



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

The subcommissions of ICS together have about 350 titular members. When the corresponding members of Subcommissions 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 Subcommissions and task group) and the other subcommission 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 subcommissions include at least 30 more nations.

Websites:

ICS main site	www.stratigraphy.org
Quaternary	www.quaternary.stratigraphy.org.uk
Neogene	www.geo.uu.nl/SNS
Paleogene	wzar.unizar.es/isps/index.htm
Lutetian GSSP task group	wzar.unizar.es/perso/emolina/ypresian.html
Cretaceous	www2.mnhn.fr/hdt203/info/iscs.php
Jurassic	http://jurassic.earth.ox.ac.uk/
Triassic	paleo.cortland.edu/sts/
<i>Albertiana</i> newsletter:	www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm
Permian (newsletter)	www.nigpas.ac.cn/permian/web/index.asp
Devonian	www.unica.it/sds/
Silurian	www.silurian.cn/home.asp
Ordovician	www.ordovician.cn
Cambrian	www.uni-wuerzburg.de/palaeontologie/ISCS/index.html
Neoproterozoic	www.stratigraphy.org/bak/ediacaran/
Precambrian	www.stratigraphy.org/bak/precambrian/
Stratigraphic Classification	http://users.unimi.it/issc
Stratigraphic Information Systems	http://stratigraphy.science.purdue.edu/
CHRONOS database	www.chronos.org
(<i>concept posted at:</i>)	www.eas.purdue.edu/chronos
<i>PaleoStrat</i> database network	www.paleostrat.org

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 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

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 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. 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 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 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 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 Furongian Series
 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 2011

Full Commission

- Rejuvenation of the ICS website was a major accomplishment after it was down for several months in 2010-2011. A new server had to be found, and the webmaster dedicated many hours to bringing it up-to-date.
- Dedication of the GSSP the base Hettangian Stage and thus the Triassic-Jurassic boundary.
- Ratification of the GSSP for the base of the Lutetian Stage (Eocene Series) by the IUGS EC.
- Revisions of the GSSP proposal for the base Santonian Stage so that it could be reconsidered for approval by ICS (vote in progress).
- Approval by ICS and Ratification by the IUGS EC of the GSSP proposal and name of the Jiangshanian Stage (Furongian Series, Cambrian System).
- Posting of the Ordovician Chronostratigraphic Chart and the Ordovician carbon isotope curve on the ICS webpage.
- Posting on the ICS webpage of a new version of the stratigraphic poster for the last 2.7 Ma and of a new poster for the last 270 ka prepared by the Quaternary Subcommittee.
- Approval by ICS of the name “Calabrian” for the second stage of the Pleistocene Epoch (Quaternary System).
- Attendance by the ICS Chair at Siluria Revisited: an international symposium of the Silurian Subcommittee with the purpose of inspecting six GSSPs for Silurian stages that need reconsideration.
- Attendance and presentation of a paper by the ICS chair at the 11th International Symposium on the Ordovician System.
- Attendance and presentation of a paper on ICS and GSSPs by the ICS Chair at the 14th Latin American Geological Congress.
- Attendance of ICS secretary-general at the following meetings: EU Earthtime Plankton stratigraphy meeting, Barcelona; Climate and Biota of the early Paleogene, Salzburg; Cretaceous plankton stratigraphy workshop, London; EU Earthtime Plankton stratigraphy meeting, Varna (Bulgaria); and AGU Fall Meeting, San Francisco.

- Publication of “Sequence Stratigraphy: Methodology and Nomenclature” as part of the series of papers on subdisciplines of stratigraphy organized by the Subcommittee on Stratigraphic Nomenclature.
- Responded to media requests for interviews with the ICS Chair on the Anthropocene.
- Organization of a workshop on establishment of GSSPs for the Precambrian at the Annual Meeting of the Geological Society of America.
- Planning of thematic sessions and field excursions sponsored by ICS and some of its subcommissions for the 34th IGC.
- Development and implementation of a SmartPhone application with the ICS International Stratigraphic Chart.
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Quaternary Subcommittee

- The working group on the Lower-Middle Pleistocene boundary continues to evaluate three candidate stratotype sections.
- Preparation of a GSSP proposal on the “Tarentian Stage”, the base of which would also serve as the Middle-Upper Pleistocene boundary.
- The Anthropocene Working Group published a thematic issue of the *Philosophical Transactions of the Royal Society of London, Series A* on *The Anthropocene – a new epoch of geological time?* Furthermore, a successful meeting held at the Geological Society of London received extensive media attention. A panel discussion on the Anthropocene was held at the Annual Meeting of the Geological Society of America with the ICS Chair participating as a panel member.
- Approval by ICS of Calabrian as the name of the second stage of the Pleistocene with proposal forwarded to the IUGS EC for ratification.
- The Subcommittee website continues to be expanded at: <http://www.quaternary.stratigraphy.org.uk> This site is used as the main form of communication for the Subcommittee, and it continues to be sponsored by the *Journal of Quaternary Science* and *Boreas*.
- Production of a new version of the stratigraphic poster for the last 2.7 Ma and of a new poster for the last 270 ka.

