



INTERNATIONAL UNION OF GEOLOGICAL SCIENCES  
INTERNATIONAL COMMISSION ON STRATIGRAPHY



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## 1. TITLE OF CONSTITUENT BODY

### International Commission on Stratigraphy (ICS)

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

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## 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 Committees 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, an executive task group (Stratigraphic Information Services), and 15 Subcommissions that deal with the major chronostratigraphic units and aspects of stratigraphic classification and time scales.

### **Subcommissions:**

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

The *Executive Task Group*: Stratigraphic Information Services had been approved for Subcommittee status in 1997, but the officers were inactive and little was produced. More recently, previous ICS Secretary-General Jim Ogg was appointed to lead the task group.

The reports of each Subcommittee and the task group are appended to this ICS summary compilation.

The subcommittees of ICS together have about 350 titular members. When the corresponding members of Subcommittees are added, several thousand stratigraphers worldwide participate in the activities of ICS. In addition, many countries have national stratigraphic committees, with which ICS establishes or maintains contacts. The members of the Full Commission (i.e. the 3 members of the Executive and the chairs of the 15 Subcommittees and task group) and the other subcommittee officers (vice-chairs and secretaries) come from 18 countries: Australia, Belgium, Canada, China, Denmark, Estonia, France, Germany, Great Britain, Hungary, Italy, Morocco, Netherlands, Poland, Spain, Sweden, Switzerland and the United States. The voting memberships of the aggregate subcommittees include at least 30 more nations.

### Websites:

ICS main site	<a href="http://www.stratigraphy.org">www.stratigraphy.org</a>
Quaternary	<a href="http://www.quaternary.stratigraphy.org.uk">www.quaternary.stratigraphy.org.uk</a>
Neogene	<a href="http://www.geo.uu.nl/SNS">www.geo.uu.nl/SNS</a>
Paleogene	<a href="http://wzar.unizar.es/isps/index.htm">wzar.unizar.es/isps/index.htm</a>
Lutetian GSSP task group	<a href="http://wzar.unizar.es/perso/emolina/ypresian.html">wzar.unizar.es/perso/emolina/ypresian.html</a>
Jurassic	<a href="http://jurassic.earth.ox.ac.uk/">http://jurassic.earth.ox.ac.uk/</a>
Triassic	<a href="http://paleo.cortland.edu/sts/">paleo.cortland.edu/sts/</a>
<i>Albertiana</i> newsletter:	<a href="http://www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm">www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm</a>
Permian (newsletter)	<a href="http://www.nigpas.ac.cn/permian/web/index.asp">www.nigpas.ac.cn/permian/web/index.asp</a>
Devonian	<a href="http://www.unica.it/sds/">www.unica.it/sds/</a>
Silurian	<a href="http://www.silurian.cn/home.asp">www.silurian.cn/home.asp</a>
Ordovician	<a href="http://www.ordovician.cn">www.ordovician.cn</a>
Cambrian	<a href="http://www.uni-wuerzburg.de/palaeontologie/ISCS/index.html">www.uni-wuerzburg.de/palaeontologie/ISCS/index.html</a>
Neoproterozoic	<a href="http://www.stratigraphy.org/bak/ediacaran/">www.stratigraphy.org/bak/ediacaran/</a>
Precambrian	<a href="http://www.stratigraphy.org/bak/precambrian/">www.stratigraphy.org/bak/precambrian/</a>
Stratigraphic Classification	<a href="http://users.unimi.it/issc">http://users.unimi.it/issc</a>
Stratigraphic Information Systems	<a href="http://stratigraphy.science.purdue.edu/">http://stratigraphy.science.purdue.edu/</a>
CHRONOS database	<a href="http://www.chronos.org">www.chronos.org</a>
(concept posted at:)	<a href="http://www.eas.purdue.edu/chronos">www.eas.purdue.edu/chronos</a>
<i>PaleoStrat</i> database network	<a href="http://www.paleostrat.org">www.paleostrat.org</a>

### ICS Executive Officers for 2008-2012:

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 subcommittee reports include a listing of all voting members (typically 20 in each subcommittee).

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

Only a few of the subcommissions have formal financial contributions from external sources other than IUGS (through ICS), and these are 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 petroleum companies and the National Science Foundation of USA through its CHRONOS database consortium funding. 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 to Commission for the Geological Map of the World (*CGMW*) in Paris regarding standardization of chronostratigraphy and its color scheme on charts. 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: 478, 493, 497, 499, 503, 506, 507, 508, 512, and 572. 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 SINCE 2000

Quaternary	Base Holocene Series Base Quaternary/Pleistocene defined at the Base of the Gelasian Stage, c. 2.558 Ma
Neogene:	Base Zanclean Stage (Base Pliocene Series) Base Messinian Stage Base Tortonian Stage Base Serravallian Stage
Paleogene:	Base Ypresian Stage (Base Eocene Series) Base Thanetian Stage Base Selandian Stage
Cretaceous:	Base Maastrichtian Stage Base Turonian Stage Base Cenomanian Stage
Jurassic:	Base Bathonian Stage Base Aalenian Stage Base Pliensbachian Stage Base Sinemurian Stage Base Hittangian Stage (Base Jurassic System and Lower Jurassic Series)
Triassic:	Base Carnian Stage Base Ladinian Stage Base Induan Stage (Base Triassic System)
Permian:	Name and Base Changhsingian Stage Name and Base Wuchiapingian Stage and Lopingian Series Base Capitanian Stage Base Wordian Stage Base Roadian Stage and Guadalupian Series
Carboniferous:	Mississippian and Pennsylvanian subsystem Names and Lower, Middle and Upper series subdivision of each and stage nomenclature for each Base Visean Stage
Silurian:	Base redefinition for Rueddian Stage (Base Silurian)
Ordovician:	Name and Base Hirnantian Stage Name and Base Katian Stage Name and Base Sandbian Stage Name and Base Dapingian Stage Name and Base Floian Stage Base Tremadocian Stage
Cambrian:	Name and Base Furongian Series Name and Base Paibian Stage Name and Base Guzhangian Stage

