the basis of new regional stratigraphic data and their relationship to the newly established international stages. In additional regional isotope and sea-level data will be added.

### **Cambrian Subcommittee**

- Continue work toward defining GSSPs for provisional stages 2, 3, 4, 5, and 10.
- During 2016, a GSSP for provisional Stage 5 (and Series 3) is expected to be submitted to a vote of the subcommission and, if approved, forwarded to ICS.
- Examine issues surrounding possible redefinition of the Cambrian GSSP.
- The subcommission will hold its annual field meeting in Adelaide, South Australia, 10-15 July, in association with Palaeo Down Under 2, a meeting of the Association of Australasian Palaeontologists.

### **Ediacaran Subcommission**

- Publication in *Episodes* of a white paper on Ediacaran subdivision and correlation. This will be a guiding document for the Subcommission's work in the next few years.
- Field workshop and symposium in association of Palaeo Down Under 2, to be held at the University of Adelaide in South Australia. The Field Excursion will examine Cambrian and Ediacaran of the Flinders Ranges. The field excursion will help TES working group to assess criteria for the subdivision of correlation of the Terminal Ediacaran Stage.
- Field workshop and symposium in association of 35<sup>th</sup> IGC, to be held in Cape Town, South Africa. The Field Excursion will examine late Ediacaran successions in southern Namibia. The field excursion will help TES working group to assess criteria for the subdivision of correlation of the Terminal Ediacaran Stage.
- Continue to update Subcommission webpage and to produce and distribute Annual Newsletter.

### **Cryogenian Subcommission**

- To compile a special volume of Precambrian Research to provide overviews of each potential GSSP section and relevant methodologies (chemostratigraphy, palaeomagnetism, geochronology, biostratigraphy), addressing their suitability for defining the future GSSP. Submission deadline: November 2016.
- To construct an interactive, updated website for the Cryogenian Subcommission listing new publications and relevant meetings. Deadline February 2016.

### **Precambrian Subcommission**

- No annual report submitted.

### **Stratigraphic Classification Subcommission**

- First drafts of papers on Biostratigraphy, Chronostratigraphy, and Lithostratigraphy will be completed and distributed for review.
- ISSC is organizing a session entitled Earth Systems History – the Need for Integrated Stratigraphy will be held at the EGU General Assembly 2016 (EGU 2016), 17–22 April 2016, Vienna, Austria.
- Membership will be updated.

## **11. BUDGET REQUEST TO IUGS FOR 2016 (\$ US)**

The following table is based on the budget requests from all Subcommissions submitting annual reports and the ICS Executive. The total amount is \$105,177. In past years, the ICS Executive has evaluated these requests and reduced them so that the total amount is closer to the \$50,000 normally allocated to ICS. This year reduced amounts have not been determined for two reasons. The ICS allocation from IUGS has historically been increased to \$60,000 during the year of an IGC in order to support the attendance of ICS and subcommission officers. It is expected that such will be done again for 2016. For 2016, such determinations will be done after the ICS allocation has been set by the IUGS Executive Committee, and consideration will be given to allocation of ~\$15,000 remaining from the NSF grant to ICS. In some instances, a Subcommission reduced the total budget planned for 2016 by the carryover from its 2015 budget allocation.

Subcommission	Request for 2014 USD	Justification
Quaternary	5000.00	IGC attendance
Neogene	1640.00	GSSP Burdigalian field meeting
Paleogene	9500.00	IGC attendance, Chattian GSSP dedication
Cretaceous	14347.00	IGC, J/K boundary meeting, GSSP dedication
Jurassic	6004.00	Preparation of Toarcian GSSP dedication
Triassic	6000.00	IGC attendance, field workshop
Permian	6000.00	IGC, GSSP meeting, field meeting workshop
Carboniferous	2000.00	IGC attendance
Devonian	3600.00	IGC attendance, Newsletter
Silurian	14000.00	IGC attendance, IGCP meeting, GSSP field meeting
Ordovician	7000.00	IGC attendance, Ghent meeting, numerical dating
Cambrian	6100.00	GSSP field meeting
Ediacaran	6486.00	IGC attendance, two field workshops
Cryogenian	0	
Precambrian	0	no annual report
Stratigraphic Classific.	5000.00	IGC attendance, Newsletter, working group meeting
ICS Executive (3)	7500.00	IGC attendance, organizational meeting of new officers of reconstituted Precambrian Subcomm.
Reserve	3000.00	GSSP dedication ceremonies: Portugal and Spain
<b>Total</b>	<b>\$105,17.00</b>	