Neogene Subcommittee

- Integrated high-resolution magnetostratigraphic and plankton biostratigraphy completed at two candidate stratotype sections for the base of the Langhian Stage: La Vedova beach in northern Italy and St. Peter’s Pool in Malta. Astronomical tuning of the sections is now in progress.

Paleogene Subcommittee

- *Episodes* article on the GSSPs for Selandian and Thanetian stages is in press.
- Ratification by the IUGS EC of the base-Lutitian GSSP at the Gorrondatxe section, Spain.
- Extensive research completed on the base-Priabonian Stage GSSP candidate at the Alano section, Italy; GSSP proposal in preparation.
- Formal proposal for GSSP for base-Chattian Stage in preparation.
- Working Group on Paleogene Planktonic Foraminifera held meeting at Smithsonian and is nearly completion of the *Atlas of Oligocene Planktonic Foraminifera*.

- Working Group on Paleogene Calcareous Nannofossils is greatly revising the taxonomy of several important groups and developing an online taxonomic resources for them.
- Regional Committee on North-European Paleogene Stratigraphy

Cretaceous Subcommittee

- The working group on the Jurassic-Cretaceous boundary and the Berriasian-Stage GSSP made considerable progress with a workshop in Sofia, Bulgaria that included study of a candidate stratotype section. Activity of the working group has increased rapidly as well as the number of active participants with intense new studies being carried out in sections in 17 countries on all continents but Antarctica.
- Base-Santonian Stage GSSP was revised following review by ICS and is now before ICS again for approval.

Jurassic Subcommittee

- Dedication of the base-Jurassic (Lower Jurassic, Hettangian) GSSP.
- Preparation of GSSP proposal for base-Toarcian Stage largely completed.
- 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

- Special Symposium on the Triassic in commemoration of Edward Tozer at 21st Canadian Paleontological Conference.
- 8th International Field Workshop on Triassic in southeast France.
- Extensive sampling completed of sections in the Salt Range and Himalayas of Pakistan and India, respectively, that are candidates for the base-Olenekian Stage GSSP.
- Test of correlation of GSSP for base-Rhaetian Stage GSSP was successful, and preparation of formal proposal underway.

Permian Subcommittee

- Proposal for base-Sakmarian Stage GSSP at Usolka section, Russian is in final stages of preparation.
- Base-Artinskian Stage GSSP proposal in being written.
- Extensive studies of conodont biostratigraphy of Rockland section (Nevada, USA) were completed as a step in final preparation of a GSSP proposal for the base-Kungurian Stage.

Carboniferous Subcommittee

- International Congress on the Carboniferous and Permian held in Australia, July 2011.
- Field meeting in southern Urals, Russia, August 2011.

Devonian Subcommittee

- SDS Annual Business Meeting and field excursions, Novosibirsk, Russia, July 2011.
- Resampling completed at Zinzilban section necessary for re-evaluation of base-Emsian Stage GSSP.
- Taxonomic studies for conodont lineages critical for re-definition of the Devonian-Carboniferous boundary completed in 2011 with additional studies of conodont biostratigraphy ongoing in Morocco, Moravia, and Russia.

Silurian Subcommittee

- The International Symposium on the Silurian System “Siluria Revisited” was held in Ludlow, England in July 2011. The field excursions provided the opportunity to examine long-established GSSPs for six stages and to reach the consensus that all needed reconsideration.
- Working groups established for GSSPs for Wenlock and Ludlow Series.
- Publication in *Lethaia* of proposed, informal subdivision of Silurian time scale into time slices and correlation into it a carbon isotope curve for the Silurian and as well as the regional stages of North America.

Ordovician Subcommittee

- The 11th International Symposium on the Ordovician System was held in Alcalá de Henares, Spain in May 2011.
- Launched an effort to produce revised regional correlation charts.
- Considerable progress made on a carbon isotope curve for the Ordovician.
- Established collaboration with the StarPlan group in Copenhagen, a geochronology laboratory to promote the acquisition of more, robust numerical dates for the Ordovician.

