



INTERNATIONAL UNION OF GEOLOGICAL SCIENCES
INTERNATIONAL COMMISSION ON STRATIGRAPHY

CHAIR

Prof. Felix M. **GRADSTEIN**, Museum of Natural History, Univ. Oslo, P.O.Box 1172 Blindern, N-0318 OSLO, NORWAY
TEL +47-22-851663 office; +47-67-540966 home; FAX +47-22-851832; E-mail: *felix.gradstein@geologi.uio.no*

VICE-CHAIR

Prof. Stanley **FINNEY**, Dept. Geological Sciences, Long Beach, CA 90840, USA
TEL +1-562-985-8637 office; FAX +1-562-985-8638; E-mail: *scfinney@csulb.edu*

SECRETARY-GENERAL

Prof. James **OGG**, Dept. Earth & Atmos. Sci., 550 Stadium Mall Dr., Purdue University, West Lafayette, IN 47907-2051, USA
TEL +1-765-494-8681 office; +1-765-743-0400 home; FAX +1-765-496-1210; E-mail: *jogg@purdue.edu*

10 December 2006

International Union of Geological Sciences
International Commission on Stratigraphy (ICS)
CONSOLIDATED ANNUAL REPORT
FOR 2006

Compiled by Felix M. Gradstein, *chair*, and James G. Ogg, *secretary-general* of ICS
Oslo (Norway) and West Lafayette (USA)

This ICS Consolidated Annual Report for 2006 has several portions:

- The executive summary, with two main parts:
- **Items 1 - 8** summarize the current goals and scientific activities of the Commission and its component Subcommissions.
- **Items 9 - 13** detail the plans for 2007 and associated budget, and a multi-year overview of achievements and future goals.
- An updated list of officers of all ICS subcommissions
- The detailed reports of each individual Subcommission.
- An Appendix of ICS-sponsored Symposia and other activities for the 33rd IGC.

A separate attachment to this annual report is the latest version of the International Stratigraphic Chart.

As ICS explained in the 2005 annual report, several longer-range issues have been active topics of discussion in 2006. These include:

- A distinct role of a '*Bureau of Standards*' to preserve and communicate our GSSPs and other stratotypes, and to start to more actively focus on intra-stage standardization.
- Councilors for regional contacts, and improved coordination with INQUA and IODP, and with the radiogenic isotope (EarthTime) community.
- Special projects section of ICS to collaborate with national Geologic Surveys, Industry, BRGM and Geology Sections in Academies of Sciences and the '**INTERNATIONAL YEAR OF PLANET EARTH**'. In particular, for the *International Year of Planet Earth*, ICS is compiling a popular-level booklet on the modern geologic time scale and an accompanying school-level poster on Earth's history.
- Favored status for two journals: *Episodes* for news, forum, GSSPs, etc., and the appropriately named, *Stratigraphy*, for major science items.
- An "International Association of Stratigraphic Geologists" that would have a complementary role to ICS in Earth history activities and promotion. The latter is preparing its founding meeting.

New on the long-term agenda are:

- Extension of the long term collaboration with several dozen specialists to create *Geologic Time Scale 2008 - 2010*, that (for the first time) will be in interactive digital format.
- Co-sponsorship of the '*Concise Geologic Time Scale*' to be published in mid 2008.
- Further programming and standard data loading with the globally popular *TimeScale Creator* program, that allows to quickly build custom bio-magneto-isotope-sequence-chronostratigraphic charts for any interval of time. A professional *Pro* version is under development.
- An oversight committee to assist with critical issues in GSSP planning and execution.

On the financial side, we already explained at the IUGS-review in Paris that present funding levels (especially the 25% reduction that was incurred between 2004 and 2005 in just the basic "operating" support) to ICS are insufficient, and greatly slow down the planned and projected GSSP completion in 2008. Several of the subcommissions have vividly complained about these cutbacks (*see excerpts in Part 7 of the Annual Report*). We have aggressively pursued other sources of funds for our ICS-wide projects, but it is important that the "core IUGS support" be returned to pre-2005 levels or higher.

We kindly request that IUGS considers our 'bare bones' 2006 budget of \$40K to be the 'bare bones' for 100% funding. This amount already represents nearly a 50% reduction in the modest budgets submitted by our component subcommissions (*detailed in Part 10*). In addition, INQUA has requested that IUGS support ICS participation at their Congress in Sept 2007 in Australia to establish a useful global subdivision and nomenclature for the Quaternary interval; therefore, a special \$5K travel fund is needed. The total request is **\$45K**; which, before special items and inflation is the same level of funding as in 2003 and 2004.

With best regards

Yours Sincerely

Felix M. Gradstein *and* James G. Ogg

International Commission on Stratigraphy (ICS)

1. TITLE OF CONSTITUENT BODY

International Commission on Stratigraphy (ICS)

Submitted Jointly by:

Felix GRADSTEIN [ICS Chair]

Museum of Natural History, University of Oslo
P.O. Box 1172 Blindern, N-0318 Oslo, Norway
Tel: 47-22-851663 (home tel. 47-67-540966); Fax: 47-22-851832;
E-mail: felix.gradstein@nhm.uio.no

James OGG [ICS Secretary-General]

Dept. Earth and Atmospheric Sciences, Purdue University, 550 Stadium Mall Drive, West Lafayette, Indiana, 47907-2051, USA.
Tel: 1-765-494-8681 (off.), 1-765-494-0257 (lab); Fax: 1-765-496-1210, Home tel: 1-765-743-0400;
e-mail: jogg@purdue.edu

November, 2006

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

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 world-wide
- 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 14 Subcommissions that deal with the major chronostratigraphic units and aspects of stratigraphic classification and time scales.

Subcommissions:

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

In addition, there is an *Executive Task Group*: Stratigraphic Information Services

The reports of each Subcommittee 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 tries to establish or maintain contacts. The members of the Full Commission (i.e. the 3 members of the Executive + webmaster and the officers of the 15 Subcommittees and task group) come from 21 countries: Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Great Britain, Ireland, Italy, Morocco, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Spain, Sweden, and USA. The voting memberships of the aggregate subcommittees 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
Jurassic	www.es.ucl.ac.uk/people/bown/ISJSwebsite.htm
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/
Link to Permian research:	www.geo.ucalgary.ca/asrg
Devonian	sds.uta.edu/
Silurian	www.silurian.cn/home.asp
Pre-2005 newsletters	iago.stfx.ca/people/mmelchin/SILURIAN.HTM
Ordovician	www.ordovician.cn
GSSP discussion site	seis.natsci.csulb.edu/ISOS
Cambrian	www.uni-wuerzburg.de/palaeontologie/ISCS/index.html
Precambrian	www.stratigraphy.org/precambrian
Stratigraphic Classification	www.geocities.com/issc_arg (commercial site, which will be moved to www.stratigraphy.org)
Stratigraphic Information Systems	
Main site	www.stratigraphy.org
CHRONOS database network	www.chronos.org
(concept posted at:)	www.eas.purdue.edu/chronos
PaleoStrat database network	www.paleostrat.org

ICS Officers for 2004-2008:

(1) ICS Executive

Chair: **Felix Gradstein** (Oslo, Norway) *is serving a second and last term*

Vice-Chair: **Stanley Finney** (California, USA) *is serving a second and last term*

Secretary (*appointed by Chair*): **James Ogg** (Indiana, USA)

The next IGC organizing committee may want to appoint a 4th executive (Vice-Chair at large) to assist the myriad of national and international tasks.

(2) ICS Subcommission officers

All subcommissions had changes in their officers and memberships during 2004, with new chairs being selected for the majority. Those subcommissions with re-elected chairs who will serve a second (and last) term are: Quaternary, Jurassic, Carboniferous, Silurian, Precambrian and Stratigraphic Classification.

A full listing of all 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 distributing charts of the Geologic Time Scale 2004 and placing this information onto public websites, receive some support from petroleum companies (e.g., GTS2004 chart printing) 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. In particular, the majority of the extensive ICS-related travel by Dr. Gradstein, the ICS chair, is reimbursed from his research grants or home institution.

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

ICS has an active link to the NSF (Washington) scientific database initiative for Earth history called “*CHRONOS*”, and to the International Association for Mathematical Geology (*IAMG*).

ICS subcommissions are traditionally affiliated with a considerable number of IUGS and IGCP activities. Details of these are given in each subcommission’s annual reports.

ICS members maintains active links with international research groups, including The (British) Micropaleontology Society, the North American Micropaleontology Society, and the Association of American Stratigraphic Palynologists, and international paleontological research

groups on Graptolites, Conodonts, Ammonites, Radiolarians (Interrad), Nannofossils, Foraminifers, etc.

There are close links of many ICS stratigraphers with the International Ocean Drilling Project (IODP). The latter is presently undertaking a major re-organization with focus on ultra-deep drilling using riser systems (in Japan 's subduction zones), non-riser high-resolution grid drilling, riser and non-riser continental margin drilling, and mobile platform Arctic Ocean drilling (the last major stratigraphic frontier, for which an initial successful drilling campaign occurred during 2004). 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.

6. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2005

The following are a few highlights of the numerous activities of the ICS Full Commission and the detailed reports of each subcommission. See the individual subcommission reports for details.

Full Commission

The Executive notes with satisfaction that ICS is a rather stable organization with a dedicated and loyal membership and with good coherence, which leads to fruitful scientific and educational developments. Through its website, ICS has become a well-known brand name for authoritative stratigraphic information. The Executive seeks to maintain this energy and momentum of this truly global organization during 2007 and beyond (*see section on new initiatives*).

The following is a partial summary of achievements during 2006:

- ***Ongoing standardization of the International Chronostratigraphic Scale***
 - Approval and ratification of the GSSPs for the Serravalian, Toarcian, Middle Ordovician, 6th stage (Drumian) of Cambrian.
 - ICS proudly announces that the scientifically and politically complex task of standardizing the international Ordovician Chronostratigraphic scale is essentially complete, with only one single stage needing selection. At the same time the Cambrian is following suite and achieving much needed clarity and much improved resolution. The managing officers, and participating officers of the Ordovician and the Cambrian Subcommissions, and not least the vice chair of ICS, Dr. Stan Finney deserve much compliments for these prominent scientific achievements.
 - To ensure broader stratigraphic standardization, closer cooperation is being executed with the CGMW (World Geological Map) in Paris. ICS is helping CGMW's drive to establish a single global colour scheme for all chronostratigraphic charts, thus simplifying map and chart (re-)productions.
 - Close cooperation is underway with the journal 'Geoarabia', and its editors, that in an Open Letter to this journal we have called 'The Best Stratigraphic Journal' in the World. The Journal actively publishes superb stratigraphic articles on a wide range of petroleum

related Georabian topics, many executed in classic stratigraphic style, closely adhering to the international standards. The journal actively promotes the ICS stratigraphic chart and other products, and keenly follows ICS's lead.

- A JAVA package "***Time-Scale Creator***" was unveiled on the ICS website. The software incorporates a database of over 15000 biostratigraphic, magnetic and geochemical datums and zones that are tied to the Geologic Time Scale 2004 age-model. The package enables both on-screen visualization of user-selected time intervals (with choice of columns to display, etc.) and downloading of final publication-quality charts for printing. Future versions with enhance databases and plotting capabilities are underway, including a version for professionals, '*TSCreator Pro*' that will be licensed by a third party.
 - Special Symposium in September 2006 on '*Astronomical Tuning of the Geologic Time Scale*', in Liege, Belgium, at the Annual International Association of Mathematical Geology (IAMG) Conference. This special symposium of the International Commission on Stratigraphy in collaboration with IAMG focuses on present status, new applications, and problems and challenges in cycle tuning of the geologic record and calibrating the next-generation Geologic Time Scale
- ***New initiatives in organization, publication and outreach***
 - Strategic planning, especially the role of ICS in the post-GSSP (after 2008) period, is moving ahead. The ICS had a role in such a planning conference (Penrose) in Graz, Austria, chaired by Werner Piller.
 - Over 20 lectures were given by the executive on ICS achievements and prospects, incl. GTS2004 and beyond at geosocieties, national and international conferences, and stratigraphic shortcourses in over a dozen countries.
 - ***Selected Major Products under ICS Executive***
 - ICS is extending its longterm collaboration with several dozen specialists to create *Geologic Time Scale 2008 - 2010*, that (for the first time) will be in interactive digital format. Cambridge University Press and the GTS editors are actively planning this ambitious and prestigious digital stratigraphic project.
 - ICS is co-sponsoring publication of '*The Concise Geologic Time Scale*' handbook by Ogg et al., This 100 page handy and cheap full-color booklet to appear mid 2008 as part of ICS's contribution to the **INTERNATIONAL YEAR OF THE PLANET EARTH**.
 - ICS is assisting revision of the Offshore Norwegian Lithostratigraphy (NORLEX; <http://norges.uio.no>), and nearing completion.
 - The 2004 book '*A Geologic Time Scale 2004*', Cambridge University Press, co-sponsored by ICS received the Mary B. Ansari Best Reference Work Award of the Geoscience Information Society (GSIS). The award was presented at the Geological Society of America 2006 Annual Meeting and Exposition in Philadelphia. The chair of ICS, Dr. Alan Smith and senior publisher of Cambridge University Press, Dr. Matt Lloyd attended the ceremony.
 - It may be of interest to list the **Geologic Time Scale** A3 linear chart, wall chart, laminated card and standard (landscape) chart products sponsored by ICS since 1996, with over 50000 copies physically distributed. Laminated GTS cards, and/or A3 size linear GTS chart amongst others have been produced or distributed by

Episodes (IUGS)	Shell	Encyclopedia Britannica
Saga Petroleum	DNO	Wiley Publishing
RWE-DEA	Museum of Natural	Freeman Publishing
Statoil	History Oslo	Electronic Geologic
Chevron	CGMW	Encyclopedia
Exxon	<i>CHRONOS</i>	

And several newsletters of national geoscience organizations, incl. KNGMG, BGS, GSC etc.

- A three-person task force (Pillans, Heckel, Tesakov) was proposed to gather scientific input on an appropriate global (land, sea) set of useful divisions and hierarchy for the Late Cenozoic. There has been ongoing confusion in some circles on the historic background, achieved ratification and definition of terms like Neogene, Quaternary, Tertiary, Pleistocene, Gelasian, etc. It seems most appropriate to adopt the time-span of the term Quaternary as utilized by INQUA; but the overlapping array of other divisions need to be established from first-principles, rather than trying to force to past historical or popular precedents.
- Special scientific assistance to the Orbital Tuning stratigraphic community to accomplish a better GTS. An excellent international workshop/symposium on this hot topic was conveyed at the occasion of the 6th Congress of the International Association of Mathematical Geology in Liege, Belgium. Presentations by Hinnov, Ogg, Gradstein, Hilgen, Lourens, Weedon, Palike, Laskar and others were well attended and much debated. Blueprints for orbital tuning of most of the Cenozoic and also Mesozoic unfolded.
- In 2007, ICS will co-sponsor a quantitative stratigraphy workshop and symposium at the Institute of Land and Resources Information System of the China University of Geosciences, Wuhan, China.

IUGS Ad Hoc Review of ICS activities

During spring of 2006, there was a formal IUGS review of ICS, which lauded the range of activities and accomplishments. There were some specific recommendations that are being incorporated by ICS during the coming year:

- *International Stratigraphic Guide* revision procedures for new editions should be clarified; in addition to several other recommendations for the Stratigraphic Classification subcommission.
- The election of ICS officers should have a Nominating Committee that does not include any ICS subcommission chairs. This will be a ballot measure in the new year.
- ICS publications should be distributed through IUGS arrangements with a specific publishing house, when this is practical (*and not causing problems with free open access or excessive costs for users*).
- Descriptions of GSSPs should include clear specifications of all the elements used in their definitions and their applicability. This implies that new GSSP proposals should include a full database appendix for the different stratigraphic methods; and ICS (with NSF financial support) has archived this raw data for all existing GSSPs on the *CHRONOS* and *PaleoStrat* public websites for stratigraphic information.
- Typological definitions of standard chronostratigraphical units by means of boundary stratotypes, such as Stage GSSPs, should be extended downwards, below the Stage level in the hierarchy. Therefore, standardized substages are being pursued by some of the ICS

subcommissions; although achieving a full GSSP-defined geologic scale at the stage-level is the current ICS priority.

Color of International Divisions of Geologic Time

The International Commission for the Geologic Map of the World (CGMW) in Paris is responsible for standards in geologic maps, including the colors assigned to represent lithologic units of a certain age. Until late 2006, the standard colors were only to the Series (Epoch) level. ICS has worked with CGMW to achieve a systematic system for stage-level color system for higher-resolution geologic maps. This improved color scheme is now used on the ICS chart of “International Divisions of Geologic Time” that is posted at our www.stratigraphy.org website.

Quaternary Subcommission (jointly with INQUA)

- ICS and INQUA agreed that the Quaternary, as currently used by active Quaternary researchers, began at 2.6 Ma (approximately equivalent to base of Gelasian stage of upper Pliocene), and should become a formal unit of the international geologic scale. The request to establish a Quaternary at this level with sub-era ranking (which allowed a preceding Tertiary sub-era) was submitted to INQUA/IUGS. INQUA agreed in principle (indeed, this sub-era placement was originally proposed by their executive in 2005). However, the IUGS executive indicated that neither this basal age nor a sub-era ranking that was offset from lower-ranked units was acceptable; therefore, the “status-quo” of non-ranked Quaternary (as ratified by IUGS in 1985) should be adhered to. However, for now, ICS is showing the preferred INQUA usage of Quaternary (and a Tertiary) on its posted time-scale charts, but with a footnote indicating that this is neither of these are a ratified division of geologic time by IUGS.
- GSSP proposals were published for base-Late Pleistocene sub-series (base of Eemian regional stage in Amsterdam-Terminal borehole) and base-Holocene (NorthGRIP ice core, at 11,784 years before AD 2000). The base-Middle Pleistocene sub-series will be close to the Matuyama/Brunhes magnetic boundary (ca. 760 ka), and there are two candidate GSSP sections in southern Italy and one in Japan.

Neogene Subcommission

- A vast majority of the members had voted to accept the proposal (Aubry et al., 2005, *Episodes*) that the Neogene as a Period extends to the Present, and that the Quaternary should be established as a Sub-Era covering the last 2.6 Ma.
- The *Serravallian* GSSP was defined at the base of the Blue Clay Formation in the Ras il Pellegrin section on Malta, coincident with the younger end of the major mid-Miocene (Mi-3b) oxygen isotope event and relatively close to the *Sphenolithus heteromorphus* LO, previously considered as prime guiding criterion for the boundary.

Paleogene Subcommission

- The proposed *Chattian* GSSP at Monte Cagnero in Italy has been submitted for publication, then will be prepared for voting.
- A synthesis of integrated stratigraphy for a potential candidate for the *Priabonian* GSSP in northeastern Italy was completed.
- Studies of potential *Bartonian* GSSP sections near Gubbio, Italy and at Barton-on-Sea, U.K. focused on base of polarity Chron C19n as a primary means of global correlation.

- High-resolution integrated-stratigraphy studies of potential *Lutetian* GSSP sections in Spain revealed that the different events traditionally used to place the Ypresian/Lutetian boundary, hitherto thought to be almost simultaneous, actually occur at very different levels. The criterion to precisely define this boundary will be selected in 2007.
- Two correlation-horizon options for base-*Selandian* (and/or *Thanetian*) are being considered for a GSSP in either Egypt or Spain.
- Full documentation for the *base-Cenozoic* (base-Paleogene; base-*Danian*) GSSP at El Kef, Tunisia, was published in Episodes.

Cretaceous Subcommittee

- A possible auxiliary GSSP for base-*Maastrichtian* is being considered that will enable other types of geochemical and paleontological correlations that are not possible at the ratified Tercis GSSP.
- A flurry of publications during this year on the three candidates for the *Santonian* GSSP should enable an informed vote decision in 2007.
- The *Coniacian* working group completed a proposal for establishing the GSSP at Salzgitter-Salder (Germany) with different macrofossil and microfossil correlation methods, and a vote is anticipated within the next two months.
- The *Barremian* GSSP is being proposed for southeastern Spain.
- The *Hauterivian* GSSP is proposed for La Charce (France), with Tethyan/Boreal correlation being summarized by the working group for the formal proposal.
- The *Valanginian* will begin with the *Pertransiens* ammonite zone, and the formal GSSP proposal is expected soon.
- After a long delay, the base-*Berriasian* (base-Cretaceous) working group has been established. Candidate GSSP sections include the historical stratotype near Berrias (France), the Bosso section (Italy), and the Tatra Mountains (Poland).

Jurassic Subcommittee

- The 7th International Congress on the Jurassic System was held in Krakow, Poland, during Sept 2006, with 129 participants from 29 countries. Details of two GSSP proposals (Toarcian, Kimmeridgian) were published in *Volumina Jurassica* vol. 4 together with the Congress Abstracts.
- it was decided that the Sub-Boreal definition of the Oxfordian-Kimmeridgian boundary should take precedence over the (stratigraphically higher) Sub-Mediterranean definition. The candidate for the *Kimmeridgian* GSSP is at the Isle of Skye, (N.W. Scotland).
- The *Bathonian* Working Group will submit the proposal of the Ravin du Bès section as a GSSP for vote by April 2007.
- The *Toarcian* Working Group confirmed the selection of the Peniche section in Portugal as the GSSP candidate, and this will be submitted to a Subcommittee vote by the end of 2006.
- Detailed formal proposals for the *Triassic/Jurassic Boundary (Hettangian GSSP)* will be voted within the Working Group in February 2007 and submission to the Jurassic Subcommittee by April 2007. There was consensus to combine New York Canyon (Nevada, USA) and Kunga Island (B.C., Canada) into a single proposal as GSSP and ASP respectively.

Triassic Subcommittee

- A flurry of newsletters, workshops and external publications are maintaining a high level of energy of international workers in solving the remaining boundary issues. The goal is to

unite conodont, ammonite, stable isotope and magnetic stratigraphy as multiple correlation horizons for each selected GSSP.

- However, a byproduct of this intense activity has been discoveries that the criteria and candidate GSSP sections have proved less ideal than previously thought. This has delayed voting on the current candidates.

Permian Subcommittee

- Both the base-*Wuchiapingian* and the base-*Changhsingian* (Upper Permian or Lopingian Series) GSSPs were published in *Episodes* (volume 29, No. 3&4).

Carboniferous Subcommittee

- Base-*Tournaisian* GSSP proposal for the Pengchong section (South China) was voted within the Subcommittee during November 2006.
- Global conodont lineages for correlating potential GSSP levels for *Serpukhovian*, *Moscovian* and *Kasimovian* were established, which is the main step toward preparing final GSSP proposals.
- High-resolution cycle-stratigraphy will be used to place the *Gzhelian* GSSP into an inter-regional glacial-interglacial sea-level context.

Devonian Subcommittee

- Ballot on subdivision of the Givetian, Frasnian and Famennian stages.

Silurian Subcommittee

- Study of GSSPs for both the base-Silurian and the base-Wenlockian led to recognition that these GSSP-levels are not suitable for global correlation, but another level within each GSSP site would have more global applicability. Therefore, the Silurian subcommittee voted to recommend revision of the GSSP levels during 2006. The base-Silurian GSSP was kept at the same level, but should be regarded as coinciding with the first appearance of *Akidograptus ascensus*, defining the base of the *A. ascensus* Biozone at that section.
- The primary marker for the base-Wenlock was a graptolite, but the GSSP in England is notably poor in allowing exact determination of their ranges. Recent evidence has shown that the current GSSP does not coincide with the base of the *Cyrtograptus centrifugus* Biozone, as was supposed when the GSSP was defined. It was decided not to propose a new GSSP and stick for the time being to the old GSSP, although it had many shortcomings, until new studies can propose a better alternative.
- 2006 was been mainly a year of preparation for the 3rd International Symposium on the Silurian System and the IGCP 503 4th Annual meeting both in Nanjing, China, 27 – 30 June, 2007.

Ordovician Subcommittee

- The Black Knob Ridge section, Oklahoma, USA, has been ratified by IUGS in May this year as the GSSP for the base of the Katian Stage of the Upper Ordovician Series defined at the level of the FAD of the graptolite *D. caudatus*.
- The Wangjiawan North section, Yichang, China, has been ratified by IUGS in May this year as the GSSP for the base of the Hirnantian Stage, the uppermost stage of the Upper Ordovician Series, defined at the level of the FAD of the graptolite *N. extraordinarius*.

- Three stage names have been approved by the Subcommittee and ratified by the ICS and the IUGS this year. They are the Floian Stage (the second Stage), the Sandbian Stage (the fifth Stage) and the Katian Stage (the sixth Stage).
- Two GSSP proposals for the base of the Middle Ordovician Series, and its lower stage (the 3th Stage, yet to be named), have been considered. The Subcommittee will report the result after two rounds of votes, already in progress.
- The Subcommittee sponsored the book of “Global Ordovician Earth System” editing by Stan Finney, whose results will be published in a special paper of the Geological Society of America.

Cambrian Subcommittee

- The Drumian Stage (6th stage in Cambrian), with a GSSP in in the Drum Mountains, Utah, USA, was approved by ICS and ratified by IUGS.
- Proposals for a GSSP of provisional Cambrian Stage 7 were submitted on the *Lejopyge laevigata* level, and voted by the Cambrian Subcommittee in early 2007.
- Potential names for all international Cambrian series and stages have now been identified, and will be put to a vote by the Cambrian Subcommittee in early 2007.

Ediacaran (and Cryogenian) Subcommittee

- Series of conferences, including *The elusive Ediacarans — where did they come from and where did they go?* (Japan, 30-31 January 2006); *Neoproterozoic field workshop* at 2nd International Palaeontological Congress (China, 17-24 June 2006); *Acraman Workshop* (South Australia, 4-9 August 2006 on drilling this impact crater that forms a lower age limit to the first large organic-walled microfossils in the Ediacaran); *Snowball Earth 2006 appraisal conference* (Switzerland, 16-21 July 2006).
- Australian Broadcasting Commission (ABC) weekly science program, *Catalyst*, broadcast a feature on the Ediacaran GSSP and Ediacara fossils of the Flinders Ranges, South Australia, on 9 November 2006.

Precambrian Subcommittee

- Survey being taken of Precambrian workers to access support and opinions on formalizing Archean subdivisions and applying GSSP concept to Proterozoic boundaries.
- Made preparations for a next workshop of the Subcommittee on Precambrian Stratigraphy, to be held in Beijing, China, in September of 2007.

International Stratigraphic Classification Subcommittee

- Two discussion newsletters on various aspects of stratigraphy.
- Cycle stratigraphy working group has published their summary of concepts, definitions and applications. The other working groups are currently writing their contributions.

Stratigraphic Information System

- The ICS website was continually updated, and has established an international reputation for providing authoritative information on divisions of geologic time, summary posters of the International Geologic Chart (in different standardized color schemes), and other items. The ICS website has a phenomenal hit and download rate from over 85 countries, reaching several million per year -- most interest is in the GSSP summary, the ICS chronostratigraphic chart and PDF files and graphics that detail GTS2004.

7. CHIEF PROBLEMS ENCOUNTERED IN 2006

The following is a summary of problems or concerns of the ICS Executive Commission and a compilation of key items noted in the detailed reports of each subcommission.

ICS Executive Committee

- The Executive considers that its limited funding does not serve its membership. This theme has been emphasized by our component subcommissions (see below, and each of their annual reports).
- ICS leans too much on developed, 'western' universities and surveys, especially those of Europe, North America and China. Incorporation of more active participation from African, Middle East, Asian and South American nations in field meetings and workshops will require an order of magnitude increase in budget to subsidize their travel and research needs.
- Many subcommission chairs and other officers in 2005-06 have a retired status (e.g., the chairs of Jurassic, Carboniferous, and Stratigraphic Classification subcommissions). As a result, although they can often maintain a more active role without interruptions by teaching and other administrative duties, they no longer enjoy a university-supported subsidy for travel, website design, and mailing.
- Progress on Global Stratotype Section and Point (GSSP) selection did not proceed in the timely manner indicated by several subcommission projections.
- Despite the fact that over 30 Russian stratigraphers are voting members in the ICS subcommissions, the Russian Interdepartmental Stratigraphic Committee considers that ICS is actively cooperating with their vast regional body. ICS will actively look into this, but notes that ICS invited and paid the travel for Russian stratigraphers to attend the ICS workshops on 'Future Directions in Stratigraphy' in 2003 in Urbino and in 2005 in Leuven. Regional membership in ICS is not a realistic option, since ICS is an international body of scientific specialists, and not of countries. Philosophical misunderstandings in Russia between the global GSSP concept and the regional unit stratotype concept should be addressed, and ICS is preparing a special set of stratigraphic charts and spreadsheets showing correlations and calibrations of regional chronostratigraphic units to the global standard.

Quaternary Subcommission (joint with INQUA)

- The set of GSSPs (Holocene, Early Pleistocene, Middle Pleistocene) which were in final proposal stage in early 2006 have still not been voted upon by the Subcommission.

Neogene Subcommission

- An important signaled problem is the possible lack of suitable sections in the Mediterranean for defining the remaining Neogene GSSPs, namely the **Langhian** and **Burdigalian** GSSPs. A potential Langhian-GSSP section near Ancona would require considerable research effort and money to be properly evaluated. The option to have these boundaries defined in ODP cores is being considered.

Paleogene Subcommittee

- The problems encountered this year are essentially the same as those discussed in the previous annual reports -- Reduced funding levels were insufficient for supporting working groups and regional committees. In particular, we would need a substantial increase in our budget in order to support and in part to reactivate regional committees in poorer areas (e.g. Africa, Indian Subcontinent, SE Asia).

Cretaceous Subcommittee

- One of the main problems encountered in 2006 concerns the delay in publishing the basic data in peer-reviewed literature for finalizing the GSSP proposals. Co-ordinate the work of several scientists from different subdisciplines (different type of paleontology, stable isotopes, magnetostratigraphy) is not an easy task and has delayed submission GSSP proposals.
- The important Jurassic/Cretaceous boundary WG has only now begun work, making the Jurassic the only Period without a formal definition, thereby hampering geochronology.
- Magnetostratigraphy is an important tool for Berriasian through Aptian correlations, but the best studied ammonite-rich possibilities for these GSSPs are not suitable for this method.
- The Aptian GSSP decisions await unambiguous ammonite to magnetic polarity correlations; and the Albian GSSP proposal has been delayed until stable isotope data can be incorporated.

Jurassic Subcommittee

- Difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Working Groups. It would be helpful if IUGS emphasized to its member countries the importance it attaches to the GSSP program and encouraged the relevant research funding bodies to give priority to funding relevant basic research. For example, recent applications for projects on the palaeomagnetic stratigraphy of key sections, including those selected as GSSPs, have been refused funding.
- Decisions on GSSPs for Tithonian, Oxfordian and Callovian have been delayed due to slow activity within the working groups to achieve a satisfactory inter-regional correlation or GSSP that allows multiple useful correlation methods.

Triassic Subcommittee

- New government program structures, lack of funds and 'approval' for foreign travel have hampered full participation by the STS officers and most task group members.
- Decisions on GSSPs await completion of ongoing high-resolution studies; which have delayed most Triassic GSSP placements until 2007 or 2008.

Permian Subcommittee

- The Cisuralian excursion planned for 2006 was delayed to July 2007. Unfortunately, this may delay production and voting on GSSP proposals until 2008.

Carboniferous Subcommittee

- Endemism of conodont and foram lineages between Eurasia and North America is seriously hampering the potential for global correlation for the Viséan, Serpulkhovian and Moscovian stage boundaries; which, in turn, has slowed the choice of GSSP levels.

- A major problem has arisen for the correlation criteria for the base-Carboniferous GSSP that was placed at La Serre in France. The “D-C boundary-event-marking” conodont *Siphonodella sulcata* is now known to occur significantly below the GSSP, which implies that the apparent lineage is an artifact of recovery and possible reworking. Indeed, the GSSP level at the base of Bed 89 seems to fall in the upper part of the *Siph. sulcata* Zone or even already in the *Siph. duplicata* Zone. Therefore, this GSSP level cannot be correlated with precision into any of the other numerous D/C boundary sections. The GSSP will either require lowering or raising to a level in that same section that allows unambiguous global correlation, or a new GSSP section should be selected.

Devonian Subcommittee

- See “Carboniferous Subcommittee” above for the major problem with the existing GSSP for the Devonian-Carboniferous boundary.

Silurian Subcommittee

- The vice-chair from Russia has no funds for international travel from her institute. Similar problems have precluded the full participation of Russian scientists in other subcommittees.
- Other Silurian GSSPs need to be revisited, because some are not suitable for global correlation.

Ordovician Subcommittee

- The Subcommittee plan to publish an Ordovician time table after all of the GSSPs were approved and ratified may face a financial support problem.
- As always, the lack of travel support limits the participation of Voting Members to attend the 10th Ordovician conference in China, 2007.

Cambrian Subcommittee

- Obtaining funding to support travel and basic research on key stratigraphic intervals (potential GSSP horizons and sections).
- A significant increase in funding for the coming year would be of great benefit to members of some of the Working Groups on key horizons who have limited access to funding through nationally competitive research grants.
- It is hoped that the field excursion to Kazakhstan will receive financial support from local authorities, but extent of support cannot be predicted at this stage.

Ediacaran Subcommittee

The problems are mainly scientific, rather than logistical:

- The problem of the apparent diachroneity of Neoproterozoic diamictites judging from recent U-Pb dates.
- Determining criteria for a Cryogenian GSSP, which might utilize a chemostratigraphic anomaly in conjunction with microflora and event stratigraphy.
- Mismatch of timing of the onset and extinction of large ornate, organic walled microfossils in the Ediacaran that suggests problems for determining series boundaries.
- Previously proposed Ediacara biota fossil associations, representing a potential time sequence, are showing evidence of being more a product of environmental differences between and within fossil assemblages. However, a series boundary may well be determined using the end of the Gaskiers glaciation as a series boundary, since it appears to represent the base of

the oldest known fossils of the Ediacara biota. There is now geochemical evidence for a rise in marine oxygen levels to a level that could sustain metazoans.

- Polarization of researchers on the potential of stable isotope patterns as a means for intercontinental correlation.

Precambrian Subcommittee

- Lack of free time on officers to accomplish goals, due to heavy institutional commitments.

International Stratigraphic Classification Subcommittee

- The subvention allocated to ISSC was very very low (*slightly below the average amount to subcommissions*) – inadequate to support all the travel commitments by the ISSC officers.
- A new website needs to be established, because the commercial-hosted version is out of space.

Stratigraphic Information System

- No major problems.

8. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

In 2006, the ICS suffered its lowest budget level in the past 8 years.

The ICS Executive Bureau established the following budget for April 2006 – March 2007 after consideration for relative needs, planned activities, and funding requests of the subcommissions; and re-allocating based on the final (drastically reduced) amount received from IUGS. All Subcommissions were limited to a maximum of \$500 for communications and administration costs. Funds and distributions are maintained by James Ogg (ICS secretary-treasurer) using a special account in the USA; but each subcommission maintains 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. Note that these budget reports include projected expenditures through March 2007 (e.g., another four months), which is the month when the next annual (“2007”) funding suite is typically received from IUGS.

All amounts are in \$US; although most Subcommissin maintain accounting in Euro or other currency.

(A) ICS Operating Budgets and expenditures for 2006:

	Requested by ICS 2006	IUGS 2006 Allocation	<i>Comments on distribution</i>
Quaternary	\$500	\$325	
Neogene	\$1500	\$975	<i>GSSP-study field trip requests moved to Special travel contingency</i>
Paleogene	\$2500	\$1,625	<i>Non-specific requests for task group support moved to contingency</i>
Cretaceous	\$1500	\$1,500	
Jurassic	\$4500	\$2,925	<i>Major Jurassic symposium associated with several GSSP decisions. Non-specific requests for task group support moved to contingency</i>
Triassic	\$2000	\$1,300	<i>Travel subsidies moved to "Special travel needs"</i>
Permian	\$1400	\$900	<i>Major suite of GSSP preparations</i>
Carboniferous	\$1200	\$800	
Devonian	\$750	\$500	<i>Travel subsidies moved to "Special travel needs"</i>
Silurian	\$500	\$300	<i>Travel subsidies moved to "Special travel needs"</i>
Ordovician	\$1500	\$1,000	<i>-specific requests for task group support moved to contingency</i>
Cambrian	\$2000	\$1,300	<i>Major Working group meeting in Australia. Other travel subsidies moved to "Special travel needs"</i>
Ediacaran	\$3000	\$1,950	<i>"</i>
Precambrian	\$500	\$325	<i>Travel subsidies moved to "Special travel needs"</i>
Classification	\$500	\$1,025	<i>Excessive initial request. Includes \$700 travel</i>
Strat. Info. System	\$2500	\$1,625	<i>ICS web development support. Travel subsidies moved to "Special travel needs"</i>
Subcommission Total	\$26,350	\$18,465	<i>Initial Subcomm requests totaled \$50,600. ICS had drastically reduced these to the same funding levels as in 2004; but IUGS slashed this much deeper.</i>
<i>Special travel needs (*)</i>	\$5000	\$6125	<i>See explanation above. Pooled requests from ALL subcommissions and executive.</i>
ICS Executive	\$3500	\$2000	<i>Educational chart drafting/printing delayed until 2007</i>
<i>Publications and Contingency</i>	\$4500	\$3500	<i>Reserved for subcommission workshops, GSSP evaluations, posters, and other special projects.</i>
<i>SPECIAL – Year of Planet Earth preparations</i>	\$1000	\$0	<i>Printing/mailing of special brochures and posters on TimeScale and GSSPs for Year of Earth. [NOW DELAYED TO 2007]</i>
TOTAL (\$ USD)	40,350	\$30,000	<i>[A 25% reduction from planned ICS operating levels.]</i>

(*) *Several subcommissions had indicated a pressing need for travel funds allowing key workers from less affluent countries or officers on pension status to participate in meetings and symposia. More and more researchers from poorer countries were becoming marginal to the main stream of research because of financial reasons. We had grouped these requests into a special line-item “travel funds” (to be dispersed by the ICS secretary-treasurer according to various needs, rather than allocate to individual subcommissions). These funds are re-allocated to subcommissions in approximately \$500 grants by the ICS secretary-treasurer.*

The ICS maintains a small contingency fund (last line on the budget above), maintained by the Executive Secretary, which is used for unforeseen expenses of subcommissions, special publication costs, and for initiating “special opportunity” projects that may arise during the fiscal year.

9. WORK PLAN, CRITICAL MILESTONES, and ANTICIPATED RESULTS TO BE ACHIEVED FOR April 2007-March 2008:

The following is a summary of plans of the ICS Executive Commission and a compilation of key goals noted in the detailed reports of each subcommission. Details of the subcommission goals are given in their attached annual reports.

ICS Executive Committee

- Support and promote all subcommission activities for the INTERNATIONAL YEAR OF PLANET EARTH, plus prepare a series of popular-level brochures on the geological time scale and on Earth history in different languages.
- Compile and publish a 100-page booklet “
- Updated Paleozoic global chronostratigraphic charts (biostratigraphy, sequences, geochemistry, magnetism, etc.) to compliment the current revision of the Mesozoic-Cenozoic global charts.
- An in-depth Atlas of the Standard Geologic Time Scale.
- Enhance “*TimeScale Creator*”, a JAVA-application for user-defined detailed time-scale graphics hosted on www.stratigraphy.org, and linked to other stratigraphic websites such as NORGES and *CHRONOS*.

GSSP voting schedule (as pledged by Subcommissions in 2005); updated for Nov 2006:

Subcomm	2007	2008
<i>Pleistocene</i>	<i>Holocene</i> ; Late Pleist, Middle Pleist	
<i>Neogene</i>		Langhian, Burdigalian
<i>Paleogene</i>	Chatian, Priabonian, Lutetian, Selandian, Thanetian	Bartonian
<i>Cretaceous</i>	Santonian, Coniacian, Aptian?, Barremian, Hauterivian Valanginian	Campanian, Albian, Aptian, Berriasian (<i>base Cretaceous</i>)
<i>Jurassic</i>	Tithonian, Kimmeridgian, Oxfordian, Callovian, Bathonian, Toarcian Hettangian (<i>base Jurassic</i>)	
<i>Triassic</i>	Carnian, Anisian, Olenekian,	Rhaetian, Norian
<i>Permian</i>	Kungurian, Artinskian, Sakmarian,	
<i>Carboniferous</i>	Gzhelian, Serpukhovian, Visean	Kasimovian, Moscovian
<i>Devonian</i>	-- finished --	
<i>Silurian</i>	-- finished --	
<i>Ordovician</i>	Middle Ordov.	
<i>Cambrian</i>	Fifth, Seventh, Ninth	Tenth
<i>Neoproterozoic</i>	Cryogenian	
<i>Precambrian</i>	Proterozoic, Archean, Hadean	

Quaternary Subcommission

- Formalization of GSSPs for the base of the Holocene Series/Epoch, and base of the Upper Pleistocene sub-series.
- The Regional Stratigraphic Committee of Italy is proposing to formalize a tripartite subdivision of the Mediterranean Pleistocene in three regional stages, which will improve intra-Pleistocene correlations in that classical region.

Neogene Subcommission

- By the end of 2007, the WG on the *Langhian* and *Burdigalian* GSSPs will provide a list of candidate sections and guiding criteria for the formal definition of these boundaries.

Paleogene Subcommittee

- Complete GSSPs proposals for the base of the *Priabonian* and *Chattian*.