## 12. REVIEW CHIEF ACCOMPLISHMENTS SINCE 2000

### A. GSSPs (boundary-stratotypes) created since 2000 (*listed in stratigraphic order*)

#### Quaternary

1. base of the **Holocene** Series in archived Greenland NorthGRIP (NGRIP) ice core (2008)
2. base of **Quaternary** Period formally defined at base of Gelasian Stage (2009)
3. base of **Calabrian** Age formally defined at Vrica, Calabria, Italy at the GSSP that defined the base of the Pleistocene Epoch from 1984 to 2009
4. base of **Pleistocene** Epoch redefined at base of Gelasian Stage with Gelasian transferred from Neogene (2009)

#### Neogene

5. base of the **Zanclean** Stage and of the **Pliocene** Series at Eraclea Minoa, Italy (2000)
6. base of the **Messinian** Stage at Oued Akrech, Morocco (2000)
7. base of the **Tortonian** Stage at the Monte dei Corvi beach section near Ancona, Italy (2003)
8. base of the **Serravallian** Stage at Ras il Pellegrin section on Malta (2006)

#### Paleogene

9. base of the **Lutetian** Stage at Gorrondatxe, Spain (2011)

10. base of the **Eocene** Series (and *Ypresian* Stage) in the Dababiya Section near Luxor, Egypt (2003)
11. base of the *Thanetian* Stage at Zumaia, Spain (2008)
12. base of the *Selandian* Stage at Zumaia, Spain (2008)

### **Cretaceous**

13. base of the *Maastrichtian* Stage at Tercis, France (2000)
14. base of the *Santonian* Stage at Olazagutia, Spain (2013)
15. base of the *Turonian* Stage at Pueblo, Colorado, USA (2003)
16. base of the *Cenomanian* Stage and of the **Upper Cretaceous** Series, at Risou, France (2002)

### **Jurassic**

17. base of the *Bathonian* Stage at Ravin du Bès, Bas Auran, near Digne, France (2008)
18. base of the *Aalenian* Stage and of the **Middle Jurassic** Series at Fuentalsaz, Spain (2000)
19. base of the *Toarcian* Stage at Peniche, Portugal (2014).
20. base of the *Pliensbachian* Stage at Robin Hood Bay, England (2004)
21. base of the *Sinemurian* Stage at East Somerset, England (2001)
22. base of the *Hittangian* Stage and of the **Lower Jurassic** Series and **Jurassic** System at Kuhjoch, Northern Calcareous Alps, Tyrol, Austria (2010)

### **Triassic**

23. base of the *Carnian* Stage at Prati di Stuares, Italy (2008)
24. base of the *Ladinian* Stage at Bagolino, Italy (2005).
25. base of the **Triassic** System and of **Lower Triassic** Series and of *Induan* Stage at Meishan, China (2001)

### **Permian**

26. base of the *Changhsingian* Stage at Meishan, China (2005)
27. base of the *Wuchiapingian* Stage and of the **Lopingian** Series (Upper Permian) in China (2004)
28. base of the **Guadalupian** Series (Middle Permian) and component *Roadian*, *Wordian* and *Capitanian* Stages in Guadalupian Mountains, USA (2001)

### **Carboniferous**

29. agreement on Series-level divisions (2004)
30. ratification of Series names, and Stage names (2006)
31. base of *Visean* Stage in Guangxi, China (2008)

### **Devonian**

32. all Devonian stage boundaries are defined by a GSSP
33. publication of two volumes (*Courier Forschungsinstitut Senckenberg*, 220 (205 pp.) and 225 (347 pp.) in 2000, in which the GSSPs of all Devonian stages have been updated and their correlative value for worldwide correlation is demonstrated.

### **Silurian**

34. all Silurian stage boundaries are defined by a GSSP; however, some of these appear to be more useful for regional correlation, rather than having global applicability.

35. Revision to taxonomy and biostratigraphy of graptolites used to define base-**Rhuddanian** (**Ordovician-Silurian** boundary and **Llandovery** Series) in stratotype section, Dob's Linn, Scotland.

### **Ordovician**

36. base of the **Hirnantian** Stage in China (2005).  
 37. base of the **Katian** Stage in Oklahoma, USA (2006)  
 38. base of the **Sandian** Stage and the **Upper Ordovician** Series at Fågelsång in Sweden (2002).  
 39. base of **Dapingian** Stage and the **Middle Ordovician** Series in China (2006, named 2007)  
 40. base of the **Floian** Stage at Diabasbrottet in southern Sweden (2002).  
 41. base of the **Ordovician** System and the **Lower Ordovician** Series and of the **Tremadocian** Stage at Green Point, Newfoundland, Canada (2000).