Name and Base Drumian Stage  
 Name Terreneuvian Series  
 Name Fortunian Stage

Neoproterozoic: Name and Base Ediacaran System

## 7. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2010

### Full Commission

- Prague 2010 – ICS Workshop held 30 May to 3 June was a major event for ICS in 2010. This workshop allowed chairs of ICS subcommissions, the ICS executive, and additional members of ICS subcommissions to spend five days in extended discussions regarding the mission and objectives of ICS as well as ICS statutes, policies, and procedures. Most importantly, characterization and correlation of GSSPs, GSSP proposals, success and shortcomings of the GSSP process were discussed at length in order that all subcommission chairs understand the essential elements of GSSP definitions and selection. At the workshop, several long-standing issues were discussed and subject to informal vote, followed by a postal ballot. As a result, ICS approved 1) a recommendation on the use of formal abbreviations for both specific calibrated ages as well as durations of geologic time as proposed by the joint IUGS-IUPAC task group, a recommendation forwarded to the IUGS EC; 2) a decision to maintain the dual system of stratigraphic nomenclature (chronostratigraphic and geochronologic units for time-rock and time concepts, respectively; 3) a decision to revise the *International Stratigraphic Guide* such that chronostratigraphic nomenclature will be restricted to stratified rocks and that geochronologic nomenclature will be applied to both stratified and non-stratified rocks; 4) a decision that the term Stage be used exclusively as a chronostratigraphic unit and that the term Age will be retained for the equivalent geochronologic unit; 5) and decisions that ICS voting should be carried out, normally, through e-mail ballots and completed within 30 days. See the attached summary of the workshop (Appendix 1).
- Ratification by the IUGS EC of the GSSP proposal for the base Hettangian Stage (Triassic-Jurassic boundary).
- Approval by ICS of the GSSP for the base of the Lutetian Stage (Eocene Series) and forward of the recommendation to the IUGS EC for ratification.
- Approval by the Subcommittee on Cretaceous System of the GSSP proposal for the base Santonian Stage and its consideration by ICS (vote in progress).
- Approval by the Subcommittee on the Cambrian System of the GSSP proposal and name of the Jiangshanian Stage and its consideration by ICS (vote in progress).
- ICS Chair presented the ICS position on the validity of GSSPs as global standards and the history and justification of the ICS decision on formal definition of the Quaternary System/Period and redefinition of the Pleistocene Series/Epoch at meetings of the Italian Geological Survey, the INQUA executive committee, the North American Commission on Stratigraphic Nomenclature, the Geological Society of America, the IUGS Commission on Geoscience Information, and the 4<sup>th</sup> (French) Congress on Stratigraphy.

- The ICS Chair participated in an exceptional dedication ceremony of the GSSPs for the Selandian and Thanetian stages at Zumaia, Spain.

### **Quaternary Subcommission**

- Continued deliberation of candidate GSSPs for Lower-Middle Pleistocene boundary resulted in elimination of one of three.
- The Anthropocene Working Group, chaired by Dr J. Zalasiewicz (Leicester) established in 2009 to examine the potential value of the term and its underlying stratigraphic basis in more detail and to consider, and subsequently make recommendations on, its possible formalisation.
- Compilation and editing of a thematic volume of papers for the *Philosophical Transactions of the Royal Society of London, Series A on The Anthropocene – a new epoch of geological time?*
- Forwarded to ICS a recommendation that Calabrian be formally approved as the name of the second stage of the Pleistocene.
- The Subcommission website continues to be expanded at: <http://www.quaternary.stratigraphy.org.uk> This site is used as the main form of communication for the Subcommission, and it continues to be sponsored by the *Journal of Quaternary Science* and *Boreas*.

### **Neogene Subcommission**

- Meeting in Naples, Italy of the Mediterranean Neogene research group led to extensive papers on the two candidates for the base-Langhian Stage GSSP being prepared and submitted to a special issue of *Stratigraphy*.
- Discussion continued on the base-Burdigalian Stage GSSP.

### **Paleogene Subcommission**

- Dedication of GSSPs for Selandian and Thanetian stages.
- Approval by ICS by a unanimous vote of base-Lutitian GSSP at the Gorrondatxe section, Spain with the proposal now submitted to the IUGS EC for ratification.
- Extensive research, including astronomical tuning, completed on the base-Bartonian GSSP candidate at the Contessa Highway section near Gubbio, Italy.
- Extensive research completed on the base-Priabonian Stage GSSP candidate at the Alano section, Italy.

### **Cretaceous Subcommission**

- The working group on the Jurassic-Cretaceous boundary and the Berriasian-Stage GSSP made considerable progress with workshops in 2010 in Slovakia and in Paris and re-examination of the Berriasian type area.
- New working group formed for the base-Albian Stage GSSP and began integrated stratigraphic work on candidate sections in France and Spain.
- Base-Santonian Stage GSSP was approved and forwarded to ICS for consideration and approval.

### **Jurassic Subcommission**

- Ratification by IUGS EC of the base-Jurassic (Lower Jurassic, Hettangian) GSSP.
- 8<sup>th</sup> International Congress on the Jurassic System held in Shehong, China in August 2010.

- Entered in a strategic relationship with *Volumina Jurassica* and long-term sponsorship of this journal of the Polish Geological Institute and Warsaw University.