Cambrian Subcommittee

- The 16th International Field Conference was held in June 2011 in Arizona and Nevada, USA.
- The name and GSSP for the Jiangshanian Stage with the stratotype at Buibian, Zhejiang, China was approved by ICS and ratified by the IUGS EC.
- 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.
- The Subcommittee considered it necessary to find a practical solution to resolve imprecise correlation of the GSSP that defines the base of the Cambrian System (Paleozoic Erathem and Phanerozoic Eonthem).

Neoproterozoic (Ediacaran and Cryogenian) Subcommittee

- An international conference on Neoproterozoic sedimentary basins and a Neoproterozoic subcommittee workshop on Ediacaran paleobiology was held in Novosibirsk,
- Subcommittee voted to divide into separate kEdiacaran and Cryogenian subcommittees to enable each to concentrate on separate issues of correlation, subdivision, and proposals for GSSPs.

Precambrian Subcommittee

- Presentation and Workshop at the Annual Meeting of the Geological Society of America on the proposed plan for revising the Precambrian timescale.

Stratigraphic Classification Subcommittee

- Publication in *Newsletters on Stratigraphy* of “Sequence Stratigraphy: Methodology and Nomenclature” as a part of the ISSC Series on the subdisciplines of stratigraphy.
- Manuscript on Chronostratigraphy for publication in *GSA Today* neared completion.

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 2011

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.
- Budget allocation seriously limits participation of voting members at business meetings and field meetings of subcommissions, which is necessary for progress on GSSPs.
- Budget allocation allows almost no travel support for stratigraphers from under-represented countries to participate in activities of subcommissions.
- ICS website needs the services of a webmaster who is always attentive to update requests.
- Some boundary task group leaders inactive; some boundary task groups need rejuvenation.
- Role of Stratigraphic Information group within structure of 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.

- End of support from IGCP 467 and soon to end support from IGCP 572.

Permian Subcommittee

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

Carboniferous Subcommittee

- None mentioned
- Annual Report not submitted

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, Argentina, Turkey, and Caucasian countries.

Silurian Subcommittee

- 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.
- Challenging logistics have caused difficulties in organizing a formal subcommittee excursion to Svalbard.
- 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 2011:

The ICS Executive established the following budget for April 2011 – March 2012 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.

ICS Budget April 2010-April 2011

	Recommended to IUGS Jan'09	Final ICS Allocation
Quaternary	650	500
Neogene	1350	1500
Paleogene	6264	3000
Cretaceous	6197	4000
Jurassic	2600	2600
Triassic	3300	3000
Permian	5000	3000
Carboniferous	1800	1800
Devonian	2000	2000
Silurian	10000	3500
Ordovician	4000	3000

Cambrian	8000	3500
Ediacaran	3300	3000
Precambrian	4900	3000
Classification	5000	2500
Strat. Info. System	2000	1500
Subcommission Total	66,361	41,400
ICS Workshop funds	0	0
Special travel needs	5000	4000
ICS Executive	5000	4450
TOTAL (in USD)	76,361	49,850

50,000
allocated from
IUGS

10. WORK PLAN, CRITICAL MILESTONES, and ANTICIPATED RESULTS TO BE ACHIEVED FOR March 2012-February 2013:

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.
- Encourage recruitment of under-represented group, particularly young workers, to ICS subcommissions.
- 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.
- Initiate plans to produce a new version of the *International Stratigraphic Guide*.
- Preparation of ICS-sponsored symposia, activities and subcommission meetings and an ICS workshop for the 34th 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 regularly.
- A permanent archive of global standards (GSSPs and the International Chronostratigraphic Chart) must be established.
- Fund work of Silurian Subcommittee to re-examine GSSPs for all Silurian stages.
- Establish new Ediacaran and Cryogenian subcommissions.
- 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 34th IGC.

Quaternary Subcommittee

- Formalize GSSPs for the Lower/Middle and for the Middle/Upper subseries/subepoch boundaries of the Pleistocene Series/Epoch.
- The Working Group on the Pleistocene-Holocene Boundary will change focus to examine the possibility of defining formal subdivisions for the Holocene.
- The subcommittee will continue to 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.
- Prepare standardized regional correlation charts and paleogeographic maps by the Regional Committees.
- Support the organization of the Ninth International Workshop on Agglutinated Foraminifera, Zaragoza, Spain, September, 2012.
- Present an updated version of an integrated Paleogene time scale.
- Produce a state-of-the-art review of the stratigraphic tools used in the Paleogene.