### **Cambrian**

42. base of the **Jiangshanian** Stage at Duibian, China (2011)  
 43. base of the **Paibian** Stage and the **Furongian Series** (uppermost series of Cambrian) in the Paibi section, NW Hunan province, south China (2003)  
 44. base of **Guzhangian** Stage (Series 3) in China (2007)  
 45. base of **Drumian** Stage (Series 3) in USA (2007)  
 46. vote to subdivide the Cambrian into **four series** and **10 stages** (2004)  
 47. Vote to name lowest series and stage as **Terreneuvian** and **Fortunian**, respectively (2007)

### **Proterozoic Era**

48. base of the **Ediacaran System** (uppermost system of Proterozoic) in the Flinders Range, Australia (2004).

## **B. Stratigraphic Classification**

Publication in *Newsletters on Stratigraphy* of papers on Cyclostratigraphy (2006), Chemostratigraphy (2008), Magnetostratigraphy (2010), and Sequence Stratigraphy (2011).

## **C. The International Stratigraphic Chart**

The ICS International Chronostratigraphic Chart highlights all units that are formally defined by a GSSP or anticipated by a future GSSP decision, plus presents the ratified nomenclature of global chronostratigraphy. The Chart is regularly updated, and translations into a number of languages have been prepared. The Chart and translations can be downloaded at [www.stratigraphy.org](http://www.stratigraphy.org). The January 2013 version was published along with an explanatory text in the September 2013 issue of *Episodes*. A 2015 version is posted on the ICS website. The Chart and all its prior versions together with the Table of GSSPs on [www.stratigraphy.org](http://www.stratigraphy.org) comprise the recognized archive of the international geostandards developed by the International Commission on Stratigraphy.

### **13. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2016-2021)**

The following is a summary of objectives of the ICS Executive Commission and a selection of key goals noted in the detailed reports of each subcommission. **See Section 10 for a summary of objectives for 2016.**

#### **ICS Executive Committee**

1. Development proposals and their approval for a substantial number of GSSPs, particularly for stages in the Carboniferous, Triassic, Jurassic, Cretaceous, and Cambrian systems; re-evaluate GSSPs for the several Silurian stages and the Devonian-Carboniferous boundary, and moves towards GSSP-defined subdivisions of the Precambrian.
2. Maintain website and its formal, permanent archive of the global geostandards - GSSPs and the ICS International Chronostratigraphic Chart.
3. Coordinate websites and the information they contain among all subcommissions and the Commission in order that they become the primary global web-based entry point to information on the activities and accomplishments of the subcommissions and ICS.
4. Establish the regular archiving of stratigraphic information from GSSP proposals on the Geobiodiversity Database and continue to promote the archiving of all information from stratigraphic successions worldwide in that database.
5. Encourage subcommissions to regularly re-assess GSSPs and to develop new initiatives and projects that utilize the refined International Stratigraphic Chart.
6. Encourage the recruitment by subcommissions of members from under-represented countries/regions and of those at early career stages.
7. Promote the preservation of GSSPs by local communities and national stratigraphic commissions and dedication ceremonies, including the placement of permanent markers, at all ratified GSSPs.
8. Produce a new edition of the *International Stratigraphic Guide* with its joint publication by IUGS and the Geological Society of America
9. Have a strong presence at the 35<sup>th</sup> IGC in 2016 and the 36th IGC in 2020 with exciting symposia, varied field excursions, business meetings, and other activities sponsored by ICS and its subcommissions, and hold a ICS workshop.
10. Hold a successful STRATI 2019 - 3rd International Congress on Stratigraphy.
11. Develop and maintain close collaboration with all national stratigraphic commissions.
12. Cooperate with One-Geology and the Commission on the Geologic Map of the World to ensure that these projects continually incorporate the latest revisions to the International Stratigraphic Chart.
13. Serve as the primary international body setting global standards and illustrating best practices in stratigraphy.

#### **Quaternary Subcommission**

1. GSSP definition for the Middle Pleistocene Stage/Subseries boundary.
2. GSSP definition for the Upper Pleistocene Stage/Subseries boundary.
3. Nominate two GSSPs to subdivide the Holocene Series into three named stages.
4. Explore further chronostratigraphic subdivision of the Quaternary System/Period, including the duration and status of the “Anthropocene”.

#### **Neogene Subcommission**

1. Selection of boundary criteria and sections for the definition of the base-Langhian GSSP.

2. Critical questions to be decided with regard to the GSSP for the Burdigalian Stage are: 1) should the ambition of having the Burdigalian GSSP directly tied within an astrochronologic framework in order to have the GSSP defined in a Mediterranean land-based section, or should the GSSP be placed in drilled ODP sequences at Ceara Rise or any other tuned sequence drilled by (I)ODP, or 2) should the Burdigalian as Stage denotation be disused because no suitable onland stratigraphic sections are available.