### **Triassic Subcommittee**

- 7<sup>th</sup> International Field Workshop on Triassic held in the Dolomites, Italy, September 2010.
- Workshop “New developments on Triassic integrated stratigraphy” held in Palermo, Italy with session devoted to Carnian-Norian boundary.
- Two candidates for base-Norian Stage GSSP (in British Columbia, Canada and Sicily, Italy) were visited by the working group.
- “The Triassic Timescale” S.G. Lucas (ed.), *Geological Society of London Special Publications*, published in 2010.
- Proceedings of the workshop “The Triassic Climate” were published in a special issue of *Palaeogeography, Palaeoclimatology, Palaeoecology*.

### **Permian Subcommittee**

- Decision made to change section and point for base-Sakmarian Stage GSSP to Usolka section, Russian, which is already well studied.
- Two sections in North America under consideration for base-Artinskian Stage GSSP.

### **Carboniferous Subcommittee**

- Following realization of correlation difficulties of the present Devonian-Carboniferous boundary, restudy of conodont lineages used to define and correlate the D-C boundary is underway.
- Several field evaluations of sections and laboratory studies of conodont lineages and of ammonoid and foraminiferal biostratigraphy for defining GSSPs of the Viséan-Serpukhovian, Bashkirian-Moscovian, and Moscovian-Kasimovian stage boundaries are nearing completion.
- The event marker (the FAD of a conodont species) has been selected for defining the Kasimovian-Gzhelian boundary and candidate stratotype sections are being evaluated.
- Website established.

### **Devonian Subcommittee**

- The new Devonian-Carboniferous Boundary Working Group made significant progress during a special symposium and discussions session held at the International Palaeontological Congress in London in July 2010.
- Decisions made on biohorizons for defining substages of Pragian, Givetian, Frasnian, and Famennian stages are progressing rapidly; Devonian workers want to define substages, even though they will not have ICS approved GSSPs, because they consider them fundamental for expressing refined global correlations with greater resolution than the defined stages.

### **Silurian Subcommittee**

- A field meeting was organized for Ludlow, England in July 2011 to evaluate the long-ago defined, but seriously deficient, GSSPs defined in England for most of the Silurian series and stages.
- Initial investigations of sections for re-defining the GSSP for the Wenlock Series were begun in the Czech Republic and China.
- Collaboration advanced with the British Geological Survey on refinement of, and evaluation of, GSSPs for almost all stages of Silurian, which are located in Wales and the Welsh

borderland, including the Aeronian, Telychian, Wenlock (Sheinwoodian), Homerian, Ludlow (Gorstian), and Ludfordian.

- A paper that presented a generalized carbon-isotope curve for the Silurian as well as an updated correlation of North American regional stages with the global standard scale was published in *Lethaia*.

### **Ordovician Subcommittee**

- The 11<sup>th</sup> International Symposium on the Ordovician System was organized for Madrid, Spain to be held in May 2011.
- Working groups were established to evaluate the efficacy and utility of all stages and stage boundaries, to define time slices established for higher-resolution global correlations that the global stages, to develop regional correlation charts based on the new global stages and series, to develop a carbon-isotope and sea-level curves for the entire Ordovician, and to produce paleogeographic maps.

### **Cambrian Subcommittee**

- The 15<sup>th</sup> International Field Conference was held in June 2010 in Prague, Czech Republic and southeastern Germany. Appointment of working groups to investigate potential GSSP horizons for base of Cambrian stages 2, 3, and 4.
- The name and GSSP for the Jiangshanian Stage with the stratotype at Buibian, Zhejiang, China was approved (85% majority vote) and submitted to ICS.
- Proposals being prepared for GSSP for base of Cambrian Stage 5 (and Series 3).
- A working group for the GSSP for stage 10 (the highest stage in the system) was formed and initiated consideration of levels and sections for the GSSP.

### **Neoproterozoic (Ediacaran and Cryogenian) Subcommittee**

- An international conference was held in India in February 2010.
- The book *Neoproterozoic Ice Ages* was published in 2010. It summarizes knowledge of Cryogenian Period glaciogenic units worldwide.
- Task groups were assembled to test criteria for defining a Cryogenian GSSP and for subdividing the Ediacaran Period/System.

### **Precambrian Subcommittee**

- Sulfur isotope analysis was completed of Australian section under consideration for defining Archean-Proterozoic boundary.
- 5<sup>th</sup> International Archean Symposium with field excursion to proposed Archean-Proterozoic boundary section.

### **Stratigraphic Classification Subcommittee**

- Work continued on review articles on lithostratigraphy, biostratigraphy, chronostratigraphy, and sequence stratigraphy.

### **Stratigraphic Information Task Group**

- Continued development of, and updating of information on, RSS-feed for One-Geology and Time-Scale Creator.
- Updated International Chronostratigraphic Chart and GSSP table with information on GSSPs approved in 2009.

## **8. CHIEF PROBLEMS ENCOUNTERED IN 2010**

### **Full Commission**

- Stratigraphy is given low priority for funding by national granting agencies, thus making it very difficult to obtain support for research necessary to propose GSSPs.
- ICS website went down for an extended period of time (4+ months) for complicated reasons and had to be moved to an inadequate server. In addition, the webmaster has little time to maintain the site.
- Some boundary task group leaders inactive; some boundary task groups need rejuvenation.
- Role of Stratigraphic Information group within structure if ICS.

### **Quaternary Subcommission**

- None mentioned.

### **Neogene Subcommission**

- Lack of suitable sections in the Mediterranean for defining the Burdigalian Stage GSSP in an astronomically-tuned, deep-marine section.

### **Paleogene Subcommission**

- Subcommission budgets are inadequate to support travel necessary for boundary working groups to make significant progress, nor to support regional committees in under-developed regions (e.g. Africa, Indian subcontinent, SE Asia).

### **Cretaceous Subcommission**

- 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 Subcommission**

- Professional commitments to home institutions have greatly limited time that subcommission executive officers (chair, vice-chair, and secretary) can devote to subcommission business.