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 8th and 9th meetings of the Berriasian Stage (Jurassic/Cretaceous boundary) working group in Tunisia and Russia.
- Preparation of Aptian Stage GSSP.

Jurassic Subcommittee

- Completion of the GSSP proposal for the Peniche section, Portugal for the base of the Toarcian Stage and a vote for approval by the subcommission..
- 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 Subcommission

- International Field Workshop on Triassic, Italy and Switzerland, September, 2012.
- Organization of several sessions on the Triassic at the 29th meeting of the International Association of Sedimentology.
- Geological Society of America Annual Meeting – Pardee symposium on Triassic stratigraphy.
- Vote on a GSSP proposal for the base-Olenekian Stage GSSP.
- Vote in the Task Group on the base-Rhaetian Stage GSSP.

Permian Subcommission

- Subcommission votes on base-Sakmarian and base-Artinskian.
- Workshop on base-Kungurian Stage GSSP in Boise, Idaho, USA in June 2012.

Carboniferous Subcommission

- Field meeting in southern Urals to examine Kardailovka GSSP candidate for base-Serpukhovian Stage GSSP.

Devonian Subcommission

- Manuscript on Givetian and Frasnian substages.
- New sampling campaign for the revised base of Emsian Stage in Kitab Reserve, Uzbekistan.
- Update of website and publication of SDS Newsletter 27 for subcommission.
- Continuing work on Devonian-Carboniferous boundary problem.
- Formal vote on uppermost Famennian substage.

Silurian Subcommission

- Reconsider GSSP for Aeronian Stage, and Wenlock and Ludlow series.
- 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 issue of Bulletin of Geosciences arising from papers presented at the Silurian Symposium.
- Collaborate as a key partner in IGCP 591 – The Early to Middle Paleozoic Revolution with meetings at the EGU General Assembly, Vienna, Austria, April 2012, and the annual IGCP 591 meeting in Cincinnati, Ohio, USA, July 2012.

Ordovician Subcommission

- Regional teams initiate 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 sealevel curves and to compile paleogeographic maps for the Ordovician System.
- Re-design website.

Cambrian Subcommittee

- 17th Cambrian Stage Subdivision Working Group conference in Guiyang, Guizhou, South China, August 2012.
- Planning Cambrian System session at IGC.
- Completion of GSSP proposal and recommendation of name for base of Stage 5.
- Reconsider GSSP for base of Cambrian System (Paleozoic Erathem, Phanerozoic Eon).

Neoproterozoic (Ediacaran and Cryogenian) Subcommittee

- Formally divide the Neoproterozoic Subcommittee into separate Ediacaran and Cryogenian subcommittees.
- Planning for symposium and theme sessions and field excursion at 34th IGC.
- An international meeting titled “The Neoproterozoic Era: evolution, glaciations and oxygenation” will be held as a Rermor meeting of the Geological Society of London, September 2012.

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 34th IGC.
- Establish active working groups for chronostratigraphic definition and subdivision of the Archean and Proterozoic.

Stratigraphic Classification Subcommittee

- Initiate discussions on producing new edition of *International Stratigraphic Guide*
- First drafts of papers on Biostratigraphy, Chronostratigraphy, and Lithostratigraphy will be completed and distributed for review.

Stratigraphic Information Task Group

- Enhance TimeScale Creator.
- Recruit adequate number of active, contributing voting members necessary to be considered for subcommittee status.

11. BUDGET REQUEST TO IUGS FOR 2012 (\$ US)

The following budget request is for operations and special initiatives through March 2013 (funds are generally transferred from IUGS to ICS in April; which implies ICS subcommittees must operate on an April-to-March fiscal year).