### **Paleogene Subcommittee**

1. Actively participate in STRATI2015 and in the 35<sup>th</sup> IGC at Cape Town, South Africa.
2. Produce an updated version of an integrated Paleogene time scale.
3. Produce a state-of-the-art review of the stratigraphic tools used in the Paleogene.
4. Preparation of standardized regional correlation charts and paleogeographic maps by the Regional Committees.
5. Revise and find auxiliary sections to better characterize the:
  - a. P/E boundary (i.e Alamedilla, Caravaca, Zumaia, Spain; Forada, Italy, Contessa highway Italy, Polecat Bench (Wyoming),
  - b. Danian/Selandian: Contessa, Bottaccione, Sopelana, Italy; Caravaca, Spain
  - c. Selandian/Thanetian: Contessa, Italy
  - d. Priabonian: Egypt Wadi Hitan Valley, in the Fayum
  - e. E/O: Monte Cagnero, Italy, Fuente Caldera, Spain.

### **Cretaceous Subcommittee**

1. Active participation in 35<sup>th</sup> International Geological Congress, Cape Town, South Africa, August 2016.
2. 10<sup>th</sup> International Symposium on the Cretaceous System, Vienna or Salzburg, Austria, September 2017.
3. Approval of GSSP proposals for the bases of the Valanginian, Hauterivian, Barremian, Aptian, Coniacian, and Campanian stages.
4. Finalize GSSP proposal for the base of Berriasian (Jurassic/Cretaceous boundary).

### **Jurassic Subcommittee**

1. Finalize proposals for the bases of the Bathonian, Callovian, Oxfordian, Kimmeridgian, and Tithonian stages.
2. Stage Working Groups to standardise and propose GSSPs for Substages as appropriate, but named ONLY as Lower/Middle/Upper.
3. Develop strategy for integration of cyclostratigraphy and geochronology into knowledge of stages and substages
4. Develop website as forum for exchange ideas in relation to Jurassic stratigraphy

### **Triassic Subcommittee**

1. Complete update of Subcommittee website.
2. Completion of Triassic GSSPs: 2016 – Rhaetian, 2017 – Norian, and 2018 - Anisian.
3. Improvement of numerical calibration of Triassic chronostratigraphic units, particularly the durations of the Induan, Norian, and Rhaetian stages.
4. Improvement of the marine-land correlations, especially as regard the calibration of the correlations between the Newark Basin succession with its superb astrochronological record and the marine successions from the Tethys.
5. Improvement of the numerical calibration of the Triassic chronostratigraphic scale.
6. Once GSSPs for all stages are ratified, establishment of working groups to define substages.

### **Permian Subcommittee**

1. Publish revised GSSP proposals for the Sakmarian, Artinskian and Kungurian stages, Cisuralian Series, and vote on at least two of them.
2. Analyze large set of samples collected for chemostratigraphy and geochronologic calibration of the Guadalupian Series.
3. Publish the *Episodes* articles required as the final step in ratification of the GSSPs for the three stages of the Guadalupian Series, and of the series itself.
4. Correlations into continental deposits and across provincial boundaries.
5. Replacement the base Lopingian GSSP the stratotype section at Penglaitan, Guangxi, South China with another nearby outcrop because the original stratotype section will be flooded in 5-10 years by a dam being built for electronic power.

### **Carboniferous Subcommittee**

1. Select new stratigraphic level and stratotype section for redefinition of the Devonian-Carboniferous boundary.s
2. Select biostratigraphic events on which to define stage boundaries for the Serpukhovian, Moscovian, Ksaimovian, and Gzhelian.
3. Investigate candidate stratotype sections for bases of Serpukhovian, Moscovian, Ksaimovian, and Gzhelian stages.
4. Continue studies of chemostratigraphy and magnetostratigraphy for the Carboniferous with the goal of identifying events that can be used to supplement the stage boundaries that will be defined by means of faunal events, and will eventually provide the basis for correlating these boundaries into the northern-hemisphere Angara region and the southern-hemisphere Gondwana region, where the pan-tropical biotas are replaced by provincial cold-climate communities.
5. Continue efforts to obtain new, precise radiometric dates on biostratigraphically well-constrained marine successions.

### **Devonian Subcommittee**

1. Selection of a new GSSP for the Devonian-Carboniferous boundary.
2. Redefine the base of the Emsian Stage following field investigations in Uzbekistan in 2015 and the study of new samples and their evaluation at the ICOS meeting in Valencia in 2017.
3. Formalize the substage subdivision of stages.

### **Silurian Subcommittee**

1. Continue research on bases of Aeronian, Telychian and Sheinwoodian sections in UK, Czech Republic, Spain and China, as part of the process of selection of possible new GSSP sections.
2. Co-sponsor closing meeting of IGCP 591, Ghent, Belgium, 2016.
3. Development of databases that will bring together and make available information from all sources associated with the Silurian researchers.