### **Triassic Subcommission**

- Severe budget cuts for research in many countries, due to the global economic crisis, reduce not only research in the field but also the possibility of Task Group members from attending meetings and workshops necessary for progress on GSSP definitions.
- Aging community of Triassic specialists with many experienced members close to retirement.

### **Permian Subcommission**

- Progress is slow because of the voluntary nature of most of this work and minimal financial support.

### **Carboniferous Subcommittee**

- Multiple task group duties for some members hinder their ability to focus their time and efforts, making progress difficult.
- Selection of biohorizons and candidate stratotype sections for GSSPs is hindered by endemism in key conodont and foraminiferal lineages.
- The project for upper Paleozoic boreal biota, stratigraphy and biogeography, work that is very important for establishing global Carboniferous correlations, has collapsed, requiring new leadership and a revised mandate.

### **Devonian Subcommittee**

- Definition of formal global substages delayed by the open and unresolved procedure.
- Poor recovery of critical conodonts from intervals and sections of interest slowed progress on the Emsian Stage revision.
- Lack of formal members from a range of countries with extensive and important Devonian outcrop, such as Algeria, Libya, Brazil, Bolivia, Argentine, Turkey, and Caucasian countries.

### **Silurian Subcommittee**

- 2011 Silurian Field Meeting planned for St. Petersburg, Russia had to be moved to Ludlow, England for financial reasons.
- Low priority given to stratigraphic studies by national, grant-awarding agencies makes it difficult, if not impossible, to obtain grants to support research on GSSPs.

### **Ordovician Subcommittee**

- Lack of financial support to print and distribute *The Ordovician Time Table*, a color chart.
- Lack of financial support for subcommittee members to attend the International Geological Congress greatly limits critical opportunity for majority of members to meet, preventing any significant business being completed.

### **Cambrian Subcommittee**

- Difficulty of subcommittee members obtaining financial support for basic research on key stratigraphic intervals (potential GSSP horizons and sections).
- Limited funds for travel by working groups to inspect and evaluate candidate GSSPs.

### **Neoproterozoic (Ediacaran and Cryogenian) Subcommittee**

- Continuing inadequacy of geochronological control in key sections, but being addressed continuously using new U-Pb and Lu-Hf ages and chemostratigraphy.
- An international conference, workshop and field excursion to be based in Novosibirsk (Siberia) in 2010 had to be moved to 2011.
- Research teams working on Neoproterozoic projects in Australia required to take greater efforts to access key outcrops on private property and parks and reserves.

### **Precambrian Subcommittee**

- Other commitments of subcommittee chair slowed progress on organizing new boundary working groups.

### **Stratigraphic Classification Subcommittee**

- The ICS budget allocation was very small, particularly given the overall importance and significance of the subcommittee.

- Little progress was made on chapters on Lithostratigraphy and biostratigraphy due to over-commitments of the authors, including the ICS Chair.

### **Stratigraphic Information Task Group**

- The task group consists of a very small core group of dedicated researchers and students who produced almost all of the products. It is essential that more researchers and students become involved and contribute to the products.
- Role of Stratigraphic Information Task Group within ICS.

## **9. SUMMARY OF EXPENDITURES IN 2009:**

The ICS Executive established the following budget for April 2010 – March 2011 after consideration for relative needs, planned activities, and funding requests of the subcommissions; and re-allocated funds based on the final amount received from IUGS. Funds were maintained by Stan Finney (ICS chair) using a special account in the USA from which subcommission allocations were distributed with each subcommission then maintaining its own account and budgeting for its allocated funds (as listed below). Itemized financial reports of individual subcommissions are contained within their attached annual reports. All amounts are in \$US.

Subcommissions + other	Recommended to IUGS Jan'09	Final ICS Allocation
Quaternary	500	0
Neogene	4000	2000
Paleogene	5000	3000
Cretaceous	2500	2000
Jurassic	1000	1000
Triassic	3500	3500
Permian	500	1500
Carboniferous	1000	1000
Devonian	1000	1000
Silurian	500	1000
Ordovician	1500	1000
Cambrian	5000	3000

Ediacaran	4000	3000
Precambrian	500	500
Classification	500	500
Strat. Info. System	800	1000
Subcommission Total	31,800	25,000
ICS Workshop funds	20000	26500
Outreach and web funds	5000	
Special travel needs	5000	
ICS Executive	5000	5000
TOTAL (in USD)	66,800	56,500
		50,000 allocated from IUGS

## **10. WORK PLAN, CRITICAL MILESTONES, and ANTICIPATED RESULTS TO BE ACHIEVED FOR March 2011-February 2012:**

### **ICS Executive Committee**

- The primary attention of the ICS Chair will be to promote progress on GSSPs by the subcommissions. The ICS budget will be used to encourage and support those boundary working groups that demonstrate the potential to make significant progress. Although important progress was made in the past year, the ICS Chair and Secretary-General will continue to collaborate extensively with chairs of the Cambrian, Carboniferous, Jurassic, and Cretaceous subcommissions to stimulate more progress than has hitherto been made.
- Maintain and further develop communication between ICS and important parts of the geoscience community it serves; complete and maintain a current contact list for all national stratigraphic commissions so that all can be informed of deliberations related to selection of GSSPs and definition and redefinition of international chronostratigraphic units.
- Preparation of ICS-sponsored symposia, activities and subcommission meetings for the 34<sup>th</sup> International Geological Congress in 2012.
- The location of the server and the webmaster for the ICS website must be re-evaluation and a better solution found; in addition, the webpages must be updated.
- A permanent archive of global standards (GSSPs and the International Chronostratigraphic Chart) must be established.