Cretaceous Subcommittee

- Nearly the entire suite of Late Cretaceous GSSP proposals will be completed for voting by the Subcommittee and ICS during early 2007.
- GSSP proposals for Valanginian through Albian stages are in the final stages, and most will undergo voting during late 2007.

Jurassic Subcommittee

- The timetables for completion and submission of proposals to the Jurassic Subcommittee have been agreed between the Executive and most of the Working Groups: Toarcian – December 2006; Kimmeridgian – January/February 2007; Hettangian and Triassic/Jurassic boundary – April 2007; Bathonian – April 2007; Oxfordian – April/May 2007; Callovian – August 2007. Only the Tithonian remains uncertain, but should become clearer after a specialist meeting planned for November 2006.
- IGCP Project 506 *Marine and Non-marine Jurassic: Global Correlation and Major Geological Events* will hold a meeting in SW England in 2007.
- The next tasks for the Stage Working Groups will be the definition of smaller chronostratigraphic units, at Substage and Standard (Ammonite) Zone level, coordination of parallel biostratigraphic scales and regional scales.
- Investigate the establishment of data-bases which would bring together and make available information from all sources associated with the Jurassic

Triassic Subcommittee

- International meeting on *The Global Triassic*. May 19-25, Albuquerque, New Mexico, will be the official meeting of STS and the final meeting of IGCP 467 on the *Triassic timescale and Triassic biotic events*.
- Voting on *Olenekian* GSSP candidates in Spring 2007 within the working group; and the *Carnian* GSSP for May 2007.

Permian Subcommittee

- There will be International Workshop for July 2007 at the probable Cisuralian GSSP sites along the west flank of the Urals. This field workshop will be limited to twenty researchers and they will be charged with completing analysis of new samples and producing first drafts of GSSP proposals by early 2008.
- A vote on the *Sakmarian* GSSP is planned for earliest 2008.

Carboniferous Subcommittee

- *Tournaisian* GSSP will be submitted to ICS in early 2007 for approval.
- All task groups will present their work on boundary events and possible candidates for GSSPs at the *XVI International Congress on the Carboniferous and Permian* to be held June 21-24, 2007, in Nanjing, China.

Devonian Subcommittee

- Publication of the use of substages of the Givetian, Frasnian and Famennian in *Episodes* and *Geological Quarterly*.

Silurian Subcommittee

- The major Yangtze Conference on Ordovician and Silurian (Nanjing, China, 27 – 30 June, 2007).
- Continued discussion on base-Wenlock GSSP problem, and discussion on possible re-study of other Silurian GSSP's.
- Substage Working Groups to propose GSSPs for Substages as appropriate,

Ordovician Subcommittee

- Submission of GSSP proposal to IUGS for the base of the Middle Ordovician Series, and its lower stage (the 3th Stage, yet to be named).
- The major Yangtze Conference on Ordovician and Silurian (Nanjing, China, 27 – 30 June, 2007).

Cambrian Subcommittee

- Cambrian Stage Subdivision Working Group in 2007 (New York), and 2008 (Siberia). One additional field excursion is expected to be held in 2007 in Kazakhstan.
- Voting on a proposal for a stage-level GSSP to be placed at a horizon coinciding with the FAD of the cosmopolitan agnostoid trilobite *Agnostotes orientalis*. This horizon is also one of the most recognizable in the Cambrian.
- We expect to hold ballots on two more GSSPs (for stages 5 and 10) in early 2008.

Ediacaran Subcommittee

- Voting on preliminary proposals for a Cryogenian GSSP and on Ediacaran series/stage subdivisions toward the end of 2007.

Precambrian Subcommittee

- Results on survey done in early 2007 on GSSP-definitions for Precambrian and formalizing Archean divisions will form the basis for a paper in *Precambrian Research* and a shorter report in *Episodes*.
- Workshop of the Subcommittee on Precambrian Stratigraphy, to be held in Beijing, China, in September of 2007, in conjunction with the “International Symposium on Precambrian Chronology and Tectonic Evolution”.
- Firming up Indian and full Russian participation on the Subcommittee before the GSSP-definition process is launched.

International Stratigraphic Classification Subcommittee (ISSC)

- A new ISSC newsletter series, called “New Developments in Stratigraphic Classification”, will publish texts of cycle, sequence, bio- and chemo-stratigraphy; and outlines of magneto-, litho- and chrono-stratigraphy.

Stratigraphic Information Services

- Produce school-level educational material in both printed and Internet form for the INTERNATIONAL YEAR OF PLANET EARTH.
- Establish an on-line “booklet” for the geological time scale
- Add new sub-sites to host the ISSC, Cretaceous and possibly another subcommittee site.

- Promote *TimeScale Creator* visualization package for exploring Earth history.
- Place databases on-line to support “hot-link” version of TimeScale Creator, and create a “TimeScale Creator Pro” version to obtain industrial contributions.
- RMS feed to provide updated GSSP and numerical time-scale information to national geological surveys.

Communications: Websites, Newsletters and Special Publications by ICS Subcommissions

In addition to the main website "www.stratigraphy.org" of ICS, most of the subcommissions have established websites that have placed an impressive amount of virtual information on geological time into the public domain. These are listed under Section #3 (above)

Nearly all subcommissions of ICS publish regularly newsletters or circulars of a high scientific caliber. These constitute an important international platform for publicizing the work of ICS bodies, allowing the stratigraphic community outside ICS to participate in discussions about boundary definitions. Most of them are circulated electronically or posted on subcommission websites, but hard copies are still necessary for distribution in countries without the necessary computer equipment.

10. BUDGET REQUEST TO IUGS FOR 2007 (\$ US)

The following budget request is for operations and special initiatives through March 2007 (funds are generally transferred from IUGS to ICS in April; which implies ICS subcommissions must operate on an April-to-March fiscal year).

Budget Summary:

The initial total of all submitted Subcommission and ICS Executive budget requests is **\$62,600**. These amounts have already been adjusted for external funding sources. As can be seen in the following table, each subcommission requested substantially more than it received in 2006. This partially reflects the financial hardships that each subcommission suffered when their 2006 budgets were forced to be cut to less than half of their submitted needs (\$48K); as is often dramatically emphasized in their Annual Reports. This was the second consecutive year of sever budget reduction for the subcommissions and other ICS activities. Therefore, the subcommissions wish to recover some of their personal out-of-pocket debts and regain their pre-2005 level of activities.

However, the ICS Chair and Secretary-General have adjusted these initial requests based on previous year’s expenditures and allocations (*a total of \$23K decrease in the initial subcommission requests*), but with consideration of special programs, as indicated in the comments on the following table. Much of the necessary subcommission travel and uncertain required funding has been pooled into special funds. We have tried to maintain composite request for 2007 “routine subcommission & ICS operation” (\$40,000) at the former funding levels in 2003 (\$35,000; before fall of US dollar and inflation). An additional Special item is INQUA’s request that ICS have officer representation at the INQUA Congress in Australia (see explanation below).

We therefore request a total allocation of **\$40,000** (*normal subcommission operations and INTERNATIONAL YEAR OF PLANET EARTH activities*), plus **\$5,000** for ICS participation requested by the INQUA Congress on Quaternary = **\$45,000**.

	Final 2006 Allocation (Item#8 above)	Initial Subcomm Requests 2007	ICS recommended allocation	Comments on “ICS recommended allocation” to initial subcommission requests
Quaternary	\$325	400	\$400	
Neogene	\$975	4000	\$2000	GSSP-study field trip request moved to Special travel contingency
Paleogene	\$1,625	5750	\$3000	Includes deficit acquired due to 2006 short-fall of funding. Unspecified travel moved to Special travel contingency
Cretaceous	\$1,500	3000	\$1000	Six GSSPs will undergo voting and publication.
Jurassic	\$2,925	3700	\$2500	Seven GSSPs will undergo voting and publication.
Triassic	\$1,300	3500	\$2000	Travel subsidies moved to “ <i>Special travel needs</i> ”
Permian	\$900	1100	\$1000	Major suite of GSSP preparations.
Carboniferous	\$800	800	\$500	
Devonian	\$500	500	\$500	
Silurian	\$300	1200	\$500	Travel subsidies moved to “ <i>Special travel needs</i> ”
Ordovician	\$1,000	2400	\$1500	Major conference and GSSP dedication in China; plus preparation of summary publications. Travel subsidies moved to “ <i>Special travel needs</i> ”
Cambrian	\$1,300	8100	\$3100	Major Working group meeting in New York. Other travel subsidies moved to “ <i>Special travel needs</i> ”
Ediacaran	\$1,950	5000	\$3000	”
Precambrian	\$325	3000	\$500	Travel subsidies moved to “ <i>Special travel needs</i> ”
Classification	\$1025	3300	\$1000	Publication costs, and website transfer costs. Includes \$1000 travel deficit from earlier years.

Strat. Info. System	\$1,625	3000	\$2500	ICS web development support. Installation of databases to support <i>TimeScale Creator</i> hot-links.
<i>Subcommission Total</i>	\$18,465	48,750	\$25,000	
<i>Special travel needs</i>	\$6125	8500	\$7500	<i>See explanation above. Pooled requests of 16 subcommissions and ICS Executive.</i>
ICS Executive	\$2000	3500	\$2500	Educational chart drafting/printing will be a major expense
<i>Publications and Contingency</i>	\$3500	4000	\$3000	<i>Reserved for posters, subcommission workshops, GSSP evaluations, and other special projects.</i>
<i>SPECIAL – Year of Planet Earth and IGC preparations</i>	0	3000	\$2000	<i>Drafting, printing/mailing of special brochures and posters on TimeScale and Earth History for Year of Planet Earth</i>
<i>SPECIAL – INQUA Congress participation</i>	0	5000	\$5000	<i>Special INQUA-ICS workshop at INQUA Congress in Australia (Aug, 2007) to formalize Quaternary-Pleistocene geologic scale.</i>
TOTAL (in USD)	30,000	71,750	45,000	[NOTE: We have trimmed this to be the approximate level received in 2004, excluding special items.]

Budget Explanation:

It is important to note that the previous 2006 allocations of all subcommissions and other programs were reduced by IUGS by almost 30% below their already-slashed requests (subcommissions had requested \$60,000; ICS had lowered these for a total of \$40,000; and IUGS granted all categories only a total of \$30,000 – see re-allocation table and other remarks in Item #8 above).

The column of "Initial Subcomm Request 2007" is taken from each Subcommission annual report of 2006 (*already adjusted for projected residual balances through March 2007; with Nov 2006 exchange ranges of 1Euro=\$1.30 or 1 Pound=\$2.00, which includes conversion costs*). We (ICS Executive) have added an additional column of "ICS recommended allocation" based on past budgets and performances of each subcommissions and their itemized work plans for the next fiscal year.

Special Budget Categories:

We have grouped some aspects of the subcommission requests into aggregate categories of "Special travel needs" and "Contingency" categories. The funds will be redistributed by the ICS secretary-treasurer according to the final budget received from IUGS and needs of the subcommissions as their activities occur during 2007 and early 2008. The ICS Contingency supports special and unanticipated needs of subcommission as these arise in the later part of 2007-2008. The Special Travel Needs fund is explained in Section #8 (see above), and pools the travel requests by the various subcommissions – this fund is usually exhausted by the mid-point of the budget year.

A Special item arose during the preparation of this Annual Report, when John Clague, President of INQUA, sent ICS a letter about coordinating the re-definiton and subdivision of the

Quaternary (pending without official rank since 1985, when IUGS ratified the Pleistocene) – “*I further suggest that INQUA and IUGS jointly cover the costs of one or two meetings of this committee prior the IGC 2008. Perhaps the joint group might meet at the INQUA Congress in Cairns, Australia in the summer of 2007.*” Therefore, ICS requests funds for airfare and accommodation/registration for two of its officers to attend this important INQUA Congress.

11. REVIEW CHIEF ACCOMPLISHMENTS SINCE 2000

A combined 4-year review was compiled as part of the ICS report for 2004, and the accomplishments for 2006 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*)

Neogene

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

Paleogene

- base of the **Eocene** Series (and Ypresian Stage) in the Dababiya Section near Luxor, Egypt (2003).

Cretaceous

- base of the **Maastrichtian** Stage at Tercis, France (2000)
- base of the **Turonian** Stage at Pueblo, Colorado, USA (2003)
- base of the **Cenomanian** Stage and of the Late Cretaceous Series, at Risou, France (2002)

Jurassic

- base of the **Pliensbachian** Stage at Robin Hood Bay, England (2004)
- base of the **Aalenian** Stage and of the Middle Jurassic Series at Fuentalsaz, Spain (2000).
- base of the **Sinemurian** Stage at East Somerset, England (2001).

Triassic

- base of the **Ladinian** Stage at Bagolino, Italy (2005).
- base of the **Triassic** System at Meishan, China (2001).

Permian

- base of the **Changhsingian** Stage at Meishan, China (2005).
- base of the **Lopingian** Series (Wuchiapingian stage) in China (2004).
- base of the **Guadalupian** Series (Middle Permian) and component **Roadian**, **Wordian** and **Capitanian** Stages in Guadalupian mountains, USA (2001).

Carboniferous

- agreement on Series-level divisions (2004)

Devonian

- all Devonian stage boundaries are defined by a GSSP
- 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

- 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.

Ordovician

- base of the *Hirnantian* Stage in China (2005).
- base of the *Katian* Stage in Oklahoma, USA (2006)
- base of the Sandian Stage and **Upper Ordovician** Series at Fågelsång in Sweden (2002).
- base of the Floian stage of the **Lower Ordovician** Series at Diabasbrottet in southern Sweden (2002).
- base of the **Ordovician** System and of the **Tremadocian** stage at Green Point, Newfoundland, Canada (2000).

Cambrian

- base of the **Paibian** Stage and the **Furongian Series** (uppermost series of Cambrian) in the Paibi section, NW Hunan province, south China (2003).
- vote to subdivide the Cambrian into **four series** and **10 stages**.

Proterozoic Era

- base of the **Ediacaran Period** (uppermost period of Proterozoic) in the Flinders Range, Australia (2004).

B. 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. Two color schemes are available: the International Geological Map of the World conventions or those of the U.S. Geological Survey. This chart is continually updated, and public graphics can be downloaded in either color scheme at www.stratigraphy.org.

12. OBJECTIVES AND WORK PLAN FOR NEXT 3 YEARS (2007-2009)

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 9 for a summary of objectives for 2007-2008.

ICS Executive Committee

- Define GSSP sections for all stages of the Phanerozoic Era, and solidify subdivisions of the Precambrian. **All GSSPs will be ratified by 2008.** The schedules for ICS/IUGS voting/ratification of the remaining GSSPs in each period is detailed below.
- Develop a suite of web-accessible international databases on all aspects of chronostratigraphy (paleontology, isotopes, cycles, magnetics, etc.).
- Produce the '*Atlas of the Geologic Time Scale*' in pocket (A4) book and digital formats.

Quaternary Subcommission

- GSSPs for base of Holocene Epoch and for Pleistocene subdivisions.
- Compiling regional sequences throughout the Quaternary.
- Classify and formalize, where necessary, divisions based on very short-term events.
- 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

- Selection of boundary criteria and sections for the definition of the 2 remaining Miocene stage boundaries, namely the base-**Langhian** and base-**Burdigalian**.

Paleogene Subcommission

- Complete and publish the GSSPs of the Paleogene. We hope to present proposals for most of the remaining GSSPs before the Geological Congress in Oslo, 2008.
- Produce an updated and integrated Paleogene time scale.
- Produce a state-of-the-art review of the stratigraphic tools used in the Paleogene.
- Preparation of standardized regional correlation charts and paleogeographic maps by the Regional Committees.

Cretaceous Subcommission

- To bring recommendations for the remaining 9 GSSPs before ICS as soon as possible, and not later than 2008.
- To communicate the results as widely as possible.
- To develop new directions for the Subcommission as GSSP proposals are completed..

Jurassic Subcommission

- Stage Working Groups to standardise and propose GSSPs for Substages as appropriate, but named **ONLY** as Lower/Middle/Upper. We do not want to clutter up the nomenclature with

- named Substages such as Carixian, Domerian etc. These will be approved by the Jurassic Subcommittee, but ICS and IUGS have no current plans for involvement with Substages.
- Asking the Stage Working Groups to 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. Similar definition of Regional Zones and maximising the detail of correlation with the Standard Zones would be very valuable.
 - Involvement in the aims and objectives of IGCP Project 506, targeted on developing means of correlation between marine and non-marine Jurassic successions. In recent decades, the latter have been recognised to be very widespread and economically important in several regions, with exciting terrestrial faunas and floras.
 - Developing and expanding the Thematic Working Groups, some of which have been very successful. For this to work they need to be given more specific projects and targets - for example searching for and interpreting data from all sources relevant to reconstructing the palaeobiogeography or the climate of one or more specific time-intervals. In part, this will be given further impetus by involvement in IGCP Project 506.
 - Investigate the establishment of **data-bases** which would bring together and make available information from all sources associated with the "members and friends" of the Jurassic.

Triassic Subcommittee

- Completion of Triassic GSSPs
 - 2007 – Olenekian, Anisian and Carnian
 - 2008 – Norian and Rhaetian.
 - 2008 – Summary volume of all Triassic GSSPs. Emphasis switches to choice of non-marine auxiliary sections.

Permian Subcommittee

- Completion of Permian GSSPs
 - 2007 – Sakmarian, Artinskian and Kungurian.
- Correlations into Continental deposits, and across provincial boundaries.
- Detailed documentation of the geologic evolution of the Earth during the Permian with respect to the established chronostratigraphic framework.

Carboniferous Subcommittee

- International Carboniferous Congress is 2007 in Nanjing, China.
- Selecting all GSSPs by 2008.

Devonian Subcommittee

- Formalize the substage subdivision of stages.

Silurian Subcommittee

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

Ordovician Subcommittee

- Completion of selection of GSSPs for all stages.

- Selection of names for 5th stage of Ordovician System.
- Refocusing of Subcommittee to address the global Ordovician Earth system.
- 10th International Symposium on the Ordovician System to be held in Nanjing, China in summer 2007.
- Editing of a new Ordovician Time Table.

Cambrian Subcommittee

- 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.
- A secondary objective of the Subcommittee is to develop and publish regional correlation charts for the Cambrian.

Ediacaran Subcommittee

- 2007 – Preliminary proposals for Cryogenian GSSP and Ediacaran subdivision.
- 2008 – Voting on base of Cryogenian System GSSP.
- 2008 – Intra-Ediacaran subdivisions (series, stages) and GSSP decisions.

Precambrian Subcommittee

- A complete Precambrian time scale in place, with formalized Hadean and Archean eons.
- Formal GSSP for the bases of the Archean and Proterozoic.
- Natural subdivision of the Archean Eon, with GSSPs for each era-rank subdivision (Eo-, Paleo-, Meso-, and Neoproterozoic).
- 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

- A new *International Guidebook* for stratigraphic classification printed for the 33th IGC (Oslo, 2008). The book is conceived as a user's 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.

Stratigraphic Information Services

- 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.

INTERNATIONAL COMMISSION ON STRATIGRAPHY (ICS)

DIRECTORY OF OFFICERS 2006-2007

15 Nov 2006

COMMISSION EXECUTIVE

Chair: Prof. Felix M. Gradstein

Museum of Natural History, University of Oslo
P.O.Box 1172 Blindern, N-0318 Oslo, Norway
Tel 47-22-851663; Fax: 47-22-851832, E-mail: felix.gradstein@nhm.uio.no

Vice Chair: Prof. Stanley Finney

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

Secretary General: Prof. James G. Ogg

Dept. Earth and Atmospheric Sciences, Civil Eng. Bldg., 550 Stadium Mall Drive
Purdue University, West Lafayette, Indiana, 47907-2051, USA
Tel: 1-765-494-8681 (off.), 1-765-494-0257 (lab); Fax: 1-765-496-1210
Home tel: 1-765-743-0400; E-mail: jogg@purdue.edu

ICS Webmaster (not an officer): Prof. Sorin Filipescu

Dept. of Geology, Babes-Bolyai University
Str. Kogalniceanu 1, 3400 Cluj-Napoca, Romania
Tel. 40-92-849544, Fax. 40-64-191906; E-mail: sorin@bioge.ubbcluj.ro

SUBCOMMISSION ON QUATERNARY STRATIGRAPHY

Chair: Dr. Philip Gibbard

Godwin Institute of Quaternary Research, Department of Geography
University of Cambridge, Downing Street, Cambridge CB2 3EN, England
E-mail: plg1@cus.cam.ac.uk

Vice-Chair: Dr. Jerry McManus

Wood's Hole Oceanographic Institute
Wood's Hole, MA, USA
E-mail: jmcmanus@whoi.edu

2nd Vice-Chair: Dr. John van Couvering

American Museum of Natural History
Central Park West at 79 St., New York, NY 10024 USA
Tel: 212-769-5657; Fax: 212-769-5653
E-mail: vanc@amnh.org

Secretary: Dr. Thijs van Kolfschoten
Faculty of Archaeology, Leiden University
Reuvenplaats 4, 2300 RA Leiden, The Netherlands
E-mail: T.van.Kolfschoten@rulpre.leidenuniv.nl

SUBCOMMISSION ON NEOGENE STRATIGRAPHY

Chair: Dr. Frederik J. Hilgen
Institute of Earth Sciences, University of Utrecht, Budapestlaan 4, POB 80021,
3584 TA Utrecht, The Netherlands
Tel: 31-30-2535186/2535122, Fax: 31-30-2532648; E-mail: fhilgen@geo.uu.nl

Vice-Chair: David Hodell
Department of Geological Sciences, University of Florida,
Gainesville, FL 32611, USA.
E-mail: dhodell@geology.ufl.edu

Vice-Chair: Francisco Javier Sierro Sánchez,
Departamento de Geología, Facultad de Ciencias, Universidad de Salamanca,
37008 Salamanca, España.
E-mail: sierro@usal.es

Secretary: Elena Turco,
Dipartimento di Scienze della Terra, Università degli Studi di Parma,
Parco Area delle Scienze 157, 43100, Parma, Italia.
E-mail: elena.turco@unipr.it

SUBCOMMISSION OF PALEOGENE STRATIGRAPHY

Chair: Eustoquio Molina
Departamento de Ciencias de la Tierra, Universidad de Zaragoza
Calle Pedro Cerbuna, 12, E-50009 Zaragoza, Spain
Tel. 34 976 761077, Fax. 34 976 761106; E-mail: emolina@unizar.es

Vice-Chairman: Jan Hardenbol
Global Sequence Chronostratigraphy Inc.
826, Plainwood Drive, Houston, Texas 77079-4227, USA
E-mail: jhardenbol@aol.com

Secretary: Dr. Noël VandenBerghe
Departement Geografie-Geologie, Afdeling Historische Geologie
Redingenstraat 16, B-3000 Leuven-België, Belgium
E-mail: noel.vandenberghe@geo.kuleuven.ac.be

SUBCOMMISSION OF CRETACEOUS STRATIGRAPHY

Chair: Prof. Isaabella Premoli Silva

University of Milano, Dipartimento di Scienze della Terra “Ardito Desio”
Via Mangiagalli, 34; I-20133 MILANO, Italy

Tel: 39-02 503-15528 (direct line); Fax-Tel 39-02 503-15494; Email: isabella.premoli@unimi.it

Vice Chair: Dr. I. Walaszczyk

University of Warsaw, Warsaw, Poland
E-mail: walas@geo.uw.edu.pl

Secretary: Dr Silvia Gardin

ESA-CNRS 7073, Laboratoire de Micropaléontologie, case 104, Université Pierre et Marie Curie,
4 Place Jussieu, F-75252 Paris 05, France

E-mail: gardin@ccr.jussieu.fr

SUBCOMMISSION ON JURASSIC STRATIGRAPHY

Chair: Dr. Nicol Morton

Le Chardon, Quartier Brugière
F-07200 Vogüé, France

Tel: +33-4 75 37 03 80; E-mail: NICOL.MORTON@wanadoo.fr

Vice Chair: Prof. Paul L. Smith

Earth and Ocean Sciences, University of British Columbia,
6339 Stores Road, Vancouver, B. C. V6T 1Z4, Canada

Tel: 1-604-822-6456; Fax: 1-604-822-6088; E-mail: psmith@eos.ubc.ca

Secretary: Dr. Paul R. Bown

Department of Geological Sciences, University College London,
Gower Street, London WC1E 6BT, Great Britain

Tel: 44-0-20-7504-2431; Fax: 44-0-20-7388-7614; E-mail: p.bown@ucl.ac.uk

SUBCOMMISSION OF TRIASSIC STRATIGRAPHY

Chair: Dr. Michael J. Orchard

Geological Survey of Canada, 101-605 Robson Str.,
Vancouver, British Columbia, V6B 5J3, Canada

Tel: 1-604-666-0409; Fax: 1-604-666-1124; E-mail: morchard@nrcan.gc.ca

Vice Chair: Yin Hongfu

China University of Geosciences, Yujiashan,
Wuhan, Hubei, 430074, Peoples Republic of China.

E-mail: hfyin@cug.edu.cn

Vice Chair: Marco Balini

Dipartimento di Scienze della Terra,
via Mangiagalli 34, I-20133 Milano, Italy.

E-mail: Marco.Balini@unimi.it

Secretary/ STS web: Christopher A. McRoberts

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

Albertiana Editor/ Webmaster: Wolfram M. Kuerschner

Laboratory of Palaeobotany and Palynology, Utrecht University, Budapestlaan 4,
3584 CD Utrecht, The Netherlands.
e-mail: W..M.Kuerschner@bio.uu.nl

SUBCOMMISSION ON PERMIAN STRATIGRAPHY

Chair: Dr. Charles Henderson

Department of Geology and Geophysics, University of Calgary, Calgary, AB Canada T2N 1N4
Phone: 403-220-6170; Fax: 403-284-0074; Email: charles.henderson@ucalgary.ca;
Website: www.geo.ucalgary.ca/asrg

Vice Chair: Dr. Vladimir Davydov

Department of Geosciences, Boise State University
1910 University Drive, Boise ID 83725 USA

Secretary: Dr. Shuzhong Shen

Nanjing Institute of Geology and Palaeontology, 39 East Beijing Rd.
Nanjing, Jiangsu, China 210008

SUBCOMMISSION ON CARBONIFEROUS STRATIGRAPHY

Chair: Dr. Philip H. Heckel

Department of Geoscience, University of Iowa,
Iowa City, Iowa 52242, USA
Tel: 1-319-335-1804; Fax: 1-319-335-1821; E-mail: Philip-heckel@uiowa.edu

Vice-Chair: Dr Geoffrey Clayton

Department of Geology, Trinity College
Dublin 2, IRELAND
Fax: +353 1 671 1199; E-mail: gclayton@tcd.ie

Secretary: Dr. David M. Work

Maine State Museum, 83 State House Station
Augusta, ME 04333-0083 USA
Fax: +1 207 287 6633; E-mail: david.work@maine.gov

SUBCOMMISSION ON DEVONIAN STRATIGRAPHY

Chair: Dr. Thomas Becker

Geologisch-Paläontologisches Institut, Westfälische Wilhelm-Universität
Correnstrasse 24, D-48149 Münster, Germany
Tel: 49-30-2093-8580, Fax: 49-30-2093-8868; E-mail: rbecker@uni-muenster.de

Vice-Chair: Dr Almed El Hassani

Département de Géologie, Institut Scientifique, B.P 703-Rabat-Agdal, Morocco
E-mail: elhassani@israbat.ac.ma

Secretary: John E.A. Marshall

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

SDS Newsletter editor and **Webmaster**: Rex E. Crick

Department of Geology, UTA Box 19049
University of Texas at Arlington, TX 76019-0049 USA
crick@uta.edu

SUBCOMMISSION OF SILURIAN STRATIGRAPHY

Chair: Dr. Rong Jia-yu

Nanjing Institute of Geology and Paleontology, Academia Sinica,
39 East Beijing Road, Nanjing 210008, China
Tel: 86-25-3282 169; Fax: +86-25 3357 026; E-mail: jyrong@nigpas.ac.cn

Vice-Chair: Dr. Tatjana N. Koren'

All Russian Geological Research Institute -VSEGEI, Sredny Pr. 74,
199026, St. Petersburg, Russia
E-mail: koren@vsegei.sp.ru

Secretary: Dr. Michael J. Melchin (*ending Dec 2004*)

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

Secretary: Dr. Jacques Verniers (*beginning Jan 2005*)

Research Unit Palaeontology, Department of Geology and Pedology, Gent University
Krijgslaan 281 S8, B-9000, Gent, Belgium
E-mail: Jacques.Verniers@rug.ac.be

SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY

Chair: Prof. Chen Xu

State Key Laboratory of Stratigraphy and Palaeobiology, Nanjing Institute of Geology & Paleontology
Chinese Academia of Sciences, 39 East Beijing Road, Nanjing, 210008, China
Tel & Fax: 86-25-8333-75157, E-mail: xu1936@yahoo.com

Vice Chairman: Juan Carlos Gutierrez-Marco

Instituto de Geología Económica (SCIC-UCM), Facultad de Ciencias Geológicas
28040 Madrid, Spain
Tel.: +34-915 44 54 59, Fax: +34-913 94 48 74
E-mail: jcgrapto@geo.ucm.es, URL: <http://www.ucm.es/info/paleo/personal/gutierrez.htm>

Secretary: Dr. Guillermo L. Albanesi

Museo de Paleontología, Universidad Nacional de Córdoba, Casilla de Correo 1598
5000 Córdoba, Argentina
Tel.: +54-(0)351-4719575, Fax.: +54-(0)351-4216350
E-mail: *galbanesi@arnet.com.ar*, and *galbanes@com.uncor.edu*

SUBCOMMISSION OF CAMBRIAN STRATIGRAPHY

Chairman: Shanchi Peng

Nanjing Institute of Geology and Palaeontology, The Chinese Academy of Sciences,
39 East Beijing Street, Nanjing 210008, China,
Email: *scpeng@nigpas.ac.cn*

First Vice Chair: Malgorzata Moczydlowska-Vidal

Department of Earth Sciences, Palaeobiology, Uppsala University,
Norbyvägen 22, Box 558, 752 36 Uppsala, Sweden,
Email: *malgo.vidal@pal.uu.se*

Vice-Chair (and webmaster): Prof. Dr. Gerd Geyer

Institut für Paläontologie, Bayerische Julius-Maximilians-Universität, Pleicherwall 1
D-97070 Würzburg, Germany
Tel: 49-931-312599, Fax: 49-931-312378; E-mail: *palo001@rzroe.uni-wuerzburg.de*

Secretary: Loren E. Babcock

Department of Geological Sciences, 125 South Oval Mall, The Ohio State University
Columbus, OH 43210, USA
E-mail: *babcock.5@osu.edu*

SUBCOMMISSION ON EDIACARAN STRATIGRAPHY

Chairman: James Gehling

South Australian Museum, North Terrace, Adelaide, 5000 Australia.
Tel. +61-8-8207-7441, email *jgehling@ozemail.com*

Vice-Chairman: Shuhai Xiao

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

Secretary: Graham Shields

School of Earth Sciences, James Cook University,
Townsville, Queensland 4814, Australia
Tel. +61-7-4781-5008 email *graham.shields@jcu.edu.au*

SUBCOMMISSION ON PRECAMBRIAN STRATIGRAPHY

Chair: Dr. Wouter Bleeker

Geological Survey of Canada, 601 Booth Street
Ottawa, Ontario K1A 0E8, Canada
Tel: (613) 943-7277; Fax: (613) 995-9273; E-mail: wbleeker@nrcan.gc.ca

Vice Chair: Dr. Martin Van Kranendonk

Geological Survey of Western Australia,
Mineral House, 100 Plain Street, East Perth, Western Australia 6004, Australia
Tel: (08) 9222-3631; Fax: (08) 9222-3633; E-mail: martin.vankranendonk@doir.wa.gov.au

Secretary: Dr. Robert Rainbird

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

SUBCOMMISSION ON STRATIGRAPHIC CLASSIFICATION

Chair: Prof. Maria Bianca Cita Sironi

Dept. Scienze della Terra, Università di Milano, via Mangiagalli 34
I-20133 Milano, Italy
Tel: +39-02-503-15529, Fax: 39-02-503-15494; E-mail: maria.cita@unimi.it

Vice Chair: Dr. Aston Embry

Institute of Sedimentary and Petroleum Geology Geological Survey of Canada,
3303 33rd St. N.W., Calgary, Alberta T2L 2A7, Canada
E-mail: AEmbry@NRCan.gc.ca

Secretary and Webmaster: M.R. Petrizzo,

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

TASK GROUP: STRATIGRAPHY INFORMATION SERVICES

James S. Crampton

Institute of Geological and Nuclear Sciences, Gracefield Research Centre
69 Gracefield Road, Lower Hutt, New Zealand.
E-mail: j.crampton@gns.cri.nz

Simone Galeotti

Istituto di Geologia, Università degli Studi di Urbino, Campus Scientifico,
Località Crocicchia, 61029 Urbino, Italy.
E-mail: s.galeotti@uniurb.it

Webmaster: Sorin Filipescu

Department of Geology, Babes-Bolyai University, Str. Kogalniceanu 1, 3400
Cluj-Napoca, Romania.
E-mail: sorin@bioge.ubbcluj.ro



International Commission on Stratigraphy Subcommission on Quaternary Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

Subcommission on Quaternary Stratigraphy (SQS)

Submitted by:

Philip Gibbard *Chair, SQS*

Godwin Institute of Quaternary Research, Department of Geography,
University of Cambridge, Downing Street, CAMBRIDGE CB2 3EN, England.

Tel: +44 (0)1223 333924; Fax: +44 (0)1223 333392, E-mail: plg1@cus.cam.ac.uk

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

- Rationalization of global chronostratigraphical classification.
- Intercalibration of fossil biostratigraphies, integrated zonation and recognition of global datum points.
- Definition of Subseries/Series boundaries and selection of global stratotype sections.
- Correlation of Quaternary rock successions and events, including terrestrial to marine sequences.

The objectives satisfy the IUGS mandate 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 Quaternary geology world-wide; attracting competent students and research workers to the discipline; and fostering an increased awareness among individual scientists world-wide of what related programmes are being undertaken.

3. ORGANIZATION

SQS is a Subcommission of the International Commission on Stratigraphy.

Officers (chairman, two vice-chairmen, secretary), voting members (20). (*see Appendix for complete listing*). There are currently three Working Groups established the remit of which is their definition of GSSPs for the Early-Middle, Middle/Late Pleistocene and Late Pleistocene/Holocene boundaries.

These individuals represent a broad spectrum of specialized stratigraphical disciplines from throughout the World. Publication of information is by website.

Officers for 2004-2008:

[Full addresses are in Appendix]

Chairman: Dr. Philip Gibbard

Vice-Chair: Dr. Jerry McManus

2nd Vice-Chair: Dr. John van Couvering

Secretary: Dr. Thijs van Kolfschoten

Website: www.quaternary.stratigraphy.org.uk

This site is used as the main line of communication for the Subcommittee. The pages are maintained by Phil Gibbard.

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

Support by the chairman's university (University of Cambridge), and by the International Quaternary Association (INQUA).

5. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Quaternary Subcommittee is directly affiliated with the International Quaternary Association (INQUA).

In order to strengthen the interchange of information between the INQUA Commission on Stratigraphy and Geochronology, the Secretary Valerie Hall (Queen's University, Belfast) was invited by Phil Gibbard to become an *ex-officio* member of the Subcommittee.

6. CHIEF ACCOMPLISHMENTS IN 2006

Three GSSP Working Group are fully functioning.

Lower-Middle Pleistocene Boundary

The Working Group on Lower-Middle Pleistocene boundary working group began in November 2002 and currently comprises 11 members: Brad Pillans (Australia, Chair), Thijs Van Kolfschoten (The Netherlands), Andrei Dodonov (Russia), Anastasia Markova (Russia), Lui Jiaqi (China), Charles Turner (UK), Luc Lourens (The Netherlands), Martin Head (UK), Cesare Ravazzi (Italy), Craig Feibel (USA) and Tom Meijer (The Netherlands).

The 32nd IGC Congress in Florence, in August, enabled many members of the Working Group to meet and discuss current and future activities.

A symposium entitled "Early-Middle Pleistocene transition", convened by Phil Gibbard and Thijs van Kolfschoten, included 7 oral and 6 poster presentations. After the symposium, a meeting of the working group was held, chaired by Brad Pillans and attended by 9 members and 7 other conference attendees.

The meeting passed two significant resolutions:

1. That the Early -Middle Pleistocene boundary be defined in a marine section at a point "close to" the Matuyama/Brunhes magnetic boundary.

2. That a GSSP should not be defined in a marine core, but in a marine section exposed on-land.

A second symposium “Pleistocene chronostratigraphic subdivision and stratigraphic boundaries in the mammalian record” was convened by Neri Ciaranfi, Phil Gibbard and Anastasia Markova, which included 9 oral and 7 poster presentations. Two candidate GSSPs in southern Italy were described – Montalbano Jorica section and Valle di Manche section.

Following the Florence meeting, Dr Pillans received information on a third candidate GSSP: the Chiba section in Japan. A fourth potential candidate section (Castlecliff, Wanganui Basin, New Zealand) is ruled out because it is a shallow-water section and contains significant unconformities. Other potential GSSPs may be considered if they are brought to the attention of the working group within the near future.

Middle/Late Pleistocene Boundary

The first meeting of the working group Middle/Late Pleistocene Boundary, chaired by Professor Thomas Litt (Bonn, Germany), was held in Bonn, Germany 19 20 March 2004. The aim was to begin selecting sites for a potential boundary stratotype.

Phil Gibbard (Cambridge) summarised the present state of the discussion: this boundary is not formally defined, but has been placed at the beginning of the Last Interglacial (Eemian, Mikulino, Sangamonian etc.), since the 1930s. More recently, it has been placed at the base of Marine Isotope Stage (MIS) 5 by Richmond (1996). Although it may seem attractive to define the boundary in an ocean sediment sequence, the inherent imprecision of most of such sequences, resulting from slow sedimentation rate, combined with the effects of bioturbation, suggests that for high-resolution stratigraphical purposes they are generally unsuitable for the definition of golden spike-type, time-plane boundaries. It is therefore proposed that the Saalian-Eemian stage boundary, and thus the Middle-Upper Pleistocene Subseries boundary-stratotype be defined from a terrestrial locality (Amsterdam-Terminal borehole). This parastratotype locality is also to be proposed as the Eemian Stage unit-stratotype for NW Europe.

Aleid Bosch (Utrecht) informed about the stratotype of the Eemian in the Netherlands. He gave further information about the parastratotype locality at 63.5 m below surface in the Amsterdam-Terminal borehole, The Netherlands (52E0913: 52° 22 45N; 4° 54 52E) which is the best for the Eemian in the Netherlands.

Thomas Litt (Bonn) and Charles Turner (Cambridge) discussed the correlation and synchronisation of Eemian sequences in continental Europe based on palynological data.

Jerry McManus (Woods Hole) informed about the potential of the oxygen isotope signal for global correlation based on benthic foraminifera. He demonstrated the importance of the Heinrich Event H11 at the onset of MISubstage 5e for correlation in the North Atlantic region and adjacent areas.

Wighart von Koenigswald (Bonn) summarised the state of the art concerning micro-mammalian stratigraphy. He described the potential of the transition between *Arvicola cantianus* and *A. terrestris* during the beginning of the Last Interglacial in northern central Europe, however he underlined the regional variability caused by migration processes.

The final discussion has shown that the difficulties posed by using boreholes as type-localities, because of potential problems arising for access and lateral correlation etc., should not be underestimated. However, the lack of exposures in the type area necessitate the use of a reference borehole for this purpose.

It was agreed that it is important to select several parastratotypes for the Middle/Upper Pleistocene boundary both in the continental and marine environment.

To make further progress and to get financial support for regular annual meetings and workshops, Thomas Litt will prepare a proposal which will be sent to DFG (German Research Foundation) and eventually to IGCP.

Pleistocene-Holocene Boundary

The Working Group on the Pleistocene-Holocene Boundary is chaired by Professor Mike Walker (University of Wales, Lampeter). The Working Group draws on the expertise of the INTIMATE (Integration of Ice-core, Marine and Terrestrial Records) Group, which is, in turn, a Working Group of the INQUA Palaeoclimate Commission. Accordingly, it includes ice-core, marine and terrestrial scientists. The intention is to define the GSSP/GSSA for the base of the Holocene in the new NorthGRIP ice core (*Nature*, 2004, 431, 147-151) from which a high-resolution, multi-parameter proxy climate record is in the process of being generated. The aim will be to define the base of the Holocene with a temporal resolution of 10 yr, or possibly even less.

Once that boundary has been defined, it is intended to bring forward proposals for suitable parastratotypes in marine and terrestrial sequences in both the northern and southern hemispheres. The broad technical and geographical expertise of the Working Group should ensure that the most appropriate parastratotypes are designated.

In addition to the Working Group activities noted above, the Subcommission website continues to be expanded at: <http://www.quaternary.stratigraphy.org.uk>. This site is used as the main line of communication for the Subcommission. The pages are maintained by Phil Gibbard.

7. SUMMARY OF EXPENDITURE IN 2006:

Maintenance of website (address) 2 years initially:	£10.00
Travel by participants to Milano meeting	£150.00
TOTAL	£150.00

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED IN NEXT YEAR (2007-2008)

All three working groups will continue to function in 2007. The Working Group on the Pleistocene-Holocene Boundary is about to submit its proposal in the new year. Other groups will also continue their deliberations.