### **Ordovician Subcommittee**

1. Production of revised correlation charts, linking regional chronostratigraphic schemes to the global stages for each major paleogeographic region.
2. Develop a global sealevel curve for the Ordovician.
3. Develop a standard set of paleogeographic base maps for the Ordovician.
4. Develop more robust absolute ages for the Ordovician.
5. Evaluate the GSSP for the Cambrian-Ordovician boundary, base of Tremadocian stage.

### **Cambrian Subcommittee**

1. Approval of GSSP proposal and name for Provisional Stage 5 in 2016.
2. Approval of GSSP proposal and name for Provisional Stage 10 by 2018.
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 paleocontinents, and the ISCS is now engaged in seeking a practical solution to remedy the problem. 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.

### **Ediacaran Subcommittee**

1. 2017: A field trip to celebrate the 50-year anniversary of the discovery of the Mistaken Point biota is planned for the year 2017. This will be a good opportunity to discuss criteria for the subdivision of the Ediacaran System into series.
2. 2017: Organize two international field workshops to focus on the second and terminal stages of the Ediacaran System, including a field trip in northern India and one in Oman.
3. 2017: 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).
4. 2018-2019: Submission and discussion of formal proposals for Ediacaran Series/Stage GSSP(s);
5. 2018-2019: Review and vote on Ediacaran Series/Stage GSSP proposals.
6. 2018-2019: Ratification of Ediacaran Series/Stage GSSP(s).

### **Cryogenian Subcommittee**

1. Publish a special volume of overviews of candidate sections to guide discussions and eventual establishment of rock-based Cryogenian GSSP by the 2020 IGC. Thereafter, focus on the establishment of subdivisions within the newly defined Cryogenian.
2. 2016-2017: Special session at the Geological Association of Canada annual meeting in Whitehorse, Yukon
3. 2016-2017: Special volume in Precambrian Research.
4. 2016-2017: Review and vote on Cryogenian proposals.
5. 2017-2020: Ratification of Cryogenian GSSP.

### **Precambrian Subcommittee**

1. No annual report submitted.

### **International Stratigraphic Classification Subcommittee**

1. Publication of separate papers on Lithostratigraphy, Biostratigraphy, and Chronostratigraphy in *Newsletters on Stratigraphy* by 2016.
2. The ULTIMATE GOAL of ISSC is the publication of a new, multi-authored, really multinational *International Stratigraphic Guide*—a guide not a code, simple, clear, concise, user-friendly, for world wide distribution and acceptance.
3. ISSC will continue to participate in GSSP discussions with ICS subcommittees.
4. ISSC continues to interface with national stratigraphic commissions although only in an

advisory capacity.

5. ISSC is updating its membership list, in order to eliminate dormant colleagues and incorporate new ones.
6. ISSC will take the initiative to contact journal editors and scholarly book publishers to remind them of the basic tenets in the existing *International Stratigraphic Guide* as well as relevant national codes, as well as the background in the review papers.
7. Potential new executive members will be canvassed from stratigraphically disposed colleagues.
  8. The ULTIMATE GOAL of ISSC is the publication of a new, multi-authored, really multinational International Stratigraphic Guide—a guide not a code, simple, clear, concise, user-friendly, for world wide distribution and acceptance.

## ICS DIRECTORY OF OFFICERS 2012-2016

### COMMISSION EXECUTIVE

**Chair:** Prof. Stanley Finney

Department of Geological Sciences, California State University at Long Beach,  
Long Beach, CA 90840, USA  
Tel: 1-562-985-8637; Mobile: 1-310-710-0701; Fax: 1-562-985-8638; E-mail: Stan.Finney@csulb.edu

**Vice Chair:** Prof. Shanchi Peng

Nanjing Institute of Geology and Palaeontology, The Chinese Academy of Sciences,  
39 East Beijing Road, Nanjing 210008, China  
Tel & Fax: +86-25-83282135; E-mail: scpeng@nigpas.ac.cn

**Secretary General:** Dr. Paul R Bown

Dept. Earth Sciences  
University College London, Gower Street, London, WC1E 6BT, UK  
Tel: +44(0)20-7485-3257; E-mail: p.bown@ucl.ac.uk

### SUBCOMMISSION ON QUATERNARY STRATIGRAPHY

**Chair:** Prof. Martin Head

Department of Earth Sciences, Brock University, 500 Glenridge Avenue,  
St. Catharines, Ontario, Canada L2S 3A1  
Tel: 905-688-5550 ext. 5216; E-mail mjhead@brocku.ca