- The ICS executive will work closely with the chair of the IUGS Commission on Geoscience to further develop the incorporation of the International Chronostratigraphic Chart into the computer language being used to store, access, and archive geoscience information.
- The ICS executive will work closely with the President of the CGMW (Commission on Geologic Map of the World to produce ICS products (time scale charts, mouse pads, and posters) for distribution at the 34<sup>th</sup> IGC.
- The ICS Chair will attend a meeting of the Silurian Subcommittee in Ludlow, England in July 2011. The meeting will focus on the seriously deficient GSSPs for many of the Silurian stages and series, and the ICS Chair must give both direction, procedures, and urgency to making progress on this issue.
- The ICS Chair and four subcommittee officers and members (Babcock, Gibbard, Gardin, Vai) have agreed to serve as editor and associate editors, respectively, of the *Encyclopedia of Stratigraphy* to be published by Springer with most of the work being completed in 2011.

### **Quaternary Subcommittee**

- Formalize GSSPs for the Lower/Middle and for the Middle/Upper subseries/subepoch boundaries of the Pleistocene Series/Epoch.
- A new working group will be established to assess the formal definition of short-time divisions of the Quaternary.
- The subcommittee will investigate the need and potential value in establishing the term Anthropocene for the last 200 yr or so.

### **Neogene Subcommittee**

- Complete study of candidate GSSPs for base Langhian.
- Workshop will be held to consider defining the GSSPs for the Langhian and Burdigalian stages.

### **Paleogene Subcommittee**

- Complete work on GSSPs for the bases of the Priabonian and Chattian GSSPs.
- Screen and rejuvenate the list of Corresponding Members.
- Reactive or close those Regional Committees and Working Groups that have shown little progress.
- Update the subcommittee website.
- Organize a meeting on the Climate and Biota of the Early Neogene in Salzburg, Austria in June 2011.

### **Cretaceous Subcommittee**

- Vote by ICS and IUGS EC to approve and ratify the base-Santonian Stage GSSP.
- Vote on the Coniacian GSSP and submission to ICS.
- Vote on the Hauterivian GSSP and submission to ICS.
- Decision on the criteria to define the base of the Berriasian Stage (Jurassic/Cretaceous boundary).
- The 8<sup>th</sup> and 9<sup>th</sup> meetings of the Berriasian Stage (Jurassic/Cretaceous boundary) working group in Tunisia and Russia.
- Workshop and field excursion on the Valangian Stage GSSP in Spain.

### **Jurassic Subcommittee**

- Completion of the GSSP proposal for the Peniche section, Portugal for the base of the Toarcian Stage.
- Appointment of a new chair (following death of leader J. Callomon) and reconstitution of the working group on the GSSP for the Callovian Stage.
- A field workshop on two sections in France recently proposed as candidates for the GSSP for the Oxfordian Stage.
- Decision on the precise level of the GSSP for the Kimmeridgian Stage in the candidate section on the Isle of Skye.
- A field meeting will be held, in conjunction with that on the Oxfordian Stage to examine the Savournon, France section, which is the candidate for the GSSP for the Tithonian Stage.

### **Triassic Subcommittee**

- Major revision of voting membership of the Subcommittee.
- 8<sup>th</sup> International Field Workshop on Triassic in southern France in September 2011.
- Workshop on Upper Triassic stages in the Dolomites (Italy) or Austria to make progress on the base-Norian Stage GSSP.
- Vote on a GSSP proposal for the base-Olenekian Stage GSSP.
- Reorganization of the Task Group on the base-Anisian Stage GSSP.
- Selection of boundary marker for base-Norian Stage and a vote in the Task Group on the GSSP proposal.
- Vote in the Task Group on the base-Rhaetian Stage GSSP.

### **Permian Subcommittee**

- Subcommittee votes on base-Sakmarian and base-Artinskian GSSPs.
- Workshop on base-Kungurian Stage GSSP in Boise, Idaho, USA in June 2011.
- Business meeting at International Congress on Carboniferous and Permian in Perth, Australia in July 2011.

### **Carboniferous Subcommittee**

- XVII International Congress on the Carboniferous and Permian in Perth, Australia, July 2011 for an extended subcommittee business meeting.
- Subcommittee workshop and field meeting at Nanjing Institute of Geology and Palaeontology, China in November to December, 2011.
- Resolve conodont lineages that may best allow for re-definition of D-C boundary.
- Continue study of conodont lineages and candidate sections for defining GSSPs for Viséan-Serpukhovian, Bashkirian-Moscovian, and Moscovian-Kasimovian stage boundaries.

### **Devonian Subcommittee**

- International field meeting on “Middle-Upper Devonian and Lower Carboniferous Biostratigraphy of South Urals and Kuznetsk Basin” in Novosibirsk, Russia in July-August 2011.
- Finalize and submit proposals for the formal definition of Givetian and Frasnian substages to ICS.
- Compilation of conodont results from re-sampling of boundary interval for base of Emsian Stage in the Zinsilban Gorge section.
- Revision of conodont biostratigraphy in boundary interval by Devonian/Carboniferous Boundary Task Group.
- Formal vote on uppermost Famennian substage.

### **Silurian Subcommittee**

- International Symposium on the Silurian System in Ludlow, England, July 2011 with field excursions to examine the many GSSPs for stages and series located in Wales and the Welsh border areas.
- Continued program on Silurian GSSPs.
- Continue collaboration on full integration of various regional and global biostratigraphic, lithostratigraphic, sequence stratigraphic, and chemostratigraphic scales for refinement of the Silurian time scale and high-resolution correlation of Silurian events.
- Publication of a special volume of papers entitled “Silurian-Devonian Studies” as a Memoir of the Association of Australasian Palaeontologists.

### **Ordovician Subcommittee**

- The 11<sup>th</sup> International Symposium on the Ordovician System was organized for Madrid, Spain to be held in May 2011.
- Open debate on formal definition of chronozones within the Ordovician System.
- Initiate task group work on revised regional correlation charts on basis of new regional stratigraphic data and their relationship to newly-established international stages.
- Establishment of working groups to compile data on isotope and sea-level curves and to compile paleogeographic maps for the Ordovician System.
- Re-design website.