9. BUDGET FROM ICS IN 2006 AND REQUESTED FOR 2007

Currency in British Pounds (£), based on an exchange rate of £1 GBP = 1.95 US\$

Actual costs 2006

Amount carried over from 2005	£1073
Amount received from ICS	£191 (\$375)
General office expenses	£20
Contribution towards cost of web-site	£10
Travel costs	£150
Current bank balance	£1084

Proposed costs for 2007

General office expenses	£100
Contribution towards cost of website	£10
Contributions to Working Groups	£100
Support for meetings	£100
Total 2007 budget	£774 (\$1510)
AMOUNT REQUESTED	£200 (\$390)

Potential funding sources outside IUGS

Financial support will be sought by individual members from their grant-awarding bodies for specific projects such as research projects and meetings, but support has also been received from INQUA through interaction with the INQUA Commission on Stratigraphy and Geochronology.

10. OBJECTIVES AND WORK PLAN FOR NEXT YEARS

The Science plan to be completed before the year 2008 will be as follows:

- a. Formalisation of Global Stratotype section and Points (GSSP) for the **Lower/Middle** and for the **Middle/Upper** subseries/subepoch boundaries of the Pleistocene Series/Epoch. The formal nomenclature for the subseries/subepoch divisions of the Pleistocene will be Lower/Early, Middle/Mid, and Upper/Late.
- b. Formalisation of a GSSA for the base of the **Holocene** Series/Epoch.
- c. An international correlation chart for the most commonly used regional stratigraphic units and isotope stages. No international stage-level subdivisions for the Pleistocene or Holocene will be formalised. *This has now been completed and was published in early 2005.*
- d. The voting members, and make-up of each GSSP task group, should strive to provide a uniform coverage of terrestrial, shallow-marine and pelagic settings with global coverage.
- e. Progress and discussions within the Subcommittee will be summarised through an active SQS website.

Together the officers “will compile a list of active persons willing to act as voting members. The latter will consist of individuals who will represent the widest-possible range of Quaternary stratigraphical expertise and will include no more than two persons from each geographical region”. The full list is given below.

P.L. GIBBARD (Cambridge)
6.12.06

APPENDIX [Names and Addresses of Current Officers and Voting Members]

Chair: Dr. Philip Gibbard

Godwin Institute of Quaternary Research, Department of Geography, University of Cambridge
Downing Street, Cambridge CB2 3EN, England
E-mail: plg1@cus.cam.ac.uk

Vice-Chair: Dr. Jerry McManus

Wood's Hole Oceanographic Institute, Wood's Hole, MA, USA
E-mail: jmcmamus@whoi.edu

2nd Vice-Chair: Dr. John van Couvering

American Museum of Natural History, Central Park West at 79 St., New York, NY 10024 USA
Tel: 212-769-5657; Fax: 212-769-5653
E-mail: vanc@amnh.org

Secretary: Dr. Thijs van Kolfschoten

Faculty of Archaeology, Leiden University, Reuvenplaats 4, 2300 RA Leiden, The Netherlands
E-mail: T.van.Kolfschoten@rulpre.leidenuniv.nl

List of Voting Members

Dr Brent Alloway
Senior Research Scientist
Institute of Geological & Nuclear Sciences,
Wairakei Research Centre,
State Highway 1, Private Bag 2000,
Taupo, New Zealand
Phone: +64-7-374-8211
Direct: +64-7-376-0160
Fax: : +64-7-374-8199
E-mail: b.alloway@gns.cri.nz

Dr Alan Glenn Beu
Paleontologist
Institute of Geological & Nuclear Sciences
P O Box 30368, Lower Hutt, New Zealand
[Courier address: Gracefield Research Centre
69 Gracefield Road, Lower Hutt, New Zealand]
Direct phone: +64-4-570 4847
Fax: +64-4-570 4600
E-mail: a.beu@gns.cri.nz

Professor Mauro Coltorti
Dipartimento di Scienze della Terra
Via di Laterina, 8
53100 Siena, Italy
tel +39- (0)577-233814
fax +39-(0)577-233938
email: coltorti@unisi.it

Dr Andrey Dodonov,
Geological Institute RAS,
Pyzhevsky, 7, 119017
Moscow, Russia.
Phone: +7 (095) 230 81 31
Fax: +7 (095) 953 07 60
E-mail: dodonov@geo.tv-sign.ru

Professor Martin J. Head
Department of Earth Sciences
Brock University
St.Catherine's,
Ontario, Canada
Phone: +44 (0)1223 339751
Fax: +44 (0)1223 333392
Email: mh300@cam.ac.uk

Professor Dr. Liu Jiaqi
Institute of Geology and Geophysics
Chinese Academy of Sciences
Beituchenglu, Qijiahuozhi
P.O.Box 9825, Beijing
100029 China
Tel. +86 10 62008005(0)/62008240(h)
Fax. +86 10 62052184/62010846
email: liujq@mail.igcas.ac.cn/liujiaqi2001@yahoo.com.cn

Professor Karen Luise Knudsen
Department of Earth Sciences
University of Aarhus
C.F. Møllers Alle 120
DK-8000 Aarhus C
Denmark
Tel: +45 8942 3557
Fax: +45 8618 3936
E-mail: karenluise.knudsen@geo.au.dk

Professor Thomas Litt
Institute of Paleontology
University of Bonn
Nussallee 8
D-53115 Bonn, Germany
Phone: 0049 228 732736
Fax: 0049 228 733509
E-mail: t.litt@uni-bonn.de

Professor Tim Partridge
Climatology Research Group
University of the Witwatersrand
12 Cluny Road
Forest Town
Johannesburg 2193
South Africa
Phone (+2711) 646-3324
Fax (+2711) 486-1689

Professor Brad Pillans
Research School of Earth Sciences
The Australian National University
Canberra, Act, 0200,
Australia
Ph: +61-2-6125 9644 (Office)
+61-2-6249 1507 (Lab)
+61-2-6232 4687 (Home)
Fax: +61-2-6125 3683

Professor Jean-Pierre Suc
Directeur de Recherche CNRS
Laboratoire Paléoenvironnements et Paleobiosphère
Université Claude Bernard - Lyon 1
27-43 boulevard du 11 Novembre
F 69622 Villeurbanne Cedex,
France
Tel. (33).(0)4.72.44.85.90
Fax. (33).(0)4.72.44.83.82
E-mail: jean-pierre.suc@univ-lyon1.fr
jean-pierre.suc@wanadoo.fr

Dr. Charles Turner,
Department of Earth Sciences,
The Open University,
Milton Keynes MK7 6AA,
UK
Tel: +44 1908 652889
Fax +44 1908 655151
E-mail c.turner@open.ac.uk

Professor M.J.C. Walker
Department of Archaeology
University of Wales, Lampeter
Ceredigion, SA48 7ED,
Wales, UK
Email: walker@lamp.ac.uk
Phone: +44 1570 424736
Fax: +44 1570 423669

Professor Cari Zazo
Departamento de Geología
Museo Nacional de Ciencias Naturales (CSIC)
Jose Gutierrez Abascal 28006-Madrid (Spain)
Tel. -++34.91.4111328 (ext.11899)
Fax. -++34.91.5644740
e-mail.-menzc65@mncn.csic.es

Working group leaders and corresponding members

Working Group on the Pleistocene/Holocene Boundary

convenor: Professor M.J.C. Walker (Lampeter)

members:

INTIMATE group members

Working Group on the Middle/Late Pleistocene Boundary

convenor: Professor Thomas Litt (Bonn, Germany) t.litt@uni-bonn.de

members:

Dr. Art Bettis (Iowa, USA) art-bettis@uiowa.edu
Dr. Aleid Bosch (Zwolle, The Netherlands) A.Bosch@nitg.tno.nl
Dr. Andrey Dodonov (Moscow, Russia) dodonov@geo.tv-sign.ru
Professor Philip Gibbard (Cambridge, UK) plg1@cus.cam.ac.uk
Prof. Liu Jiaqi (Beijing, China) liujiaqi2001@yahoo.com.cn
Prof. Peter Kershaw (Clayton, Australia) Peter.Kershaw@arts.monash.edu.au
Prof. Wighart von Koenigswald (Bonn, Germany) koenigswald@uni-bonn.de
Dr. Jerry McManus (Wood's Hole, USA) jmcmanus@whoi.edu
Prof. Tim Partridge (Johannesburg (South Africa)
Dr. Charles Turner (Milton Keynes, UK) c.turner@open.ac.uk

Working Group on the Early/Middle Pleistocene Boundary

convenor: Professor Brad Pillans (Canberra)

members:

Professor Thijs Van Kolfshoten (Leiden),
Dr Andrei Dodonov (Moscow),
Professor Anastasia Markova (Moscow),
Professor Jiaqi Lui (Beijing),
Dr Charles Turner (Cambridge),
Professor Luc Lourens (Utrecht),
Dr Martin Head (Cambridge),
Dr Cesare Ravazzi (Bergamo),
Dr Craig Feibel (New Jersey)
Dr Tom Meijer (Utrecht),



International Commission on Stratigraphy Subcommission on Neogene Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

Subcommission on Neogene Stratigraphy (SNS)

Submitted by: Frederik J. Hilgen, Chairman SNS
Faculty of Geosciences, Utrecht University
P.O. Box 80021, 3508 TA Utrecht, Netherlands. E-mail: fhilgen@geo.uu.nl.

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The SNS is the primary body responsible for providing optimum clarity and stability in the Neogene Chronostratigraphic Scale by selecting and defining Global Stratotype Sections and Points (GSSPs) for Series and Stages.

3. ORGANIZATION

The SNS is a subcommission of the ICS, founded in 1971. Reference is made to the annual report of 1995 for a brief historical resume of the SNS. The subcommission has four regional committees (Mediterranean, Pacific, Atlantic and Nordic) and keeps close contacts with the Russian Neogene Commission chaired by Prof. Yuri B. Gladenkov. Apart from the executive bureau, the SNS has 20 voting members and 38 corresponding members (*see Appendix for full list of officers and voting members*). The SNS has presently one active working group for defining the GSSP remaining for the Langhian and Burdigalian chaired by Isabella Raffi. The SNS web site (www.geo.uu.nl/SNS) is used for news release and contains the following sections: Home, News, Board, Members, Newsletters, GSSPs, and Links.

3a. Officers for 2004-2008:

Chair: Frits Hilgen, Utrecht, The Netherlands

Vice-Chairs: Francisco Javier Sierro, Salamanca, Spain
David Hodell, Florida, USA

Secretary: Elena Turco, Parma, Italy

Support for the SNS comes from the Chairman's Institute (Faculty of Geosciences, Utrecht University). This institute also hosts the SNS web-site.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

There is a close link with (I)ODP because of its important role in the development of integrated time scales for the Neogene, in testing the global correlation potential of bio-events, and in a better understanding of climate and ocean history during this time span.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

The Serravallian GSSP was defined at the base of the Blue Clay Formation in the Ras il Pellegrin section on Malta, coincident with the younger end of the major mid-Miocene (Mi-3b) oxygen isotope event and relatively close to the *Sphenolithus heteromorphus* LO, previously considered as prime guiding criterion for the boundary. The proposal had been sent out to SNS voting members in mid-June. A quorum of about **86%** (18 votes out of 21, 3 no reply) was reached and all votes were fully positive except for one which was positive but with reservations. The Working Group reacted by writing a reply to these reservations.

The revised proposal was submitted to ICS and sent out for voting to the full ICS commission by the end of September. The votes received from the ICS were **15 "Yes" (83%)**. Two members voted *No* (11%), and one *Abstained*. Our Serravallian Working Group replied to the concerns raised by the "No" and "Abstain" votes. The ICS subsequently submitted the GSSP proposal for the base of the Serravallian Stage of the middle Neogene to the IUGS for ratification at their next meeting. If ratified, then a modified form of this proposal will be published in *Episodes*. The working group on the Serravallian GSSP will "add a figure and a table which summarizes all the stratigraphic information near the GSSP" in the formal document to be published in *Episodes*, in case the proposal is ratified by IUGS.

Finally a paper on the application of Unit-Stratotypes for global stages was published in *Earth Science Reviews*. This paper discusses the potential need for a revival of the Unit Stratotype approach albeit in a modified form in defining Global Stages.

6. CHIEF PROBLEMS ENCOUNTERED IN 2005

An important signaled problem is the possible lack of suitable sections in the Mediterranean for defining the remaining Neogene GSSPs, namely the Langhian and Burdigalian GSSP. This is certainly the case if we prefer to have the boundaries defined in astronomically tuned deep marine sections that underlie the geologic time scale. One potentially suitable section for the **Langhian** has been identified, namely the La Vedova section near Ancona. A pilot study showed that this section is suitable for establishing a reliable magnetostratigraphy but that the microfossil preservation is only moderate. However, it will cost a considerable amount of research effort and money before this section has been studied in sufficient detail to be promoted as Langhian GSSP. An alternative section located on Sardegna (Italy) is presently being investigated. The option to have these boundaries defined in ODP cores is also being considered by the Working Group on the Langhian and Burdigalian GSSPs.

7. SUMMARY OF EXPENDITURES IN 2006:

Credit on July 2005	Euro	4865,00
Credit on Nov 2006	Euro	3502,59
Contribution 2006 ICS to SNS	Euro	751,17
<i>Expenditures</i>		
Working visit Malta	Euro	1350,00
Working visit Italy	Euro	662,70
Meeting	Euro	53,60

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

Intensification of the search for suitable sections and/or cores to define the remaining GSSPs of the Langhian and Burdigalian. A detailed study of the La Vedova section, a potential candidate for the Langhian GSSP, will be carried out. Although preservation is not perfect, the section is suitable for establishing a high-resolution magnetostratigraphy and a calcareous plankton biostratigraphy. A pilot study will be carried out on alternative sections located on Sardegna.

By the end of 2007 the WG on the Langhian and Burdigalian GSSP will provide a list of candidate sections and guiding criteria for the formal definition of these boundaries.

9. BUDGET AND ICS COMPONENT FOR 2006

Organization workshop on base-Langhian and base-Burdigalian Euro 1500
Optional: Fieldtrip to the La Vedova section (base-Langhian) Euro 1500

10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

See Accomplishments in 2006 (above) for additional details.

2002

Base-Tortonian field workshop in Italy. Agreement that Monte dei Corvi section near Ancona is the best choice for a Serravallian-Tortonian boundary section. Completion of Tortonian GSSP proposal.

2003

Ratification by IUGS of Tortonian GSSP at the midpoint of the sapropel of basic cycle 76 in the Monte dei Corvi section (northern Italy).

2004

Publication of a revised Neogene Time Scale (Lourens et al., 2004 in Gradstein et al., 2004. Geologic Time Scale 2004. Cambridge University Press, ~500 pages).

2005

Selection of the Ras il Pellegrin section on Malta as the most suitable (Mediterranean) section to define the Serravallian GSSP and the mid-Miocene Mi-3b oxygen isotope event as prime guiding criterion for the boundary. Preparation of the Serravallian GSSP proposal.

11. OBJECTIVES AND WORK PLAN FOR NEXT 2 YEARS (2007-2008)

Organization of a workshop on the selection of boundary criteria and sections for defining the 2 remaining stage boundaries in the Miocene, namely the base-Langhian and the base-Burdigalian. Suitable sections in the Mediterranean region that may serve as GSSP sections for these boundaries have not yet been identified although the La Vedova might be a good candidate for the Langhian GSSP. Most candidate sections specifically fail in the matter of potential for astronomical tuning. A crucial question to be answered during the workshop is whether we should abandon the ambition of having also these GSSPs directly tied within an astrochronologic framework and having them defined in landbased sections without possibilities of tuning or whether we should have these GSSPs defined in drilled ODP sequences at Ceara Rise or any other tuned sequence drilled by (I)ODP.

Selection of most suitable section/ODP core and guiding criteria for defining the Langhian and Burdigalian GSSPs in 2007. Writing of proposals for the Langhian and Burdigalian GSSPs in 2008.

APPENDIX [Names and Full Addresses of Current Officers and Voting Members]

Subcommission officers

Chairman: Frederik J. Hilgen, Faculty of Geosciences, Utrecht University, P.O. Box 80021, 3508 TA Utrecht, The Netherlands, e-mail: fhilgen@geo.uu.nl

Vice Chairmen: David Hodell, Department of Geological Sciences, University of Florida, Gainesville, FL 32611, USA. Email: dhodell@geology.ufl.edu

Francisco Javier Sierra Sánchez, Departamento de Geología, Facultad de Ciencias, Universidad de Salamanca, 37008 Salamanca, España. Email: sierro@usal.es

Secretary: Elena Turco, Dipartimento di Scienze della Terra, Università degli Studi di Parma, Parco Area delle Scienze 157, 43100, Parma, Italia. Email: elena.turco@unipr.it

List of Voting Members

Agusti, J., Spain, agustibj@diba.es

Aubry, M.P., USA, aubry@rci.rutgers.edu

Backman, J. Sweden, backman@geo.su.se

Berggren, W.A., USA, wberggren@whoi.edu

Bernor, R., USA, rbernor@Howard.edu

Beu, A.G., New Zealand, a.beu@gns.cri.nz

Gladenkov, Y.B., Russia, gladenkov@geo.tv-sign.ru

Hilgen, F.J., Netherlands, fhilgen@geo.uu.nl

Hodell, D.A., USA, dhodell@geology.ufl.edu

Iaccarino, S., Italy, iaccarin@unipr.it

Kent, D.V., USA, dvk@ldeo.columbia.edu

Meyer, K.J., Germany, ----

Nagymarosy, A., Hungary, gtorfo@ludens.elte.hu

Semenenko, V.N., Russia, ----

Sierro, F.J., Spain, sierro@gugu.usal.es

Sprovieri, R., Italy, rspr@unipa.it

Turco, E., Italy, eturco@unipr.it

Vai, G.B., Italy, vai@geomin.unibo.it

Van Couvering, J., USA, vanc@amnh.org

Wang, P., China, pxwang@online.sh.cn

Zachariasse, W.J., Netherlands, jwzach@geo.uu.nl



International Commission on Stratigraphy Subcommission on Paleogene Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

International Subcommission on Paleogene Stratigraphy

Submitted by:

Eustoquio MOLINA, Chairman
Departamento de Ciencias de la Tierra
Universidad de Zaragoza
Calle Pedro Cerbuna, 12
E-50009 Zaragoza
Spain.
Tel. 34 976 761077, Fax. 34 976 761106
Email: emolina@unizar.es

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission statement

The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Paleogene Stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of the evolution of the Earth during the Paleogene Period. Its first priority is the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units, which provide the framework for global correlation.

Goals

- a) to agree on an international set of stages and series for the Paleogene.
- b) to establish basal boundary stratotypes (GSSPs) of the Paleogene stages and series.
- c) to encourage research into the Paleogene by setting up and supporting Working Groups and Regional Committees to study and report on specific problems.
- d) to organize symposia and workshops on subjects of Paleogene stratigraphy.
- e) to maintain a website informing on progress and coming events in Paleogene stratigraphy.

Fit within IUGS Science Policy

The objectives of the Subcommission relate to three main aspects of IUGS policy:

- 1) Establishment of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs. A set of Paleogene stages has been voted and agreed on by the ISPS in 1989.

Subsequently, Working Groups have been set up to find a Global Stratotype Sections and Points (GSSPs) for the boundary of each of these stages.

- 2) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Paleogene Period.
- 3) Working toward an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs. This relates to, inter alia, the IUGS Geosites Programme and the UNESCO Geoparks Programme.

3. ORGANIZATION

ISPS is a Subcommittee of the International Commission on Stratigraphy. The Subcommittee is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting members of the Subcommittee. There are 20 Voting Members (Akhmetiev, Aubry, Cosovic, Fluegeman, Gely, Gingerich, Gladenkov, Hardenbol, Hooker, Hottinger, Malumian, Miller, Molina, Monechi, Premoli Silva, Schmitz, Strong, Strougo, Thomas, and Vandenberghe) elected for their personal expertise and experience and 84 Corresponding Members, who have a responsibility for communication in both directions between the Subcommittee and researchers on Paleogene topics in their region. Voting and Corresponding Members were selected regionally to provide expertise in the Paleogene stratigraphy of each major area and according to their speciality in order to cover the main fields of stratigraphic tools used in the Paleogene.

Under the umbrella of the Subcommittee, we have set up the following Working Groups and Regional Committees:

- 1) Paleocene Working Group. Chairman: B. Schmitz, Sweden.
- 2) Ypresian/Lutetian Boundary Stratotype Working Group. Chairman: E. Molina, Spain. Secretary: C. Gonzalvo, Spain.
- 3) Lutetian/Bartonian Boundary Stratotype Working Group. Chairman: R. Fluegeman, USA.
- 4) Bartonian/Priabonian Boundary Stratotype Working Group. Chairwoman: I. Premoli Silva, Italy.
- 5) Rupelian/Chattian Boundary Stratotype Working Group. Chairwoman: I. Premoli Silva, Italy.
- 6) Paleogene Planktonic Foraminifera Working Group. Chairman: B. Wade, USA. Secretary: H. Coxall, UK.
- 7) Paleogene Benthos Working Group. Chairman: L. Hottinger, Switzerland.
- 8) Regional Committee in North-European Paleogene Stratigraphy. Chairman: G. Vestegaard Laursen, Norway. Secretary: J.W. Verbeek, Netherlands.
- 9) South-American Regional Committee on Paleogene Stratigraphy. Chairman: N. Malumian, Argentina. Secretary: C. Nañez, Argentina.
- 10) Russian Paleogene Commission. Chairman: M.A. Akhmetiev, Russia. Secretary: G.N. Aleksandrova.
- 11) Working Group on Paleogene Stratigraphy of the North Pacific. Chairman: Y.B. Gladenkov, Russia.

Furthermore, the Subcommittee sponsors and International Meeting on the Paleogene about every two years: Zaragoza, Spain (1996); Göteborg, Sweden (1999); Powell, USA (2001); Leuven, Belgium (2003); Luxor, Egypt (2004); Bilbao, Spain (2006); Lower Hutt, New Zealand (2008).

Officers for 2004-2008:

Chair:	Eustoquio Molina, Spain
Vice-Chair:	Jan Hardenbol, USA
Secretary:	Nöel Vandenberghe, Belgium

The WEB address for ISPS site is: <http://wzar.unizar.es/isps/index.htm>. The web site content is the following: Home (overall objectives, organization), Past & Future (accomplishments, problems and plans), Working Groups and Regional Committees (annual reports), Literature (a selection of monographies on the Paleogene). News/Books (two monographies on Paleogene Stratigraphy edited by Luterbacher and Vandenberghe in 2004) and News/Events (Meeting on Climate and Biota of the Early Paleogene in Bilbao, Spain, June 2006).

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Some of our members participate also in the work of the following International projects:

- Ocean Drilling Programme.
- International Subcommissions on Cretaceous and Neogene Stratigraphy.
- International Geoscience Programme (IGCP).
- ProGEO, Geosites and Geoparks Initiatives.
- UNESCO World Heritage Sites.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

The main event in 2006 has been the Meeting on Climate and Biota of the Early Paleogene, which was held in Bilbao, Spain, in June 2006.

5a. Climate and Biota of the Early Paleogene, Bilbao, Spain, June 2006.

The Meeting was organized by Victoriano Pujalte and Xabier Orue-Etxebarria, Department of Stratigraphy and Paleontology, Faculty of Science and Technology, University of the Basque Country, Spain. 156 papers were presented and edited in a volume of abstracts (Caballero, F. et al. Eds. 2006). Furthermore, 3 field trips were organized: A mid-conference field excursion to Azkorri-Gorrondatxe and two post-conference field excursions to Zumaia and Southern Pyrenees.

5b. Progress with selection of GSSPs for Paleogene Stages.

On the web site of ISPS can be found the annual reports of the Working Groups and Regional Committees and some other accomplishments and information. The reports on the Paleogene GSSPs are the following:

Danian (Cretaceous/Paleogene boundary). The GSSP for the base of the Danian was defined in the El Kef Section (Tunisia) and ratified by the IUGS in 1991. However, this GSSP was not officially published in a prestigious stratigraphical journal of wide distribution. Since that time, some problems arose because the detailed proposal was unknown to many scientists working on the K/Pg boundary, new sections in Mexico were found and controversial interpretations were proposed. Therefore, in order to resolve these problems, the ICS has required the ISPS to finally

publish the proposal. The chairman of ISPS (E. Molina) in collaboration with Tunisian colleagues visited the GSSP at El Kef in April, in order to put in place an artificial marker ("golden spike"), and to request the Tunisian authorities to protect the site. At the same time, the present status of the site has been documented by a series of photographs. Finally, the official publication was submitted and accepted in *Episodes*:

Molina E., Alegret L., Arenillas I., Arz JA., Gallala N., Hardenbol J., Von Salis K., Steurbaut E., Vandenberghe N. & Zaghbib-Turki D. (2006). The Global Boundary Stratotype Section and Point for the base of the Danian Stage (Paleocene, Paleogene, "Tertiary", Cenozoic) at El Kef, Tunisia - Original definition and revision. *Episodes* (in press, Vol. 29, No. 3, December 2006).

Paleocene (Selandian and/or Thanetian). During 2006 focus has been on trying to improve the correlations in the Danian-Selandian interval between the Qreiya section in Egypt and the Zumaia section in Spain. These two sections are main candidates for the Danian-Selandian and Selandian-Thanetian boundary GSSP's. A meeting of the Paleocene Working Group was held in Bilbao on June 15 in connection with the meeting Climate and Biota of the Early Paleogene 2006. The correlation between Zumaia and the North Sea region appears to be resolved, with the transition of the limestone to clay/marl facies in both regions occurring close to the NP4/NP5 boundary. However, discussions in Bilbao revealed that there are problems with the correlation between Zumaia and Qreiya. An interval in the Qreiya section characterized by laminated, organic-rich black clays, and traceable throughout Egypt and Israel, has been considered to correspond to the level with the limestone-marl shift in Zumaia. The correlation was initially established based on the FAD of *Morozovella crosswixensis* in the two sections. However, new data on the nannofossils of the Qreiya section by O.M. Rodriguez and M.P. Aubry show that the vertical distance between the FAD of *M. crosswixensis* and the NP4/NP5 boundary differs substantially between the sections, tentatively suggesting the existence of an unconformity in the Zumaia section. The discussions in Bilbao revealed that there is a problem in the correlation between Spain and Egypt. Later findings by I. Arenillas indicate that the FAD of *M. crosswixensis* may actually occur ca. 10 m below the limestone-marl shift in Zumaia and not at the shift as believed so far.

This means that there presently are two options for the placement of the Danian-Selandian boundary, either at a level in the middle of NP4, corresponding to the organic-rich interval in Egypt, or at a level close to the NP4/NP5 boundary, where the major shift from limestone to marl facies occurs at Zumaia, and possibly also in the North Sea. During the fall of 2006, samples from the Qreiya and Zumaia sections will be distributed to several biostratigraphers and earlier correlations will be reassessed.

Ypresian (Paleocene/Eocene boundary). The Working Group directed by M.-P. Aubry (Rutgers University) successfully completed its task and proposed to place the GSSP for the base of the Eocene Series in the Dababiya Section near Luxor in Upper Egypt. The GSSP is located at the base of the Carbon Isotope Excursion, which has been selected as the criterion for the recognition of the Paleocene/Eocene boundary in 2002. The proposed boundary section has a good chemostratigraphic (stable isotopes) and biostratigraphic record. The "Benthic Foraminiferal Extinction Event", the peculiar planktonic foraminiferal and calcareous nannoplankton assemblages linked to the Initial Eocene Thermal Maximum are well represented in connection with the Carbon Isotope Excursion. The proposal for this GSSP was accepted by the Voting Members of ISPS and ICS. Finally, it has been ratified by IUGS. A complete documentation of the proposed GSSP was published by Micropaleontology Press.

Lutetian. The new section found last year in Agost, Betic Cordillera, Alicante province (Spain) has been intensively studied. Biostratigraphy by means of planktic foraminifera, calcareous nannofossils, small benthic foraminifera and larger foraminifera indicated that the section is continuous and quite expanded. The magnetostratigraphical study reveals a series of reversed and normal chrons, which are now being interpreted and integrated with the biostratigraphical data. This section is a suitable candidate to define the Ypresian/Lutetian boundary. Another suitable candidate found last year is the Gorrondatxe beach section, W Pyrenees, Basque country (Spain). A high-resolution multi-disciplinary study, including physical stratigraphy (lithostratigraphy, sequence stratigraphy and magnetostratigraphy) and biostratigraphy (calcareous nannofossils, planktic and larger foraminifera) has been carried out over the 700 m thick Gorrondatxe section by Orue-Etxebarria et al. (2006).

The results of both sections show that the different events traditionally used to place the Ypresian/Lutetian boundary, hitherto thought to be almost simultaneous, actually occur at very different levels. The criterion to precisely define this boundary will be selected in 2007, before to choose one of these sections to place the Ypresian/Lutetian boundary, and the best section will be chosen and the GSSP proposed before the Geological Congress in 2008.

Reference: Orue-Etxebarria, X., Payros, A., Bernaola, G., Dinarès-Turell, J., Tosquella, J., Apellaniz, E. and Caballero F. (2006) The Ypresian/Lutetian boundary at the Gorrondatxe beach section (Basque country, W Pyrenees). *Mid-Conference Field Excursion Guidebook, Climate & Biota of the Early Paleogene*, Bilbao, 33 pp.

Bartonian. The work of the Lutetian-Bartonian Boundary Working Group during 2006 has continued its focus on the base of magnetic polarity Chron C19n as a guide horizon for the base of the Bartonian. For the base of Chron C19n to be a useful guide horizon for the base of the Bartonian Stage, its correlation potential must be demonstrated. The working group has continued to focus field and laboratory studies on the correlation potential of this horizon.

The Contessa Highway Section, Central Apennines, Italy: The section along the Contessa Highway near Gubbio, Italy is the primary candidate for a GSSP. Historically, this section has been the focus of important biostratigraphic studies of planktonic foraminifera and calcareous nannofossils. The Contessa Highway section also contains an excellent magnetic stratigraphy record in the Paleocene and Eocene. Detailed paleontologic and geochemical studies are underway on the Contessa Highway section by a research team within the framework of the International PALIS (Paleogene Integrated Stratigraphy) Project coordinated by Rodolfo Coccioni. This team is a working group of different specialists (foraminifera, calcareous nannofossils, magnetostratigraphy, geochemistry) and is involved in the study of the Lutetian-Bartonian Boundary at the Contessa Highway section. This working group at present includes Rodolfo Coccioni (Urbino) and Valeria Luciani (Ferrara) (coordinators), Rita Catanzariti (IGG and CNR, Pisa), Luciana Ferraro (CNR, Naples), Fabio Florindo (INGV, Rome), Fabrizio Frontalini (Urbino), Luigi Jovane (INGV, Rome), Mike Kaminski (UCL), Fabrizio Lirer (CNR, Naples), Andea Marsili (Urbino), Simonetta Monechi (Florence), Alessandro Montanari (OGC), Silvia Spezzaferri (Fribourg), Mario Sprovieri (CNR, Naples), and Giordana Uguccioni (Urbino). The Contessa Highway section has been sampled at a very high-resolution (every 5 cm). It is anticipated that a high-resolution biostratigraphic framework and details of the paleoecological and paleoceanographic conditions that accompanied the deposition of the Contessa Highway succession will be the result of this work.

Studies at Barton-on-Sea, U.K: Field work on the Barton Clay and adjacent beds at Barton-on-Sea, southern England were conducted in 2006 by Andy Gale and colleagues. This section is the

traditional Bartonian unit Stratotype. The primary purpose of this work was to collect paleomagnetic data from the Barton Clay. Magnetic stratigraphy has been completed on the underlying Bracklesham beds on the Isle of Wight and correlated with polarity chronozones through the use of calcareous nannofossils. To date, no paleomagnetic data has been collected from the Barton. Results from this work will enhance our understanding of the chronostratigraphy of the type Bartonian and enable better decision-making when selecting a final GSSP.

The working group hopes to complete its work and propose a GSSP for the Bartonian by 2008.

Priabonian. Studies in 2006 focused on the Alano di Piave section (Veneto region, NE Italy), the potential candidate for defining the GSSP of Middle/Upper Eocene, equated to the base of the Priabonian Stage. The Alano section, continuously exposed along the banks of the Calcino Creek, consists of 120-130 m-thick gray marls of the Scaglia Cinerea Formation deposited at bathyal depth. It is easily accessible, is unaffected by structural deformation, is rich in calcareous plankton and contains the critical interval for defining the GSSP of the Priabonian. Calcareous plankton (nannofossils and foraminifera) high-resolution biostratigraphies have been completed and correlated to magnetostratigraphy across the critical interval. The main bioevent in planktonic foraminifera, the extinction of the large acarininids (e.g. *A. praetopilensis*, *A. rohri*) and of *Morozovelloides crassatus* (formerly *Morozovella crassata*) just above, correlates with magnetic chron C17.3n falling in the same position as detected at ODP Site 1052 (Blake Nose, W Atlantic). This is supported by quantitative analysis on calcareous nannofossil distribution from both locations: across the studied interval at Alano and Site 1052 calcareous nannofossils show similar abundance patterns and in the same position with respect to the main planktonic foraminiferal event and magnetic chrons. Magnetic measurements of the Alano section have been extended below and above the critical interval and currently cover almost the whole section. Stable isotope analysis, dinocyst biostratigraphical and benthic foraminiferal studies are in progress. A paper on integrated calcareous plankton biostratigraphy calibrated to magnetostratigraphy is in preparation. A synthesis of the available data was presented at the international meeting on “Climate and Biota of the early Paleogene” held in Bilbao in June 2006.

Reference: Rio D., Premoli Silva I., Agnini C., Brinkhuis H., Fornaciari E., Giusberti L., Grandesso P., Lanci L., Luciani V., Muttoni G., Stefani C., Villa I., The Alano di Piave section (Venetian Southern Alps, NE Italy). A potential GSSP of the Priabonian Stage (Upper Eocene). *International Conference on “Climate and Biota of the early Paleogene” Abstract Volume*, p. 109. ISBN 84-689-8939-8.

Rupelian (Eocene/Oligocene boundary). The GSSP for this boundary was selected in the Massignano Section (central Italy), ratified by the IUGS in 1992 and officially published by Premoli Silva and Jenkins (1993) in *Episodes*.

Chattian. A revised version of the paper on “Integrated stratigraphy of the Oligocene pelagic sequence in the Umbria-Marche basin (Northeastern Apennines, Italy): A potential GSSP for the Rupelian/Chattian boundary” by Coccioni and others, was re-submitted to the *Geological Society of America Bulletin* in January 2006. This version was returned to the first author at the end of August for a second revision which is presently underway. The new further revised manuscript will be re-submitted to the *GSA Bulletin* by next November in the hope it will be accepted for publication. This long revision process delayed considerably the preparation of the formal proposal designating the Monte Cagnero (MCA) section, out of the three sections studied, as GSSP for the Rupelian/Chattian boundary.

5c. Paleogene Subcommittee Directory.

The Directory of members of the Paleogene Subcommittee is being prepared by the secretary. It will give the addresses and e-mail addresses of all members of the Subcommittee, including Voting, Corresponding and Honorary Members. For the Subcommittee Bureau and the Voting Members the research interest and Subcommittee responsibilities will be also listed.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

The problems encountered this year are essentially the same as those discussed in the previous annual reports. ISPS can support only very insufficiently its working groups and regional committees. In particular, we would need a substantial increase in our budget in order to support and in part to reactivate regional committees in poorer areas (e.g. Africa, Indian Subcontinent, SE Asia). Most of the secretarial and other expenses have been covered by the institutions of the officers and other members of ISPS. Since money becomes tighter everywhere, these sources may dry up.

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

INCOME

Carried forward from 2005	€uro 0
ICS Allocation	€uro 1260
TOTAL	€uro 1260

EXPENDITURE FROM 2006 BUDGET

General office expenses	€uro 60
Professional help with the website	€uro 700
Support for Working Groups and Regional Committees	€uro 1000
TOTAL	€uro 1760

Deficit to be carried forward to 2007 €uro -500

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

Complete the work on the GSSPs of the base of the Priabonian and Chattian.
Screen and rejuvenate the list of the Corresponding Members.
Reactivate or close those Regional Committees and Working Groups which are asleep.
Update periodically the ISPS website.

9. BUDGET AND ICS COMPONENT FOR 2007

Projected Budget for 2007:

Deficit from 2006	€uro 500
General office expenses	€uro 400
Professional help with the website	€uro 700
Contributions to Officers travel costs	€uro 800
Support for Working Groups and Regional Committees	€uro 2000

TOTAL BUDGET PROJECTED	€uro 4400

Please note that the financial situation has deteriorated in recent years, particularly in Latin America and the former Soviet Union; an increase would help us to support the corresponding Regional Committees more actively. We also will need some seed money to start new regional committees or working groups.

10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

At present, the GSSPs of the base of the Danian (= Cretaceous/Paleogene Boundary), the base of the Ypresian (= Paleocene/Eocene Boundary), the Rupelian (= Eocene/Oligocene Boundary) and the base of the Aquitanian (= Paleogene/Neogene Boundary) have been established and ratified by the International Union of Geological Sciences.

In 2006 good progress has been made in the search for the remaining GSSPs.

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2006-2009)

Complete and publish the GSSPs of the Paleogene. We hope to present proposals for most of the remaining GSSPs before the Geological Congress in Oslo, 2008.

Produce an updated version of an integrated Paleogene time scale.

Produce a state-of-the-art review of the stratigraphic tools used in the Paleogene.

Preparation of standardized regional correlation charts and paleogeographic maps by the Regional Committees.

Support the organization of the next Meeting on Climate and Biota of the Paleogene, which will be held in Lower Hutt, New Zealand, in 2006. The Meeting will be organized by Christopher Hollis and members of the GNS Science in Lower Hutt, assisted by researchers from other institutions and will be supported by a prestigious Scientific Committee and the ISPS.

**APPENDIX (Names and Addresses of Current Officers and Voting Members, 2004-2008)
INTERNATIONAL SUBCOMMISSION ON PALEOGENE STRATIGRAPHY**

Subcommission officers

Chairman:

Eustoquio Molina, Departamento de Ciencias de la Tierra, Universidad de Zaragoza, Calle Pedro Cerbuna, 12, E-50009 Zaragoza, Spain.
emolina@unizar.es

Vice-Chairman:

Jan Hardenbol, Global Sequence Chronostratigraphy Inc. 826, Plainwood Drive, Houston, Texas 77079-4227, USA.
jhardenbol@aol.com

Secretary:

Noël Vandenberghe, Departement Geografie-Geologie, Afdeling Geologie, Redingenstraat, 16, B-3000 Leuven, Belgium.
noel.vandenberghe@geo.kuleuven.be

List of Working (Task) Groups and their officers

Paleocene Working Group. Chairman: B. Schmitz, Sweden. birger.schmitz@geol.lu.se

Ypresian/Lutetian Boundary Stratotype Working Group. Chairman: E. Molina, Spain.
emolina@unizar.es Secretary: C. Gonzalvo, Spain. concha@unizar.es

Lutetian/Bartonian Boundary Stratotype Working Group. Chairman: R. Fluegeman, USA.
fluegem@bsu.edu

Bartonian/Priabonian Boundary Stratotype Working Group. Chairwoman: I. Premoli Silva, Italy. isabella.Premoli@unimi.it

Rupelian/Chattian Boundary Stratotype Working Group. Chairwoman: I. Premoli Silva, Italy.
isabella.Premoli@unimi.it

Paleogene Planktonic Foraminifera Working Group. Chairman: B. Wade, USA.
bwade@rci.rutgers.edu. Secretary: H. Coxal, UK. hkc@gso.uri.edu

Paleogene Benthos Working Group. Chairman: L. Hottinger, Switzerland.
lukas.hottinger@unibas.ch

Regional Committee in North-European Paleogene Stratigraphy. Chairman: G. Vestegaard Laursen, Norway. gila@statoil.com Secretary: J.W. Verbeek, Netherlands.
j.verbeek@nitg.tno.nl

South-American Regional Committee on Paleogene Stratigraphy. Chairman: N. Malumian, Argentina. malumian@mpgeol.gov.ar Secretary: C. Nañez, Argentina.
cnaniez@mpgeol.gov.ar

Russian Paleogene Commission. Chairman: M.A. Akhmetiev, Russia. akhmetiev@ginras.ru
Secretary: G.N. Aleksandrova

Working Group on Paleogene Stratigraphy of the North Pacific. Chairman: Y.B. Gladenkov, Russia. gladenkov@ginras.ru

List of Voting Members

Mikhail Akhmetiev, Russian Academy of Science, Moscow, Russia, akhmetiev@ginras.ru

Mary Pierre Aubry, Rutgers University, New Jersey, USA, aubry@rci.rutgers.edu

Vlasta Cosovic, University of Zagreb, Croatia, vlasta.cosovic@jagor.srce.hr

Richard H. Fluegeman, Ball State University, Indiana, USA, fluegem@bsu.edu

Jean Pierre Gély, Museum d'Histoire naturelle Paris, France jean-pierre.gely@gazdefrance.com

Philip D. Gingerich, University of Michigan, USA, gingeric@umich.edu

Yuri B. Gladenkov, Russian Academy of Science, Moscow, Russia, gladenkov@ginras.ru

Jan Hardenbol, Global Sequence Chronostratigraphy, Houston, USA, jhardenbol@sbcglobal.net

Jerry J. Hooker, Natural History Museum, London, UK, jjh@nhm.ac.uk

Lukas Hottinger, Naturhistorisches Museum Basel, Switzerland, lukas.hottinger@unibas.ch

Norberto Malumian, Servicio Geológico, Buenos Aires, Argentina, malumian@mpgeo1.gov.ar

Kenneth G. Miller, Rutgers University, New Jersey, USA, kgm@rci.rutgers.edu

Eustoquio Molina, Universidad de Zaragoza, Spain, emolina@unizar.es

Simonetta Monechi, Università di Firenze, Italy, monechi@geo.unifi.it

Isabella Premoli Silva, Università di Milano, Italy, isabella.Premoli@unimi.it

Birger Schmitz, University of Lund, Sweden, birger.schmitz@geol.lu.se

Percy Strong, Institute of Geological Sciences, Lower Hutt, New Zealand, p.strong@gns.cri.nz

Amin Strougo, Ain Shams University, Cairo, Egypt, aminstrougo@yahoo.com

Ellen Thomas, Wesleyan University, Connecticut, USA, ethomas@wesleyan.edu

Noël Vandenberghe, K.U. Leuven, Belgium, noel.vandenberghe@geo.kuleuven.be

APPENDIX #2 - Summary Reports of GSSP Working Groups

[Detailed reports of **GSSP Working Groups**, and other task groups are found on the webpage of the International Subcommission on Paleogene Stratigraphy: wzar.unizar.es/isps/index.htm].