**Vice Chair:** Prof. Brad Pillans

Research School of Earth Sciences, The Australian National University,  
Canberra, Act, 0200, Australia  
Tel: +61-2-6125 9644; E-mail: brad.pillans@anu.edu.au

**Secretary:** Dr. Jan Zalasiewicz

Department of Geology, University of Leicester, Leicester, LE1 7RH, UK  
Tel: 0116 2523928; E-mail: jaz1@leicester.ac.uk

### SUBCOMMISSION ON NEOGENE STRATIGRAPHY

**Chair:** Prof. Isabella Raffi

Dipartimento di Ingegneria e Geologia,  
Università degli Studi "G. d'Annunzio" di Chieti-Pescara,  
Campus Universitario, Via dei Vestini 31, 66013 Chieti Scalo, Italy  
Tel: +39 08713556421; E-mail: raffi@unich.it

**Vice Chair:** Prof. Kenneth G. Miller

Department of Earth & Planetary Sciences, Rutgers,  
The State University of New Jersey, 610 Taylor Rd.,  
Piscataway, NY 08854-8066, USA  
Tel: 732-445-3622; E-mail: kgm@rci.rutgers.edu

**Secretary:** Prof. Elena Turco,

Dipartimento di Scienze della Terra,  
Universita' degli Studi di Parma,  
Parco Area delle Scienze 157,  
43100, Parma, Italia.  
Tel: +39 0521905366; E-mail: elena.turco@unipr.it

**SUBCOMMISSION OF PALEOGENE STRATIGRAPHY****Chair:** Prof. Simonetta Monechi

Dipartimento di Scienze della Terra, Università di Firenze,  
4, Via la Pira, I-50121, Italy  
Tel: 00390552757657 E-mail: monechi@unifi.it

**Vice Chair:** Prof. Noël VandenBerghe

Departement Geografie-Geologie, Afdeling Historische Geologie  
Redingenstraat 16, B-3000 Leuven-België, Belgium  
Tel :003216326438; E-mail: noel.vandenbergh@geo.kuleuven.ac.be

**Secretary:** Dr. Laia Alegret

Departamento de Ciencias de la Tierra, Universidad de Zaragoza  
Calle Pedro Cerbuna, 12, E-50009 Zaragoza, Spain  
Tel: 0034 876553465; E-mail: laia@unizar.es

**SUBCOMMISSION OF CRETACEOUS STRATIGRAPHY****Chair:** Prof. Malcolm Hart

School of Geography, Earth & Environmental Sciences,  
University of Plymouth, Drake Circus, Plymouth PL4 8AA, UK  
Tel. +44-(0)1752-584761; Email: M.Hart@plymouth.ac.uk

**Vice Chair:** Dr. James Haggart

Geological Survey of Canada, 1500-605 Robson Street,  
Vancouver, British Columbia V6B 5J3, Canada  
Tel: 1-604-666-8460; E-mail: jhaggart@nrcan.gc.ca

**Vice Chair:** Dr. Brian T. Huber

Department of Paleobiology, PO Box 37012,  
MRC-121 Smithsonian Institution,  
Washington, DC 20013-7012  
Tel. 1-202-633-1328; E-mail: [HUBERB@si.edu](mailto:HUBERB@si.edu)

**Secretary:** Prof. Bruno Granier

Département des Sciences de la Terre et de l'Univers,  
UFR Sciences et Techniques,  
Université de Bretagne Occidentale,  
6 avenue Le Gorgeu – CS 93837  
F – 29238 Brest cedex 3, France  
[bgranier@univ-brest.fr](mailto:bgranier@univ-brest.fr)

## **SUBCOMMISSION ON JURASSIC STRATIGRAPHY**

**Chair:** Prof. Stephen P. Hesselbo

Department of Earth Sciences, University of Oxford, Oxford, OX1 3PR, U.K  
Tel: +44 1865 272029; E-mail: Stephen.Hesselbo@earth.ox.ac.uk

**Vice Chair:** Prof. Jingeng Sha

Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences,  
39 East Beijing Road, Nanjing, 210008, China  
Tel: +86-25-8328 2181; E-mail: jgsha@nigpas.ac.cn

**Secretary:** Angela Coe

Department of Environment, Earth and Ecosystems, The Open University, Walton Hall, Milton Keynes,  
Buckinghamshire, U.K.  
a.l.coe@open.ac.uk

## **SUBCOMMISSION OF TRIASSIC STRATIGRAPHY**

**Chair:** Marco Balini

Dipartimento di Scienze della Terra,  
via Mangiagalli 34, I-20133 Milano, Italy.  
E-mail: Marco.Balini@unimi.it

**Vice Chair:** Mark Hounslow

Centre for Environmental Magnetism and Palaeomagnetism, Geography Dept, Farrer Avenue, Lancaster  
University, Lancaster, LA1 4YQ, UK.  
E-mail: m.hounslow@lancaster.ac.uk