### **Cambrian Subcommittee**

- Approval and ratification by ICS and IUGS EC of the Jiangshanian Stage GSSP proposal.
- Completion of GSSP proposal and recommendation of name for base of Stage 5.
- Planning of workshop and symposium session focused on stages for lower part of Cambrian at 34<sup>th</sup> IGC.

### **Neoproterozoic (Ediacaran and Cryogenian) Subcommittee**

- International Conference “Neoproterozoic sedimentary basins: stratigraphy, geodynamics and petroleum potential” and Russian workshop on Ediacaran Acritarch Taxonomy will be held in Novosibirsk in August 2011.
- Informal proposals on base-Cryogenian System/Period GSSP to be received and considered.
- Vote on criteria for subdivision of Ediacaran System/Period.

### **Precambrian Subcommittee**

- Establishment of working group to formalize the Hadean Eon.
- Establishment of a working group on the Archean-Proterozoic boundary.
- Prepare a special session and field trip to potential GSSP sites in Western Australia for the 34<sup>th</sup> IGC.
- Symposium session titled “Application of New Stratigraphic Tools to Precambrian and Igneous Rocks: Challenges and Solutions” at GSA Annual Meeting in Minneapolis, MN, USA in November 2011 with goal of stimulating work and generating interest in Precambrian community for redefining units Precambrian time scale on basis of GSSPs.

### **Stratigraphic Classification Subcommittee**

- First drafts of papers on Biostratigraphy, Chronostratigraphy, and Lithostratigraphy will be completed and distributed for review.

- Workshop for authors of chronostratigraphy article in London, England.

### **Stratigraphic Information Task Group**

- Enhance TimeScale Creator.
- Coordinate preparation of comprehensive *Geologic Time Scale 2012*.
- Recruit adequate number of active, contributing voting members necessary to be considered for subcommission status.

## **11. BUDGET REQUEST TO IUGS FOR 2010 (\$ US)**

The following budget request is for operations and special initiatives through March 2012 (funds are generally transferred from IUGS to ICS in April; which implies ICS subcommissions must operate on an April-to-March fiscal year).

### **Proposed ICS Budget 2010-2011**

	<b>Allocated budget 2010 (USD)</b>	<b>Subcomm. budget requests 2011</b>	<b>ICS proposed allocation 2011</b>	<b>comments, info.</b>
Quaternary	0	650	650	website, mtg and groups
Neogene	2000	1350	1350	2 workshop mtgs
Paleogene	3000	6264	6264	website, travel, groups
Cretaceous	2000	6197	6197	3 workshop mtgs
Jurassic	1000	2600	2600	base Cretaceous mtgs + other workshops
Triassic	3500	3300	3300	workshop, Newsletter
Permian	1500	5000	5000	workshop, fieldtrip
Carboniferous	1000	1800	1800	Carb. mtg., fieldtrips and workshops
Devonian	1000	2000	2000	meeting, Newsletter
Silurian	1000	10000	10000	major Silurian Ludlow mtg + travel
Ordovician	1000	8000	4000	publications + review mtg

Cambrian	3000	9100	8000	publications + field mtg support
Neoproterozoic	3000	3300	3300	Cryogenian Russia workshop publication,
Precambrian	500	4900	4900	research travel + dating
Classification	500	5000	5000	conference att.
Strat. Info. System	1000	2000	2000	website, publications
<b>Subcommissions Total</b>	<b>25,000</b>	<b>71,461</b>	<b>66,361</b>	
ICS Workshop funds	26500	0		
Special travel needs		5000	5000	
ICS Executive	5000	5000	5000	
<b>TOTAL (in USD)</b>	<b>56,500</b>	<b>81,461</b>	<b>76,361</b>	

50,000  
allocated  
from  
IUGS

## 12. REVIEW CHIEF ACCOMPLISHMENTS SINCE 2000

A combined 4-year review was compiled as part of the ICS report for 2004, and the accomplishments for 2011 are listed in Item #7 above. A subset of major accomplishments is reproduced here. More details are in the individual subcommission reports.

### 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 **Pleistocene** Epoch redefined at base of Gelasian Stage with Gelasian transferred from Neogene (2009)

#### Neogene

4. base of the **Zanclean** Stage and of the **Pliocene** Series at Eraclea Minoa, Italy (2000)
5. base of the **Messinian** Stage at Oued Akrech, Morocco (2000)
6. base of the **Tortonian** Stage at the Monte dei Corvi beach section near Ancona, Italy (2003)

7. base of the *Serravallian* Stage at Ras il Pellegrin section on Malta (2006)

### **Paleogene**

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

### **Cretaceous**

11. base of the *Maastrichtian* Stage at Tercis, France (2000)
12. base of the *Turonian* Stage at Pueblo, Colorado, USA (2003)
13. base of the *Cenomanian* Stage and of the **Upper Cretaceous** Series, at Risou, France (2002)

### **Jurassic**

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

### **Triassic**

19. base of the *Carnian* Stage at Prati di Stuoeres, Italy (2008)
20. base of the *Ladinian* Stage at Bagolino, Italy (2005).
21. base of the **Triassic** System at Meishan, China (2001)

### **Permian**

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

### **Carboniferous**

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

### **Devonian**

28. all Devonian stage boundaries are defined by a GSSP
29. 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**

30. 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.

31. 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**

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

### **Cambrian**

38. base of the *Paibian* Stage and the **Furongian Series** (uppermost series of Cambrian) in the Paibi section, NW Hunan province, south China (2003).  
 39. base of *Guzhangian* Stage (Series 3) in China (2007)  
 40. base of *Drumian* Stage (Series 3) in USA (2007)  
 41. vote to subdivide the Cambrian into **four series** and **10 stages**.  
 42. Vote to name lowest series and stage as **Terreneuvian** and **Fortunian**, respectively.