International Commission on Stratigraphy Subcommission on Cretaceous Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

International Subcommission on Cretaceous Stratigraphy (SCS)

SUBMITTED BY

Prof. Isabella Premoli Silva, Chair
University of Milano
Dipartimento di Scienze della Terra “Ardito Desio”
Via Mangiagalli, 34, 20133 MILANO, Italy
telephone: 39-02 5031 5528 (direct line)
telefax: 39-02 5031 5494
Email: isabella.premoli@unimi.it

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

- *To facilitate international communication in all aspects of Cretaceous stratigraphy and correlation*
- *To establish a standard global stratigraphic subdivision and nomenclature for the Cretaceous, as part of the ICS standard global stratigraphic scale;*
- *To produce a stratigraphic table displaying agreed subdivision to substage level and intervals of disagreement, marking boundaries that are defined by a GSSP.*

3. ORGANIZATION

SCS is a Subcommission of the International Commission on Stratigraphy.

3a. Officers for 2004-2008:

Chair:	Prof. Isabella Premoli Silva (Milan, Italy)
Vice-Chair:	Dr. Irek Walaszczyk (Warsaw, Poland)
Secretary:	Dr. Silvia Gardin (Paris, France)

There are an additional 14 Voting Members of the Subcommission, from all the continents. Over 130 Cretaceous scientists from all over the world and in many different disciplines belong to one or more of the 12 Stage Working Groups of the SCS, or to the Kilian Group. All WG members are

treated as Corresponding Members of the Subcommittee. Effectively, anyone with interest and expertise that can contribute to our objectives is welcome to do so. ***The great bulk of the Subcommittee's work is carried out by these Working Groups.***

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The Subcommittee has liaised with successive meetings of the *International Cretaceous Symposium*, which until 2004 have been promoted by the German *Subkommission für Kreide-Stratigraphie*. The SCS has now taken over the responsibility for selection of future venues, though the successful applicants will organize individual congresses. At the seventh Congress held in Neuchâtel, Switzerland, in September 2005, it was decided that the *8th International Cretaceous Symposium* will be convened in Plymouth, UK, in 2009 by Prof. Malcom Hart.

The Subcommittee will organize a session at 33rd International Geological Congress in Oslo, 2008.

The Subcommittee also liaises closely with the Subcommittee on Jurassic Stratigraphy, especially over the definition of the Jurassic/Cretaceous boundary.

When appropriate, the Subcommittee liaises also with IGCP projects. In particular, a strong liason was established by our colleagues from Japan with IGCP 434 – “Land-ocean interaction of carbon cycle and bio-diversity changes during the Cretaceous in Asia” (Project Leader H. Hirano), the new IGCP 507 – “Cretaceous paleoclimatology”, and IGCP Project 506 - Marine and Non-marine Jurassic: Global correlation and major geological events (Project Co-Leader W. Wimbledon).

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

General Contributions

Fourteen papers on the Cretaceous geology and paleontology in Asia, related to IGCP Project 434, have been published in *Geosciences Journal* (v. 10/3) and a volume of *Island Arc* is now in preparation. These researches are focused on the establishment of the Cretaceous stable carbon isotope stratigraphy for the forearc basin deposits integrated with the traditional ammonoid, inoceramid, foraminiferal, and radiolarian biostratigraphy.

Jarvis and co-authors just published “a new $\delta^{13}\text{C}$ carbonate reference curve for the Cenomanian-Campanian (99.6-70.6 Ma) (*Geol. Mag.*, v.143/5). Moreover, Oosting and others provided a “Correlation of Barremian to Aptian dinoflagellate cysts between the Tethyan and Austral realms” (*Cret.Res.*, 2006 on-line).

The Kilian Group (Lower Cretaceous Ammonite Working Group).

The current Lower Cretaceous standard ammonite zonation was established during the 1st International Workshop of the "Kilian Group" (Lower Cretaceous Ammonite Working Group) in Lyon (July 2002) and summarized by Hoedemaeker and Reboulet (reporters) et al. (2003). It was completely adopted by Gradstein et al. (2004), editors of "*A Geological Timescale 2004*".

During the 2nd international meeting of the "Kilian Group", held in Neuchâtel, Switzerland (Sept. 2005), the zonation of the Berriasian, Valanginian, Hauterivian and Albian stages was not discussed, but several amendments were introduced to the Barremian and Aptian stages (Reboulet and Hoedemaeker, reporters, 2006, *Cret. Res.*, v. 27).

The *Holcodiscus uhligi* Zone, the *Heinzia sayni* and *Barrancyloceras barremense* Subzones, and the *Imerites giraudi*, *Heteroceras emerici* and *Leptoceratoides puzosianum* Horizons have been added to the scheme of the Barremian stage. The former *Pseudocrioceras waagenoides* Zone has been lowered in rank to subzone and occupies the upper part of the *Martelites sarasini* Zone (= former *Colchidites sarasini* Zone).

Concerning the Aptian stage, the subzone *Deshayesites grandis* and the subzones *Epicheloniceras debile*, *Epicheloniceras gracile* and *Epicheloniceras buxtorfi* of Casey (1961) have been recognized in the *Deshayesites deshayesi* Zone and *Epicheloniceras martini* Zone (= former *Epicheloniceras subnodosocostatum* Zone) of southeast France, respectively. The *Dufrenoyia furcata* Zone is maintained in the lower Aptian.

Although the next meeting of the Group has still to be arranged, the chairman proposed to organize several workshops to work on the zonation of a particular stage/substage or on the boundary of some stages/substages. Even though a specific problem will concern only some specialists of the Kilian Group, a report of the discussions will be sent by e-mail to other colleagues. The main results of these discussions will be submitted to all members of the Kilian Group for acceptance at the next meeting.

The first workshop on the Aptian zonation was held in Lyon (Nov. 2005). The discussion mainly focused on the ammonite faunal turnovers and the Lower/Middle Aptian (Bedoulian/Gargasian) boundary in relation to the position of the Furcata Zone.

The Berriasian GSSP and the J/K boundary.

W. Wimbledon accepted to chair the WG and, following his announcement given at the Jurassic Conference in Krakov last September, is in the process of implementing the membership of the new Working Group for base of the Berriasian and a GSSP for the J/K boundary. Task of the WG will be to look for markers, using all possible methods – traditional biostratigraphy, but also magnetostratigraphy, chemical stratigraphy, sequence and cyclic studies, other event stratigraphy, and marine/non-marine correlation potential (particularly relevant with this the J/K boundary) – to derive widely applicable correlations. As a good start, the WG will consider Hoedemaker's proposal for a GSSP at the base of bed 146/15B in the historical stratotype section of the Berriasian, which includes a discussion of the J/K-Berriasian boundary based on all Hoedemaker's work since 1981.

Meanwhile, Jim Channell proposed to select the Bosso section (Umbria, Italy), the magnetostratigraphy of which, correlated to calpionellid distribution, was published by Housa et al. in 2004 (*Cret. Res.*, v. 25). Moreover, a detailed magnetostratigraphy and calpionellid biostratigraphy across the J/K boundary from four sections surveyed in the Tatra Mountains (Poland) was recently published by Grabowski and Pszczołkowski (*Cret. Res.*, v. 27, 2006). Finally, V. V. Mitta provided "new data on the age of the Ryazanian Stage Basal Layers (translated in *Stratigraphy and Geological Correlation*, v. 13/5, 2005).

An official meeting of the Berriasian and J/K boundary WG is planned for Summer 2007 in Bristol, UK, in conjunction with the meeting of IGCP Project 506 – "Marine and Non-marine Jurassic: Global correlation and major geological events".

Base Valanginian GSSP.

After the agreement reached by the Kilian Group (see Reboulet and Hoedemaeker et al., 2006) to begin the Valanginian with the Pertransiens Zone, the formal GSSP proposal is expected soon.

Base Hauterivian GSSP.

Luc Bulot and Peter Rawson are preparing the final version of the proposal for the Hauterivian GSSP for a horizon at La Charce (France), which was re-visited last summer by Bulot and Reboulet. The different aspects of the La Charce section have been studied by a number of scientists, while Bulot and Rawson discussed the overall progresses including the Tethyan/Boreal correlation. The proposal is expected to be distributed very soon.

Base Barremian GSSP.

Peter Rawson, chair of the WG, established a strict liaison with a group of Spanish colleagues (led by Miguel Company) who are collating the details of the GSSP that will be located in SE Spain. The formal proposal is in preparation and should be distributed very soon.

Base Aptian GSSP.

There is a consensus in considering *Paradeshayesite oglanlensis* as the index of the lowermost zone of the Aptian instead of the too "provincial" *P. tuarkyricus* (Reboulet, Hoedemaker et al., 2006; Ropolo et al. 2006, *Notebooks on Geology, Mem.* 2006/01). A wealth of data have been published recently by our French colleagues on the stratotype sections of Bedoulian and Gargasian substages including revised biostratigraphies and $\delta^{13}\text{C}$ curve across the base of the Aptian (Moullade et al., 2005/02; Renard et al., 2005/04; Moullade et al., 2006/01, in *Notebooks on Geology*). However, due to the lack of magnetic signature in the French stratotype sections, the correlation to the base of magnetic Chron M0, recommended at the 1995 Brussels Meeting for identifying the base of the Aptian, is still prevented. Although a general agreement is still pending, a formal proposal will be prepared soon by the chair of the WG.

Base Albian GSSP.

Based on the integrated study published by Kennedy et al. in 2000 (*Cret. Res.*, v. 21), in June 2006 Jim Kennedy and others prepared a proposal for the base of the Albian at the first occurrence of the ammonite *Leymeriella tardefurcata* (d'Orbigny, 1841) in the section at Tartonne (Provence, France). Since then, additional stable isotope data have been acquired and a new version of the proposal is expected soon for distribution.

Base Turonian GSSP

Although the Turonian GSSP has been ratified, studies on the Pueblo type-section continued with implementation in high-resolution of stable-isotope stratigraphy, cyclostratigraphy and bio-events (Sageman et al, 2006, *Geology*, v. 34/2; Caron et al., 2006, *Géobios*, v. 39).

Base Coniacian GSSP.

The Coniacian Working Group is preparing a report on the Salzgitter-Salder, a proposed stratotype of the base of the Coniacian Stage. The report, in a manuscript form, will be ready by the end of the year, and then circulated to the members of the Subcommittee. The report will comprise: (1) The general description of the succession, historical background and the inoceramid biostratigraphy (Walaszczyk and Wood); (2) Nannofossil biostratigraphy and taxonomy (Lees); (3) Ammonite taxonomy and biostratigraphy (Wiese); (4) Foraminiferal biostratigraphy (Peryt); (5) Stable Isotope stratigraphy (Voigt). The report is expected to be published in *Acta Geologica Polonica* early in 2007.

It is worth mentioning that nannofossil biostratigraphy across the base of the Coniacian, as defined by the first occurrence of the inoceramid *Cremnoceramus deformis erectus* (Meek), was

extended by J. Lees to other sections from central Poland, NW Czech Republic and SE England. The main result is that the base of the Coniacian falls within nannofossil Subzone UC9c (submitted to *Cret. Res.*).

Base Santonian GSSP.

The 1995 Brussels Meeting recommended placing the base of the Santonian at the FO of *Cladoceramus undulatoPLICATUS* (F. Roemer), at one of three possible sections: (1) Olazagutia quarry (Navarra, Spain), (2) the section at Seaford Head (Sussex, England), (3) the section on Ten Mill Creek (near Dallas, Texas, USA).

The Santonian WG, during the meeting organised by Lamolda (chairman of the WG) in Bilbao in 2002, visited the section in the Olazagutia quarry and discussed the choice of a GSSP for the Santonian boundary stratotype, but did not reach an agreement. The proceedings of the Bilbao meeting, sent in May 2006 to *Cretaceous Research* for publication, will appear in a special issue (Co-Editor M. Lamolda) early 2007 (*Cret. Res.* v. 28). Out of the eleven peer-reviewed papers five concern macro- and microfossil contents, and stable isotopes from the Olazagutia quarry, two the Seaford Head section and one the Ten Mill Creek (only calcareous plankton). Few papers concern the Coniacian-Santonian interval from other European regions and Japan.

Moreover, a monograph on the description of inoceramids and discussion on biostratigraphy of the Middle Coniacian through Santonian of the US Western Interior was published by Walaszczyk and Cobban in 2006 (*Acta Geol. Polonica*, v. 56/3).

A first draft of the manuscript on the base of the Santonian at Ten Mile Creek, Dallas, was prepared by Jim Kennedy and Andy Gale. They are awaiting the last data by co-authors for finalizing the paper to be submitted to *Acta Geologica Polonica*.

Base Campanian GSSP.

A draft of a paper on the base of the Campanian at the Waxahachie dam spillway section (northcentral Texas, USA) was prepared by Jim Kennedy on the basis of the data partially assembled by late Jack Hancock. A new revised version will be sent by Kennedy in the next few weeks. It will probably be submitted for publication to *Cretaceous Research*. The problem concerning who owns the land where the Texas section is situated is still unsolved.

The other possible candidate section, west of Seaford Head (Sussex, England), was studied by Hampton and co-authors and the data are in press on *Cretaceous Research* special issue of the Bilbao meeting.

Base Maastrichtian -- auxiliary GSSP.

In addition to the ratified Tercis GSSP, a proposal for an auxiliary section along the Vistula (Poland) that enables other types of geochemical and paleontological correlations is being prepared by Irek Walaszczyk and others.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

One of the main problems encountered in 2006 concerns the delay in having published the basic data for finalizing the GSSP proposals. This was particularly true for the Coniacian GSSP due to the long illness of late Annie Dhont, who was the co-editor of the special issue on the Bilbao meeting. Moreover, the need nowadays for a high-resolution framework to be exportable worldwide resulted in the necessity of revisiting several sections already studied by implementing multiple biostratigraphies and stratigraphic tools other than fossils, profoundly affected by bioprovincialism

in several intervals, like magnetostratigraphy, stable isotope stratigraphy, etc. To co-ordinate the work of several scientists from different subdisciplines was not an easy task and delay in submitting GSSP proposals was inevitable.

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

I. INCOME

ICS subvention for 2006	Euro 1,500

Total income	Euro 1,500

II. EXPENDITURE

Chairman's office expenses (telephone, photocopying, etc.)	Euro 200
Secretary's office expenses	Euro 200
Bank charges	Euro 15
Support for WG activities (actual & anticipated)	Euro 1,085

Total expenditure (estimated)	Euro 1,500

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

Membership of Cretaceous Subcommittee.

The Voting Membership of the Cretaceous Subcommittee was renewed during 2004. However, the number of Voting Members needs to be implemented by one in substitution of late Annie Dhont, who died in September of this year.

The Corresponding Membership of the Berriasian - J/K boundary WG remains to be finalised.

Publication of Cretaceous Newsletter.

Plans for 2007 are to restart the publication (electronically) of the ISCS *Cretaceous Newsletter* which should include the progress reports of the Working Groups, references to papers dealing with Cretaceous stratigraphy, and meeting announcements of some interest to the all members of the Subcommittee.

Meetings

2007 - An official meeting of the Berriasian and J/K boundary WG is planned for Summer 2007 in Bristol, UK, in conjunction with the meeting of IGCP Project 506 – “*Marine and Non-marine Jurassic: Global correlation and major geological events*”.

A few Workshops of the Kilian Group are yet to be decided.

9. BUDGET AND ICS COMPONENT FOR 2006

Office expenses (Fax, phone, postage etc)	Euro 200
Support to participants to the J/K Bristol Meeting	Euro 800
Duplication of GSSP proposals for circulation to SCS Voting Members	Euro 350
Working Groups: expenses incurred in preparing draft GSSP proposals etc.	Euro 850

Total estimated expenditure	Euro 2,200

10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

See Accomplishments in 2006 (above) for additional details.

Renewed research by WG members (resulting in a great number of publications, still ongoing), based on research needs pinpointed by the 1995 Brussels and 2005 Neuchâtel meetings.

Completion of 2 GSSP proposals: Cenomanian (ratified 2002) and Turonian (ratified 2003).

Presentation of the latest results to 7th *International Cretaceous Symposium*, Neuchâtel, Switzerland. September 4-9, 2005.

Workshop on the Aptian zonation, held in Lyon (Nov. 2005) focused the discussion mainly on the ammonite faunal turnovers and the Lower/Middle Aptian (Bedoulian/ Gargasian) boundary in relation to the position of the Furcata Zone.

The Chair and/or Vice Chair represented the SCS at:

1st meeting on the *Cretaceous System of Russia*, Moscow, February 2002.

1st meeting on *Future Directions in Stratigraphy*, Urbino, June 2002

German *Subkommission für Kreide-Stratigraphie*, Maastricht, September 2002

SCS session at 32nd *International Geological Congress*, Florence, August 2004

SCS meeting during the 7th *International Cretaceous Symposium*, Neuchâtel, Switzerland, September 2005

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2005-2008)

Meetings

Summer 2007 - An official meeting of the Berriasian and **J/K boundary** WG is planned for in Bristol, UK, in conjunction with the meeting of IGCP Project 506 – “Marine and Non-marine Jurassic: Global correlation and major geological events”.

To be decided, 2007 - few Workshops of the Kilian Group.

August 2008 - the Subcommission will organize a session on “*Cretaceous Stage boundaries and Correlations*” at 33rd International Geological Congress in Oslo.

Details of other meetings are not yet available.

Objectives

- To bring recommendations for the remaining 9 GSSPs to ICS as soon as possible, and not later than 2008.
- To communicate the results as widely as possible.
- To develop new directions for the Subcommittee as GSSP proposals are completed.

Work Plan

2007 Finalize proposals for Valanginian, Hauterivian, Barremian, Aptian, Albian, Coniacian, Santonian, and Campanian
2008 Finalize proposal for Berriasian (Jurassic/Cretaceous boundary)

APPENDIX [Names and Full Addresses of Current Officers and Voting Members]

Subcommittee officers (with addresses)

Chair: Prof. I. Premoli Silva

Dipartimento di Scienze della Terra “A. Desio”, Via Mangiagalli, 34, 20133 Milano, Italy
isabella.premoli@unimi.it

Vice Chair: Dr. I. Walaszczyk

University of Warsaw, Warsaw, Poland
walas@geo.uw.edu.pl

Secretary: Dr. Silvia Gardin

ESA-CNRS 7073, Laboratoire de Micropaléontologie, case 104, Université Pierre et Marie Curie, 4 Place Jussieu, F-75252 Paris 05, France.
gardin@ccr.jussieu.fr

List of Voting Members

E Baraboshkin (Russia) barabosh@geol.msu.ru
Prof. Peter Bengtson (Germany) peter.bengtson@urz.uni-heidelberg.de
Prof. Jim Channel (USA) jetc@nersp.nerdc.ufl.edu
Dr James Crampton (New Zealand) J.Crampton@gns.cri.nz
Dr Elisabetta Erba (Italy) Elisabetta.erba@unimi.it
Prof. Andy Gale (UK) asg@nhm.ac.uk
Dr Jim Haggart (Canada) jhaggart@nrca.gc.ca
Prof. Hiromichi Hirano (Japan) hirano@waseda.jp
Dr. Peter Hochuli (Switzerland) peter.hochuli@erdw.ethz.ch
Dr. Brian Huber (USA) Huber.Brian@NMNH.SI.edu
Dr Herbie Klinger (South Africa) hklinger@samuseum.ac.za
Dr Eduardo Koutsoukos (Brazil) koutsoukos@petrobras.com.br
Prof. Marcos Lamolda (Spain) mlamolda@ugr.es
Dr. Stéphane Reboulet (France) stephane.reboulet@univ-lyon1.fr

Prof. Helmut Weissert (Switzerland) helmut.weissert@erdw.ethz.ch
Late Dr Annie Dhondt (Belgium) to be replaced

List of Task Groups and their officers

Maastrichtian WG: GSSP ratified. Giles Odin, France. gilodin@moka.ccr.jussieu.fr
Campanian WG: jim.kennedy@oum.ox.ac.uk, Andy Gale (UK) asg@nhm.ac.uk
Santonian WG: Marcos Lamolda, Spain. gpplapam@lg.ehu.es
Coniacian WG: Irek Walaszczyk, Poland. walas@geo.uw.edu.pl
Turonian WG: GSSP ratified.
Cenomanian WG: GSSP ratified.
Albian WG: Malcolm Hart, UK. mhart@plymouth.ac.uk
Aptian WG: Elisabetta Erba, Italy. elisabetta.erba@unimi.it
Barremian WG: Peter Rawson, UK. p.rawson@ucl.ac.uk
Hauterivian WG: Jörg Mutterlose, Germany. Joerg.Mutterlose@rz.ruhr-uni-bochum.de
Valanginian WG: Luc Bulot, France. lucgbulot@aol.com
Berriasian (J/K boundary) WG: William A.P. Wimbledon, UK. B.Wimbledon@ccw.gov.uk

Kilian Group [formerly Lower Cretaceous ammonite WG]:

Chairman: Stéphane Reboulet, France. stephane.reboulet@univ-lyon1.fr
Vise-chairmen: Peter Rawson, UK. peter.rawson1@btinternet.com,
Jaap Klein, NL. j.klein@amc.uva.nl



International Commission on Stratigraphy Subcommission on Jurassic Stratigraphy

ANNUAL REPORT 2006

2. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

International Subcommission on Jurassic Stratigraphy

SUBMITTED BY

Dr Nicol MORTON, Chairman

Le Chardon, Quartier Brugière, 07200 Vogüé, France

Tel. ** 33 4 75 37 03 80, Email NICOL.MORTON@wanadoo.fr

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

2a. Mission statement

The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Jurassic stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of the evolution of the Earth during the Jurassic Period. Its first priority remains the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units that provide the framework for global correlation. This mission is well advanced at Stage level, and future plans include formal definitions of Substages (but only as Lower/Middle/Upper as appropriate) and Standard (Ammonite) Zones. At zonal level definitions will be proposed also for Regional Zones, with correlations to the Standard Zones established as precisely as possible.

2b. Goals

These fall into four main areas:

- (a) The definition of basal boundary stratotypes (GSSPs) and the refinement of standard chronostratigraphical scales, through the establishment of multidisciplinary Working Groups;
- (b) Application, where possible, of cyclic stratigraphy to develop orbital tuning estimates of durations of chronostratigraphic units, and integration of radiometric dates to improve the linear time-scale of the Jurassic;
- (c) During IGCP Project 506, initiated by the Subcommission, the development of methods of correlation between the units of the standard chronostratigraphic scale, established in marine Jurassic successions, and non-marine successions, to enable reconstruction of the history of the global biosphere and the lithosphere during the Jurassic Period;

- (d) International coordination of and collaboration in research on Jurassic environments, through the establishment of Thematic Working Groups, for example on Paleobiogeography, Paleoclimate, Sequence Stratigraphy and Tectonics.

In addition the Subcommittee has developed lines of communication with a wider public through two initiatives (also called Working Groups for simplicity): one is concerned with conservation of Jurassic geological sites such as those selected as GSSPs or ASPs; the second encourages collaboration and liaison with non-professionals, mainly fossil collectors, who have valuable data to contribute towards the Subcommittee's goals.

2c. Fit within IUGS Science Policy

The objectives of the Subcommittee relate to three main aspects of IUGS policy:

- (1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs at Series and Stage levels and related to a hierarchy of units (Substages, Standard Zones, Subzones etc.) to maximize relative time resolution within the Jurassic Period;
- (2) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Jurassic Period;
- (3) Working towards an international policy concerning conservation of geologically and palaeontologically important sites such as GSSPs. This relates to, inter alia, the IUGS Geosites Programme and the UNESCO Geoparks Programme. The Subcommittee also has links to the Management Group of the UNESCO East Devon and Dorset Coast (The Jurassic Coast) World Heritage Site.

3. ORGANIZATION

The Subcommittee has an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommittee. There are twenty other Voting Members, and it is emphasised that they are not elected to represent a country or region, but for their personal expertise and experience. Each has agreed defined areas of responsibility, which are published in the Subcommittee Directory.

In addition to the Voting Members, there is a network of Corresponding Members, who have a responsibility for communication in both directions between the Subcommittee and researchers on Jurassic topics in their region. Most are also active in one or more Working Groups.

The objectives of the Subcommittee are pursued by Working Groups, both Stratigraphical and Thematic, and each group is organized by a Convenor, sometimes assisted by a Secretary, who are Voting or Corresponding Members. [*The Subcommittee has not adopted the term Task Group.*]

The Subcommittee sponsors an International Congress/Symposium on the Jurassic System every four years (2006, 2010, ---). The Chairman of the Organizing Committee is normally a Voting Member of the Subcommittee, but the Committee is independent of the Subcommittee.

3a. Officers for 2004-2008:

Chair:	Dr. Nicol MORTON, France
Vice-Chair:	Prof. Paul SMITH, Canada
Secretary:	Dr. Paul BOWN, UK

WEB address for Subcommittee: <http://www.es.ucl.ac.uk/people/bown/ISJSwebsite.htm>

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Members of the Jurassic Subcommittee are involved in a number of international projects, normally in an individual capacity but sometimes facilitated by contacts through activities related to the Subcommittee such as its Working Groups and the Jurassic Congresses/Symposia.

4a. International Geoscience Programme (IGCP).

4a (i) IGCP Project 458: Triassic - Jurassic Boundary Events. This Project terminated officially in 2005 but remained active until 2006, with involvement in the 2006 International Jurassic Congress in Kraków, Poland. All three co-leaders are Voting (Stephen HESSELBO, UK, and Jozsef PALFY, Hungary) or Corresponding (Chris. McROBERTS, USA) Members of the Jurassic Subcommittee. *Inter alia*, the Project has contributed much valuable data and information relevant to the ISJS Working Group on the Triassic/Jurassic Boundary, and there are many members in common, including the Convenor (Geoff WARRINGTON, UK) and Secretary (Gert BLOOS, Germany) of the Triassic/Jurassic Boundary Working Group.

4a (ii) IGCP Project 506: Marine and Non-marine Jurassic: Global correlation and major geological events. This Project was initiated by the Jurassic Subcommittee and was proposed formally and is led by one of the Voting Members (SHA Jingeng, China). The co-leaders include one Voting (Nicol MORTON, France) and five Corresponding (Paul OLSEN, USA, Grzegorz PIENKOWSKI, Poland, Alberto RICCARDI, Argentina, WANG Wongdong, China and Bill WIMBLEDON, UK) Members. The first Symposium and first Project business meeting was held in Nanjing, China, November 2005, and in 2006 further meetings were held as part of the International Palaeontological Congress in Beijing, China, in June and as a Special Session of the 7th International Congress on the Jurassic System in Kraków, Poland, in September.

4b. ProGEO, Geosites and Geoparks Initiatives.

4b (i) ProGEO and Geosites. The Subcommittee Geoconservation Working Group (Convenor Voting Member Kevin PAGE, UK) has several links (including himself and Corresponding Members Maria Helena HENRIQUES, Portugal, Platon TCHOUMATCHENKO, Bulgaria and Bill WIMBLEDON, UK) and the. A special session on conservation issues was organized by the Group during the 7th International Jurassic Symposium in Kraków, Poland, in September 2006 (see 5a. below).

4b (ii) European and UNESCO Geoparks Programme. National systems of Geoparks have been established in several countries. The Subcommittee representatives for those which feature Jurassic sites include Bulgaria (Platon TCHOUMATCHENKO) and Portugal (Maria Helena HENRIQUES).

4c. UNESCO World Heritage Sites.

4c (i) "Jurassic Coast" World Heritage Site. Several members of the Subcommittee, including Voting Member Kevin PAGE, UK, Corresponding Members Robert CHANDLER, UK, and John CALLOMON, UK, and others, act as advisors to the Management Group of the UNESCO East

Devon and Dorset Coast (informally known as the Jurassic Coast) World Heritage Site. There are ongoing consultations and discussions about the balance of public outreach (with, for example, guided fossil-collecting days for the public) and the geoconservation of important sensitive sites.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

The most important events for the Jurassic community are the International Congresses/Symposia on the Jurassic System, held every four years. These are especially significant because of their multidisciplinary character, bringing together researchers in all fields of Jurassic geology. The 7th Congress was held in Kraków, Poland, in September 2006, and had also been set by the Subcommission as the deadline for submission of Stage GSSP proposals.

5a. 7th International Congress on the Jurassic System, Kraków, Poland, September 2006.

The 7th International Jurassic Congress was held in Kraków, Poland, in September 2006. The Organising Committee, chaired by Andrzej WIERZBOWSKI, included representatives from Poland and Slovakia. 195 participants from 29 countries, representing 6 continents, registered for the Congress.

5a (i) Scientific sessions:

Scientific sessions were held over four days in Akademia Górniczo-Hutnicza (AGH) – University of Science and Technology, Kraków, from 11th to 14th September. During the opening ceremony participants were welcomed by Tadeusz SŁOMKA (Vice Rector of University of Science and Technology (AGH), by Jacek MATYSZKIEWICZ (Dean of the Faculty of Geology, Geophysics and Environmental Protection of AGH), by Nicol MORTON, the Chairman of ISJS, and by a representative of the President of the city of Kraków. Keynote talks were given by Felix GRADSTEIN (Chairman of the International Commission on Stratigraphy) on *ICS on Stage*, and by Andrzej WIERZBOWSKI (Chairman of Organising Committee) on *Jurassic of Poland: review and current research*.

Abstracts of scientific communications are published in *Volumina Jurassica* vol. 4 (ISSN 1731-3708), which contains 226 abstracts involving 398 different authors. Presentations by oral communication (133) or by poster (93) were arranged by the scientific programme convenor Ewa GŁOWNIAK (Univ. of Warsaw) into nine topics:

1. Geodynamics and evolution of different areas;
2. Facies analysis and reconstruction of palaeoenvironments;
3. Palaeoecology, palaeobiogeography;
4. Integrated stratigraphy;
5. Jurassic organisms in space and time;
6. Geoconservation and geological heritage;
7. Organic geochemistry;
8. IGCP 506: Marine and non-marine Jurassic: global correlation and major geological events;
9. IGCP 458: Triassic/Jurassic boundary events.

Submitted papers will be subject to peer review and those accepted after referees' reports will be published as the Congress Proceedings in a future issue of *Volumina Jurassica*, edited by the Faculty of Geology of Warsaw University.

5a (ii) Fieldtrips:

Five Congress Fieldtrips demonstrated the extremely varied Jurassic geology of southern Poland and northern Slovakia. For the fieldtrips an extremely well-illustrated Fieldtrip Guidebook with 235 pages was prepared and published. This contains reviews of the Jurassic geology of Poland and northern Slovakia and a vast amount of detailed information, much of it new and previously unpublished. It includes material provided by 47 contributors, from 13 institutions in 2 countries, and features contributions by many young researchers. The bibliographic reference for the volume is:

WIERZBOWSKI, A., AUBRECHT, R., GOLONKA, J., GUTOWSKI, J., KROBICKI, M., MATYJA, B.A., PIENKOWSKI, G. & UCHMAN, A. (eds.) 2006. *Jurassic of Poland and adjacent Slovakian Carpathians. Field trip guidebook, 7th International Congress on the Jurassic System, 6-18 September 2006, Kraków, Poland.* Polish Geological Institute, Warsaw. ISBN 83-7372-909-7.

5a (iii) Open meeting of Jurassic Subcommittee:

A meeting of the Jurassic Subcommittee was held during the 7th International Congress on the Jurassic System, to which all were welcome. After a welcome by the Chairman, Convenors of the Working Groups gave brief reports summarising the main conclusions of their discussions and to indicate future plans. The Chairman then explained the procedures for proposal and ratification of GSSP proposals, the deadlines proposed by IUGS and ICS and those that would be required for the Working Groups and the Subcommittee. Convenors were asked to regard 1st July 2007 as the deadline for submission to the Jurassic Subcommittee.

The Chairman explained the new procedure which was being adopted for election of the Jurassic Subcommittee Executive (Chairman and Vice-Chairman; the Secretary is nominated by the incoming Chairman) for 2008-2012. A Nominations Committee has been established and will seek suggestions.

There followed presentations and discussions of two invitations received, from China and India, for hosting the 8th International Congress on the Jurassic System, due to be held in 2010. As a result of an open vote the invitation for this Congress to be held in Suining City, Shedong County, Sichuan Province in China was accepted. The preferred dates for the Congress were then discussed. Several had commented that the traditional September period was becoming increasingly difficult because of work commitments. It was decided that August would be more widely suitable for intending participants.

5b. Progress with selection of GSSPs for Jurassic Stages.

Four of the eleven Jurassic Stages have ratified GSSPs (Sinemurian, Pliensbachian, Aalenian, Bajocian) and the remaining seven Working Groups held discussion meetings during the Congress in order to make progress with preparation of GSSP proposals. Details of two proposals (Toarcian, Kimmeridgian) were published in *Volumina Jurassica* vol. 4 together with the Congress Abstracts. Although no formal decisions could be taken during the meetings (these must be by postal/email vote), consensus was reached over three proposals (Toarcian, Bathonian, Kimmeridgian) and timetabled plans with deadlines were agreed for selection of preferred candidate followed by formal proposal for three others (Hettangian [which is also the Triassic/Jurassic boundary], Callovian, Oxfordian).

5b (i) Hettangian and Triassic/Jurassic Boundary. Of the four previously-proposed GSSP candidates, that in Peru was withdrawn during the Working Group discussion session, and there

was consensus to combine New York Canyon (Nevada, USA) and Kunga Island (B.C., Canada) into a single proposal as GSSP and ASP respectively. The fourth previous candidate, St. Audries' Bay (Somerset, UK) remains. During the Congress preliminary information on a new candidate section in the Karwendel Syncline (Austria) and on a new potential candidate section in Waterloo Bay (Northern Ireland) were presented. It was agreed that detailed formal proposals must be published by January 2007 to enable voting within the Working Group in February and submission to the Jurassic Subcommittee by April 2007.

5b (ii) *Sinemurian*. The Sinemurian GSSP in Somerset (S.W. England) was ratified by IUGS in 2000 and published in *Episodes* **25/1**, 22-28, 2002.

5b (iii) *Pliensbachian*. The Pliensbachian GSSP in Wine Haven section in Yorkshire (E. England) was ratified by IUGS in 2005 and published in *Episodes* **29/2**, 93-106, 2006.

5b (iv) *Toarcian*. The Working Group field meeting in Peniche, Portugal (June 2005) confirmed selection of the Peniche section as GSSP. The proposal, with references to further papers, was published in the Abstracts Volume for the 7th International Jurassic Congress in Krakow in September 2006 (*Volumina Jurassica* **4**, 5-16). Several further communications on the Peniche section were also presented. At the Working Group meeting in Kraków there was agreement for the proposal to proceed to voting within the Working Group followed by submission to the Jurassic Subcommittee, possibly before the end of 2006.

5b (v) *Aalenian and Lower/Middle Jurassic Boundary*. GSSP proposal of Fuentelsaz section (Spain) ratified by IUGS in 2000 and published in *Episodes* **24/3**, 166-175, 2001.

5b (vi) *Bajocian*. Proposal of GSSP at Cabo Mondego section (Portugal) and ASP at Berreraig, Isle of Skye section (NW Scotland) was ratified by IUGS in 1996 and published in *Episodes* **20/1**, 16-22, 1997.

5b (vii) *Bathonian*. Working Group meetings were held in Lyon, France, in March 2005 and in Torino, Italy, in September 2005 to complete investigations of Cabo Mondego (Portugal) as possible candidate section and of Ravin du Bès near Digne, Hautes-Alpes (S.E. France) as leading candidate section. Details of the former were presented to the Congress in Kraków and are published in *Lethaia* **39**, 253-264, 2006, those of the latter will be published in the Congress Proceedings. The Working Group meeting during the 7th International Jurassic Congress in Krakow agreed to submission of the proposal of the Ravin du Bès section as GSSP for vote in the Working Group and to the Jurassic Subcommittee by April 2007.

5b (viii) *Callovian*. Details of the GSSP candidate section at Albstadt-Pfeffingen, Swabia (S. Germany) were published in the Proceedings of 5th International Jurassic Symposium (*GeoResearch Forum* **6**, 41-54, 2000). At the Working Group meeting during the 7th International Jurassic Congress in Krakow some reservations were expressed and it was agreed that a possible alternative section on the Russian Platform should be examined, provided that this could be completed by the summer of 2007. A vote and submission to the Jurassic Subcommittee will follow during the summer.

5b (ix) *Oxfordian and Middle/Upper Jurassic Boundary*. Results of detailed multidisciplinary investigations of the Savouron, Provence (S.E. France) and Redcliffe Point, Dorset (S.W. England),

the two candidate sections, have been published and were presented to the Kraków Congress, together with details of the Dubki section, Saratov (Russia) (not a candidate section). In Working Group discussions during the Congress it was evident that the French and English sections have comparable ammonite records and are in many ways complementary to each other with respect to other data. Comparison of specimens from each section to resolve details of the earliest ammonite horizon is planned for March 2007. Immediately afterwards a vote will be held within the Working Group and a proposal to the Jurassic Subcommittee of one section as GSSP and the other as ASP.

5b (x) Kimmeridgian Subsequent to the Working Group meeting held in Stuttgart (Germany) in June 2005, it was decided that the Sub-Boreal definition of the Oxfordian-Kimmeridgian boundary should take precedence over the (stratigraphically higher) Sub-Mediterranean definition for reasons of historical priority. Details of the ammonite succession in the candidate section of the Boreal/Subboreal Realm at Flodigarry, Isle of Skye, (N.W. Scotland) were published in *Transactions of the Royal Society of Edinburgh, Earth Sciences*, **96**, 309-318, 2006 and a multidisciplinary analysis published in the Abstract Volume for the 7th International Jurassic Congress in Kraków, (*Volumina Jurassica* **4**, 17-33, 2006).

5b (xi) Tithonian. Difficulties of precise correlation between sections as a result of extreme provincialism of the ammonite faunas has caused problems with finding and selecting potential candidate sections for the Kimmeridgian-Tithonian boundary. Only one section, the Contrada Fornazzo section, Sicily (S. Italy) has been proposed as candidate GSSP, published in *Revista Italiana di Paleontologia e Stratigrafia* **110**, 329-338, 2004 (Proceedings of 6th International Jurassic Symposium). Completion of work on other possible candidate sections, notably at Canjuers and Mt. Crussol (S.E. France) has been delayed but meetings to enable progress are planned for November 2006.

5c. Jurassic Newsletter no. 33.

The *Jurassic Newsletter* of the International Subcommittee on Jurassic Stratigraphy is the principle organ of communication between the Subcommittee and those with an interest in the Jurassic. *Jurassic Newsletter* **33** for 2006, edited by Nicol MORTON (France) and Paul BOWN (UK), was published electronically in July 2006 and circulated as an email attachment to all Honorary, Voting and Corresponding Members of the Subcommittee, who are expected to forward it on to others. This Newsletter has 41 pages, and includes reports by the Chairman and the Convenors of eleven of the Working Groups, eleven items of discussion or report by correspondence, reports on two IGCP Projects 458 and 506, and a memorial tribute to a recently deceased member.

5d. Jurassic Subcommittee Directory.

At the same time as the publication and distribution of *Jurassic Newsletter* no. 33, a revised *ISJS Directory 2006* of members of the Jurassic Subcommittee for 2004 – 2008 was distributed, also as an email attachment. This gives the addresses, telephone/fax numbers and email addresses of all members of the Subcommittee, including Voting, Corresponding and Honorary Members. For the Subcommittee Bureau and the Voting Members the research interests and Subcommittee responsibilities are also listed. Also listed are the details of the Convenors of the Working Groups (who are all Voting or Corresponding Members). Some additional Corresponding Members will be added to the list.

5e. ISJS Website.

The website for the International Subcommittee on Jurassic Stratigraphy was established in August 2005 by Paul BOWN (UK), Secretary of the Subcommittee. The content of the site includes information on the goals and objectives of the Subcommittee, details (with photographs) of the Voting Members and recent Jurassic Newsletters. The current address is <http://www.es.ucl.ac.uk/people/bown/ISJSwebsite.htm>.

5f. IGCP Project 506: Marine and Non-marine Jurassic: Global correlation and major geological events.