**Vice Chair:** Jinnan Tong

GPMR and BGEG laboratories at China University of Geosciences, Wuhan 430074, China  
E-mail: jntong@cug.edu.cn

**Secretary:** Christopher A. McRoberts

Department of Geology, State University of New York at Cortland, P.O. Box 2000,  
Cortland, New York 13045, USA.  
E-mail: mcroberts@cortland.edu

## **SUBCOMMISSION ON PERMIAN STRATIGRAPHY**

**Chair:** Prof. Shuzhong Shen

Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences  
39 East Beijing Rd., Nanjing, Jiangsu, China 21008  
Tel: +86-25-83282121; E-mail szshen@nigpac.ac.cn

**Vice Chair:** Prof. Joerg W. Schneider

TU Bergakademie Freiberg, Geologisches Institut  
 Lehrstuhl Paläontologie, Bernhard-von-Cotta-Strasse 2  
 09599 Freiberg, Germany  
 Tel.: +49 (0)3731-39-2856; E-mail: [Joerg.Schneider@geo.tu-freiberg.de](mailto:Joerg.Schneider@geo.tu-freiberg.de)

**Secretary:** Prof. Lucia Angiolini

Dipartimento di Scienze della Terra "A. Desio",  
 Via Mangiagalli 34, 20133 Milano, Italy  
 E-mail: [lucia.angiolini@unimi.it](mailto:lucia.angiolini@unimi.it) Re

**SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY****Chair:** Dr. Barry C. Richards

Geological Survey of Canada, 3303-33<sup>rd</sup> St. N.W.,  
 Calgary, AB, T2L 2A7, Canada  
 E-mail: [brichard@NRCan.gc.ca](mailto:brichard@NRCan.gc.ca)

**Vice Chair:** Prof. Wang Xiangdong

Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences,  
 39 East Beijing Road, Nanjing 210008, China  
 Tel: +86-25-83282188; E-mail: [xdwang@nigpas.ac.cn](mailto:xdwang@nigpas.ac.cn)

**Secretary:** Prof. Markus Aretz

Université de Toulouse (Université Paul-Sabatier), Observatoire Midi-Pyrenees,  
 14 Avenue Edouard Belin, 31400 Toulouse, France  
 E-mail: [aretz@lmtg.obs-mip.fr](mailto:aretz@lmtg.obs-mip.fr)

**SUBCOMMISSION ON DEVONIAN STRATIGRAPHY****Chair:** Prof. John E. A. Marshall

School of Ocean and Earth Science, Univ. Southampton,  
 Southampton Oceanography Centre  
 European Way, Southampton, SO14 3ZH, United Kingdom  
 E-mail: [jeam@soc.soton.ac.uk](mailto:jeam@soc.soton.ac.uk)

**Vice Chair:** Prof. Carlton E. Brett

Department of Geology, University of Cincinnati,  
 345 Clifton Court, Cincinnati, Ohio 45221, USA  
 Tel: 513-556-6931; E-mail: [carlton.brett@uc.edu](mailto:carlton.brett@uc.edu)

**Secretary:** Dr. Ladislav Slavik

Institute of Geology AS CR, Rozvojova 269,  
 CZ-165 02 Praha 6, Czech Republic  
 Tel: +420 233087247; E-mail: [slavik@gli.cas.cz](mailto:slavik@gli.cas.cz)

**SUBCOMMISSION OF SILURIAN STRATIGRAPHY****Chair:** Prof. Michael J. Melchin

Department of Earth Sciences, St. Francis Xavier University  
 P.O. Box 5000, Antigonish, Nova Scotia B2G 2V5, Canada  
 Phone: 902-867-5177; Fax: 902-867-2457; E-mail: [mmelchin@stfx.ca](mailto:mmelchin@stfx.ca)

**Vice Chair:** Prof. Peep Männik

Institute of Geology, Tallinn University of Technology,  
Ehitajate tee 7, 19086 Tallinn, Estonia  
Tel: +372 6203041; Email: mannik@gi.ee

**Secretary:** Prof. Zhan Renbin

Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences  
39 East Beijing Road, Nanjing 210008, China  
Tel: +86 2583282132; E-Mail: rbzhan@nigpas.ac.cn

## **SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY**

**Chair:** Prof. David A.T. Harper

Van Mildert College, Durham University,  
Durham DH1 3LE, UK  
Tel: 44-1913347143; E-mail: david.harper@durham.ac.uk

**Vice Chair:** Prof. Andre Dronov

Geological Institute, Russian Academy of Sciences,  
Pyzhevsky per.7, 119017 Moscow, Russia  
Tel: 495-230-81-17; E-mail: [dronov@ginras.ru](mailto:dronov@ginras.ru)