### **Proterozoic Era**

43. 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), and Magnetostratigraphy (2010).

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

The International Stratigraphic Chart (divisions of geologic time) 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. This chart is continually updated, and public graphics can be downloaded at [www.stratigraphy.org](http://www.stratigraphy.org).

### **D. The Concise Geologic Time Scale**

Published in 2008, this is a condensed and updated version of *Geologic Time Scale 2004* that compiles the then current status of all ratified divisions of geologic time, diagrammed the main biologic, magnetic and geochemical events within each period, and indicated the best-available interpolation of ages for all major events in the Phanerozoic.

### 13. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2010-2015)

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 2010-2011.

#### ICS Executive Committee

1. Define GSSP sections for all stages of the Phanerozoic Era, and solidify subdivisions of the Precambrian. **All GSSPs are to be ratified by 2014** (IUGS mandate in 2000 was completion by 2008; but IUGS Ad Hoc review indicated in 2006 that a strict deadline should not be enforced.). A realistic schedule for ICS/IUGS voting/ratification of the remaining GSSPs in each period is detailed below. This schedule is based on the realization of a successful subcommission chair (S. Finney – Ordovician) of the limitations, problems, and other roadblocks that are inherent in the process.
2. Encourage subcommissions to regularly re-assess GSSPs and to develop new initiatives and projects that utilize the refined International Stratigraphic Chart.
3. Produce a new *International Guidebook* for stratigraphic classification that covers all subdisciplines of stratigraphy and printed in 2012. The book is conceived as a user friendly, simple, very well illustrated manual with schemes and color photographs full of real examples from various continents and from various parts of the stratigraphic column.
4. Have a strong presence at the 34<sup>th</sup> IGC in 2012 with exciting symposia, varied field excursions, business meetings, and other activities sponsored by ICS and its subcommissions.
5. Develop a suite of web-accessible international databases on all aspects of chronostratigraphy (paleontology, isotopes, cycles, magnetics, etc.).
6. Maintain close collaboration with all national stratigraphic commissions.
7. 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.
8. Serve as the primary international body setting global standards and illustrating best practices in stratigraphy.
9. Produce web-based educational materials ranging from introductory to advanced topics in stratigraphy.
10. Evolve the ICS website so that it serves as a permanent archive of global standards (GSSPs and the single set of global units they define).

#### Quaternary Subcommission

1. GSSPs for bases of Pleistocene subdivisions.
2. Compiling regional sequences throughout the Quaternary.
3. Classify and formalize, where necessary, divisions based on very short-term events.
4. Detailed correlation charts for specific time periods or specific regions, e.g. Weichselian Late-glacial to Holocene (15 ky); or the last 250 ky in Europe.

#### Neogene Subcommission

1. Selection of boundary criteria and sections for the definition of the 2 remaining Miocene stage boundaries, namely the base-**Langhian** and base-**Burdigalian**.
2. Apply high-resolution integrated stratigraphies to global aspects of the Earth system.

### **Paleogene Subcommittee**

1. Complete and publish the GSSPs of the Lutitian (2011), Bartonian (2011), Priabonian (2011), and Chattian (2012) stages.
2. Produce an updated and 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.

### **Cretaceous Subcommittee**

1. 2010 to 2013 - Approval proposals for the bases of the Albian and Santonian stages in 2010, and of the Valanginian, Hauterivian, Barremian, Aptian, Coniacian, and Campanian stages by 2013.
2. 2010 - Finalize proposal for the base of Berriasian (Jurassic/Cretaceous boundary).
3. 2013 to 2015 – Define substages.

### **Jurassic Subcommittee**

1. 2010-2014 - Finalize proposals for the bases of the Toarcian, 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. Define the bases of the Standard (Ammonite) Zones in terms not only of the correlation marker event but also to propose a stratotype point for the basal boundary in the same way as for the Stages.
4. Developing and expanding the Thematic Working Groups, some of which have been very successful.

### **Triassic Subcommittee**

1. Completion of Triassic GSSPs: 2011 – Olenekian, Anisian, and Rhaetian; 2012 –Norian.
2. 2013 – Summary volume of all Triassic GSSPs. Emphasis switches to choice of non- marine auxiliary sections; and standardized substages.

### **Permian Subcommittee**

1. Completion of Permian GSSPs: Sakmarian proposal will be completed in 2010; Artinskian in 2010; and Kungurian by 2012.
2. Correlations into continental deposits and across provincial boundaries.
3. Detailed documentation of the geologic evolution of the Earth during the Permian with respect to the established chronostratigraphic framework.

### **Carboniferous Subcommittee**

1. Completion of GSSPs: Serpukhovian in 2012, Moscovian in 2012, Kasimovian in 2012, and Gzhelian in 2011.
2. Consider and finalize subdivision of Visean into two new stages by 2014

### **Devonian Subcommittee**

1. Formalize the substage subdivision of stages.

### **Silurian Subcommittee**

1. Restudy of previous GSSPs that are difficult to use for global correlation (e.g., base of Wenlock).
2. *Integrated Silurian Stratigraphy* -- in which all studies on refinement of biozonal schemes, sequence and cyclo-stratigraphy, stable isotope curve are combined.

### **Ordovician Subcommittee**

1. Publication of an Ordovician time table.
2. Refocusing of Subcommittee to address the global Ordovician Earth system.

### **Cambrian Subcommittee**

1. The principal objective of the Subcommittee over the next four years is the identification of the best horizons for establishing stage-level and series-level GSSPs within the Cambrian System.
2. All stages of the upper half of the Cambrian will be defined by GSSPs by 2012. Stages of the lower half of the Cambrian are expected to be defined by GSSPs by 2014.
3. Special symposium session on stages of the lower half of the Cambrian to be held at 34<sup>th</sup> IGC in 2012.
4. A secondary objective of the Subcommittee is to develop and publish regional correlation charts for the Cambrian.