The Leaders of this Project are all members of the Jurassic Subcommittee – Jingeng SHA (China) and Nicol MORTON (France) as Voting Members, Paul OLSEN (USA, Grzegorz Pienkowski (Poland), Alberto RICCARDI (Argentina), Yongdong WANG (China) and Bill WIMBLEDON (UK) as Corresponding Members. The proceedings of the opening Symposium on Jurassic Boundary Events, held in Nanjing, China (November 2005) have now been published in Progress in Natural Science 16 (Special Issue) 1-322, 2006. At a business meeting for the Project three events were planned for 2006:

- i) A workshop and field meeting in S.W. England oriented particularly towards the Jurassic/Cretaceous boundary interval (*postponed to 2007 for financial reasons*);
- ii) Topical Symposium **T12: Marine and non-marine Jurassic: biodiversity and ecosystems** during the 2nd International Palaeontological Congress in Beijing, China (June 2006), followed by the post-Congress field excursion **C7. Terrestrial Triassic-Jurassic sequence and biota in the Junggar Basin, Xinjiang**;
- iii) Session 8: **Marine and non-marine Jurassic – global correlation and major geological events** during the 7th International Congress on the Jurassic System in Kraków, Poland (September 2006) followed by post-Congress field trip **B4: Lower Jurassic marginal-marine and continental deposits – sedimentation, sequences, and ecosystems**.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006.

These remain as they have been in recent years, and relate mainly to difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Working Groups. Applications are often given low priority by National grant-awarding agencies. It would be helpful if IUGS emphasized to its member countries the importance it attaches to the GSSP programme and encouraged the relevant research funding bodies to give priority to funding relevant basic research. For example, recent applications for projects on the palaeomagnetic stratigraphy of key sections, including those selected as GSSPs, have been refused funding.

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

INCOME

Deficit carried forward from 2005		-	77
ICS Allocation	US\$2923 converted to €2,308.12		
	less bank charges	=	€2,262
	TOTAL		€2185

EXPENDITURE FROM 2005 BUDGET

General office expenses	⊞ 240	
ISJS Newsletter 33 preparation	⊞ 100	
Contribution to travel and Congress fees	€ 890	
Additional support for 7 th International Jurassic Congress, Krakow, for fees rebates	€ 500	
Support for Oxfordian WG meeting, Lyon	⊞ 200	
Publication charges for <i>Episodes</i> article on Pliensbachian GSSP, US\$300 =	⊞ 240	
TOTAL		⊞2170
Surplus to be carried forward to 2007		⊞ 15

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

8a. Proposals for GSSPs of Jurassic Stages.

Completion of the project to define the basal boundaries of all eleven Jurassic Stages is the priority of the Jurassic Subcommittee, with seven remaining to be defined. The timetables for completion and submission of proposals to the Jurassic Subcommittee have been agreed between the Executive and the Convenors of most of the Working Groups: Toarcian (Serge ELMI, France) – December 2006; Kimmeridgian (Andrzej WIERZBOWSKI, Poland) – January/February 2007; Hettangian and Triassic/Jurassic boundary (Geoff WARRINGTON, UK and Gert BLOOS, Germany) – April 2007; Bathonian (Sixto R. FERNANDEZ LOPEZ, Spain) – April 2007; Oxfordian (Guillermo MELENDEZ, Spain) – April/May 2007; Callovian (John CALLOMON, UK) – August 2007. Only the Tithonian (Federico OLORIZ, Spain and Günter SCHWEIGERT, Germany) remains uncertain, but should become clearer after a specialist meeting planned for November 2006.

8b. Proceedings of 7th International Congress on the Jurassic System, Krakow, Poland, 2006.

Abstracts of all communications submitted for the 7th International Jurassic Congress on the Jurassic System, held in Krakow, Poland, in September 2006 were published in 2006. Approximately 40 papers have been submitted for publication in the Proceedings Volume. These are now in the process of being reviewed by peer refereeing and those accepted will be published in a future issue of *Volumina Jurassica*, published by the Faculty of Geology of Warsaw University. This is expected to be in 2007 or 2008.

8c. Revision of Siemiradzki's Ammonite Collection.

During the Kraków Congress a visit was arranged for participants to the classical collection of ammonites (mainly Oxfordian) described originally by Józef Siemiradzki in 1891 and now housed in the Museum of Geological Sciences of the Polish Academy of Sciences in Kraków. In connection with the Congress a revision of this collection is being prepared by Ewa GLOVNIAK (Warsaw University) and is expected to be published in 2006/2007.

8d. Membership of Jurassic Subcommittee.

The Voting Membership of the Jurassic Subcommittee was renewed during 2004, with each of the six new Voting Members allocated specific areas of responsibility on behalf of the Subcommittee. Details of these were given in the Subcommittee Directory distributed in August 2005 and revised in July 2006. The list of Corresponding Members continues to be expanded to give improved subject and geographical coverage and details of new members are given in the Jurassic Newsletters.

8d. Website for Jurassic Subcommittee.

The website for the Jurassic Subcommittee was established by Paul BOWN (UK) in August 2005 and is updated when possible with, for example, new volumes of the Jurassic Newsletter.

8e. Publication of Jurassic Newsletters:

The principle organ of communication is the ISJS Jurassic Newsletter, which publishes (electronically) reports of all the Working Group and other articles, of varying length. This is emailed to all Honorary, Voting and Corresponding Members and should be forwarded to others who have an interest in Jurassic geology. Two issues are planned for 2007. The first, in January will include detailed proposals of new GSSP candidates for the base Hettangian Stage and Triassic/Jurassic boundary, a review of the Jurassic of China (to follow up selection of China for the 8th International Congress on the Jurassic System in 2010), and other matters. The second Newsletter is planned for July 2007 and will contain the normal range of reports and news items, mostly submitted by members of the Subcommittee.

8e. IGCP Project 506 Marine and Non-marine Jurassic: Global Correlation and Major Geological Events.

This Project will be pursued at many stratigraphical levels, from the Triassic/Jurassic Boundary to the Jurassic/Cretaceous Boundary. There are numerous examples in Lower, Middle and Upper Jurassic where calibration of the sequences of continental floras and faunas against marine faunal changes will provide valuable insights into the geological and biological evolution of Earth during the Jurassic Period. The opening Symposium and first planning meeting were held in Nanjing, China, in November 2005 and two meetings were held in 2006 – Beijing, China in June and Kraków, Poland in September. The meeting planned for SW England for June/July 2005 had to be postponed to 2007 for financial reasons (lack of advance funds for deposits for reservations) as well as too close proximity in time to the Beijing meeting.

8e (i) Field workshop in South-west England in June/July. The discussion sessions will be held in Bristol with fieldtrips to the Triassic/Jurassic succession in Somerset and to the Jurassic/Cretaceous succession in Dorset. A special session on correlation of the non-marine Middle Jurassic of the North Sea, Hebrides and Yorkshire is planned.

8e (ii) Workshop and fieldtrip in New York State, USA in August/September. Arrangements for this are still provisional; an alternative venue in western USA is also being considered.

9. BUDGET AND ICS COMPONENT FOR 2007

For the year 2007 the main activities of the Jurassic Subcommittee will be focussed on:

- (i) Projects related to the investigation of candidate GSSP sections and selection by the Working Groups of a preferred section to be proposed to the Subcommittee;

- (ii) Stage Working Groups which have completed Stage GSSP procedures will continue work on definitions of Substages and Standard Zones;
- (iii) Preparation of the Jurassic Newsletters;
- (iv) Preliminary planning of the 8th International Congress on the Jurassic System to be held in Suining City, Shedong County, Sichuan province, China in 2010. Much of the Jurassic in China is non-marine and, while this and correlation with the marine Jurassic will be significant aspects of the Congress, special attention will also be given to the marine Jurassic in eastern Asia – in Tibet and possibly Viet Nam and Thailand. Pre- and post-Congress fieldtrips are an extremely important part of all Jurassic Congresses and those to the areas with marine Jurassic will require careful consultation and planning, even at this apparently early stage.

9a. Budget request. Provision is requested in the budget for special field and laboratory work to resolve remaining problems with Stage GSSP proposals, especially those for the Tithonian, for help with selection and voting procedures within the Working Groups, and for collaboration with Chinese colleagues over preliminary planning of the next Congress. [*Please note that the Chairman visited Poland in 2003 to advise on the preliminary planning of the 2006 Congress; Polish colleagues founs this very helpful.*]

Most of the financial activities of the Subcommittee occur within the European Euro zone; therefore, projections are expressed in the Euro currency.

Projected Budget for 2007:

General office expenses	⊞ 260
Preparation and production of Newsletters 34 and 35	⊞ 200
Contributions to Officers' travel costs	⊞ 800
Support for Working Groups (meetings etc.)	⊞1500

TOTAL BUDGET PROJECTED	⊞2760

9b. Potential funding sources outside IUGS. Most of the costs of Working Group meetings and other activities will be met by local support from host institutions and participation by individuals by national research and travel grants from their own authorities.

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006).

For most geologists involved in research on Jurassic rocks the most significant accomplishment of the Jurassic Subcommittee has been, and will continue to be, the International Jurassic Symposia/Congresses which are now held every four years - Erlangen (Germany) 1984, Lisbon (Portugal) 1987, Poitiers (France) 1991, Mendoza (Argentina) 1994, Vancouver (Canada) 1998, Mondello (Sicily) 2002 and Kraków (Poland) 2006. [Use of "Symposium" or "Congress" follows the preferences of the hosts!] These are noted for the friendly "family" atmosphere. During the Kraków Congress the location of the next Congress was decided by democratic vote of those present. Two invitations were received and China was selected as the venue for the 2010 Congress.

For each Congress/Symposium the resultant Field Trip Guidebooks are important reference publications, often with much new previously unpublished information, while the

Congress/Symposium Proceedings are frequently quoted basic references on Jurassic geology. Within the five-year period 2002-2006, such publications include the following publications.

(a) From the Mondello Symposium (2002):

- (i) SANTONIO, M. (ed.) 2002. *General Field Trip Guidebook*, 6th International Symposium on the Jurassic System, 12-22 September 2002, Palermo, Italy. 320pp.
- (ii) PARISI, G. (ed.) 2004. The 6th International Symposium on the Jurassic System, 16-19 September 2002, Proceedings. *Revista Italiana di Paleontologia e Stratigrafia*, **110/1**, 1-428.
- (iii) PAVIA, G. & CRESTA, S. (coord.) 2002. Revision of Jurassic ammonites of the Gemmellaro Collections. *Quaderni del Museo Geologico "G.G. Gemmellaro"*, **6**, 1-406, Dipartimento di Geologia e Geodesia, Università di Palermo.
- (iv) D'ARPA, C. & SCALONE, E. 2002. *Gaetano Giorgio Gemmellaro, Sopra alcune faune Giuresi e Liasiche della Sicilia. Ristampa Anastatica con aggiornamento nomenclaturale dei taxa di ammoniti*. Tavoli I-XXXI. Dipartimento di Geologia e Geodesia, Università di Palermo.

(b) From the Kraków Congress (2006):

- (i) WIERZBOWSKI, A. et al. (eds.) 2006. *Jurassic of Poland and adjacent Slovakian Carpathians. Field trip guidebook of 7th International Congress on the Jurassic System, Poland, Kraków, September 6-18, 2006*. 1-235. Polish Geological Institute, Warsaw.
- (ii) DEMBICZ, K., PRASZKIER, T. & WIERZBOWSKI, A. (eds.) 2006. Proposals of the new GSSP: Pliensbachian/Toarcian, Oxfordian/Kimmeridgian and Abstracts of Talks and Posters presented during the 7th International Congress on the Jurassic System, September 6-18, 2006, Kraków, Poland. *Volumina Jurassica* **4**, 1-304. Institute of Geology, Warsaw University, Warsaw.

It would take too long to describe all the other publications, books and individual papers, which derive from meetings and other activities of Subcommittee Working Groups and Members, reported in the Jurassic Newsletter (see next paragraph).

The second most important accomplishment of the Subcommittee would be regarded by most as the annual ISJS Jurassic Newsletter. This is edited by the Chairman and Secretary of the Subcommittee and includes annual reports by the Subcommittee and the Convenors of the Working Groups, news items on current or recently completed research projects news and comments and discussion submitted by members and "friends". Previously the Newsletters were duplicated and distributed by post, but more recently have been distributed electronically as email attachments to all Honorary, Voting and Corresponding Members. In many countries these Members have established a network for onward forwarding so that the Newsletter should reach all with an interest. However, in other countries the onward distribution needs improvement.

For IUGS and ICS the most important achievements of the Jurassic Subcommittee concern the definition of boundary stratotypes (GSSPs) for the bases of the Jurassic System and Stages. Four of the eleven are now established, for details of the most recent ratified by IUGS in 2005, see:

MEISTER, C. et al. 2006. The Global Boundary Stratotype Section and Point (GSSP) for the base of the Pliensbachian Stage (Lower Jurassic), Wine Haven, Yorkshire, UK. *Episodes* **29/2**, 93-106.

The Jurassic Subcommittee anticipated by several years the review by the International Commission on Stratigraphy of its role within IUGS after completion of the International Chronostratigraphic Scale project. The Subcommittee started to broaden its role in 1995 by establishing thematic Working Groups, notably in Jurassic Sequence Stratigraphy. The number of these thematic "Working Groups" has been increased since 1999 and this trend will be continued.

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2006-2009)

The primary objectives for the immediate future for the Jurassic Subcommittee remain the completion of the long-standing project for definition of the Stages by GSSPs. This is expected to be completed during 2006-2007. The next tasks for the Stage Working Groups will be the definition of smaller chronostratigraphic units, at Substage and Standard (Ammonite) Zone level, coordination of parallel biostratigraphic scales and regional scales. The Subcommittee aims to enable coordination of multidisciplinary work on stratigraphical calibration, including geophysical and geochemical techniques as well as biostratigraphy, and use of Milankovic cyclicity to estimate time durations of chronostratigraphical units.

In association with IGCP 506 a Subcommittee objective will be to improve correlations between the marine and non-marine realms, to resolve problems of, to give just one example, the ages of famous dinosaur faunas.

Box 11a Proposed objectives of Jurassic Subcommittee for 2005-2008

For those of us who are interested in the geology of the Jurassic the four-yearly International Symposia/Congresses are a priority and these will be "officially" supported and sponsored. So also will other meetings as far as resources allow.

The priorities (not in order of merit) proposed for the Jurassic Subcommittee for the next four years include:

1. Stage Working Groups to standardise and propose GSSPs for Substages as appropriate, but named ONLY as Lower/Middle/Upper. We do not want to clutter up the nomenclature with named Substages such as Carixian, Domerian etc. These will be approved by the Jurassic Subcommittee, but ICS and IUGS have no current plans for involvement with Substages.

2. I suggest also asking the Stage Working Groups to 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. Similar definition of Regional Zones and maximising the detail of correlation with the Standard Zones would be very valuable.

3. Involvement in the aims and objectives of IGCP Project 506, targetted on developing means of correlation between marine and non-marine Jurassic successions. In recent decades the latter have been recognised to be very widespread and economically important in several regions, with exciting terrestrial faunas and floras.

4. Developing and expanding the Thematic Working Groups, some of which have been very successful. For this to work they need to be given more specific projects and targets - for example searching for and interpreting data from all sources relevant to reconstructing the

palaeobiogeography or the climate of one or more specific time-intervals. In part this will be given further impetus by involvement in IGCP Project 506.

5. Investigate the establishment of data-bases which would bring together and make available information from all sources associated with the "members and friends" of the Jurassic.

The schedule of meetings already planned includes the following:

1. June/July 2007 – Bristol, England; field workshop of IGCP Project 506 with particular reference to Triassic/Jurassic and Jurassic/Cretaceous boundaries;
2. August/September 2007 - to be decided, 2007 – New York State or western USA; field meeting of IGCP Project 506, with particular reference to either Lower Jurassic or Middle Jurassic non-marine successions and dinosaur faunas.
3. August 2008 – Scania, southern Sweden – meeting of IGCP Project 506, with particular reference to Triassic/Jurassic boundary successions and to correlation of Middle Jurassic in northern North Sea and adjacent regions.

Details of other meetings are not yet available.

APPENDIX

INTERNATIONAL SUBCOMMISSION ON JURASSIC STRATIGRAPHY Voting Members 2004 - 2008

Subcommission officers

- Chairman:** Nicol MORTON, Le Chardon, Quartier Brugière, 07200 Vogüé, France;
Tel. ** 33 4 75 37 03 80, email NICOL.MORTON@wanadoo.fr
(formerly Birkbeck, University of London, UK)
- Vice-Chairman:** Paul L. SMITH, Earth & Ocean Sciences, University of British Columbia,
6339 Stores Road, Vancouver, British Columbia V6T 1Z4, Canada
tel. ** 1 604 822 6456, email psmith@eos.ubc.ca
- Secretary and Webmaster:** Paul R. BOWN, Geological Sciences, University College, London,
Gower Street, London WC1E 6BT, UK
Tel. ** 44 20 7679 2431 email p.bown@ucl.ac.uk

List of Working (Task) Groups and their officers

- Hettangian (base Jurassic):**
Convenor Geoffrey WARRINGTON, Radcliffe-on-Trent, UK gw4@le.ac.uk
Secretary Gert Bloos, Stuttgart, Germany bloos.smns@naturkundemuseum-bw.de
- Sinemurian:** Convenor Gert Bloos, Stuttgart, Germany bloos.smns@naturkundemuseum-bw.de
- Pliensbachian:** Convenor Christian Meister, Geneva, Switzerland christian.meister@ville-ge.ch
- Toarcian:** Convenor Serge Elmi, Lyon, France Serge.Elmi@univ-lyon1.fr
- Aalenian:** Convenor Maria Helena Henriques, Coimbra, Portugal hhenriq@dct.uc.pt
- Bajocian:** Convenor András Galacz, Budapest, Hungary galacz@ludens.elte.hu
- Bathonian:** Convenor Sixto Fernandez Lopez, Madrid, Spain sixto@geo.ucm.es
- Callovian:** Convenor John Callomon, London, UK johncallomon@lineone.net
- Oxfordian:** Convenor Guillermo Melendez, Zaragoza, Spain gmelende@posta.unizar.es
- Kimmeridgian:** Convenor Andrzej Wierzbowski, Warszawa, Poland
Andrzej.Wierzbowski@uw.edu.pl
- Tithonian:** Convenor Federico Oloriz, Granada, Spain foloriz@goliat.ugr.es
Secretary Guenter Schweigert, Stuttgart, Germany schweigert.smns@naturkundemuseum-bw.de
- Geoconservation:** Convenor Kevin Page, Plymouth, UK KevinP@bello-page.fsnet.co.uk
- Liaison:** Convenor Robert Chandler, Whyteleafe, UK aalenian@blueyonder.co.uk
- Microfossils:** Convenor Susanne Feist Burkhardt, London, UK S.Fiest-Burkhardt@nhm.ac.uk
- Palaeobiogeography:** Convenor Fabrizio Cecca, Paris, France cecca@ccr.jussieu.fr
- Palaeoclimate:** Convenor Bruce Sellwood, Reading, UK b.w.sellwood@reading.ac.uk
- Sequence Stratigraphy:** Convenor Angela Coe, Milton Keynes, UK A.L.Coe@open.ac.uk
- Time Scale:** Convenor Jozsef Palfy, Budapest, Hungary palfy@nhmus.hu

List of Voting Members

- Elizabeth S. CARTER, Sisters OR, USA cartermicro@earthlink.net
- Fabrizio CECCA, Paris, France cecca@ccr.jussieu.fr
- Susana DAMBORENEA, La Plata, Argentina sdambore@fcnym.unlp.edu.ar
- Gerd DIETL, Stuttgart, Germany g.dietl.smns@naturkundemuseum-bw.de
- Serge ELMi, Lyon, France Serge.Elmi@univ-lyon1.fr

Bouza FEDAN, Rabat, Morocco fedan@israbat.ac.ma
Sixto FERNANDEZ LOPEZ, Madrid, Spain sixto@geo.ucm.es
Stephen HESSELBO, Oxford, UK Stephen.Hesselbo@earth.ox.ac.uk
Axel von HILLEBRANDT, Berlin, Germany hil10632@mailbox.tu-berlin.de
Francis HIRSCH, Naruto, Japan francis-hirsch@mrj.biglobe.ne.jp
James G. OGG, West Lafayette IN, USA jogg@purdue.edu
Kevin N. PAGE, Crediton, UK KevinP@bellopage.fsnet.co.uk
Jozsef PALFY, Budapest, Hungary palfy@nhmus.hu
Giulio PAVIA, Torino, Italy giulio.pavia@unito.it
Jingeng SHA, Nanjing, China jgsha@nigpas.ac.cn
Xiaoying SHI, Beijing, China shixyb@cugb.edu.cn
Boris SHURYGIN, Novosibirsk, Russia ShuryginBN@uiggm.nsc.ru
Geoffrey WARRINGTON, Leicester, UK gw47@le.ac.uk
Andrzej WIERZBOWSKI, Warsaw, Poland Andrzej.Wierzbowski@uw.edu.pl
Akira YAO, Osaka, Japan yao@sci.osaka-cu.ac.jp



International Commission on Stratigraphy Subcommission on Triassic Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

International Subcommission on Triassic Stratigraphy

SUBMITTED BY:

Dr Michael ORCHARD, Chairman
625 Robson Street, Vancouver, BC, V6B 5J3, Canada
Tel. ** 604 666 0409, Email morchard@nrca.gc.ca

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Rationalization of global chronostratigraphical classification.
Intercalibration of fossil biostratigraphies, integrated zonations, and recognition of global datums.
Establishment of magneto- and chemo-stratigraphic scales.
Definition of Stage boundaries and selection of global stratotype sections.
Correlation of Triassic rock successions and events, including marine to non-marine.
Climatic evolution and modeling.

The objectives satisfy the IUGS mandate 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 Triassic geology world-wide; attracting competent students and research workers to the discipline; and fostering an increased awareness among individual scientists world-wide of what related programs are being undertaken.

3. ORGANIZATION

STS is a Subcommission of the Commission on Stratigraphy.
Officers (chairman, two vice-chairmen, secretary), Editor/ Webmaster of newsletter *Albertiana*, voting members (25), and corresponding members (~100). The Secretary hosts a web site for STS announcements and task group discussions.

Subcommission members represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Triassic rocks are extensively studied in relation to fundamental

and/or applied geological research. Current research activities and future plans are communicated through publication of the bi-annual STS newsletter *Albertiana* as both hardcopy and web release.

3a. Officers for 2004-2008:

Chair: Dr. Michael J. Orchard, Canada
Vice-Chair: Prof. Yin Hongfu, China
Vice-Chair: Prof. Marco Balini, Italy
Secretary: Prof. Christopher R. McRoberts, USA

WEB addresses for Subcommission

<http://www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm> - Albertiana issues for access and download.

<http://paleo.cortland.edu/sts/> - STS information, task group discussions.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP Project 467: Triassic time and trans-Panthalassan correlations
IGCP Project 458: Triassic/ Jurassic Boundary Events.
CHRONOS/ SPS: co-sponsors of Chaohu meeting, 2005.
InterRad: co-sponsors for Wellington, New Zealand meeting, 2006.
Pander Society: co-sponsors for ICOS1, 2006

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

Publications

Four volumes focused on Triassic time and stratigraphy moved forward or were conceived during 2006:

1. Editing of contributed papers from the Chaohu meeting was completed for a special volume of *Palaeo3* on the *Permo-Triassic Boundary Events and Early Triassic Biotic Recovery*. The volume (special editors, Thomas Algeo, Daniel Lehrmann, Michael Orchard, and Tong Jinnan) features 26 papers that are now submitted to the Palaeo3 editors.

2. Contributed papers from the New Zealand Triassic Symposium *Triassic time and trans-Panthalassa correlations* are planned for a volume of *Stratigraphy*, with special editors Hamish Campbell and Michael Orchard.

3. Contributed papers from the Svalbard meeting are planned for *Polar Research*.

4. Proceedings of the Global Triassic meeting in New Mexico will be available as a *Bulletin of the New Mexico Museum of Natural History and Science*.

After publication of three issues of *Albertiana*, the official newsletter of the Triassic Subcommission, in 2005 there was a hiatus but the next issue, #34, was released in November, 2006. *Albertiana* #35 is due for release in January, 2007.

The primary aim of *Albertiana* is to promote the interdisciplinary collaboration and understanding among members of the Subcommission and within this scope serves as a platform for announcements, meeting reports, business minutes, reviews, and Triassic literature compilations as well as preliminary notes, progress reports, and articles on Triassic research. Electronic versions are

also available in PDF format at <http://www.bio.uu.nl/%7Epalaeo/Albertiana/Albertiana01.htm>.

Meetings:

March 19-24, 2006. *Circum-Panthalassa Triassic Faunas and Sequences.* Te Papa Tongarewa, Museum of New Zealand, in Wellington, Wellington, New Zealand. The conference was co-sponsored by InterRad, IGCP Project 467, the Subcommittee on Triassic Stratigraphy (STS), and the Institute of Geological and Nuclear Sciences (GNS).

In attendance were 120 participants came from 19 countries, who presented a total of 71 talks and 32 posters. This included 17 plenary talks, nine of which were open to public, which addressed the key themes of the conference: Triassic catastrophes and their consequences, biological indicators of oceanographic change, micropaleontological methodologies for the 21st century and radiolarian solutions to tectonic problems. A symposium on *Circum-Pacific Triassic Stratigraphy & Correlation* was held, and conference excursions included six field trips that covered almost every corner of New Zealand, including the Permian-Triassic boundary of Northland within Waipapa terrane, key Triassic–Early Jurassic sections in Murihiku terrane on the North Island’s west coast, a mid-conference excursion to examine Triassic rocks of Torlesse composite terrane exposed on Wellington’s south coast, and a post-conference excursion to Southland viewing the key stratotype sections for six of the eight local Triassic stages. A full report of the conference and field trips, and a compendium of Triassic abstracts compiled by Hamish Campbell, can be found on the IGCP467 website (<http://paleo.cortland.edu/IGCP467/>). A full Programme and Abstracts is downloadable from <http://www.gns.cri.nz/interrad/>.

July 17-21, 2006. *The First International Conodont Symposium (ICOS1)*, in Leicester, England included a joint STS sponsored Symposium on *Triassic Conodonts: Taxonomy and Time Scales*. This attracted 15 talks and posters, and a full day was devoted to boundary discussions amongst a small group of Triassic researchers.

August 16-20, 2006. *The Boreal Triassic.* Longyearbyen, Svalbard, Arctic Norway. Co-sponsored by IGCP 467 and hosted by UNIS (University studies on Svalbard) Institute.

Seventy participants from 15 countries attended the conference. A total of 34 talks were presented as well as 27 posters, with particular emphasis on the Boreal Triassic. The last day of the conference was devoted to a full-day excursion to the Festningen section, where rocks from Late Permian to Early Cretaceous were visited. Emphasis was also given to show interaction between basic scientific and exploration activity of the Triassic succession of the Barents Sea Shelf. Abstracts and introduction to the Triassic of Svalbard can be found in the conference volume that can be accessed at <http://natmus.uio.no/triassic-2006/>. Besides the extended abstract volume in the series *Abstracts and Proceedings of the Geological Society of Norway*, a conference volume in Polar Research is planned.

Organization of the *Global Triassic* meeting in Albuquerque, May 2007 (see below) progressed, including a road log for the planned field excursion in Nevada.

Progress on outstanding Triassic GSSPs:

Induan-Olenekian: Following the proposal for the I/O boundary GSSP at the Chaohu section in China, work focused on completing the formal publication of the conodont data from Chaohu (Zhao et al., in press, *Palaeo3*) and completion of work on an alternate candidate at Muth, Spiti. A study of the conodonts from Spiti was completed by M. Orchard and copy distributed to task group

members in June 2006. Several new taxa were identified, as well as several described first from Chaohu. A new chemostratigraphic profile for Spiti produced by S. Richoz shows a positive excursion and turning point coincident with the appearance of *Rohillites* and *Kashmirites*, the ammonoid chronology having been worked out in detail by L. Krystyn. Data from H. Bucher and his team working in Jinya, South China have reported the same situation there. This isotope datum, which corresponds also to the appearance of the conodonts *Neospathodus waageni* sensu lato and *Ns. posterolongatus* in Spiti, evidently correlates with a position well below the appearance of those conodonts in the Chaohu section. Meanwhile, the considerable discussion on this boundary that took place during and after the Svalbard meeting has been synthesized by task group leader Y. Zakharov and will be published in *Albertiana* 34. In the same issue of *Albertiana* is further work on the Chaohu sections, including bivalves, ammonoids and palynomorphs. [See Task Group report at end of this report for full details.]

Olenekian-Anisian: At the Svalbard meeting, E. Grădinaru presented data on the ammonoids and nautiloids of Desli Cairia and especially their stratigraphic value. The boundary is placed between beds with *Deslicairites simionescui* n. g. n. sp., *Procarnites kokeni* and other upper Spathian ammonoids below and the *Paracrochordiceras-Japonites* Beds of basal Anisian age above. Especially important for correlation with the Boreal Realm is the outstanding occurrence of olenekitids (*Deslicairites*, ?*Svalbardiceras*) in the topmost Olenekian of the Tethys and of ?*Karangatites* at the very base of the Anisian at Desli Cairia. *Karangatites* is the zonal marker for the base of the Anisian in Arctic Siberia.

The use of the FAD of the conodont *Chiosella timorensis* as a datum for the O-A boundary was challenged due to variation in its taxonomic treatment and evolution in our understanding of the group leading to historical records of the species occurring within Olenekian strata. A study of *Chiosella* based on the collections from both Desli Cairia and Guandao was undertaken in order to clarify its taxonomy and demonstrate its utility as a global index. A paper on this topic will be published in *Albertiana* #34. It is anticipated that this is the final hurdle prior to resolution of this boundary. [See Task Group report at end of this report for full details.]

Ladinian-Carnian: M. Gaetani, the task group chair, distributed a questionnaire in June 2006 concerning the status of the boundary deliberations and the pros and cons of various fossil criteria. An outcome of this was that, in spite of a lack of an ancestor for *Daxatina*, ammonoids were favored for definition of the boundary. Marco Balini, the principal worker on the ammonoid faunas of this boundary interval visited the Smithsonian Museum for comparative studies and then completed his collections in South Canyon, Nevada. He reports a much more detailed view of the lithologic as well as of the faunal succession, with bed-by-bed data from 5 sites: A, B, D, E, F, three of which have yielded conodont fauna. Not only *Daxatina*-like forms, but also forms with true *Trachyceras*-like suture line are identified in the upper part of the studied sections above the occurrence of *Frankites sutherlandi* and of *Halobia*, and these are the focus of present study. A preliminary report on the occurrence of *Frankites sutherlandi* at South Canyon was completed. [See Task Group report at end of this report for full details.]

Carnian-Norian: Some discussions during ICOS1 centered on the suitability of key C/N boundary conodont taxa for intercontinental correlation. It was agreed amongst those present that the FAD of *Epigondolella quadrata*, a higher level than those previously considered, might be the most suitable in the absence of cosmopolitan taxa prior to that level. This would place the boundary within the

Kerri Zone rather than at its base. The working group is currently being polled on this suggestion, which has had mixed reviews. Two new PhD students at the University of Milan began work on ammonoids, halobiids, and conodonts of the Pizzo Mondello section and surrounding areas. Plans to visit Williston Lake to complete C-N studies began. [See Task Group report at end of this report for full details.]

Norian-Rhaetian - At Steinbergkogel in Austria, one of the potential GSSP candidates, the FAD of the conodont *Misikella posthernsteini* has been proven within a phylomorphogenetic cline to be isochronous with the FO of the ammonoid *Cochloceras*. This well-constrained bioevent is closely above the FO of the conodont *Misikella hernsteini* and a magnetic polarity change from a long normal to a well developed reversed interval allowing an additional and independent correlation tool of this boundary option 1. The distinctive dinoflagellate change, which occurs with the FO of *Rhaetogonyaulax rhaetica* in the Zlambach section, is stratigraphically higher and corresponds to another ammonoid change with the FO of the widely distributed genera *Cycloceltites* and *Vandaites*: this is boundary option 2. Preliminary data show no significant C-isotope excursions with either of the two options. [See Task Group report at end of this report for full details.]

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

As in recent years, the Chair's ability to fulfil his STS duties is compromised by the new government program structure and lack of funds and 'approval' for foreign travel. Similar financial problems face most task group members. Disruption of the publication of the STS newsletter *Albertiana* #34 caused a back up of articles and caused delay in communications although the web site hosted in Cortland continued to post news and announcements.

7. SUMMARY OF EXPENDITURES IN 2006

ICS FUNDING	
Subcommission allocation	□1300
TOTAL	□1300
STS EXPENDITURES	
Participation in Svalbard conference, Orchard	□ 300
Albertiana - STS Newsletter	□ 500
<i>Global Triassic</i> meeting, carried forward	□ 500
TOTAL	□1300

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

Meeting/field workshop schedule

May (19-)23-25, 2007. International meeting on *The Global Triassic*. Albuquerque, New Mexico, USA. <http://museums.state.nm.us/nmmnh/globaltriassic.html>

This international symposium will be devoted to all aspects of the Triassic System with particular focus on the Triassic timescale and Triassic biotic events. It will be an official meeting of the STS and a final meeting of IGCP 467 on Triassic Time and Correlation. The meeting will be three days of talks and posters at the New Mexico Museum of Natural History in Albuquerque. Focus will be on all outstanding Triassic GSSPs. A pre-meeting fieldtrip will visit classic marine Middle-Upper Triassic sections in Nevada (19-21 May). Proceedings of the meeting will be available as a Bulletin of the New Mexico Museum of Natural History and Science.

May 27-31, 2007. Field workshop on the *Carnian-Norian boundary*, Williston Lake, NE BC, Canada. A multidisciplinary team of task group members will spend some days in this classic Triassic area focusing on the CNB at several localities with the goal of completing the collection of data necessary for a GSSP proposal.

GSSP deliberations

The I-O Boundary (Olenekian GSSP): Full disclosure of new data from Spiti to task group members this Fall and careful comparison with Chaohu sections should precede a decision on the GSSP. The Task Group Chair writes that voting on I-O GSSP candidates will take place winter/spring, 2006/7. Three main questions remain: (1) What is the explanation for anomalies in conodont occurrences in the two candidate sections? (2) Is it possible to use volcanic ash layers from IOB beds of the Chaohu section for radio-isotopic geochronological calibration, which could partly compensate for the poor ammonoid control? (3) How much of a disadvantage is the absence of an I-O magnetostratigraphy in Spiti?

The O-A Boundary (Anisian GSSP): Publication of a revised *Chiosella* taxonomy and conodont succession; completion of the O-A GSSP proposal for Desli Caira.

The L-C Boundary (Carnian GSSP): Publication of the preliminary report on the occurrence of *Frankites sutherlandi* at South Canyon, Nevada; preparation of a general description of the succession for the field guidebook of the Albuquerque meeting; presentation of data on *Trachyceras* for the same meeting; preparation of report on ammonoid-conodont-bivalve fossil calibration across the boundary beds. Completion of the final report for Spiti by the Spring. Most new data should be available for the May 2007 meeting where a decision on the GSSP will be close.

The Italian Group of palynologists from Perugia and Padova universities plan to submit papers for both the Albuquerque meeting and to Albertiana in the next few months. This involves revision of all the material about the Stuoeres section, and coeval sections in which important palynological events can be calibrated with the FAD of *Daxatina canadensis*. A magnetostratigraphic sampling of an auxiliary section in Eastern Dolomites is planned for April.

The C-N Boundary (Norian GSSP): New data from Pizzo Mondello is anticipated with progress in PhD studies. A field workshop to Williston Lake in May 2007 is planned with the goal of completing the data set for sections there.

The N-R Boundary (Rhaetian GSSP): A proposal for a GSSP at Steinbergkogel is anticipated.

Publications:

Two issues of *Albertiana*.

Appearance of Special Volume of *Palaeo3* on *Permo-Triassic Boundary Events and Early Triassic Biotic Recovery*.

Editing of Special Volume of *Stratigraphy* on *Triassic time and trans-Panthalassa correlations*.

Compilation of contributed papers for *Polar Research on The Boreal Triassic*.

Compilation of Proceedings and contributed papers for the *Bulletin of the New Mexico Museum of Natural History and Science* on the *Global Triassic*.

9. BUDGET AND ICS COMPONENT FOR 2007

<i>Albertiana</i> - STS Newsletter production	□ 500
Support, Albuquerque meeting, May 2007	□1500
Support, Williston Lake C-N field workshop, May 2007	<u>□1500</u>
TOTAL	□3500

Potential funding sources outside IUGS:

Cost sharing with IGCP Project 467, Triassic time and trans-Panthalassan correlation.

Dept. of Geosciences, University of Utrecht provides facilities for the production of *Albertiana* and hosts its web-site.

Dept. of Geosciences, Cortland, New York hosts an STS website.

National research and travel grants provide support to individuals, and host institutions provide in-kind support to the executive and task group chairs.

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (thru 2006)

Organization

Renewal of STS voting and corresponding membership in 2001. Voting membership was reduced from 31 to 26, and a broader geographical and disciplinary base established. This was the first significant turnover of voting members since the inception of the STS. A summary of all members' research interests was published in *Albertiana* 26. Four new GSSP Task Group chairs were appointed. A second renewal took place in the Fall of 2004 with 11 new voting members amongst 25: this addressed the ICS recommended limit for terms served as well as lapsed members. A second web site was created to supplement that of *Albertiana* and host discussion groups.

Meetings/ workshops

1. Field meeting in Tulcea, Dobrogea, Romania, 7-10 June, 2000. Prospective O-A boundary.
2. International Symposium on the Global Stratotype of the Permian-Triassic boundary and the Paleozoic-Mesozoic events. Changxing, South China, August 2001
3. International Conference in Oman: Permo-Triassic deposits: from shallow water to base of slope.
4. Field workshop on Middle Triassic boundaries, Veszprum, Hungary, September, 2002.
5. *Extinction events, faunal turnovers, and natural boundaries within and around the Late Triassic*. Vancouver, Canada. May 25th -28th, 2003. Conodont workshop on the Carnian-Norian boundary.
6. *Triassic geochronology and cyclostratigraphy* a field symposium, September 11th -15th 2003. Focus on Secada core research and Middle Triassic time scales. Conodont workshop on the Olenekian-Anisian boundary.

7. Field workshop in Spiti, India, 26th June-6th July 2004. Conodont workshop on the Ladinian-Carnian boundary.
8. International Geological Congress, Florence, Italy, August 20-28, 2004. G22-06: Triassic in Tethys Realm; DWO-09: Upper Triassic boundaries.
9. Meeting on *Triassic Chronostratigraphy and Biotic Recovery*. Chaohu, China, May 23-25, 2005. Focus on I-O boundary
10. Symposium on *Circum-Panthalassa Triassic Faunas and Sequences*, at INTERRAD conference. Te Papa Tongarewa, Museum of New Zealand, in Wellington, Wellington, New Zealand. March 19-24, 2006.
11. Symposium on *Triassic Conodonts: Taxonomy and Time Scales*, at the First International Conodont Symposium (ICOS1), in Leicester, England, July 17-21, 2006.
12. Conference, *The Boreal Triassic*. Longyearbyen, Svalbard, Arctic Norway, August 16-20, 2006.

Publications

12 issues of *Albertiana* (#24-34) were published in 2000 thru 2006. Each of these issues was made available for download from the web.

Abstract volumes/ field guides prepared for meetings in Romania, Oman, Stuores, Felsőors, Vancouver, St Cristina, Spiti, Chaohu, Wellington, Leicester, and Longyearbyen.

Nakrem, H. A. & Mørk, A. (Eds.) 2006. *Boreal Triassic*. Longyearbyen, Svalbard, 16-19 August 2006. *NGF Abstracts and Proceedings of the Geological Society of Norway* **3 (2006)**, 149 pp.

11. OBJECTIVES AND WORK PLAN BEYOND 2007.

Complete remaining GSSPs!

APPENDIX 1 [Task Group reports]

The **Permian-Triassic boundary** was agreed and ratified: the first appearance of the conodont *Hindeodus parvus* in the middle of bed 27, within the Yinkeng Formation at Meishan, Changxing County, Zhejiang Province, South China. A formal celebration at the GSSP took place during August 2001.

The **Induan-Olenekian boundary** Task Group, formed in 1997, reviewed the options for a GSSP in the Russian Far East but found them lacking because of strong remagnetization of Triassic rocks and poor recovery of I/O conodont assemblages. A section in Chaohu, Anhui Province, China became the focus of intensive study. Ammonoid and conodont biostratigraphy, magnetostratigraphy, and chemostratigraphy were undertaken. The FAD of the conodont *Neospathodus waageni* was identified as a potential GSSP datum: it lies 26 cm below the FAD of the Flemingitid ammonoids, and is located slightly prior to the top of the second Triassic normal magnetozone, and the peak of the first Triassic positive excursion of $\delta^{13}\text{C}$. A preliminary conodont biostratigraphy for Chaohu was summarized in *Albertiana* #29 (2004), and the ammonoids described in *Albertiana* #31. This boundary and proposed GSSP was the focus of a meeting held in China during June 2005, at which time many members of the task group were able to examine the section.

After 2004 field work carried out in Muth, Spiti, an evaluation of the Mikin Fm. for establishing an Induan-Olenekian boundary GSSP candidate was begun. The rocks include top *Gyronites*, complete *Flemingites*, and basal *Euflemingites* ammonoid intervals. Three boundary options based in ammonoids were suggested and provisionally tied to the FAD of *Neospathodus waageni* subsp. Initial conodont studies identified useful taxa common to Chaohu. The ammonoid record appears superior to that at Chaohu but the section lacks a magnetostratigraphy.