**Secretary:** Ian Percival

State Geoscience Centre 947-953 Londonderry Road,  
Londonderry 2753, New South Wales, Australia  
Tel: 61-2-4777-0315; E-mail: [ian.percival@industry.nsw.gov.au](mailto:ian.percival@industry.nsw.gov.au)

## **SUBCOMMISSION OF CAMBRIAN STRATIGRAPHY**

**Chair:** Prof. Loren E. Babcock

Department of Geological Sciences, 125 South Oval Mall,  
The Ohio State University  
Columbus, OH 43210, USA  
E-mail: [loren.babcock@geol.lu.se](mailto:loren.babcock@geol.lu.se)

**Vice Chair:** Prof. Zhang Xingliang

Department of Geology, Northwest University,  
229 Taibailu Street, Xi'an 710069, China  
E-mail: [xzhang69@nwu.edu.cn](mailto:xzhang69@nwu.edu.cn)

**Secretary:** Prof. Per Ahlberg

Department of Geology, Lund University,  
Sölvegatan 12, SE-223-62 Lund, Sweden  
E-mail: [per.ahlberg@geol.lu.se](mailto:per.ahlberg@geol.lu.se)

## **SUBCOMMISSION ON EDIACARAN STRATIGRAPHY**

**Chair:** Prof. Shuhai Xiao

Department of Geological Sciences, Virginia Polytechnical Institute and University,  
4044 Derring Hall, Blacksburg, VA 24061-0420, USA.  
Tel. +1-540-231-1336, email [xiao@vt.edu](mailto:xiao@vt.edu)

**Vice Chair:** Dr. Dmitriy Grahdankin

Institute of Petroleum Geology and Geophysics,  
Siberian Branch of Russian Academy of Sciences,  
Koptuyug Avenue 3, Novosibirsk 630090 Russia  
E-mail: dima.grazhdankin@googlemail.com

**Secretary:** Prof. Mark Laflamme

Department of Chemical and Physical Sciences, University of Toronto Mississauga,  
3359 Mississauga Road N., Mississauga, Ontario L4L 1C6, Canada  
E-mail: marc.laflamme@utoronto.ca

**SUBCOMMISSION ON CRYOGENIAN STRATIGRAPHY****Chair:** Prof. Graham Shields

Department of Earth Sciences, University College London,  
London, WC1E 6BT, UK  
Tel. +44-20-7679-7821, Email: g.shields@ucl.ac.uk

**Vice Chair:** Prof. Galen P. Halverson

Dept. of Earth & Planetary Sciences, McGill University  
3450 University Street, Montreal, Quebec, H3A 2A7 Canada  
E-mail: galen.halverson@mcgill.ca

**Secretary:** Prof. Susannah M. Porter

Department of Earth Science, University of California at Santa Barbara  
Santa Barbara, CA 93106  
Tel. +44-20-7679-7821, Email: g.shields@ucl.ac.uk

**SUBCOMMISSION ON PRECAMBRIAN STRATIGRAPHY****Chair:** Dr. Martin Van Kranendonk

University of New South Wales, School of Biological, Earth and Environmental Sciences,  
Kensington, NSW 2052, Australia  
E-mail: [martin.vankranendonk@unsw.edu.au](mailto:martin.vankranendonk@unsw.edu.au)

**Vice Chair:** Wouter Bleeker

Geological Survey of Canada, 601 Booth Street, Ottawa, Canada, K1A0E8  
Tel. +1-540-231-1336, Email: wbleeker@nrcan.gc.ca

**Secretary:** Dr. Robert Rainbird

Geological Survey of Canada, 601 Booth Street  
Ottawa, Ontario K1A 0E8, Canada  
Tel: (613) 943-2212; Fax: (613) 995-9273; E-mail: rrainbir@nrcan.gc.ca

**SUBCOMMISSION ON STRATIGRAPHIC CLASSIFICATION****Chair:** Brian Pratt

Department of Geological Sciences, University of Saskatchewan, Saskatoon, Saskatchewan  
E-mail: brian.pratt@usask.ca

**Vice Chair:** Helmut Weissert

D-ERDW, ETH –Z, CH-8092 Zurich, Switzerland  
E-mail: helmut.weissert@erdw.ethz.ch

**Vice Chair:** Jan Zalasiewicz

Department of Geology, University of Leicester, Leicester, LE1 7RH, UK  
E-mail: jaz1@leicester.ac.uk

**Secretary:** M.R. Petrizzo,

University of Milano, Dept. Earth Sciences, via Mangiagalli 34,  
I-20133, Milano, Italy  
E-mail: mrose.petrizzo@unimi.it