	Allocated budget 2011 (USD)	Subcomm. budget requests 2012 (USD)	minus ICS funding	Subcomm. IGC funding 2012 (USD)	plus ICS funding	Comments, etc.
						17
Quaternary	500	472.00	472.00	2500.00	2972.00	working groups, meetings
Neogene	1500	5383.00	5383.00	2500.00	7883.00	2 workshop, 1 mtg
Paleogene	3000	4980.00	4980.00	2500.00	7480.00	website, travel, groups
Cretaceous	4000	8816.00	8816.00	2500.00	11316.00	2 base Cretaceous mtgs + IGC
Jurassic	2600	3000.00	3000.00	2500.00	5500.00	2 Stage workshop meetings + meeting funds
Triassic	3000	6000.00	500.00	5500.00	6000.00	mostly IGC
Permian	3000	7000.00	7000.00	2500.00	9500.00	workshop - unspecified
Carboniferous	1800			2500.00	2500.00	
Devonian	2000	4500.00	500.00	4000.00	4500.00	mostly IGC
Silurian	3500	9500.00	9500.00	2500.00	12000.00	2 stage workshops + IGC
Ordovician	3000			2500.00	2500.00	
Cambrian	3500	8100.00	8100.00	2500.00	10600.00	workshop
Neoproterozoic	3000			2500.00	2500.00	
Precambrian	3000	2600.00	0.00	2600.00	2600.00	IGC workshop + IGC fieldtrip?
Classification	2500			2500.00	2500.00	
Strat. Info. System	1500	3250.00	1000.00	2250.00	3250.00	IGC + diverse activities
Submissions Total	41,400	63,601	49,251	44,350	93,601	
ICS Workshop funds	0	0	0	0	0	
Special travel needs	4000	7500	7500	7500	7500	
ICS Executive	4450	5000	5000	0	5000	
TOTAL (in USD)	49,850	76,101	61,751	51,850	106,101	

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 **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 **Turonian** Stage at Pueblo, Colorado, USA (2003)
15. base of the **Cenomanian** Stage and of the **Upper Cretaceous** Series, at Risou, France (2002)

Jurassic

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

Triassic

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

Permian

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

Carboniferous

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

Devonian

30. all Devonian stage boundaries are defined by a GSSP
31. 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

32. 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.
33. 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

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

Cambrian

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

Proterozoic Era

46. 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 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.

13. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2012-2017)

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. 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. Encourage the recruitment by subcommissions of members from under-represented countries/regions.
4. Promote the preservation of GSSPs by local communities and national stratigraphic commissions.
5. 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.
6. Have a strong presence at the 34th IGC in 2012 with exciting symposia, varied field excursions, business meetings, and other activities sponsored by ICS and its subcommissions, and hold a ICS workshop..
7. Develop a suite of web-accessible international databases on all aspects of chronostratigraphy (paleontology, isotopes, cycles, magnetics, etc.).
8. Produce a new edition of the **International Stratigraphic Guide**.
9. Maintain close collaboration with all national stratigraphic commissions.
10. 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.
11. Serve as the primary international body setting global standards and illustrating best practices in stratigraphy.
12. Produce web-based educational materials ranging from introductory to advanced topics in stratigraphy.

13. 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 Subcommittee

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.
5. Investigation of the need and potential value in establishing the term Anthropocene.

Neogene Subcommittee

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 Bartonian (2013), Priabonian (2012), 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. Approval of proposals for the bases of the Albian and Stage in 2012, and of the Valanginian, Hauterivian, Barremian, Aptian, Coniacian, and Campanian stages by 2013.
2. 2013 - Finalize proposal for the base of Berriasian (Jurassic/Cretaceous boundary).
3. 2015 to 2017 – Define substages.

Jurassic Subcommittee

1. 2012-2015 - 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: 2012 – Olenekian, Anisian, and Rhaetian; 2013 –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 with voting in 2012 on proposals for the Sakmarian, Artinskian and Kungurian stage.
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 in 2012-2012 of GSSPs for the following stage: Serpukhovian, Moscovian, Kasimovian, and Gzhelian.
2. Consider and finalize subdivision of Viséan into two new stages by 2014.
3. Selection of a new GSSP for the Devonian-Carboniferous boundary.

Devonian Subcommittee

1. Formalize the substage subdivision of stages.
2. Selection of a new GSSP for the Devonian-Carboniferous boundary.
3. Resolution of the GSSP for the base of the Emsian Stage.

Silurian Subcommittee

1. Restudy of six GSSPs that are difficult to use for global correlation; those of the Aeronian, Telychian, Sheinwoodian, Homerian, Gorstian and Ludfordian stages and Wenlock and Ludlow series.
2. *Integrated Silurian Stratigraphy* -- in which all studies on refinement of biozonal schemes, sequence and cyclo-stratigraphy, stable isotope curve are combined.
3. Silurian field meeting in Lund, Sweden, 2012.

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.

Cambrian Subcommittee

1. 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.
2. Special symposium session on stages of the lower half of the Cambrian to be held at 34th IGC in 2012.
3. A secondary objective of the Subcommittee is to develop and publish regional correlation charts for the Cambrian.

Neoproterozoic (Ediacaran-Cryogenian) Subcommittee

1. 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 Neoproterozoic).
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 2013. 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. Production of a new edition of the **International Stratigraphic Guide**.

Stratigraphic Information Services

1. 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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