A field workshop was held at Desli Caira, in Dobrogea, Romania, in June 2000, to view the **Olenekian-Anisian boundary** candidate. Major work was undertaken on ammonoid, nautiloid, conodont, and foraminiferid biostratigraphy. Both chemo- and magneto-stratigraphic analyses were largely completed. At the 2003 field workshop in St Christina, a conodont workshop amongst task group members agreed that the appearance of the conodont *Chiosella timorensis* at the base of bed 7 was a suitable datum for GSSP definition. Further geochemical sampling was undertaken in 2004 to fill a perceived gap in the coverage at the principal section. Further work has been undertaken on correlative sections in South China, Spiti, and South Primorye, Russia. In particular, a section at Guandao in the Nanpanjiang Basin of Guizhou Province, South China produced an excellent dataset, including isotopic dates from about this boundary (~247 Ma).

At Desli Caira, the FAD of the conodont *Chiosella timorensis* corresponds to a significant change in the ammonoid fauna, and to the peak of a positive C isotope excursion; it falls within a short reversed polarity interval situated between two short normal intervals that follow the longer reversed interval in the upper Spathian. The Guandao section lacks rich ammonoid faunas but it is relatively expanded and has an excellent conodont succession and numerous dated ash beds that place the O-A boundary at 247.2 Ma. It too has a positive isotope excursion that peaks at the appearance of *C. timorensis*, and a magnetostratigraphy that places that datum in the same context as in Romania.

Intensive research was undertaken on **Anisian-Ladinian boundary** GSSP candidate sections in Italy and Hungary. A dedicated task group was formed in 2001 and presentations focused on the GSSP options in the Hungary meeting of 2002. A formal task group voting membership and a schedule for the choice of base-Ladinian stratotype was agreed at the St Christina Meeting in 2003, and three alternate proposals were published in *Albertiana* #28. The choice was concluded in a series of votes within STS during 2004; the IUGS ratified the choice on 21st March 2005. The GSSP is thus defined at the top of "*Chiesense* groove", located about 5 m above the base of the Buchenstein Beds at Bagolino, northern Italy; the lower surface of the overlying thick limestone bed has the lowest occurrence of the ammonoid *Eoprotrachyceras curionii*. Secondary global markers in the uppermost Anisian include the lowest occurrence of conodont *Neogondolella praehungarica* and a brief normal-polarity magnetic zone. The GSSP level is bracketed by U-Pb single zircon age data, indicating that the boundary age is within the range 240-242Ma. A description of the GSSP was published in *Episodes*.

A field workshop in the Italian Dolomites during July 1998 focused on the section at Prati di Stuares, the subject of a formal **Ladinian-Carnian boundary** GSSP proposal. A dedicated task group was established in 2001. Subsequently fieldwork was carried out in two other regions: Spiti and Nevada. Studies in Spiti have included four expeditions, with two in Nevada. Crucial biostratigraphic data concerns the distinction between prospective index ammonoids *Daxatina* and *Trachyceras*, the FAD of the prospective conodont species *polygnathiformis*, and the appearance of the bivalve *Halobia*.

Work in the Dolomites included a very heavy resampling of the Prati di Stuares section which resulted in a single incomplete specimen of *Metapolygnathus polygnathiformis* near the bed with the FAD of *Daxatina*. The Padova research group sought new sections in the Eastern Dolomites to better document the interval between the top of *Daxatina* beds and base of *Trachyceras aon*.

In Spiti, as in Prati di Stuares, *Daxatina* appears towards the top of the range interval of the genus *Frankites*, and *Trachyceras* overlaps with highest *Daxatina*. However, the FAD of the conodont *M. polygnathiformis* predates the oncoming of *Daxatina* by several meters. Doubtful *Halobia* still appear within the *Frankites* beds but well established occurrences are higher, within the beds with *Trachyceras*. The pros of the Spiti sections are the concurrent record of ammonoids, conodonts and bivalves, which allows the intercalibration of the bioevents. The cons are the remagnetization of the section, the cooked out content in palynomorphs, and the accessibility limited to the summer months, due to the altitude.

In the successions in New Pass, Nevada, *Frankites sutherlandi* overlaps the lower part of the range of *Trachyceras* gr. *T. desatoyense*, several meters above the FAD of *desatoyense*. *Halobia* appears in the same beds from where *sutherlandi* was recovered and possibly is even older. The richest beds in ammonoids of the South Canyon section overlie a sudden facies change, with the drowning of a carbonate platform. South Canyon does not appear to be a possible GSSP candidate mostly because of the facies change and the remagnetization due to the nearby Cenozoic volcanic rocks. The section is, however, of great significance for large-scale correlations of North America with the Tethyan realm

The task group on the **Carnian-Norian boundary** was established in 2001. Key sections in Canada, Sicily, Slovakia, Turkey, and Oman have been studied resulting in an integrated bio-, magneto- and chemostratigraphic cross-correlation of key sections in the Tethys. The Pizzo Mondello section in Sicily contributes a magnetostratigraphic profile tied to a preliminary conodont zonation for the C-N boundary interval in Tethys. Alternate views of its correlation with the cyclostratigraphically calibrated Newark non-marine successions, place the base of the Norian at about 214 Ma or 228 Ma. A preliminary new conodont zonation from a potential GSSP at Black Bear Ridge, Western Canada was presented during a formal Workshop on Upper Triassic boundaries at the IGC in Florence in 2004. Comparisons between this Canadian data and the faunal successions of Tethyan sections has yet to reveal an ideal definitive taxon.

A **Norian-Rhaetian boundary** task group was formed in 2001. Sections in western Canada, USA, and Austria were studied and produced important ammonoid, bivalve, and conodont data. Magnetostratigraphic and chemostratigraphic studies were undertaken in Queen Charlotte Islands, Canada. Rock magnetism carried a Cretaceous overprint. A carbon isotopic anomaly was identified at a potential boundary where radiolarians show distinctive faunal change and which is the FAD of the conodont *Epigondolella mosheri*, which approximates the Amoenum Zone in North America. A field workshop in the Gabbs Valley Range of Nevada in March 2005 included sampling of both N/R and T/J boundary strata. Palynology results were disappointing, but the presence of the 'Tethyan' conodont *Misikella* was confirmed - a first for the North American autochthon.

In Austria, a section in the Hallstatt and Zlambach Formation produced good ammonoids, pelagic bivalves, conodonts, rare radiolarians, and palynomorphs, as well as a magnetostratigraphy. A distinctive dinoflagellate change occurs midway through the Zlambach section with the FO of *Rhaetogonyaulax rhaetica*, a datum that may have potential in correlation with shallow marine and/or high latitude basins.

APPENDIX 2 [Names and Full Addresses of Current Officers and Voting Members]

Subcommission officers (with addresses)

Chairman: M. J. Orchard, Geological Survey of Canada, 625 Robson Street, Vancouver, B.C. V6B 5J3, Canada, e-mail: morchard@nrca.gc.ca

Vice Chairman: Yin Hongfu, China University of Geosciences, Yujiashan, Wuhan, Hubei, 430074, Peoples Republic of China. hfyin@cug.edu.cn

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

Secretary/ STS web: **Christopher A. McRoberts, Department of Geology, State University of New York at Cortland, P.O. Box 2000, Cortland, New York 13045 USA.**
mailto:microberts@cortland.edu

Albertiana Editor/ Webmaster: Wolfram M. Kuerschner, Laboratory of Palaeobotany and Palynology, Utrecht University, Budapestlaan 4, 3584 CD Utrecht, The Netherlands.
W.M.Kuerschner@bio.uu.nl

Task Groups and their officers

Base Induan (Triassic): Yin Hongfu, China. hfyin@cug.edu.cn

Base Olenekian: Y. Zakharov, Russia. fegi@online.marine.su

Base Anisian: E. Gradinaru, Romania. egradin@geo.edu.ro

Base Ladinian: A. Baud, Switzerland. Aymon.Baud@sst.unil.ch

Base Carnian: M. Gaetani, Italy. maurizio.gaetani@unimi.it

Base Norian: M. Orchard, Canada. morchard@nrca.gc.ca

Base Rhaetian: L. Krystyn, Austria. leopold.krystyn@univie.ac.at

Non-marina auxiliaries: S. Lucas, USA. SLucas@nmmnh.state.nm.us

List of Voting Members

Yoshiaki Aita, Utsunomiya, JAPAN

Marco Balini, Milan, ITALY

Om N. Bhargava, INDIA

Hugo Bucher, Zurich, SWITZERLAND

Hamish Campbell, Dunedin, NEW ZEALAND

Mark Hounslow, Lancaster, ENGLAND

Dennis Kent, Palisades, USA.

Heinz W. Kozur, Budapest, HUNGARY

Leopold Krystyn, Vienna, AUSTRIA

Wolfram M. Kuerschner, Utrecht, NETHERLANDS

Max Langer, BRAZIL

Spencer Lucas, Albuquerque, USA.

Christopher R. McRoberts, Cortland, USA

Manfred Menning, Potsdam, GERMANY

Paolo Mietto, Padova, ITALY

Alda Nicora, Milano, ITALY

Michael J. Orchard, Vancouver, CANADA

Bruce Rubidge, Wits, SOUTH AFRICA

Kazem Seyed-Emami, Tehran, IRAN

Michael A. Shishkin, Moscow, RUSSIA

Jinnan Tong, Hubei, CHINA

aida@cc.utsunomiya-u.ac.jp

marco@e35.gp.terra.unimi.it

onbhargava@yahoo.co

Hugo.Bucher@pim.unizh.ch

H.Campbell@gns.cri.nz

m.hounslow@lancaster.ac.uk

dvk@rci.rutgers.edu

kozurh@helka.iif.hu

leopold.krystyn@univie.ac.at

w.m.kuerschner@bio.uu.nl

mclanger@ffclrp.usp.br

SLucas@nmmnh.state.nm.us

microberts@cortland.edu

menne@gfz-potsdam.de

mietto@epidote.dmp.unipd.it

Alda.nicora@unimi.it

morchard@nrca.gc.ca

106gar@cosmos.wits.ac.za

k.seyedemami@kavosh.net

schsz@orc.ru

jntong@cug.edu.cn

Attila Voros, Budapest, HUNGARY
Wolfgang Weitschat, Hamburg, GERMANY
Hongfu Yin, Hubei, CHINA
Yuri D. Zakharov, Vladivostok, RUSSIA

voros@zoo.zoo.nhmus.hu
weitschat@geowiss.uni-hamburg.de
hfyin@cug.edu.cn
zakharov@fegi.ru



International Commission on Stratigraphy Subcommission on Permian Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

International Subcommission on Permian Stratigraphy (SPS)

Submitted by:

Charles M. Henderson, Chairman SPS

Department of Geology and Geophysics, University of Calgary, Calgary, AB Canada T2N 1N4

Phone: 403-220-6170; Fax: 403-284-0074; Email: charles.henderson@ucalgary.ca;

Website: www.geo.ucalgary.ca/asrg

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Subcommission Objectives: The Subcommission's primary objective is to define the series and stages of the Permian, by means of internationally agreed GSSP's, and to provide the international forum for scientific discussion and interchange on all aspects of the Permian, but specifically on refined regional correlations.

Fit within IUGS Science Policy: The objectives of the Subcommission involve two main aspects of IUGS policy:

1. The development of an internationally agreed chronostratigraphic scale with units defined by GSSP's where appropriate and related to a hierarchy of units to maximize relative time resolution within the Permian System; and
2. Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the Permian Period.

3. ORGANIZATION

The Subcommission has an Executive consisting of a Chairman, a Vice-Chairman, and a Secretary; all three are Voting Members of the Subcommission. There are sixteen total Voting Members representing most regions of the world where Permian rocks are exposed.

The objectives of the Subcommission are pursued by both stratigraphic and thematic Working Groups that are disbanded upon completion of their directed task. For example, the Working Groups on the Carboniferous-Permian Boundary, on the Guadalupian stages (Middle Permian), on the base-Lopingian boundary (base-Wuchiapingian Stage), and on base-Changhsingian have been disbanded upon the successful establishment of their defining GSSP's and ratification by IUGS.

The current working groups include the following: 1. Cisuralian stages, 2. Continental Permian, 3. Transitional biotas as gateways for global correlation, and 4. Neotethys, Palaeotethys, and S. China intraplatform basin correlation.

3a. Officers for 2004-2008:

Chair: Professor Charles M. Henderson, University of Calgary

Vice-Chair: Dr. Vladimir Davydov, Boise State University

Secretary: Dr. Shuzhong Shen, Nanjing Institute of Geology and Palaeontology

Website: SPS website is located at <http://www.nigpas.ac.cn/permian/web/index.asp>. This site includes all back issues of *Permophiles* in downloadable PDF format (#1 in 1978 to #48 Dec. 2006). A link to *Permophiles*/Permian research has also been established at <http://www.geo.ucalgary.ca/asrg>.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

SPS interacts with many international projects on formal and informal levels. SPS is taking an active role on the development of integrated chronostratigraphic databases by participating with CHRONOS and PALEOSTRAT, which are NSF funded initiatives. Vladimir Davydov is concentrating on the Permian-Triassic Time Slice Project and the development of improved taxonomic dictionaries, database sharing and manipulation with PALEOSTRAT. SPS is also involved in a core study from a drilling project of the Permian-Triassic boundary at Meishan, China; this project is an international collaboration investigating the signature and causes of the P-T extinction.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

GSSPs: Both the base-Wuchiapingian and the base-Changhsingian (Upper Permian or Lopingian Series) GSSPs were published in *Episodes* (volume 29, No. 3&4).

Publications: The June 2006 issue of *Permophiles* (#47) was produced at Nanjing China during June 2006 and distributed as a pdf document to a mailing list of 280. The December 2006 issue of *Permophiles* (#48) was produced at the University of Calgary during November 2006 and distributed as a pdf on our website.

We now have a complete series of *Permophiles* on our website (1978 to 2006).

Meetings: The SPS conducted one business meeting at the 2nd International Palaeontology Congress in Beijing, China in June 2006.

Membership: Two changes were made to voting membership in 2006.

Dr. **John Utting** retired as a voting member and was named by the SPS Executive as a Honorary Member given his long service to SPS (past Secretary) and distinguished research record in Late Paleozoic palynology. Honorary Members will receive GSSP proposals and be invited to comment on the merits of the proposal, but they will not vote on the proposal. The revisions suggested by Honorary Members will be included in subsequent versions of the proposal. Dr. **Lucia Angiolini** was nominated by the executive to fill this vacancy. This increased the membership from Europe bringing it more in line with other major regions.

Secondly, we sadly lost our distinguished colleague and friend Professor **Jin Yugan** who died in June 2006 (see *Permophiles* 48 for a tribute). His was a very distinguished career in Late Paleozoic paleontology and service including as a past-Secretary and past-Chairman of SPS. He has been replaced as a voting member by Professor Yue Wang.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

There were no major problems in 2006. The Cisuralian excursion planned for 2006 was delayed to 2007. This may delay production of GSSP proposals.

7. SUMMARY OF EXPENDITURES IN 2006:

INCOME

Donations:	\$ 700.00
University of Calgary (1):	\$2,000.00
NIGPAS (2):	\$2,000.00
ICS:	\$ 800.00

TOTAL: \$5,500.00 (quoted in US\$ using .88 as the conversion from Canadian\$)

(1) University of Calgary support from NSERC grant to Charles Henderson for travel to Nanjing.

(2) NIGPAS (Nanjing Institute of Geology and Palaeontology) support from NSF-C grant to Shuzhong Shen for travel to Calgary.

EXPENDITURES

Printing and Mailing of <i>Permophiles</i> :	\$1,000.00
Travel support for <i>Permophiles</i> Production:	\$4,500.00

TOTAL: \$5,500.00 (quoted in US\$ using .88 as the conversion from Canadian\$)

BALANCE: \$0.00

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

1. Cisuralian Working Group Workshop to be conducted in early July, 2007.
2. Analysis of samples collected by working group in #1.
3. Production of *Permophiles* #49 in Nanjing during June 2007.
4. Business meeting to be held during XVI ICCP (International Congress on the Carboniferous and Permian) June 2007 in Nanjing China.
5. Completion of base-Sakmarian GSSP proposal by December 2007.
6. Production of *Permophiles* #50 by January 2008.

9. BUDGET AND ICS COMPONENT FOR 2007

Expenditures

Cisuralian Working Group Field Excursion (1)	\$36,000.00
Annual Business Meeting, Nanjing ICCP (2)	\$3,000.00
<i>Permophiles</i> and GSSP proposals printing and postage	<u>\$1,000.00</u>
TOTAL 2007 BUDGET	\$40,000.00

- (1) Based on \$1,000.00/participant internal costs in Russia for 15 participants and average airfare of \$1,400 times 15 international participants.
- (2) Cost of travel to ICCP for Executive

Income

Support from University of Calgary (Henderson; NSERC)	\$5,000.00
Support from NIGPAS (Shen; NSF-C)	\$2,000.00
Fieldtrip Participants to form Cisuralian Working Group	\$31,200.00
Anticipated donations for <i>Permophiles</i>	\$ 700.00
Requested ICS contribution	<u>\$1,100.00</u>
	0.00
TOTAL BUDGET REQUEST (ICS)	<u>\$1,100.00</u>

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

The SPS has approved the general divisions of the Permian and has now had 6 GSSP's ratified by ICS and IUGS (Asselian, Roadian, Wordian, Capitanian, Wuchiapingian, Changhsingian). Proposals for the latter two stages were published in *Episodes* in 2006. Support for documentation (fieldwork and publications) of the various chronostratigraphic methods for the establishment of the GSSP's has been the most outstanding and differentiating character of this Subcommission.

Permophiles has become an internationally respected newsletter and bears an ISSN designation (1684-5927) and is deposited in the National Library of Canada; nine issues were published during the five-year period. *See Accomplishments in 2006 (above) for additional details.*

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2006-2009)

The primary objective is to complete the GSSP process by 2008 although delays in the field excursion to Urals may delay this process. We currently anticipate that the last three GSSP's (Sakmarian, Artinskian, and Kungurian) should be ratified by 2008. In order to achieve this, the SPS executive is preparing an International Workshop for July 2007 at the probable Cisuralian GSSP sites along the west flank of the Urals. This field workshop will be limited to twenty researchers and they will be charged with completing analysis of new samples and producing first drafts of GSSP proposals by early 2008. New samples will document geochemical signatures and augment extensive geochronologic work, and conodont samples will highlight the accessibility of the sections and reproducibility of the chosen potential points. We anticipate the following schedule:

1. A vote by SPS on the *Sakmarian* proposal may be conducted during early 2008.
2. A vote by SPS on the *Artinskian* is anticipated during late 2008.
3. A vote by SPS on the *Kungurian* is anticipated during late 2008.

Once this process is completed SPS will shift focus toward three directions in 2009:

1. Correlations into continental deposits,
2. Correlations across provincial boundaries and within the Tethys region,
3. Detailed documentation of the geologic evolution of the Earth during the Permian with respect to the established chronostratigraphic framework.

APPENDIX

Officers and Voting Members as of December 2006

Dr. Lucia Angiolini

Dipartimento di Scienze Terra "A. DEsio"
Via Manggiagalli 34, 20133 Milano, Italy

Dr. Boris I. Chuvashov

Institute of Geology and Geochemistry
Urals Branch of
Russian Academy of Science
Pochtovy per 7
Ekaterinburg 620154 Russia

Dr. Vladimir Davydov, SPS Vice-Chairman

Department of Geosciences
Boise State University
1910 University Drive
Boise ID 83725 USA

Dr. Marc Durand

Universite de Nancy-I, GES, BP239
54506 Vandoeuvre-les-Nancy cedex
France

Dr. Yoichi Ezaki

Department of Geosciences
Osaka City University
Sugimoto 3-3-138
Sumiyoshi-Ku, Osaka, 558-8585, Japan

Dr. Clinton B. Foster

Australian Geological Survey Organization
G.P.O. Box 378
Canberra 2601 Australia

Prof. Charles M. Henderson, SPS Chairman

Dept. of Geology and Geophysics
University of Calgary
Calgary, Alberta
Canada T2N1N4

Dr. Galina Kotlyar

All-Russian Geological Research Institute
Sredny pr. 74
St. Petersburg 199026 Russia

Prof. Ernst Ya. Leven

Geological Institute
Russian Academy of Sciences
Pyjevskiy 7
Moscow 109017 Russia

Dr. Tamra A. Schiappa

Department of Geography, Geology and the
Environment
Slippery Rock University
Slippery Rock, PA 16057 USA

Prof. Joerg W. Schneider

Freiberg University of Mining and Technology

Institute of Geology, Dept. of Palaeontology,
Bernhard-von-Cotta-Str.2
Freiberg, D-09596, Germany

Dr. Shuzhong Shen, SPS Secretary

Nanjing Institute of Geology and
Paleontology, 39 East Beijing Rd.
Nanjing, Jiangsu, China 210008

Dr. Guang Shi

Deakin University, Resden Campus
School of Aquatic Science and Natural Res.
Management
662 Blackburn Rd.
Clayton, Victoria, Australia 3168

Dr. Xiangdong Wang

Nanjing Institute of Geology and
Paleontology, 39 East Beijing Rd.

Prof. Yue Wang

Nanjing Institute of Geology and
Paleontology, 39 East Beijing Rd.
Nanjing, Jiangsu, China 210008

Dr. Bruce R. Wardlaw

U.S. Geological Survey
926A National Center
Reston, VA 20192-0001 USA

Honourary Members

Prof. Giuseppe Cassinis

Earth Sciences Dept.
University of Pavia, 1 Via Ferrata,
27100 Pavia, Italy

Prof. Brian F. Glenister

Department of Geology
University of Iowa
Iowa City, IA 52242 USA

Dr. Heinz Kozur

Rezsú u 83
Budapest H-1029 Hungary

Prof. Claude Spinosa

Department of Geosciences
Boise State University
1910 University Drive
Boise ID 83725 USA

Dr. John Utting

Geological Survey of Canada
3303 - 33rd Street N.W.
Calgary Alberta T2L2A7 Canada

List of Working Groups and their officers

1. Cisuralian stages; Chairman is **Boris Chuvashov**
2. Continental Permian Correlations; Chairman is **Joerg Schneider**
3. Transitional biotas as gateways for global correlation; Chairman is **Guang Shi**
4. Neotethys, Palaeotethys, and S. China intraplateform basin correlation; Co-Chairmen are **Vladimir Davydov** and **Heinz Kozur**.



International Commission on Stratigraphy Subcommission on Carboniferous Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

SUBMITTED BY:

Philip H. Heckel, Chair of SCCS
Department of Geoscience, University of Iowa
Iowa City, IA 52242
Phone: 319-335-1804, Fax: 319-335-1821, Philip-heckel@uiowa.edu

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The SCCS promotes and coordinates international cooperation among various geologic specialists for the purpose of defining standard global chronostratigraphic boundaries within the Carboniferous System. The Devonian-Carboniferous boundary at the base has been selected in southern France, and the Carboniferous-Permian boundary at the top has been selected in northern Kazakhstan. The Mid-Carboniferous boundary has been selected in Nevada, USA, and it subdivides the Carboniferous into two subsystems, the Mississippian Subsystem below and the Pennsylvanian Subsystem above.

The immediate goal now is to coordinate and further refine biostratigraphic correlation and to select the best stage boundaries within the two Carboniferous subsystems that will facilitate global correlation within the system. The ultimate goal is to calibrate biostratigraphic with other methods of correlation, such as chemostratigraphy, magnetostratigraphy, and radiometric dating, so that the successions dominated by terrestrial and endemic cold-water marine biotas in the Gondwana and Angara regions can be correlated with the biostratigraphic framework of the pan-tropical standard succession.

3. ORGANIZATION

3a. Officers for 2004-2008:

Chair: Philip H. Heckel (USA)
Vice-Chair: Geoffrey Clayton (Ireland)
Secretary: David M. Work (USA)

{The SCCS has no website}

SCCS has a total of 21 voting members (see list at end of report), and approximately 350-400 corresponding members. Meetings of the SCCS are held every two years, both at the

quadrennial meetings of the International Carboniferous-Permian Congress, and at a Field Meeting convened by the SCCS alone midway between the Congresses.

SCCS has four current Task Groups and two exploratory Project Groups:

Task Group to establish the Tournaisian-Visean Boundary [which is also the base of the Middle Mississippian Series], chaired by George Sevastopulo (Ireland), who summarized the recent work of the group through May 2006 in this year's *Carboniferous Newsletter* [v. 24, p. 5].

Task Group to establish the Visean-Serpukhovian Boundary [which is also the base of the Upper Mississippian Series], chaired by Barry Richards (Canada), who summarized the recent work of the group through May 2006 in this year's *Carboniferous Newsletter* [v. 24, p. 5-6].

Task Group to establish the Bashkirian-Moscovian Boundary [which is also the base of the Middle Pennsylvanian Series], chaired by John Groves (USA), who summarized the recent work of the group through May 2006 in this year's *Carboniferous Newsletter* [v. 24, p. 6-7].

Task Group to establish the Moscovian-Kasimovian Boundary [which is also the base of the Upper Pennsylvanian Series], and the **Kasimovian-Gzhelian Boundary**, chaired by Elisa Villa (Spain), who summarized the recent work of the group through May 2006 in this year's *Carboniferous Newsletter* [v. 24, p. 8-9].

Project Group on Upper Palaeozoic boreal biota, stratigraphy and biogeography, chaired by Marina Durante (Russia), who did not submit a report this year.

Project Group on Carboniferous magnetostratigraphy, chaired by Mark Hounslow (Britain), who did not submit a report this year.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

The SCCS has worked with the Subcommissions and Working Groups on Devonian and Permian Stratigraphy to establish the common boundaries with the Carboniferous. The SCCS expects to cooperate with the NSF-sponsored Chronos initiative, which has a website at www.chronos.org, and also with the NSF-sponsored PaleoStrat community digital information system for sedimentary, paleontologic, stratigraphic, geochemical, geochronologic, and related data, hosted at Boise State University, and with a website at www.paleostrat.org. It also has established a working relationship with the Permian Research Group at Boise State, which has initiated a program of obtaining precise ID-TIMS U-Pb radiometric dates from biostratigraphically constrained Carboniferous-Permian successions in the Ural Mountains.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

Newsletter on Carboniferous Stratigraphy, Volume 24, published in July 2006. Its 53 pages include commentary by the Chair on various current issues, reports of the task groups for 2005-6 [typically containing much current detail], and 9 articles on various topics of interest, including: The Dombur Limestone in the south Urals and the Visean-Serpukhovian boundary; Succession and correlation of Visean floras of the equatorial belt; Pennsylvanian fern taxonomy: new approach through the compact model; Discovery of potential Bashkirian-Moscovian boundary marker conodont *Declinognathodus donetzianus* in south Urals; Fusulinoidea of Kasimovian-Gzhelian transition in northern Timan; Potential candidate for GSSP to define base of global Gzhelian Stage at Usolka section in south Urals; Conodont and ammonoid distribution across position of proposed Kasimovian-Gzhelian boundary in lower Virgilian strata in midcontinent North America; Latest calibration of Middle to Late Pennsylvanian time scale using succession of Midcontinent

cyclothems; Kasimovian and Gzhelian (Upper Pennsylvanian) conodont zonation in Russia. As usual, it provides a significant outlet for timely presentation and discussion of useful information relating to boundary selection, often from areas that are not typically covered in other journal venues.

Summary of Task Group Reports

[Full text of all reports updated from the 2006 Newsletter is provided in Appendix B at the end]

The **Task Group to establish the Tournaisian-Visean boundary** is preparing to submit the GSSP proposal for the T-V boundary at the Pengchong section in south China to the SCCS for ballot in late November 2006, after an unexpected delay engendered by a slight repositioning of the boundary at Pengchong. U-Pb zircon dating of the base of the mid-Visean Livian Substage was carried out in Belgium.

The **Task Group to establish the Visean-Serpukhovian boundary** still finds, after further study, that the first evolutionary appearance of the conodont *Lochriea zieglerei* in the lineage *Lochriea nodosa*—*Lochriea zieglerei* presents the best potential for boundary definition. Recently this lineage has been documented in northern Spain and southern China. Moreover, the relatively deep-water carbonate section near Verkhnyaya Kardailovka section on the eastern slope of the southern Urals (Nikolaeva et al., 2005, *Newsletter on Carboniferous Stratigraphy*, v. 23, p. 27-30), which contains this lineage and has a complete succession of ammonoid, conodont, ostracode, and foraminifer zones, is still the best potential candidate for the GSSP. Recent work in the classic ammonoid-rich sections on the west side of the southern Urals, published in the *Carboniferous Newsletter* [v. 24, p. 9-11] is correlating the conodont succession into the classic ammonoid zonation, which will allow ammonoid workers to better bracket the position of the first appearance of *Lochriea zieglerei* in ammonoid-bearing sections where the *Lochriea* lineage is unknown, such as western North America where current work is focused on the Chainman Shale of Nevada and Utah. Also, current detailed work on foraminifers and corals in the carbonate successions of western Canada and of western Europe (where the *Lochriea* lineage is known) is similarly directed toward bracketing the position of *Lochriea zieglerei* in western Canada, where it is as yet unknown.

The **Task Group to establish the Bashkirian-Moscovian boundary** narrowed the search for an event level down to two conodont lineages: 1) derivation of *Idiognathoides postsulcatus* from *Id. sulcatus*; 2) derivation of *Declinognathodus donetzianus* from *D. marginodosus*. After problems surfaced with the initially favored *Idiognathoides sulcatus*—*Id. postsulcatus* lineage, and attention turned to evaluating the less widespread *Declinognathodus marginodosus*—*D. donetzianus* lineage for defining an event level, the task group focused on correlating the Bashkirian-Moscovian boundary into the areas it is absent, using other groups and other conodont taxa. Members now have reported the appearance of the distinctive *Profusulinella prisca* group near this boundary level in Spain, Turkey, southern Urals, and possibly North and South America, and another, more widespread conodont species *Diplognathodus ellesmerensis* at this level in China. Russian workers discovered the *Declinognathodus* lineage in evolutionary sequence at the Basu River section in the southern Urals, along with a rich fusuline fauna, including the *P. prisca* group, making this section a possible candidate for a GSSP.

The **Task Group to establish the Moscovian-Kasimovian and Kasimovian-Gzhelian boundaries** met in Ljubljana, Slovenia, with 14 members in attendance. More progress was made on biostratigraphic and positional correlation of the cyclothems across both boundaries in

Midcontinent U.S, Moscow Basin and Donets Basin, as the charts and text published by Heckel et al. in the 2005 *Newsletter on Carboniferous Stratigraphy* [v. 23, p. 36-44] were updated and revised. For characterizing the M-K boundary, two agreed-upon levels are critical in the major cyclothem correlation: Lost Branch—Voskresensk—N3/3, based mainly on *Swadelina nodocarinata*, and Hertha—Lower Neverovo—N5/1 based both on *Idiognathodus eccentricus* and cyclothem position. Problems still remain in determining if a lineage exists within *I. sagittalis* where a morphological event can be identified. New sections are under study in central Russia, New Mexico, and South China with the hope of expediting solutions to these problems.

The task group agreed that the K-G boundary will be based on the first appearance of the conodont *Idiognathodus simulator [sensu stricto]*, which defines correlation of the Oread—Upper Rusavkino—O6 cyclothem, and is known from the Midcontinent, Illinois, Appalachian basin, and north Texas in North America, and from the Moscow and Donets basins and several sections in the southern Urals in Eurasia and from the Nashui section in southwestern China. The taxonomy of *I. simulator* and its ancestor *I. aff. simulator* in North America is being updated by J.E. Barrick and colleagues. The first appearance of *I. simulator* in the Moscow area is accompanied by the first appearance of a cotype of the fusuline *Rauserites rossicus*, which has been reported from several parts of Eurasia, northern Spain, and northern Greenland, and will aid in recognizing this boundary in areas where conodonts are scarce, once the taxonomy of the two cotypes is resolved. Preliminary description of a potential GSSP at Usolka in the southern Urals was presented at the meeting and published by Chernykh et al. in the *Carboniferous Newsletter* [v. 24, p. 23-29].

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

A new problem with the GSSP for the base of the Carboniferous at LaSerre, France, was brought to my attention by Thomas Becker, Chair of the Devonian Subcommittee, in a 26 July 2006 email, which is copied in Appendix C at the end of this report. It involves new discoveries of the D-C boundary-event-marking conodont *Siphonodella sulcata* below the GSSP in LaSerre bed 89. After this discovery is published, Becker and I will appoint a joint Task Group to deal with resolving this problem in the most pragmatic way possible.

Within the Carboniferous, the endemism of conodont and foram lineages between Eurasia and North America that has slowed down submission of the T-V boundary proposal and is hampering the choice of the boundary levels for the V-S and B-M boundaries, is being overcome by work on correlating other fossil groups to bracket the boundary levels in major regions where the boundary-event taxon is unknown. In the case of the higher two boundary levels [M-K, K-G], there are enough conodont species in common between the regions to achieve what appear to be fairly good correlations based on utilizing the positions and scales of cyclothem in conjunction with biostratigraphy, which was published in the 2005 *Newsletter*, and has been updated for submittal to a reviewed journal. However, the strong glacial-eustatic control over sedimentation and consequent widespread disconformities across entire shelves that aids in this 'digital' correlation, still seriously hampers the selection of acceptable GSSPs for these younger boundaries, which will require successions of relatively continuous sedimentation.

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

STATEMENT OF OPERATING ACCOUNTS FOR 2005/2006

Prepared by David Work, Secretary
(Definitive accounts maintained in US currency)

INCOME (Oct. 31, 2005 – Oct. 31, 2006)

IUGS-ICS Grant 2006	\$800.00
Donations from Members*	1775.00
Interest	<u>14.41</u>
TOTAL INCOME	\$2589.41

EXPENDITURE

Newsletter 24 (printing)	\$647.64
Postage for bulk mailings	548.90
Mailing/Office Supplies	243.28
Bank Charges	<u>10.00</u>
TOTAL EXPENDITURE	\$1449.82

BALANCE SHEET (2005 – 2006)

Funds carried forward from 2004 – 2005	\$1529.51
PLUS Income 2005 – 2006	2589.41
LESS Expenditure 2005 – 2006	<u>-1449.82</u>
CREDIT balance carried forward to 2007	\$2669.10

*greatly augmented above the usual ~\$300-\$400 by two unexpectedly large contributions, which we cannot plan on becoming consistent in future years.

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

The focus of all task groups will be to present updates of their work on boundary events and possible candidates for GSSPs at the XVI International Congress on the Carboniferous and Permian to be held June 21-24 in Nanjing, China. The following activities are planned in the task groups, as distilled from the task group reports in # 5 above, for which the full texts appear in Appendix B:

Tournaisian-Visean boundary. This task group voted approval of the GSSP at Pengchong in south China in 2005, and plans to submit the proposal in late November to the SCCS for a vote, which then will forward it to the ICS for ratification in early 2007. Following U-Pb zircon dating of the base of the mid-Visean Livian Substage in Belgium, attempts are being made to date ash beds bracketing the T-V boundary in Ireland.

Visean-Serpukhovian boundary. Since recognition that the first appearance of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa*—*Lochriea ziegleri* appears to be the best event to define this boundary, work is focused on correlating successions where it occurs in Eurasia with those in North America (where it is not yet been found) by means of other fossil groups, in order to bracket its appearance level in North America. This includes work on the classic ammonoid

localities of the southern Urals and in the Chainman Shale of Nevada and Utah, and foram and coral work on the carbonate successions in western Europe and western Canada. Although the richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals with its conodont, ammonoid, ostracode, and foram zones remains the strongest candidate for a GSSP, other sections are being examined for possible consideration.

Bashkirian-Moscovian boundary. After problems surfaced with the initially favored *Idiognathoides sulcatus*—*Id. postsulcatus* lineage, attention turned to evaluating the less widespread *Declinognathodus marginonodosus*—*D. donetzianus* lineage for defining an event level, and the task group focused on correlating the Bashkirian-Moscovian boundary into the areas it is absent, using other groups and other conodont taxa. One member is attempting to expedite reassessment of the identity of *Idiognathoides postsulcatus* reported from Bashkirian strata in Japan. All members will search for more appearances of the distinctive *Profusulinella prisca* fusuline group near this boundary level in areas beyond Spain, Turkey and the southern Urals, and for the conodont *Diplognathodus ellesmerensis* in places beyond China. Russian workers will continue work on the *Declinognathodus* lineage and the distinctive fusuline group at the Basu River section in the southern Urals, to evaluate this section a possible candidate for a GSSP.

Moscovian-Kasimovian boundary. At the 2006 Ljubljana meeting, the 2005 cyclothem correlation chart of strata across this boundary was slightly revised as a result of new information made available at the meeting. Attention is still focused on refining the taxonomy of the *Idiognathodus sagittalis* group of morphotypes in order to identify a possible boundary event level, but others are being considered. To provide more information, Russian members are processing samples from across the boundary in an apparently more complete section in the Oka-Tsna swell region of central Russia, American colleagues are processing samples from the Big Hatchet Mountains of southwestern New Mexico, and Chinese colleagues will provide more detailed information on the conodont succession at the Nashui section near Luodian in Guizhou, southern China, which will be visited on a field trip in conjunction with the XVI-ICCP in Nanjing in June 2007.

Kasimovian-Gzhelian boundary. At the 2006 Ljubljana meeting, the 2005 cyclothem correlation chart of strata across this boundary was significantly revised based on new information from the Donets Basin. New work presented on the conodont lineage *Idiognathodus* aff. *simulator*—*I. simulator* [*sensu stricto*] maintained support of the consensus that the first appearance of *I. simulator* [*sensu stricto*] is the best possible boundary-defining event, which is also consistent with both the working ammonoid definition of this boundary and with the first appearance of a cotype of the fusuline *Rauserites rossicus* in the Moscow region. Taxonomic work on this conodont lineage should be near completion, and taxonomic work on the fusuline *R. rossicus* should be more advanced. Chinese colleagues will provide more detailed information on the conodont succession at the Nashui section near Luodian in Guizhou, southern China, which will be visited on a field trip in conjunction with the XVI-ICCP in Nanjing in June 2007.

Much of the work that is ongoing in all task and project groups will be published in Volume 25 of the *Newsletter on Carboniferous Stratigraphy* in July 2007.

9. BUDGET AND ICS COMPONENT FOR 2007

PROJECTED EXPENSES

Newsletter printing (est. 400 copies @ 70 pages at commercial rates [~0.05])	\$1400*
Postage for bulk and individual mailings of Newsletters	\$800**
Mailing and office supplies	\$300**
Bank charges for international account	\$200**
TOTAL PROJECTED EXPENSES	\$2700

INCOME

Carryover (from CREDIT balance in section # 7 above)*** [\$1395***]	\$2670
Estimated donations [2006 was unexpectedly and probably unrepeatably large]	\$400
TOTAL PROJECTED INCOME	\$3070

BALANCE

Estimated (deficit)*** / credit from above	[\$875***]	\$400
BUDGET REQUEST FROM ICS for 2006		\$800

*This estimate is higher than actual expense last year because the Secretary was again able to get a special rate in Portland, some distance from his home in Augusta, and this may not be repeatable.

**These estimates are higher than the actual expenses last year because although the system of bulk mailing to certain members overseas [who then distribute the Newsletters to members in their areas] has stabilized somewhat [thus limiting the number of copies mailed individually], the costs of some bulk mailings were absorbed by the Secretary's institution on a one-time basis. Also, the bank charges for this year were greatly reduced from previously because of the much larger balance carried on account of the two unexpected and probably not repeatable large donations this year.

***Because the carryover includes 2 items that were one-time-only contributions [one the \$~775 surplus from the 2001 St. Louis field trip, and the other the unused \$500 supplement for my uncompleted trip to Urbino in 2002, for a total of \$1275; see section # 10 in the 2002 report], there would have been a deficit of \$875 under ordinary circumstances. Therefore I am requesting more than what might appear necessary in order to accommodate anticipated Newsletter expenses for future years, as this year's large carryover was greatly augmented by two large but probably unrepeatably donations, in addition to the earlier one-time-only contributions.

Include potential funding sources outside IUGS

No direct funding sources for SCCS exist beyond voluntary donations from some SCCS members, which fluctuate from year to year. Last year's donations were greatly augmented by two unexpectedly large contributions, which we cannot plan on becoming consistent in future years.

10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2001-2005)

This summary is updated from the information provided last year, based on the task group reports published in the Newsletter on Carboniferous Stratigraphy, which were updated in early November.

An initial 1997 ballot on the naming of the two subdivisions of the Carboniferous System resulted in a close vote that rejected the names Lower and Upper, and approved the names Mississippian and Pennsylvanian, but just short of the required 60% majority to be declared final. After a long period of wrangling over procedure as well as the nomenclatural issues, the final ballot was ultimately taken at the mandate of former ICS Chair Jurgen Remane in late 1999. As reported in the 2000 *Carboniferous Newsletter* [v. 18, p. 3], this ballot resulted in approval of the names

Mississippian and Pennsylvanian by a 76% majority, along with a reconfirmation of the previous decisions of the SCCS to regard their rank as subsystems, by the same 76% majority. In 2003 the SCCS voted to classify the two subsystems into Lower, Middle, and Upper Mississippian Series and Lower, Middle, and Upper Pennsylvanian Series, by a 74% majority of those 90% of the total membership who voted. This vote plus its implicit acceptance of the stage names used in Russia as the global stage names for the Carboniferous now provides the Carboniferous with all its official global series and stage names, and all effort is now being focused on selecting events and GSSPs for stage boundaries. Information on usage of the new official scheme of Carboniferous subdivision was published in the following journals:

Heckel, P.H., and Clayton, G., 2006, Use of the new official names for the subsystems, series and stages of the Carboniferous System in international journals: Proceedings of the Geologists' Association, v. 117, p. 1-4.