### **Neoproterozoic (Ediacaran-Cryogenian) Subcommittee**

1. 2014 – approval of formal definition of the base of the Cryogenian System and subdivision of the Ediacaran into two or more series.

### **Precambrian Subcommittee**

1. A complete Precambrian time scale in place, with formalized Hadean and Archean eons.
2. Formal GSSP for the base of the Proterozoic.
3. Natural subdivisions of the Archean Eon, with GSSPs for each era-rank subdivision, where possible (Eo-, Paleo-, Meso-, and Neoarchean).
4. Creation and formal definition of an Eoproterozoic Era.
5. Full incorporation of latest insights from planetary science in the earliest part of the terrestrial Precambrian time scale. Compare and contrast the time scales of Earth with those of other planetary bodies, specifically the Moon and Mars.

### **International Stratigraphic Classification Subcommittee**

1. Publication of a new *International Guidebook* for stratigraphic classification printed in 2012. The book is conceived as a user friendly, simple, very well illustrated manual with schemes and color photographs full of real examples from various continents and from various parts of the stratigraphic column. It will consist of chapters on each major subdiscipline of stratigraphy, which were first published as separate papers in *Newsletters on Stratigraphy*.
2. Following Prague 2010-ICS Workshop, Subcommittee will prepare paper on “Suggestions to editors and authors on best practices in use of stratigraphic terminology”, which will include not only guidelines but also examples as a means of fostering consistent, correct usage.

**Stratigraphic Information Services**

1. Comprehensive book (*GTS2012*) and website that summarizes all aspects of global stratigraphy, inter-regional correlations, and estimated numerical ages.
2. Comprehensive and authoritative user-friendly time-scale charts (and plotting tools), GSSP databases, and stratigraphic software will make the ICS website a popular “one-stop-shopping” hub for global geoscientists, educators and the public.

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## APPENDIX I

### Prague 2010 International Commission on Stratigraphy Workshop (30 May - 3 June)

On May 30<sup>th</sup> The International Commission on Stratigraphy (ICS) held a workshop meeting in Prague attended by 53 stratigraphers from 20 countries. Attendees included officers of the 15 ICS Subcommissions, alongside scientists involved in all aspects of stratigraphic research. The prime focus of the meeting was the Global Stratotype Section and Point (GSSP) concept, but also included a range of discussions on stratigraphic concepts including the nature of time and rock stratigraphic nomenclature and the formalization of units for deep time.

GSSPs are specific successions of strata that have been chosen as standard references for the lower boundaries of the principle units of geological time (Stages, Series and Systems). The concept of the GSSP was introduced in the 1970s following extensive discussion on the best approach to reference standards for the geological timescale, and in particular standards for the boundaries of geological time. The first GSSP was established at Klonk (Czech Republic) for the base Devonian (and Lochkovian Stage) in 1972. Since then, 61 GSSPs have been formally ratified by ICS and IUGS, but 39 still remain to be formalised for the Phanerozoic. Although widely accepted as critical for the development of the geological time scale, in practise, the identification and implementation of GSSPs can be problematic for diverse reasons. Therefore, much of the first day of the workshop was devoted to reviewing and discussing the underlying principles of GSSPs and hearing accounts of successes, problems and solutions from across the geological timescale. There was general agreement that the GSSP program had been a great internationally driven success benefiting the science, practise and communication of global stratigraphy. The open, transparent methods of formal proposals, discussion, voting and ratification, give the process international legitimacy and the work should be valued and promoted as fundamental to our science. This task will remain a primary focus of ICS for the foreseeable future, but we should be aware of shortcomings and embrace rapidly developing stratigraphic fields such as isotope stratigraphy and astrochronology.

On Day Two the workshop turned it's attention to the controversial issues of dual stratigraphic nomenclature and the use of abbreviations for geological time. Both have surfaced as controversies in recent publications and the IUGS is currently looking at the use of Ma as a possible single abbreviation for both geological dates (e.g., 15Ma – the specific time 15 million years ago) and geological time more generally (e.g., the geological episode lasted for 15 Ma/million years). Jan Zalasiewicz (Leicester University) opened proceedings with an introduction to dual *versus* single stratigraphic nomenclature and questioned the need for specific terminology for both time (e.g. early and late) and rocks (e.g., lower and upper). Marie-Pierre Aubry (Rutgers University) presented arguments for the retention of both, and the meeting went on to an open and frank discussion of both positions. Next we addressed the abbreviation of 'millions of years' and Brian Pratt introduced the recent debate, sparked by the recommendation from the IUGS-IUPAC task group on isotope data, that Ma (Ga, ka) be the single abbreviation for measured dates and time duration, rather than My, Myr, etc. Marie-Pierre Aubry again stepped up to vigorously defend the need for both duration (Myr) and datum (Ma) usage, and again the floor was open for full and frank discussion. An informal vote of the meeting was close, but the single abbreviation Ma probably won the day.

Day three provided an opportunity to examine the stratigraphy of the Bohemian Basin in the person with two separate trip visiting older, Palaeozoic, and young, Mesozoic and Quaternary outcrops, but all united at days end to look at the first defined GSSP at Klonk. Torrential rain at Klonk slightly dampened our celebration of the GSSP project but the official toast was simply postponed until the next day.

The final day saw a presentation from an important ICS collaborator and major user of stratigraphic data, Philippe Rossi from the Commission for the Geological Map of the World. There was also further discussion of issues not covered in the previous days, including the formalization of substages. The full membership of the ICS met to summarize the main recommendations of the workshop and to have a preliminary vote on a number of the issues discussed. Overall, the workshop was a great success, which allowed discussion of important stratigraphic questions that ICS can now move forward with formalized recommendations. We owe a large vote of thanks to our hosts Petr Storch and Petr Kraft, who's organisation of logistics, science and social events was excellent.