Heckel, P.H., and Clayton, G., 2006, The Carboniferous System. Use of the new official names for the subsystems, series, and stages: *Geologica Acta*, v. 4, p. 403-407.

Work on the **Tournaisian-Visean boundary** through 2001 progressed to the point that its biostratigraphic definition was approved in 2002 by a vote of 19 to 0, with 2 non-responses [as reported in the Secretary-Editor's Report in the 2002 Carboniferous Newsletter, p. 2-4]. Field work progressed to the point that a proposal for the GSSP in south China was published in the June 2003 issue of Episodes. Supplementary information requested by the SCCS chair on correlating this boundary into regions where the defining taxa do not occur was published in the 2004 Carboniferous Newsletter [v. 22, p. 8-11], and further updated and summarized in the full text of this task group report in Appendix B in the 2004 report. The task group voted unanimously to approve the Pengchong GSSP in southern China in 2004, and further refined correlation with the type Mississippian in 2005, **and it plans to present the formal proposal to the SCCS in late 2006.**

The Task Group on the **Visean-Serpukhovian Boundary** was established under the leadership of Barry Richards in 2002. Membership was selected and work was started for presentation and discussion at the Utrecht Congress in 2003. This Task Group initially considered several conodont and foram lineages for potential boundary-defining events, but in 2004, it focused most attention on one conodont lineage, *Lochriea nodosa*—*Lochriea ziegleri*, for further work, particularly in regions where the succession is poorly known. In 2005, identification of this conodont lineage along with recognition of the conodont, ammonoid, ostracode, and foram zones in the richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals initiated an upgrading of correlations across this boundary elsewhere, and established this section as a strong candidate for a GSSP. In 2006, this lineage was reported from northern Spain and southwestern China, and work was initiated on ammonoid-rich successions in the southern Urals and western U.S., and on foram- and coral-rich successions in western Europe and western Canada in order to bracket the level of the first appearance of *Lochriea ziegleri* in North America, where the lineage is not yet known.

The Task Group on the **Bashkirian-Moscovian Boundary** was established in 2002 under the leadership of John Groves. Membership was selected and work was started for presentation and discussion at the Utrecht Congress in 2003. This Task Group initially considered several conodont and foram lineages, but after the Chair asked for formal boundary-defining events by April 2004, proposals for only three conodont lineages were received. More recent consensus suggested that only two conodont lineages are viable, and work became concentrated on them. Three new Spanish

members who received funding for work on this boundary in the Cantabrian Mountains were added to this task group in 2005. After further investigation of the *Idiognathoides sulcatus*—*Id. postsulcatus* lineage [the most favored of the two remaining proposals for boundary-defining events] resulted in discovery that the event taxon was misidentified in cratonic North America, and also may occur in strata well below the boundary in Japan, attention has become focused on reassessing the identity of the older specimens in Japan, and on evaluation of the second possible lineage for defining an event level. In 2006, Russian workers discovered an evolutionary lineage of *Declinognathodus marginodosus*—*D. donetzi* (the other lineage being considered) in a new accessible section in the southern Urals that also contains rich foram faunas, and might be a candidate for a GSSP. Chinese workers reported the appearance with *D. donetzi* of another conodont *Diplognathodus ellesmerensis*, which has a broader more global distribution, hence will help to identify the level of *D. donetzi* in places where it is absent, or may be another taxon to consider for a boundary event.

Work on the **Moscovian-Kasimovian boundary** has been extensively reported in all recent Newsletters. Delineation of the **Kasimovian-Gzhelian boundary** was added to this task group's work load in 1998. Much new work has been stimulated on both fusulines and conodonts as a result of the collaboration engendered within the Task Group at its nearly annual meetings in Ukraine in 1996, Spain in 1997, Moscow region of Russia in 1998, Midcontinent USA in 1999, Spain again in 2000, the Southern Urals region of Russia in 2002, Spain again in 2004, St. Petersburg, Russia in 2005, and Ljubljana, Slovenia in 2006. Fusuline workers have recognized that problems of provincialism in much of the Kasimovian part of the succession in Eurasia precludes the use of this group to define either boundary, although two fusuline events (one readily identified, but the other more dependent on preservation) appear to coincide with events in conodont appearances near the M-K boundary. Conodont workers are in the process of clearing up the serious taxonomic problems that have stymied progress within that group. Despite the recognition of more provincialism than was once thought to exist between Eurasian and North American conodont lineages during late Moscovian, Kasimovian and early Gzhelian [late Desmoinesian, Missourian and early Virgilian] time, more widespread conodont appearances are now being clarified, and one soon may be able to define the **Moscovian-Kasimovian boundary**.

The conodont lineage *Idiognathodus* aff. *simulator*—*I. simulator* [*sensu stricto*] is now being worked up, in order to define the **Kasimovian-Gzhelian boundary** at the first appearance of *I. simulator* [*sensu stricto*], which has met with general consensus. Correlation charts based on the scale of glacio-eustatic inundations as well as biostratigraphic events for the successions across both boundaries in the U.S. and eastern Europe, in order to clarify which events are more globally correlatable, were published in the 2005 Carboniferous Newsletter and are now being updated for submission to a reviewed journal. All this work has engendered more new work in Russia, southwestern U.S., and southwestern China.

Radiometric dating throughout the Carboniferous, most of it published in detail elsewhere, was summarized in the Newsletter several times by Manfred Menning and his colleagues [see especially 2001]. They have shown that use of different methods in different places, many on samples from sections without good marine biostratigraphic constraints, has resulted in inconsistencies [for example, of up to 7.5 million years at the Mid-Carboniferous boundary]. A new laboratory dating paleocaliches and fresh-water limestones at SUNY Stony Brook produced some new dates on upper Pennsylvanian units in the Appalachian Basin where there is good marine biostratigraphic control, but these are inconsistent with previous dates of supposedly the same interval in areas where accurate marine biostratigraphy is lacking. More precise radiometric U-Pb

zircon dating now being undertaken by the Permian Research Group at Boise State University on ash beds from conodont-bearing intervals in the Pennsylvanian-Permian succession in the south Urals has recently provided new dates on the Carboniferous-Permian boundary and the late Moscovian with error bars of ± 0.2 Ma, which I used to more accurately calibrate the late Pennsylvanian time scale by means of cyclothem in the 2006 *Carboniferous Newsletter* [v. 24, p. 35-39]. The volunteered Project Group on Carboniferous Magnetostratigraphy, formed in 2004 to research the potential for identifying correlatable magnetostratigraphic events in the Carboniferous, reported on some aspects of this approach in both 2004 and 2005 issues of the *Carboniferous Newsletter*.

See Accomplishments in 2006 (above) for additional details.

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2005-2008)

This is based mainly on trends that I perceive now within the SCCS. I am strongly encouraging all members to maintain progress on researching and selecting defining events and GSSPs for boundaries, keeping in mind the emphasis on selecting readily correlatable boundaries expressed by Remane et al. (1996), along with the call for selecting all GSSPs by 2008.

The Tournaisian-Visean Boundary GSSP should be voted upon in late 2006 and submitted to the ICS in early 2007, as the proposal for the GSSP published in the June 2003 issue of *Episodes* has been recently supplemented by more information on correlating the boundary into areas where the defining taxa are not present. More U-Pb dating of ash bands bracketing this boundary is underway in western Europe, and may remain as the focus of this Task Group once the boundary is ratified.

The Visean-Serpukhovian Boundary Task Group has focused study onto the most promising conodont lineage *Lochriea nodosa*—*Lochriea zieglerei*. Identification of this conodont lineage and recognition of the conodont, ammonoid, ostracode, and foram zones in the richly fossiliferous section near Verkhnyaya Kardailovka in the southern Urals establishes this section as a strong candidate for a GSSP. Current work is being carried out on conodonts, ammonoids, forams, and corals, in western North America and in the southern Urals and western Europe across this boundary interval, in order to identify correlatable faunal zones that can closely bracket the boundary interval in North America, where the defining lineage has not yet been found. This suggests that the boundary event should be selected and work well underway on better characterizing the potential GSSP in 2007.

The Bashkirian-Moscovian Boundary Task Group is now focusing attention on a second conodont lineage, *Declinognathodus marginonodosus*—*D. donetzianus*, as the event level, and has discovered it along with a distinctive fusuline group that accompanies it in several other places, at a new section in the southern Urals, which may be a potential GSSP candidate. Nevertheless, the *Idiognathoides sulcatus*—*Id. postsulcatus* lineage is still under consideration, pending reassessment of the identity of the Bashkirian specimens reported from Japan. Therefore, 2008 is still a reasonable goal for GSSP selection.

The Moscovian-Kasimovian Boundary and Kasimovian-Gzhelian Boundary Task Group is moving ahead as the previously muddled conodont taxonomic problems are slowly being clarified and resolved. Construction of the correlation charts based on scale of glacio-eustatic cyclothem as well as biostratigraphic events in the successions across both these boundaries in

North America [Midcontinent] and two places in Europe where disconformity-bounded cyclothem units are identified [Moscow region, Donets Basin] have increased the potential for selecting the events that can be identified in as many of the most complete successions of this age as possible [e.g., southern Urals and northern Spain, where cyclothem units are not yet identified]. While the event for the M-K boundary still needs to achieve consensus, the K-G boundary event should be selected in 2007 as soon as more taxonomic work on the conodont lineage is published. Further taxonomic work is planned on the morphotypes of the fusuline that accompanies the defining conodont in Eurasia. The existence of the widespread glacio-eustatic disconformities across nearly all of the well-known regions and the resulting lack of continuously deposited sections will present the greatest problems for selection of GSSPs by 2008, but further work on possibly more complete sections in Russia, southern Urals, New Mexico, and particularly on the upper slope succession in southern China, hopefully may provide more appropriate sections for potential GSSPs.

I am hopeful that ongoing work in chemostratigraphy and magnetostratigraphy will identify events that can be used to supplement the boundaries that will be defined by means of faunal events, and eventually will provide the basis for correlating these boundaries into the northern-hemisphere Angara region and the southern-hemisphere Gondwana region, where the pan-tropical biotas are replaced by provincial cold-climate communities.

I am also hopeful that new, more coordinated precise radiometric dating on biostratigraphically well-constrained marine successions, such as are being reported from the Pennsylvanian of the southern Urals by the Boise State group, and also from the Mississippian of Belgium by another group, will both narrow the age disparities that currently exist within much of the Carboniferous and also provide better correlation with more precise modern radiometric dates that will hopefully be obtained from the Angara and Gondwana regions.

Meeting/field workshop schedule with themes and anticipated results.

I expect that meetings of all task groups will take place at the 2007 International Carboniferous Congress in Nanjing, China. This congress will have a field trip to the Nashui section, a good continuous upper slope succession across all the Pennsylvanian stage boundaries [B-M, M-K, K-G] in southwestern China. This should both enhance the global correlation of potential boundary-level events, and allow examination of potential GSSPs for levels where no acceptable GSSP has yet been agreed upon. In this light, it is possible that some GSSPs will only have been informally agreed upon in late 2007, but all will hopefully be at least in the process of finalization by 2008.

APPENDIX A. [Names and Full Addresses of Current Officers and list of Voting Members]

Subcommission officers

Chairman: Philip H. Heckel
Department of Geology, University of Iowa
Iowa City, Iowa 52242 U.S.A.
FAX: +1 319 335 1821
Email: philip-heckel@uiowa.edu

Vice-Chairman: Geoffrey Clayton
Department of Geology, Trinity College
Dublin 2, IRELAND

FAX: +353 1 671 1199
Email: gclayton@tcd.ie

Secretary/Editor: David M. Work
Maine State Museum, 83 State House Station
Augusta, ME 04333-0083 U.S.A.
FAX: +1 207 287 6633
Email: david.work@maine.gov

List of Task Groups and their officers

Base Visean (base Middle Mississippian): George Sevastopulo, Ireland. gsvstpul@tcd.ie
Base Serpukhovian (base Upper Mississippian): Barry Richards, Canada. brichard@nrca.gc.ca
Base Moscovian (base Middle Pennsylvanian): John Groves, USA. john.groves@uni.edu
Base Kasimovian (base Upper Pennsylvanian) and base Gzhelian: Elisa Villa, Spain.
evilla@geol.uniovi.es

List of Voting Members [2004-2008]

Alexander S. Alekseev, Moscow, RUSSIA
Email: aaleks@geol.msu.ru

Elena I. Kulagina, Ufa, Russia
Email: kulagina@anrb.ru

Demir Altiner, Ankara, TURKEY
Email: demir@metu.edu.tr

Ian Metcalfe, AUSTRALIA
Email: imetcalf@une.edu.au

Darwin R. Boardman, Stillwater, U.S.A.
Email: amm0001@okstate.edu

Tamara I. Nemirovska, UKRAINE
Email: tnemyrov@i.com.ua

John R. Groves, Cedar Falls, U.S.A.
Email: john.groves@uni.edu

Svetlana Nikolaeva, Moscow, Russia
Email: 44svniko@mtu-net.ru

Luc Hance, BELGIUM
Email: luc.hance@skynet.be

Barry C. Richards, CANADA
Email: brichard@nrca.gc.ca

Jin Xiao-chi, Beijing, China
Email: jinxchi@cags.net.cn

Nicholas J. Riley, U.K.
Email: N.Riley@bgs.ac.uk

Jiri Kalvoda, Brno, Czech Republic
Email: dino@sci.muni.cz

Katsumi Ueno, JAPAN
E-mail: katsumi@fukuoka-u.ac.jp

Dieter Korn, Berlin, Germany
Email: dieter.korn@museum.hu-berlin.de

Elisa Villa, SPAIN
Email: evilla@geol.uniovi.es

Olga L. Kossovaya, St. Petersburg, Russia
Email: koss@mail.wplus.net

Wang Xiang-dong, Nanjing, China
Email: xdwang@nigpas.ac.cn

APPENDIX B. [Full text of Task Group Reports]

The **Task Group to establish the Tournaisian-Visean boundary**, chaired by George Sevastopulo, reports that the work of the group is almost complete. F-X Devuyst and Jiri Kalvoda have finished a major revision of late Tournaisian/early Viséan *Eoparastaffella* spp., which has been accepted for publication in the

Journal of Foraminiferal Research. Following a successful project to date the base of the Livian substage in Belgium utilizing U-Pb TIMS dating of zircons, attempts will be made to date ash bands in the latest Tournaisian and early Viséan in Ireland to bracket the age of the T/V boundary. This work is being carried out by Dr David Chew, Trinity College Dublin in collaboration with the Geochronology Laboratory of the University of Geneva, Switzerland.

A formal proposal for the GSSP for the base of the Viséan Stage to be located in the Pengchong section, south China, as outlined in previous reports of the Task Group, will be presented to the SCCS this autumn for approval and transmission to the Commission on Stratigraphy of the IUGS.

The **Task Group to establish the Viséan-Serpukhovian boundary**, chaired by Barry Richards, reports that the process for selecting a GSSP for the base of the Serpukhovian Stage continues well under way: During the past year, continued progress has been made toward the selection of a GSSP for the Viséan/Serpukhovian stage boundary. The focus of the work in Eurasia has been on strata containing the *Lochriea nodosa* - *Lochriea ziegleri* conodont lineage. Unfortunately, that lineage still has not been recognized in North America. Consequently, the search for both the lineage outside of Eurasia and a more adequate global biostratigraphic marker for the boundary continues. In case either the *Lochriea* lineage is not discovered or a better marker located, the group hopes to use other biostratigraphic criteria (using some combination of ammonoids, foraminifers, conodonts and corals) and stable Carbon-isotopic data to bracket the correlative position of the *L. nodosa* – *L. ziegleri* transition in North America.

In spite of a rigorous search for alternatives, the first evolutionary appearance of the conodont *Lochriea ziegleri* in the lineage *Lochriea nodosa* - *Lochriea ziegleri* still presents the best potential for definition of the Viséan-Serpukhovian boundary. *L. ziegleri* appears near the middle of the Brigantian Substage, which is slightly below the current base of the Serpukhovian as defined by its type section near Zaborie in the Moscow Basin. The lineage, best documented from relatively deep-water sections, has been identified in several European sections (Nemirovskaya et al., 1994; Skompski et al., 1995), Russia and China. Most recently the lineage was located in the Cantabrian Mountains of Spain (Nemirovskaya, 2005).

Task-group member, Qi Yu-ping, and his associates recently recognized the lineage *L. nodosa* – *L. ziegleri* and other lineages within the *Lochriea* group of species in the Nashui section near the town of Luodian, Guizhou, southern Peoples Republic of China (Wang and Qi, 2003; Qi and Wang 2005). Qi and Wang have decided to use the first appearance of *L. ziegleri* to define the Viséan/Serpukhovian boundary in southern China. In the near future, Qi plans to study additional sections containing the lineage in South China.

Nikolaeva et al. (2005) recognized the *L. nodosa* – *L. ziegleri* lineage in a condensed, relatively deep-water, carbonate section along the Ural River opposite the village of Verkhnyaya Kardailovka on the eastern slope of the southern Urals, southern Russia. According to Nikolaeva et al. (2005), the section is a good potential candidate section for the GSSP if the *Lochriea* lineage is used for its definition. During 2005 and 2006, Nikolaeva and her colleagues continued work on the Verkhnyaya Kardailovka section and expanded their study of carbonate-dominant, Viséan/Serpukhovian successions to the Dombar Limestone in the nearby Dombar and Kyzl-Shin region of northern Kazakhstan.

In the Dombar Limestone, the *Lochriea* lineage occurs with a taxonomically diverse association of extremely abundant ammonoids (Kulagina et al. 2006). The exact position of the ammonoid zones with respect to those based on other groups, particularly conodonts, has not been precisely established but work is currently underway to develop such a correlation. The study of ammonoids in the Dombar sections combined with related work by task-group members Alan Titus and Dieter Korn on Viséan ammonoids in the Chainman Shale of western Utah and eastern Nevada may lead to a precise correlation with North America at the proposed level of the Viséan/Serpukhovian stage boundary.

Several task group members, in addition to associate member Sergio Rodriguez from Spain, are studying various carbonate-dominant, well exposed sections across the boundary interval in the upper Viséan to Serpukhovian Etherington Formation in the southern Canadian Rocky Mountains. The group is preparing a monograph on the taxonomically diverse, abundant and well preserved rugose coral faunas that span the boundary. In conjunction with that work, task group member B.L. Mamet is studying the associated Etherington foraminifers in order to obtain a precise correlation with Eurasian sections containing the

Lochriea lineage. A multidisciplinary study resembling that of the Etherington project is proceeding in western Europe. In collaboration with D. Vachard and L. Pille (University of Lille), task group member Markus Aretz is working on upper Asbian to Serpukhovian calcareous microfaunas and rugose corals in France, Belgium, Germany, and England. It is hoped that through co-ordination, the western Canadian and European coral/microfaunal projects will lead to the discovery of biostratigraphic makers that are either more globally distributed than the *Lochriea* lineage or can be used to correlate the *L. nodosa* – *L. ziegleri* transition between Europe and North America.

References

- Kulagina, E.I., Nikolaeva, S.V., Akhmetshina, I.Z., Zainakaeva, G.F., Konovalova, V.A., Korbkov, V.F. and Kan, A.N. 2006. The Dombar Limestone in the south Urals and the Viséan-Serpukhovian boundary. Newsletter on Carboniferous Stratigraphy, 24, 9-11.
- Nemyrovska, T.I. 2005. Late Viséan/early Serpukhovian conodont succession from the Triollo section, Palencia (Cantabrian Mountains, Spain). Scripta Geologica, 129: 13-89.
- Nemirovskaya, T., Perret, M.-F. and Meischner, D. 1994. *Lochriea ziegleri* and *Lochriea senckenbergica* – new conodont species from the latest Viséan and Serpukhovian in Europe. Courier Forschungsinstitut Senckenberg, 168: 311-317.
- Nikolaeva, S.V., Kulagina, E.I., Pazukhin, V.I., Kucheva, N.A., Stepanova, T.I., Kochetova, N.N., Gibshman, N.B., Amon, E.O., Konovalova, V.A., and Zainakaeva, G.F. 2005. Advances in understanding of the Viséan-Serpukhovian boundary in the South Urals and its correlation. Newsletter on Carboniferous Stratigraphy, 23, 27-30.
- Qi, Yuping and Wang, Zhihao 2005. Serpukhovian conodont sequence and the Viséan-Serpukhovian boundary in South China. Rivista Italiana di Paleontologica e Stratigrafia, 3: 3-10.
- Skompski, S., Alekseev, A., Meischner, D., Nemirovskaya, T., Perret, M.-F. and Varker, W.J. 1995. Conodont distribution across the Viséan/Namurian boundary. Courier Forschungsinstitut Senckenberg 188: 177-209.
- Wang, Zhi-hao and Qi, Yu-ping 2003. Report on the upper Viséan-Serpukhovian conodont zonation in south China. Newsletter on Carboniferous Stratigraphy, 21: 22-24.

The **Task Group to establish the Bashkirian-Moscovian boundary**, chaired by John Groves, reports the following: Our Task Group has evaluated three proposals for defining the base of the Moscovian Stage: 1) appearance of an advanced morphotype of *Neognathodus nataliae*; 2) appearance of *Idiognathoides postsulcatus* from *I. sulcatus*; and 3) appearance of *Declinognathodus donetzianus* from *D. marginodosus*. The first of these proposals received little support from Task Group members, whereas the second and third received conditional support.

Both *D. donetzianus* and *I. postsulcatus* appear in the K₂ limestone in the Donets Basin in close association with the appearances of the fusulinids *Eofusulina triangularis* and *Aljutovella aljutovica*. The appearance of *D. donetzianus* also closely coincides with that of *A. aljutovica* in the upper Alyutovo Formation in the Moscow Basin. It is reasonable to expect that the K₂ level (or an equivalent level elsewhere) may emerge as the basal Moscovian datum.

Given that either *D. donetzianus* or *I. postsulcatus* might be chosen as the marker and that both have limited geographic distributions, our challenge is to demonstrate how the base of the Moscovian Stage might be identified in areas where these taxa do not occur. Members of the Task Group were asked in 2006 to address this challenge. To date, responses have been received from specialists working in the South Urals, Spain, Turkey, China, northern South America, and cratonic North America.

A positive observation to emerge from our work is that fusulinids of the *Profusulinella prisca* group appear at or near the base of the Moscovian Stage in many regions, including the South Urals, Spain, and Turkey. North American and South American specimens identified as *P. decora* and *P. marblensis* may be referable to *P. ex gr. prisca*, and thus represent a means for even broader geographic recognition of the basal Moscovian.

Other highlights:

- A team of Spanish researchers led by Elisa Villa is carrying out detailed multidisciplinary biostratigraphic studies of the Bashkirian–Moscovian boundary interval at the Las Llacerias section (Cantabrian Mountains).
- Russian specialists Elena Kulagina and Vladimir Pazukhin have discovered that *D. donetzianus* occurs in evolutionary continuity with its ancestor *D. marginodosus* at the Basu section in the South Urals. This transition is associated with a rich fusulinid fauna.
- Demir Altiner and his students have documented a sequence of fusulinids spanning the Bashkirian–Moscovian boundary in the central Taurides of southern Turkey. They provisionally recognize the boundary on the appearance of *P. prisca*. This event occurs ~2–3 m below the lowest *A. aljutovica* and *Eofusulina* sp.
- Wang Xiangdong, Wang Zhihao, and Katsumi Ueno are undertaking multidisciplinary studies at the Nashui Section of Luodian, South Guizhou, China. They report the appearance of *Diplognathodus ellesmerensis* at approximately the same level as the appearance of *D. donetzianus*. *Diplognathodus ellesmerensis* is known from the Bashkirian–Moscovian boundary interval in Arctic Canada, Donets Basin, Moscow Syncline, Spain, Japan, Western Europe, and possibly cratonic North America, and thus may represent a possible boundary defining taxon for further evaluation.

The **Task Group to establish the Moscovian–Kasimovian and Kasimovian–Gzhelian boundaries**, chaired by Elisa Villa, has continued studies on fossil lineages and potential levels of correlation within the interval from upper Moscovian to lower Gzhelian.

Recent activities

In July–August 2006, the group held a field trip in the Carnic Alps (Austria) followed by a meeting in Ljubljana (Slovenia) with presentations, workshops, and discussions. The field trip was led by Dr. Hans Schönlaub, Dr. Holger Forke, and Matevz Novak. The meeting was hosted by the Geological Survey of Slovenia and organized by Matevz Novak. It was attended by task group members V. Davydov, H. Forke, N. Goreva, P. Heckel, T. Isakova, L. Lambert, M.L. Martínez-Chacón, C. Méndez, T. Nemyrovska, E. Samankassou, L. C. Sánchez de Posada, K. Ueno, and E. Villa, along with collaborators J. R. Bahamonde and O. Merino-Tomé.

Discussions and joint work during the meeting provided noteworthy progress in fusuline and conodont correlation, focused especially between the Moscow Basin and Donets Basin, which are key Eurasian sections in Pennsylvanian chronostratigraphy, and the North American Midcontinent, which plays same role in the stratigraphy of the North American Carboniferous. Within Eurasia, deposition in the Moscow and Donets Basins occurred under rather different environmental conditions during the intervals of interest, producing different compositions of the fusuline and conodont assemblages. This fact had led to previous confusion in correlation, and, therefore, to clarify the existing uncertainties has been one of the main aims of this meeting. Progress on the correlation of the two boundaries are summarized below.

Moscovian–Kasimovian boundary

During the Ljubljana meeting, the Moscovian–Kasimovian correlation chart was refined on the basis of comparison of cyclothems in the three areas mentioned above. Two levels of correlation were stressed as critical for selecting and proposing a boundary:

A) Equivalence of the Lost Branch (Nuyaka Creek) cyclothem of the North American Midcontinent with the Voskresensk Formation of the Moscow Basin and the N3/3 limestone of the Donets Basin; this correlation mainly lies on the presence of the conodont *Swadelina nodocarinata* and other *Swadelina* species.

B) Equivalence of the Hertha (Mound City) of the North American Midcontinent with the Lower Neverovo Formation of the Moscow Basin and the N5/1 limestone of the Donets Basin; this is a composite correlation that mainly lies on the presence of the conodonts *Idiognathodus eccentricus* and *I. sagittalis*. Fusulines (e.g. *Montiparus* species) found in Eurasia in the interval above, reinforce the proposed correlation.

Kasimovian-Gzhelian boundary

It is generally agreed that the Kasimovian-Gzhelian boundary will be based on the occurrence of the conodont *Idiognathodus simulator*, which is known from a number of relevant sections in areas representing both the American and Eurasian paleobiogeographic provinces. This level is situated in the Oread cyclothem (Mid-Continent), Finis Shale (Texas), and Shumway cyclothem (Illinois Basin) in North America, in the Upper Rusavkino Formation (Moscow Basin), O6 limestone (Donets Basin), in eastern Europe, and in bed 46 of the Dalniy Tyulkas section, bed 4-2 of the Usolka section, and bed 7 of the Nikolsky section in the Southern Urals. The proposed boundary is slightly higher than the traditional basal Gzhelian and basal Virgilian boundaries.

This correlation is reinforced in Eurasia by the appearance of the fusuline *Rauserites rossicus* at a level very close to first appearance of *I. simulator*. This fusuline has been so far reported from Moscow Basin, Samarskaya Luka and Trans-Volga region, Northern Timan, Timan-Petchora, North Greenland, Donets Basin, Urals, Carnic Alps, Northern Fergana, Darvas, and the Cantabrian Mountains. Therefore, *Rauserites rossicus* may be a tool of prime importance for correlation within Eurasia in conjunction with *Idiognathodus simulator*. However, several possible morphotypes seem to exist within the *Rauserites rossicus* plexus: most primitive occurs below the potential boundary (limestone O5 of the Donets Basin) whereas typical forms including cotypes are found in the Upper Rusavkino Formation (Moscow Basin) and O7 limestone (Donets Basin). Member of the task group agreed that the *Rauserites rossicus* lineage needs further revision, which must be focused to ascertain the stratigraphic relationships between the Moscow Basin and Donets Basin cotypes of the original description.

Coming steps

During 2007, the group will continue the investigations on the fossil occurrences around the boundaries, and on the cyclothem correlation. It is scheduled to meet again during spring 2008, prior to the International Geological Congress, where proposals on the global markers for both boundaries are expected to be available.

APPENDIX C. [Letter from Thomas Becker, Chair of Devonian Subcommittee on problem with established GSSP for base of Carboniferous, at La Serre, France.]

Date: Wed, 26 Jul 2006 14:59:17 +0200

To: philip-heckel@uiowa.edu

From: "Prof. Dr. T. Becker" <rbecker@uni-muenster.de>

Dear Phil,

When we last met at the Leuven ICS meeting I raised the issue that there are obviously some severe problems with the D/C boundary GSSP at La Serre. In the meantime, my former Ph.D. student, Sandra Kaiser, currently based at the museum in Stuttgart, has re-sampled the GSSP once more and obtained even more conodonts that pose a serious problem. Initially I stimulated her to re-sample La Serre in order to get conodonts that are suitable for oxygen isotopic analysis of conodont phosphate, a major aspect of her Ph.D. on the D/C boundary. But she came up with *Siphonodella* specimens that confirm an old suspicion that the current GSSP level, at the base of Bed 89, is NOT the base of the the *Siph. sulcata* Zone, following the initial proposal on morphometric change from *praesulcata* to *sulcata* in the original contribution by Flajs & Feist (1988) that formed the base for the GSSP decision at Courtmacsherry (where I was present). All beds from Bed 85 to 88 produced specimens that have to be identified as *Siph. sulcata*. Intermediate forms very close to *Siph. sulcata* (specimens 85/2 85/4 in Flajs & Feist 1988) were already published and regarded as belonging to *sulcata* by some conodont workers (discussion at Courtmacsherry meeting, Ziegler & Sandberg 1996, with agreement of Wang, Chen-yuan and Ji, Qiang of China). Ziegler & Sandberg (1996) also mention *Protognathodus kuehnei* as a rare species in the next sample above lateral equivalents of Bed 85; this species

is not known from levels older than *Si. sulcata* in the few sections with a continuous *Siphonodella* record. In many other sections *Si. sulcata* enters above beds with only Protognathodus faunas and the entry of *Proto. kuehnei* (defining the Upper Protognathodus fauna) within these is currently thought to show the position of the D/C boundary (and not the facies controlled higher entry of *Si. sulcata*). To make the situation even worse, there are also specimens which might belong to *Si. duplicata*, the index of the next higher Carboniferous conodont zone, as low as Bed 85. These specimens are not well preserved. But the situation seems to be as follows:

1. The GSSP level at the base of Bed 89 seems to fall in the upper part of the *Siph. sulcata* Zone or even already in the *Siph. duplicata* Zone.
2. The precise zonal assignment at La Serre is hampered by the fact that the beds do not provide high numbers of well preserved siphonodellids (but a lot of reworked conodonts).
3. The GSSP level cannot be correlated with precision into any of the other numerous D/C boundary sections.
4. Point 1 gives a clear correlation of the GSSP level with a level well within (and not below) the *Gattendorfia subinvoluta* ammonoid zone. As a consequence, *Gattendorfia* would become partly a Devonian genus, which is completely unacceptable to ammonoid workers and with respect to the long tradition (Oberrödinghausen stratotype of 1937) of the definition of the Carboniferous.
5. There is no record of the phylogenetic transition from *Siph. praesulcata* to *sulcata* at La Serre, the main reason why the GSSP was fixed there. Both *praesulcata* and *sulcata* (and intermediates) co-occur jointly in the basal Tournaisian and above a facies break (as in all other known D/C boundary sections). Bed 84 is currently assigned to the Upper *praesulcata* Zone (defined by *Proto. kockeli*) but does not have a siphonodellid record, as the same level in many other sections.

There are various ways out of the dilemma:

- 1) The "small solution", originally favoured by me: Lower the GSSP level down to the base of Bed 85 at La Serre.
- 2) Select a new GSSP section (favoured by quite a number of people present at our business meeting last week in Leicester/ICOS symposium).
3. Select a completely new GSSP level, for example the base of the Upper *praesulcata* Zone, where many typical Carboniferous taxa start.

As mentioned we discussed the problem at our Leicester Annual Business Meeting but, of course, SDS has no right to decide on the base of the Carboniferous. Any revision will have to be done by both SDS and SCS, via a formal Working Group. As a first step, Sandra Kaiser and I will publish the new La Serre results, pointing out the mentioned implications - probably in *Episodes*. But you will have to bring up the issue during your SCS meetings as well. Once the data are available for everyone (an abstract is included in the Leicester symposium booklet), a Working Group may have to be established.

To be honest, I was not too keen to open this kind of "box of Pandora", having worked with the D/C Boundary Working Group for so long. But it seems inevitable. I know that Raimund Feist is aware that La Serre is not an ideal stratotype and he should be involved from the beginning (therefore, a copy of this message to him). George Sevastopoulo, who was present at Leicester, commented jokingly that it would have been the best to have a GSSP that was so remote that re-sampling was not done.

with best wishes
Thomas

Prof. Dr. R. Thomas Becker
Chairman of the International Subcommission on Stratigraphy
Geologisch-Paläontologisches Institut

Corrensstr. 24; D-48149 Münster



International Commission on Stratigraphy Subcommission on Devonian Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

Subcommission on Devonian Stratigraphy (SDS)

Submitted by:

Thomas Becker, *Chair of SDS*

Royal Belgian Institute of Natural Sciences, rue Vautier 29, B-1000 Bruxelles

Tel: +32(0)2 627 44 86; E-mail: pierre.bultynck@belgacom.net

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

- * Establishment of an internationally agreed time framework which is as fine as possible, including definition of substages.
- * Correlation between scales based on different methods: biostratigraphy, magnetostratigraphy, chemo- and sequence stratigraph; establishment of databases.
- * Correlation of pelagic, neritic and continental Devonian successions.
- * Stimulate and coordinate scientific research improving the understanding of Earth History during Devonian time.
- * Dissemination of progress realized by SDS: Newsletter that can also be viewed in an electronic published format via the SDS worldwide website.

These objectives fit into directions recommended by ICS and IUGS: promotion of new stratigraphic methods and their integration into a multidisciplinary stratigraphic knowledge as a basis for better understanding of Earth History, including Global Change.

3. ORGANIZATION

Officers for 2004-2008:

Chair: Thomas Becker (Germany)

Vice-Chair: Ahmed El Hassani (Morocco)

Secretary: John E.A. Marshall (United Kingdom)

SDS Website: <http://sds.uta.edu>

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

IGCP Project 499: Devonian land-sea interaction - Evolution of ecosystems and climate (DEVEC)

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

Ballot on the final proposals concerning the subdivision of the Givetian, Frasnian and Famennian stages.

Three substantial manuscripts concerning the subdivision of the Givetian, Frasnian and Famennian submitted to *Geological Quarterly* (Polish Geological Institute) in early 2006.

2006 Annual Business Meeting in conjunction with ECOS IX in England. The secretary J. Marshall will organized a long outstanding field trip to the Devonian of the Old Red Continent, which enhanced our understanding of cross facies and terrestrial correlations.

Participation in the 2nd International Palaeontological Congress in Beijing (June, 2006) including a topical session " *Devonian land sea interaction: evolution of ecosystems and climate*"-IGCP 499. There were also fieldtrips.

6. CHIEF PROBLEMS ENCOUNTERED IN 2005

None

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

Income US\$

IUGS subvention April 2006-March 2007	500.00
---------------------------------------	--------

Expenses

<i>Balance from 2005</i>	<i>00</i>
Secretary expenses	250
Support for attending Annual meeting in England	500
Support for attending Beijing PC	<u>500</u>
Total	1250

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

Short contribution in *Episodes* recommending the use of the substages of the Givetian, Frasnian and Famennian.

North American SDS members will organize a symposium in Seattle, followed by a fieldtrip in the Interior Basin, with focus on Nevada.

9. BUDGET AND ICS COMPONENT FOR 2007

None was submitted by the deadline for this Report

10. CHIEF ACCOMPLISHMENTS OVER LAST FIVE YEARS (2000-2004)

See Accomplishments in 2006 (above) for additional details.

In 2000, SDS published two volumes (*Courier Forschungsinstitut Senckenberg*, 220 (205 pp.) and 225 (347)), in which the GSSPs of all Devonian stages have been updated and their correlative value for worldwide correlation is demonstrated.

APPENDIX [*Names and Addresses of Current Officers and Voting Members, 2004-2008*] SUBCOMMISSION ON DEVONIAN STRATIGRAPHY

Subcommission Officers

Chairman: R.T. Becker, Westfälische Wilhelm-Universität, Geologisch-Paläontologisches Institut, Correnstr., 24, D-48149 Münster, Germany
rbecker@uni-muenster.de

Vice-Chairman: A. El Hassani, Département de Géologie, Institut Scientifique, B.P 703-Rabat-Agdal
elhassani@israbat.ac.ma

Secretary: J. Marshall, School of Ocean and Earth Science, Univ. Southampton, Southampton Oceanography Centre, European Way, Southampton, SO14 3ZH, United Kingdom
jeam@soc.soton.ac.uk

SDS Newsletter editor and **Webmaster:** Rex E. Crick, Department of Geology, UTA Box 19049, University of Texas at Arlington, TX USA 76019-0049,
crick@uta.edu

List of Working (Task) Groups and their officers

Subdivision of the **Emsian:** R. Mawson, Australia. *rmawson@laurel.ocs.mq.edu.au*

Subdivision of the **Givetian:** P. Bultynck, Belgium. *pierre.bultynck@belgacom.net*

Subdivision of the **Frasnian:** J. Over, USA. *over@uno.cc.geneseo.edu*

Subdivision of the **Famennian:** Th. Becker, Germany. *rbecker@uni-muenster.de*

Uppermost Famennian: M. Streel, Belgium. *maurice.streel@ulg.ac.be*

List of Voting Members

A. Blicek (France) *Alain.Blicek@univ-lille1.fr*

C.E. Brett (USA) *carlton.brett@uc.edu*

J.-G. Casier (Belgium) *casier@naturalsciences.be*

Chen Xiuqin (China) *chenxq@public1.ptt.js.cn*

Rex Crick (USA) *crick@uta.edu*

J. Hladil (Czechia) *hladil@gli.cas.cz*

R. Mawson (Australia)

rmawson@laurel.ocs.mq.edu.au

Ma Xueping (China) *maxp@pku.edu.cn*

J. Over (USA) *over@uno.cc.geneseo.edu*

M.C. Perri (Italy) *perri@geomin.unibo.it*

G. Racki (Poland) *racki@us.edu.pl*

C.A. Sandberg (USA) *casandberg@attbi.com*

E. Schindler (Germany)

eberhard.schindler@senckenberg.de

V. Tsyganko (Russia) *tsyganko@geo.komisc.ru*

T. Uyeno (Canada) *TUyeno@NRCon.gc.ca*

J.I. Valenzuela Rios (Spain) *Jose.I.Valenzuela@uv.es*

K. Weddige (Germany)

karsten.weddige@senckenberg.de

E.A. Yolkin (Russia) *YolkinEA@uiggm.nsc.ru*

G. Young (Australia) *gyoung@geology.anu.edu.au*

Zhu Min (China) *zhumin@ivpp.ac.cn*



International Commission on Stratigraphy Subcommission on Silurian Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

International Subcommission on Silurian Stratigraphy ISSS

Submitted by:

Rong Jiayu, Chairman, ISSS

Key Laboratory of Palaeobiology and Stratigraphy,

Nanjing Institute of Geology and Palaeontology,

Chinese Academy of Sciences

39# East Beijing Road

Nanjing, 210008, P R China

Telephone: 025-83282169,

Telefax: 025-83357026, 025-83282162

E-mail: jyrong@nigpas.ac.cn

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission statement

The objectives of the Subcommission relate to three main aspects of IUGS policy:

- (4) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs at Series and Stage levels and related to a hierarchy of units (Substages, Standard Zones, Subzones etc.) to maximize relative time resolution within the Jurassic Period;
- (5) Establishment of frameworks and mechanisms to encourage international collaboration in understanding the evolution of the Earth during the Jurassic Period;
- (6) Working towards an international policy concerning conservation of geologically and palaeontologically important sites such as GSSPs. This relates to, inter alia, the IUGS Geosites Programme and the UNESCO Geoparks Programme. The Subcommission also has links to the Management Group of the UNESCO East Devon and Dorset Coast (The Jurassic Coast) World Heritage Site.

Goals

- Rationalization of global chronostratigraphical classification.
- Intercalibration of fossil biostratigraphies, integrated zonations, and recognition of global datums.
- Establishment of magneto- and chemo-stratigraphic scales.
- Definition of Stage boundaries and restudy of global stratotype sections.
- Correlation of Silurian rock successions and events, including marine to non-marine.

3. ORGANIZATION

The ISSS is a Subcommittee of the Commission on Stratigraphy. The Subcommittee is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommittee. In the new Subcommittee elected for 2004-2008 there are twelve other Voting Members and Corresponding Members (50). (*see Appendix for complete listing*). The network of Corresponding Members have first of all a responsibility for communication in both directions between the Subcommittee and researchers on Silurian topics in their region. Secondly, they represent a broad spectrum of specialized stratigraphical disciplines from those countries or regions where Silurian rocks are extensively studied in relation to fundamental and/or applied geological research.

Officers for 2004-2008:

Chair:	Rong Jiayu, Nanjing, China.
Vice-Chair:	T. N. Koren', St. Petersburg, Russia.
Secretary:	J. Verniers, Ghent, Belgium (<i>began, Jan. 2005</i>)

Current research activities and future plans are communicated through publication of an annual ISSS newsletter *Silurian Times* in both email attachment and as a web release.

Websites: <http://www.silurian.cn/home.asp> contains newsletters, meeting announcements, discussion posting-boards, bibliography of Silurian articles, links to related sites, and other information.

The former web site for the Silurian Subcommittee: <http://iago.stfx.ca/people/mmelchin/SILURIAN.HTML> has access to pre-2005 issues of *Silurian Times* in PDF format.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Jointly with the **International Subcommittee on Ordovician Stratigraphy** there will be a joint meeting of the ISSS in Nanjing in 2007.

Collaboration on an IGCP Project N° 503 entitled “*Ordovician Palaeogeography and Palaeoclimate*”.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

The year 2006 has been mainly a year of preparation for the 3rd International Symposium on the Silurian System and the IGCP 503 4th Annual meeting both in Nanjing, China, 27 – 30 June, 2007, which will be held together with the 10th International Symposium on the Ordovician System and is called the “Yangtze Conference on Ordovician and Silurian”. All authors presenting a talk or poster will have their extended abstracts submitted to the organizers by the end of 2006.

In June 2006, we saw the rapid publication in the international journal GFF of selected talks and posters presented at the Silurian Field Meeting in Gotland, Sweden August (15-22, 2005). Titles and authors can be found on <http://www.gff-online.se/site/part.asp?partID=38>. The theme for the

field meeting was the global dynamics of the Silurian Period. In particular, the meeting and field trips focussed on important events of biotic and palaeoenvironmental changes as represented in the fossil, sedimentological, and chemostratigraphical record associated with their interpretation. The guest editors Mikael Calner and Mats E. Eriksson did an excellent job in the production of this high level publication, in less than a year after the symposium.

Silurian Times No 14 will be edited by the secretary in later 2006, and circulated as an email attachment to all Honorary, Voting and Corresponding Members of the Subcommittee in early 2007. It will contain the result of the votes on the base of the Silurian, the final report on the restudy of the base of the Wenlock, the second circular for the 3rd International Symposium on the Silurian System and the IGCP 503 4th Annual meeting both in Nanjing, China, 27 – 30 June, 2007 and the latest news on Silurian research,

The new web site for the ISSS at <http://www.silurian.cn/home.asp>, created in 2005 by Fan Juanxuan and Zhao Hui at the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, under the direction of Rong Jiayu, ISSS Chair, has been updated with the *Silurian Times* No.13 (2005), the Second Circular of the Yangtze Conference on Ordovician and Silurian (27-30 June, 2007), and news about oncoming meeting.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

No major problems except for the old problem related to difficulties in obtaining grants for research on stratigraphical topics and travel to meetings of Subcommittee. Applications are often given low priority by National grant-awarding agencies. It would be helpful if IUGS emphasized to its member countries the importance it attaches to the GSSP programme and encouraged the relevant research funding bodies to give priority to funding relevant basic research.

7. SUMMARY OF EXPENDITURES IN 2006

INCOME

Carried forward from 2005		00.00
ICS Allocation	US\$300 converted to	€236.16
	less bank charges of € 6.05 =	€230.11
TOTAL		€230.11

EXPENDITURE FROM 2006 BUDGET

General office expenses	□	130.11
ISSS Newsletter 13 preparation	□	100.00
TOTAL	□	230.11

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR:

8.a Preparation of the Yangtze Conference on Ordovician and Silurian (Nanjing, China, 27 – 30 June, 2007) with our 3rd International Symposium on the Silurian System, in collaboration with the 10th International Symposium on the Ordovician System and the IGCP 503 4th Annual meeting. A considerable work on the organization of this major symposium has been preparing by Chinese

colleagues at Nanjing since 2004. The preparation is going very well and we believe that the conference will be held in Nanjing very smoothly next year.

8b. Regular updating the website for Silurian Subcommittee.

8d. Publication of Silurian Newsletter 15 (2007):

8e. IGCP Project 503:

South European Regional Team Meeting, Field workshop, Zaragoza, Spain September 2007

9. BUDGET AND ICS COMPONENT FOR 2007

Transportation, accommodation & registration to participate in the Yangtse Conference in Nanjing 2007	\$1000.00
Note that Dr. Koren had no funds for international travel from her institute in Russia.	
General office expenses	\$100.00
ISSS Newsletter 14 preparation	<u>\$100.00</u>
Total:	\$1200.00

Potential funding sources outside IUGS

Most of the costs of Working Group meetings and other activities will be met by local support from host institutions and participation by individuals by national research and travel grants from their own authorities. It is hoped that the major meeting in Nanjing China (2007) will receive financial support from the respective national Ministries, but extent and purposes of this cannot be predicted at this stage.

10. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

Over the period of 2002-2006 the Subcommittee on Silurian Stratigraphy was active in several respects.

1) New York State Museum Bulletin 493 (Title: "*Silurian Lands and Seas---Paleogeography Outside of Laurentia*") was released in May 2003. The Bulletin consists of eleven contributed papers that cover Silurian palaeogeography, plate tectonic assembly, stratigraphy, and biogeography in North Africa, southern and central Europe, China, Kazakhstan, the Baltic region (including Scandinavia), Avalon, the Russian "Far East," northern Siberia, Australia and New Guinea, and the Himalayan countries and southeast Asia.

2) The field meeting of the ISSS was held in San Juan, Argentina in August, 2003, in connection with an International Symposium on the Ordovician System and an International Graptolite Conference. Field trips and the conference sessions were well organized and well attended. Accompanying this conference was the publication of the volume entitled "*Proceedings of the 7th International Graptolite Conference & Field Meeting of the International Subcommittee on Silurian Stratigraphy. INSUGEO, Serie Correlación Geológica. 18 Comunicarte Editorial, Córdoba, Argentina*" edited by G. Ortega and G.F. Aceñolaza.

3) The Silurian Field Meeting of the SSS was held in Gotland, Sweden between August 15 and 22, 2005. A three day symposium followed by five days excursion was organized by Eriksson, M.E., Calner, M. and L. Jeppsson (Lund University and support of the Swedish Geological Survey).

The field guide and the abstract book were published in the volume “*The Dynamic Silurian Earth*”. In: Eriksson, M.E., Calner, M. (Eds.), *Field Meeting of the Subcommittee on Silurian Stratigraphy 2005, Gotland, Rapporter och meddelanden-Sveriges Geologiska Undersökning vol. 121, pp.1-99.*

4) The restudy of the base of the Silurian System. A restudy of the GSSP for the **Base of Silurian** was prepared in 2002 (?) by a working group under the leadership of Mike Melchin. Through 3 year work, the working group has unanimously agreed that the current GSSP, at 1.6 m above the base of the Birkhill Shale, at Dob’s Linn, Scotland, should be maintained as the GSSP, but the biostratigraphical definition of the boundary needs to be revised. The GSSP should be regarded as coinciding with the first appearance of *Akidograptus ascensus*, defining the base of the *A. ascensus* Biozone at that GSSP section. By the middle of March 2006 all titular members have voted in favour of the proposal of Mike Melchin for the base of the Silurian at Dob's Linn.

5) Regarding the restudy of the base of the Wenlock Series. The working group to restudy the **Base of the Wenlock Series** (base of Sheinwoodian Stage) was led by David Loydell, looked at potential GSSP sections in the Czech Republic and Wales, as possible alternatives to the current GSSP in England. The primary marker for the base-Wenlock was a graptolite, but the GSSP in England is notably poor in allowing exact determination of their ranges. Recent evidence has shown that the current GSSP does not coincide with the base of the *Cyrtograptus centrifugus* Biozone, as was supposed when the GSSP was defined. It has been suggested to retain the GSSP location in England but revise the level of the GSSP slightly to coincide with a conodont event -- the Ireviken conodont datum 2, which coincides approximately with the base of the lower *murchisoni* graptolite biozone (instead of the current *centrifugus* graptolite zone). Alternatively, another GSSP locality with a precise base of the *Cyrtograptus centrifugus* Biozone could be chosen (e.g., potential sections in Great Britain and the Czech Republic), but this process would be quite lengthy. The report of this work at the Silurian Field Meeting in Gotland, in August, 2005, was discussed over the winter and spring, 2006. Most voting members appreciated very much the amount of work by the working group and especially the leader of the group. But most felt that for the moment that no good alternative for the previous GSSP can be proposed. It was decided not to propose a new GSSP and stick for the time being to the old GSSP, although it had many short comings, until new studies can propose a better alternative. This time consuming study could however not be effectuated before the deadline of the ISC, ending at the International Geological Congress in Oslo summer 2008.

6) An International Conference on the Silurian System is planned for Nanjing, China, in 2007, to be hosted by the Nanjing Institute of Geology and Palaeontology. The work on preparation and organization for this meeting has been carried out effectively and smoothly.

OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2007-2010)

For those of us who are interested in the geology of the Silurian, the four-yearly International Symposium is a priority and these will be "officially" supported and sponsored as resources allow.

The priorities (not in order of merit) proposed for the Silurian Subcommittee for the next four years include:

1. Substage Working Groups to propose GSSPs for Substages as appropriate,
2. Involvement in the aims and objectives of IGCP Project 503

3. Developing and expanding the Thematic Working Groups: for example, searching for and interpreting data from all sources relevant to reconstructing the palaeobiogeography or the climate of one or more specific time-intervals. In part this will be given further impetus by involvement in IGCP Project 503.
4. Investigate the establishment of data-bases which would bring together and make available information from all sources associated with the Silurian researchers.

2007

- a. Discussion on possible re-study of other Silurian GSSP's.
- b. Nanjing meeting and field excursion for the Ordovician and Silurian Subcommittee on Stratigraphy in Nanjing and Southwest China (upper Yangtze Platform: mainly Llandovery--Rhuddanian, Aeronian, and Telychian)
Continued discussion on **Llandovery/Wenlock boundary**
Further work on possible new GSSP re-studies
New members for next four years
- c. Silurian *Times* (edited by the secretary)

2008

- a. Possible vote on **Llandovery/Wenlock boundary**
- b. Possible continued further re-study of other GSSP's.
- c. Election of new officers and members
- d. Silurian *Times* (edited by the secretary)

**APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008]
SUBCOMMISSION ON SILURIAN STRATIGRAPHY**

Subcommission officers

Chairman: Rong Jiayu, **Key Laboratory of Palaeobiology and Stratigraphy**, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, 39# East Beijing Road, Nanjing, 210008, P R China, e-mail: jyrong@nigpas.ac.cn

Vice Chairman: Tatiana Koren', All-Russia Geological Research Institute (VSEGEI), Sredny Pr. 74, 199026, St. Petersburg, Russia, e-mail: koren@vsegei.sp.ru

Secretary: Jacques Verniers, Research Unit Palaeontology, Department of Geology and Pedology, Ghent University, Krijgslaan 281 building S8, B-9000, Gent, Belgium, e-mail: Jacques.Verniers@ugent.be.

List of Task Groups and their officers

Base of Silurian: Mike Melchin, Canada: mmelchin@stfx.ca

Base of Wenlock: David Loydell, England: david.loydell@port.ac.uk

List of Voting Members

C.E. Brett, Cincinnati, USA, brettce@email.uc.edu

L.R.M. Cocks, London, UK, R.Cocks@nhm.ac.uk

D. Holloway, Melbourne, Australia, dhollow@museum.vic.gov.au

Jin Jisuo, London, Canada, jjin@uwo.ca

M.E. Johnson, Williamstown, USA, Markes.E.Johnson@williams.edu

T.N. Koren', St. Petersburg, Russia, koren@vsegei.sp.ru

J. Kríž, Prague, Czech Republic, kriz@cgu.cz

A. Le Hérisse, Brest, France, alain.le.herisse@univ-brest.fr

D.K. Loydell, Portsmouth, UK, david.loydell@port.ac.uk

P. Mannik, Tallinn, Estonia, mannik@gi.ee

M.J. Melchin, Antigonish, Canada, mmelchin@stfx.ca

S. Peralta, San Juan, Argentina, speralta@unsj.edu.ar

Rong Jiayu, Nanjing, China, jyrong@nigpas.ac.cn

P. Štorch, Prague, Czech Republic, storch@gli.cas.cz

J. Verniers, Ghent, Belgium, Jacques.Verniers@ugent.be



International Commission on Stratigraphy Subcommission on Ordovician Stratigraphy

ANNUAL REPORT 2006

1. Name of constituent body:

Subcommission on Ordovician Stratigraphy (SOS)

Submitted by:

Chen Xu

Chairman, SOS

Oct. 3, 2005

2. Overall objectives, and Fit within IUGS science policy:

The Subcommission promotes international cooperation on Ordovician Stratigraphy. Specific objectives are:

- a. To delimit and subdivide the Ordovician System (and Period) as a part of the overall ICS mission to elaborate the standard global stratigraphic scale. This work aims to establish the boundaries (GSSPs), the correlation of the subdivisions (Stages and Series), and the nomenclature of the subdivisions.
- b. To promote regular international meetings on aspects of Ordovician geology, especially those devoted to clarifying stratigraphic procedures, nomenclature and methods for use in establishing a unified global time scale, and to prepare correlation charts with explanatory notes (this latter task is now completed).
- c. To encourage, promote, and support research on all aspects of Ordovician geology worldwide and to provide outlets, *Ordovician News*, international meetings, and a web page, for promoting discussions and reporting results of this research.
- d. To encourage, promote, and support interdisciplinary research on the Ordovician global Earth system, addressing topics that require high-resolution, global correlation.
- d. The ultimate goal of the Subcommission is to provide a high-resolution geological time scale that will be a critical foundation for interdisciplinary research on the global Earth system during the Ordovician Period. The work is broad based and must include specialists in paleontology, all subdisciplines of stratigraphy (bio-, litho-, chemo-, and magneto-), sedimentology, geochemistry, and tectonics. With active participants from more than 25 countries, the Subcommission involves much of the global geological community.

3. Summary table of Ordovician subdivisions

SYSTEM	GLOBAL SERIES	GLOBAL STAGES	KEY GRAPTOLITE/ CONODONT(C) BIOHORIZONS
ORDOVICIAN	UPPER	HIRNANTIAN	← <i>P. acuminatus</i> (GSSP-Dob's Linn)
		KATIAN	← <i>N. extraordinarius</i> (GSSP-Wangjiawan North)
		SANDBIAN	← <i>D. caudatus</i> (GSSP-Black Knob Ridge)
	MIDDLE	DARRIWILIAN	← <i>N. gracilis</i> (GSSP-Fågelsång)
		UN-NAMED	← <i>U. austrodentatus</i> (GSSP-Huangnitang)
	LOWER	FLOIAN	← <i>B. triangularis</i> (C), or <i>P. cf. aranda</i> (C)
		TREMADOCIAN	← <i>T. approximatus</i> (GSSP-Diabasbrottet)
			← <i>I. fluctivagus</i> (C) (GSSP-Green Point)

4. Organization

a. Subcommittee Executive

Chairman, Chen Xu (P.R.China)

Vice Chairman Juan Carlos Gutiérrez-Marco (Spain)

Secretary, G.L. Albanesi (Argentina)

16 other Voting Members

Over 100 Corresponding Members

Subcommittee website: www.ordovician.cn

<http://seis.natsci.csulb.edu/ISOS> (remains active for facilitating discussion of GSSP proposals).

5. Interfaces with other international projects

IGCP Project 503: Arguably the most sustained rise in marine biodiversity took place during the Ordovician, and the second largest mass extinction event took place close to the end of that Period, coincident with an episode of major climate fluctuation. The results of the very successful IGCP project n° 410 "The Great Ordovician Biodiversification Event" not only included the development of an improved globally-integrated biozonation for graptolites, conodonts and chitinozoans, but also generated biodiversity curves that have been constructed for all Ordovician fossil groups.

Following the work of the numerous regional teams and of the clade teams, that were established for each fossil group in IGCP project n° 410, a new successor project was proposed in order to develop a better understanding of the environmental changes that influenced the biodiversity trends in the Ordovician and Early Silurian. In this project, the major objective is thus to attempt to find the possible physical and/or chemical causes (e.g., related to changes in climate, sea level,

volcanism, plate movements, extraterrestrial influences, etc.) of the Ordovician biodiversification, the end-Ordovician extinction, and the Silurian radiation.

6. Chief accomplishments and products in 2004

a. The Black Knob Ridge section, Oklahoma, USA, has been ratified by IUGS in May this year as the GSSP for the base of the Katian Stage of the Upper Ordovician Series defined at the level of the FAD of the graptolite *D. caudatus*. A formal report of the GSSP has been submitted to *Episodes* very recently by Dan Goldman and his colleagues.

b. The Wangjiawan North section, Yichang, China, has been ratified by IUGS in May this year as the GSSP for the base of the Hirnantian Stage, the uppermost stage of the Upper Ordovician Series, defined at the level of the FAD of the graptolite *N. extraordinarius*. A final report to the GSSP is published in current issue of the *Episodes* (

c. Three stage names have been approved by the Subcommittee and ratified by the ICS and the IUGS this year. They are the Floian Stage (the second Stage), the Sandbian Stage (the fifth Stage) and the Katian Stage (the sixth Stage).

d. Two GSSP proposals for the base of the Middle Ordovician Series, and its lower stage (the 3th Stage, yet to be named), have been considered for voting very recently. These proposals refer to the level of the FAD of the conodont *B. ? triangularis* at Huanghuachang section in China, and the level of the FAD of the conodont *P. cf. aranda* at Niquivil section in Argentina. The Subcommittee will report the result after two rounds of votes, already in progress.

e. A discussion page on the Subcommittee's website was further developed to allow for wide dissemination of the GSSP proposals and for extensive discussion of other Subcommittee business.

f. The Subcommittee sponsored the IGCP 503 annual meeting <Changing palaeogeographical and palaeobiogeographical patterns in the Ordovician and Silurian> in Glasgow September this year. About 80 colleagues participated.

g. The Subcommittee sponsored the book of "Global Ordovician Earth System" editing by Stan Finney, whose results will be published in a special paper of the Geological Society of America.

h. *Ordovician News No. 23* was produced and posted on the Subcommittee web site recently.

7. Chief problems encountered in 2006

The Subcommittee is planning to publish an Ordovician time table after all of the GSSPs were approved and ratified. It was discussed at the Glasgow meeting and supported by all participants. The Subcommittee may face a financial support problem to publish this table.

As always, the lack of travel support limits the participation of Voting Members to attend the 10th Ordovician conference in China, 2007.

8. Summary of expenditures in 2006

TOTAL: \$ 1000

Support to the production of newsletter (Albanesi)	500 USD
Postage	50 USD
Deposition for supporting third world country participants to the 2007 10 th Ordovician conference in China	450 USD
TOTAL	1000 USD

9. Work plan, critical milestones, anticipated results and communications to be achieved next year

- a. Preparing the 2007 10th Ordovician conference
- b. Production and internet distribution of *Ordovician News No. 24* in 2007.
- c. Management of Subcommission website.

10. Budget and ICS component for 2006

Ordovician News No. 24 production: 500USD

Travel subsidies for executive members to attend the 10th Ordovician conference in China and the GSSP dedication ceremonies: 1000USD

Support to the preparing work of the organization committee for the 2007 Ordovician conference: 300USD

Management of Subcommission website: 300USD

Preparation of an Ordovician Time Table: 300USD

TOTAL 2007 BUDGET REQUEST: 2400 USD

Potential funding sources outside IUGS

The IGCP Project 503, "Ordovician Palaeogeography and Palaeoclimate", will fund the four meetings (with related field trips) in 2007 in China with the 10th Ordovician conference. This project will provide travel support to a significant number of Ordovician specialists, including voting members of the Subcommission, allowing for regular meetings at the annual workshops scheduled for the project.

The State Key Laboratory of Stratigraphy and Palaeobiology, Nanjing Institute of Geology and Palaeontology, Chinese of Academia of Sciences, provides a server for the Subcommission website.

The Subcommission officers are also supported by their research projects for parts of their activities.

11. Review chief accomplishments over last five years (2000-2006)

a. Approval, ratification, and dedication of the Green Point GSSP for the base of the Ordovician System.

b. Approval, ratification, and dedication of the Diabasbrottet and Fågelsång GSSPs for the bases of the lower stage of the Lower Ordovician Series and the Upper Ordovician Series, respectively.

c. Approval, ratification, and dedication of the Black Knob Ridge section, Oklahoma, USA and the Wangjiawan North, Yichang, China GSSPs for the bases of the Katian and Hirnantian stages, respectively.

d. Significant progress on definition of series and stages for the Ordovician System with only two GSSPs remaining to be selected and approved by the Subcommittee, following change in strategy for stages of Upper Ordovician Series in August 2003.

e. With publication in 2000 of *A Revised Correlation of Ordovician Rocks in the British Isles*, correlation charts have been completed for Ordovician rocks on all continents.

f. The 9th International Symposium on the Ordovician System held in San Juan, Argentina, in August 2003, in conjunction with the 7th International Graptolite Conference and a Field Meeting of the Subcommittee on Silurian Stratigraphy and publication of 556 page proceedings, 130 participants represented 18 countries, 124 papers were presented in technical sessions.

g. Publication of *Ordovician News* nos. 17-23 and their posting on the Subcommittee's web site.

h. Development of the web site "Ordovician Stratigraphy Discussion Group" to facilitate discussions on selection of the GSSPs. This site has evolved into the Subcommittee's web site and also includes postings of *Ordovician News*.

i. Sponsorship of a technical session and field excursion on the GSSP for the base of the Middle Ordovician Series at the Annual Meeting of the Geological Society of America in November 2000.

j. Sponsorship at the 31st International Geological Congress of the symposium "Paleontological, stratigraphical, and paleogeographical relations among South America, Laurentia, Avalonia, and Baltica during the Ordovician."

k. Sponsorship at the 32nd International Geological congress of the symposium "The global Ordovician Earth system".

l. Launched GOES (Global Ordovician Earth System) Program to stimulate integrated multi-disciplinary studies of global events (mass extinction, sea-level changes, greenhouse conditions, tectonics) during the Ordovician Period.

m. Sponsorship of a special symposium on the Ordovician System at the Geological Society of America Annual Meeting in 2000, of WOGOGO 2001 in Copenhagen, and the meeting and field excursion "The Gondwanan Platform in Ordovician times: Climatic, eustatic and geodynamic evolution", in Morocco in February 2001.

o. Selection of names for 2nd, 5th, 6th and 7th stages of the Ordovician System.

p. Sponsorship of the 2006 IGCP 503 Glasgow meeting on "Changing palaeogeographical and palaeobiogeographical patterns in the Ordovician and Silurian".

12. Objectives and work plan for the next 2 years (2007-2008)

a. Completion of selection of GSSPs for all stages.

b. Publication of an Ordovician time table.

c. Sponsor the 10th Ordovician conference, the Yangtze conference in China, 2007.

d. Publication of the special volume of "The global Ordovician Earth system".

e. Refocusing of Subcommittee to address the global Ordovician Earth system.

f. Development of a new website with transfer of Subcommittee executive to new chair.

**APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008]
SUBCOMMISSION ON ORDOVICIAN STRATIGRAPHY**

Subcommission Officers

Chairman: Chen Xu

State Key Laboratory of Stratigraphy and Palaeobiology, Nanjing Institute of Geology & Palaeontology, Chinese Academia of Sciences, Nanjing 210008, P.R. CHINA
Tel. & Fax: +86 25 83375157; Email: xu1936@yahoo.com

Vice Chairman: Juan Carlos Gutierrez-Marco

Instituto de Geología Económica (CSIC-UCM), Facultad de Ciencias Geológicas, 28040 Madrid, SPAIN
Tel.: +34-915 44 54 59, Fax: +34-913 94 48 74 e-mail: jcgrapto@geo.ucm.es
URL: <http://www.ucm.es/info/paleo/personal/gutierrez.htm>

Secretary: Guillermo L. Albanesi

CONICET - Museo de Paleontología, Universidad Nacional de Córdoba, Casilla de Correo 1598, 5000 Córdoba, ARGENTINA
Tel.: +54-(0)351-4719575, Fax.: +54-(0)351-4216350, e-mails: galbanesi@arnet.com.ar , or galbanes@com.uncor.edu

List of Voting Members

Florencio G. Acenolaza, Tucuman, ARGENTINA facenola@satlink.com

Andrej V. Dronov, St. Petersburg, RUSSIA dronov@GG2686.spb.edu

Olda Fatka, Prague, CZECH REPUBLIC fatka@prfdec.natur.cuni.cz

Stanley C. Finney, Long Beach, USA scfinney@csulb.edu

Richard A. Fortey, London, UNITED KINGDOM raf@nhm.ac.uk

David A. T. Harper, Copenhagen, DENMARK dharper@savik.geomus.ku.dk

Warren D. Huff, Cincinnati, USA warren.huff@uc.edu

Li Jun, Nanjing, CHINA junli@nigpas.ac.cn

Charles E. Mitchell, Buffalo, USA cem@acsu.buffalo.edu

Robert S. Nicoll, Flynn, AUSTRALIA bnicoll@goldweb.com.au

Godfrey S. Nowlan, Calgary, CANADA GNowlan@NRCan.gc.ca

Alan W. Owen, Glasgow, UNITED KINGDOM awo@geology.gla.ac.uk

Florentin Paris, Rennes, FRANCE florentin.paris@univ-rennes1.fr

Ian G. Percival, Lidcombe, AUSTRALIA ian.percival@minerals.nsw.gov.au

Leonid E. Popov, Cardiff, UNITED KINGDOM Leonid.Popov@nmgw.ac.uk

Matthew R. Saltzman, Columbus, USA saltzman.11@osu.edu



International Commission on Stratigraphy Subcommission on Cambrian Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

International Subcommission on Cambrian Stratigraphy

Submitted by:

Prof. Loren E. BABCOCK, *Secretary*
Department of Geological Sciences, 125 South Oval Mall
The Ohio State University, Columbus, OH 43210, USA
Tel. 01 614-292-0358, Email babcock.5@osu.edu

and

Prof. Shanchi Peng, *Chair*
Nanjing Institute of Geology and Palaeontology
39 East Beijing Street
The Chinese Academy of Sciences
Nanjing 210008, China
Email: scpeng@nigpas.ac.cn

Date: 20 November 2005

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission Statement

The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Cambrian stratigraphy.

Goals

The goals of the Subcommission fall into two main areas:

- (1) To develop a global stage-level and series-level chronostratigraphic classification of the Cambrian System.
- (2) To complete and publish regional and global correlation charts for the Cambrian System.

Fit within IUGS Science Policy

The objectives of the Subcommission fall within three main areas of IUGS policy:

- (1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (stages and series), and related to a hierarchy of units (zones) to maximize relative time resolution within the Cambrian Period.

- (2) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the Cambrian Period.
- (3) Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs.

3. ORGANIZATION

The Subcommittee is organized by an Executive consisting of Chairman, two Vice-Chairs, and Secretary, who are all Voting Members of the Subcommittee. There are currently 14 other Voting Members. The Voting Members are elected for their expertise and experience, but also represent a diversity of countries and regions.

The objectives of the Subcommittee are pursued by Working Groups, both stratigraphic and thematic. Each Working Group is organized by a Chair who is a Voting or Corresponding Member.

The Subcommittee sponsors an International Symposium on the Cambrian System at irregular intervals, and sponsors Field Conferences of the Cambrian Stage Subdivision Working Group at one- or two-year intervals. The Chair of the Organizing Committee of each of the meetings is normally a Voting Member, Honorary Member, or Corresponding Member of the Subcommittee.

Officers for 2004-2008:

Chairman:	Prof. Shanchi Peng, China
First Vice-Chair:	Prof. Malgorzata Moczydlowska-Vidal, Sweden
Second Vice-Chair:	Prof. Gerd Geyer, Germany
Secretary:	Prof. Loren E. Babcock, USA

Website: www.uni-wuerzburg.de/palaeontologie/ISCS/index.htm

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Members of the Cambrian Subcommittee are involved in a number of international projects, normally in an individual capacity but sometimes facilitated by contacts through activities related to the Subcommittee.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

5a. XIth International Field Conference on Cambrian Stage Subdivision, South Australia, August 2006.

The XIth International Field Conference on Cambrian Stage Subdivision was held in September, 2006 in South Australia. The meeting was organized principally by Jim Jago. Abstracts of the technical sessions and a field guide were published in association with the meeting.

5b. Publication stemming from IV International Conference on the Cambrian System.

The IV International Conference on the Cambrian System was held in Nanjing, China, organized principally by Maoyan Zhu, and full, peer-reviewed papers resulting from the meeting are currently in press. Publication of the papers together as a thematic issue of *PalaeoWorld* (edited by Maoyan Zhu and Loren Babcock) is expected to take place in December, 2006 or January, 2007.

5c. Sino-Russian Conference on the Lower Half of the Cambrian System.

A meeting of leading Chinese and Russian specialists on the stratigraphy of Cambrian stages 2 and 3, in association with the Subcommittee Executive, was held in Nanjing, China, in October, 2006. The meeting was organized principally by Maoyan Zhu. Goals of the symposium were: 1, to identify horizons in the lower half of the Cambrian that are potentially useful for correlation on an intercontinental scale; and 2, to make plans for targeting these potential key horizons with detailed field work. The longer range plan is to identify several horizons that hold up to scrutiny as stratigraphically complete, easily recognizable, and intercontinentally traceable. Some of these horizons should then be considered as potential global chronostratigraphic boundary positions.

5b. Progress with selection of GSSPs for Cambrian Stages.

Voting Members (VMs) of the Cambrian Subcommittee voted overwhelmingly to apply the name Drumian Stage to what was provisionally called Cambrian Stage 6. The Drumian Stage, with a GSSP in the Drum Mountains, Utah, USA, was later approved by ICS and ratified by IUGS.

Proposals for a GSSP of provisional Cambrian Stage 7 were submitted to Jim Jago, Chair of the Working Group on the *Lejopyge laevigata* level, in November, 2006. After review by Working Group members, the best options will be put forward to the VMs of the Cambrian Subcommittee for a vote. The vote is expected to take place in early 2007.

The Subcommittee is working toward determining acceptable names for the basal series and stage of the Cambrian System. The GSSP of the conterminant base of each was implicitly ratified at the time of ratification of the basal Cambrian GSSP in 1992, but names for the series and stage were not proposed. Discussions of potential names took place in Nanjing, China, in 2005, and in South Australia in 2006. The best options have now been identified, and they will be put to a vote of the Cambrian Subcommittee VMs in early 2007.

6. CHIEF PROBLEMS ENCOUNTERED IN 2005

The principal difficulties encountered in 2005 were: 1, obtaining funding to support basic research on key stratigraphic intervals (potential GSSP horizons and sections); and 2, obtaining funding to support travel. A modest increase in funding for the coming year would be of great benefit to members of some of the Working Groups on key horizons who have limited access to funding through nationally competitive research grants.

7. SUMMARY OF EXPENDITURES IN 2006:

INCOME

Carried forward from 2005	\$ 275.90
ICS Allocation	\$ 1300.00
ICS Allocation from emergency fund	\$ 1000.00
SUBTOTAL 2006 income	\$ 2575.90

EXPENDITURE FROM 2006 BUDGET

Contribution to officer's travel expenses	\$ 1427.28
Support for South Australia meeting	\$ 1000.00
SUBTOTAL 2006 expenditures	\$ 2427.28

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR

8a. GSSP proposals and names for lowermost series and stage.

In early 2007, the Subcommittee expects to vote on a proposal for a stage-level GSSP to be placed at a horizon coinciding with the FAD of the cosmopolitan agnostoid trilobite *Lejopyge laevigata*. This horizon is one of the most recognizable in the Cambrian, and it is well constrained by a variety of stratigraphic correlation tools.

In late 2007, the Subcommittee expects to vote on a proposal for a stage-level GSSP to be placed at a horizon coinciding with the FAD of the cosmopolitan agnostoid trilobite *Agnostotes orientalis*. This horizon is also one of the most recognizable in the Cambrian, and it is well constrained by a variety of stratigraphic correlation tools. As indicated at the Leuven meeting and on the ICS website, we expect to hold ballots on two GSSPs in 2007 and two more (for stages 5 and 10) in 2008.

Planning is underway for meetings of the Cambrian Stage Subdivision Working Group in 2007 (New York), 2008 (Siberia), and 2009 (Morocco). One additional field excursion is expected to be held in 2007 in Kazakhstan.

The Subcommittee expects to vote on names for the lowermost Cambrian series and stage.

8b. Newsletter.

An annual newsletter, highlighting activities of the Subcommittee, is expected to be issued by email in 2007.

9. BUDGET AND ICS COMPONENT FOR 2006

In order to accelerate the pace of work in establishing GSSPs within the Cambrian, we request a modest increase in funds as compared to previous years. The proposed increased funding is targeted at field research on key sections by Working Group members and travel by Voting Members to international meetings where much of the decision-making takes place. We request support particularly for the meeting in New York (2007) and travel by Voting Members to a potential GSSP section in Kazakhstan.

INCOME

Carry-over from 2006	\$ 148.62
----------------------	-----------

PLANNED EXPENDITURES FOR 2007

Preparation for the XII Cambrian Stage Subdivision Working Group Meeting (New York, 2007)	\$ 2000.00
Executive and VMs travel costs, New York meeting	\$ 2000.00
Support for VMs travel to Kazakhstan field site	\$ 4000.00
General office expenses	\$ 100.00
TOTAL 2007 PLANNED EXPENSES	\$ 8100.00

ICS 2007 BUDGET REQUEST

Total ICS 2005 budget request	\$ 8100.00
--------------------------------------	-------------------

Most of the costs of field conferences and other activities will be met by local support from host institutions. Some members are supported by research grants, normally awarded competitively within individual nations. It is hoped that the field excursion to Kazakhstan will receive financial support from local authorities, but extent of support cannot be predicted at this stage.

10. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

In 1998, the Cambrian Subcommittee began work to define chronostratigraphic subdivisions (stages and series) within the system. Previously, the base and top of the Cambrian were defined by Working Groups on the Precambrian-Cambrian boundary (voted on and ratified in 1991) and Cambrian-Ordovician boundary (voted on in 1999 and ratified in 2000). Most of the Subcommittee members share the opinion that the process of defining and ratifying globally appropriate divisions must begin with an evaluation of potential correlation horizons. Following this work, evaluation of candidate sections can begin. The Cambrian Stage Subdivision Working Group has made reconnaissance visits to sections in association with international field conferences. Areas visited include Morocco (1995), Spain (1996), eastern Canada (1997), Sweden (1998), the Great Basin, USA (1999), Argentina (2000), South China (2001), France (2002), South Korea (2004), North and South China (2005), and South Australia (2006).

In a seminar paper, John Shergold and Gerd Geyer (Episodes, 2000) reviewed widely recognizable biohorizons having intercontinental correlation value (ones that could potentially serve as stage-level or series-level boundaries for chronostratigraphic units). This work led to a focusing of subsequent effort on the issue of better characterizing potential chronostratigraphic boundary horizons using available stratigraphic tools. A protocol for identifying GSSPs within the Cambrian has been established: 1, selection of a horizon suitable for intercontinental correlation (followed by

balloting by the Voting Members); then 2, search for the best sections from which to select a GSSP (followed by balloting by the Voting Members).

A plan has been devised for subdivision of the Cambrian System into four international series, each representing roughly equal time intervals. The lowermost two series, which approximately correspond to the traditional lower Cambrian, are each expected to be divided into two nearly equal stages. The uppermost two stages are each expected to be divided into three nearly equal stages. The plan received overwhelming support from ISCS Voting Members.

With the objectives now better focused, and a procedure in place for selecting the best horizons and locations for GSSPs, work has proceeded toward the establishment of stage-level or series-level GSSPs. Successful GSSP proposals arising from the Cambrian Subcommittee were for the bases of the Paibian Stage and Furongian Series (2004) and the Drumian Stage (2006).

11. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2006-2009)

The primary objective for the immediate future for the Cambrian Subcommittee remains the completion of definition of the stages by GSSPs. It is hoped that all stages of the upper half of the Cambrian will be defined by GSSPs by about 2008. Stages of the lower half of the Cambrian are expected to be defined by GSSPs by 2012.

APPENDIX [Names and Addresses of Current Officers and Voting Members, 2004-2008] INTERNATIONAL SUBCOMMISSION ON CAMBRIAN STRATIGRAPHY

Subcommission officers

Chairman: Shanchi Peng, Nanjing Institute of Geology and Palaeontology, The Chinese Academy of Sciences, 39 East Beijing Street, Nanjing 210008, China, Email: scpeng@nigpas.ac.cn

First Vice Chair: Malgorzata Moczydlowska-Vidal, Department of Earth Sciences, Palaeobiology, Uppsala University, Norbyvägen 22, Box 558, 752 36 Uppsala, Sweden, Email: malgo.vidal@pal.uu.se

Second Vice-Chair: Gerd Geyer, Institut für Paläontologie, Universität Würzburg, Pleicherwall 1, 97070, Würzburg, Germany, Email: palo001@rzroe.uni-wuerzburg.de

Secretary: Loren E. Babcock, Department of Geological Sciences, 125 South Oval Mall, The Ohio State University, Columbus, OH 43210, USA, babcock.5@osu.edu

List of Working (Task) Groups and their officers

Lower Half of Cambrian: Maoyan Zhu myzhu@nigpas.ac.cn; Konstantin Pak, vtopor@paleo.ru

Stage 5: Linda McCollum lmccollum@ewu.edu

Drumian Stage: Loren Babcock babcock.5@osu.edu

Stage 7: Jim Jago jim.jago@unisa.edu.au

Series 9: Duck K. Choi dkchoi@snu.ac.kr

Stage 10: Shanchi Peng scpeng@nigpas.ac.cn

Geochemistry: Matt Saltzman saltzman.11@osu.edu

List of Voting Members

Per Ahlberg, Lund, Sweden per.ahlberg@geol.lu.se
José-Javier Álvaro, Villeneuve d'Ascq, France Jose-Javier.Alvaro@uni-lille1.fr
Martin D. Brasier, Oxford, UK martin.brasier@earth.ox.ac.uk
Duck K. Choi, Seoul, Korea dkchoi@snu.ac.kr
Gappur Kh. Ergaliev, Almaty, Kazakhstan ergaliev@nursat.kz
James B. Jago, Mawson Lakes, Australia jim.jago@unisa.edu.au
Pierre D. Kruse, Darwin, Australia pierre.kruse@dme.nt.gov.au
Ed Landing, Albany, New York, USA elanding@mail.nysed.gov
Eladio Liñán, Zaragoza, Spain linan@posta.unizar.es
Tatyana V. Pegel, Novosibirsk, Russia pegel@mail.ru
Matthew R. Saltzman, Columbus, Ohio, USA saltzman.11@osu.edu
Stephen R. Westrop, Norman, Oklahoma, USA swest@hoth.gcn.ou.edu
Maoyan Zhu, Nanjing, China myzhu@nigpas.ac.cn
Andrey Yu. Zhuravlev, Moscow, Russia ayzhur@mail.ru

Total number of Voting Members for term 2004-2008: 18.



**International Commission on Stratigraphy
Subcommission on Ediacaran and Cryogenian Stratigraphy**

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

Subcommission on Ediacaran and Cryogenian Stratigraphy

Submitted by:

Dr James GEHLING, Chairman
South Australian Museum, North Terrace, Adelaide, 5000, Australia
Tel. +61-8-8207-7441, Fax. +61-8-8207-7222
Email jgehling@ozemail.com

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Mission statement

The Subcommission is the primary body for facilitation of international communication and scientific cooperation in Ediacaran and late Neoproterozoic stratigraphy, defined in the broad sense of multidisciplinary activities directed towards better understanding of the evolution of the Earth during the Ediacaran Period and more generally during the late Neoproterozoic (circa 800 – 542 Ma). Its first priority is the unambiguous definition, by means of agreed GSSPs, of a hierarchy of chronostratigraphic units that provide the framework for global correlation.

Goals

These fall into three main areas:

- (a) The definition of basal boundary stratotypes (GSSPs) and the refinement of standard chronostratigraphic scales, through the establishment of multidisciplinary Working Groups;
- (b) International coordination of and collaboration in research on late Neoproterozoic environments, through the establishment of thematic Working Groups, for example on Neoproterozoic glaciations.
- (c) International coordination of efforts to establish consensus global stratigraphic calibration schemes for the late Neoproterozoic using alternative methods of stratigraphy, such as chemostratigraphy.

In addition, the Subcommission exists to further communication with a wider public through grassroots initiatives to conserve important Ediacaran geological sites, to support International Geological Correlation Programme projects, and to encourage the wider dissemination of research findings on the world wide web or in popular science publications.

Fit within IUGS Science Policy

The objectives of the Subcommittee relate to four main aspects of IUGS policy:

- (1) The development of an internationally agreed scale of chronostratigraphic units, fully defined by GSSPs where appropriate (Stages), and related to a hierarchy of units (Standard Zones, Subzones etc.) to maximize relative time resolution within the Ediacaran period;
- (2) Proceed with a program of workshops and symposia to select criteria, boundary stratotype section, and GSSP for a “Cryogenian” period and system, immediately below the Ediacaran;
- (3) Establishment of frameworks and systems to encourage international collaboration in understanding the evolution of the Earth during the late Neoproterozoic interval. In particular, cooperating with the **Precambrian Subcommittee** (W. Bleeker, chair) to subdivide Precambrian. The Ediacaran Subcommittee will concentrate on the Neoproterozoic, while the Precambrian Subcommittee will work on Archean and older Eras of the Proterozoic. Both subcommittee will seek to establish “natural” or rock-based boundaries that will enable global correlation.
- (4) Working towards an international policy concerning conservation of geologically and paleontologically important sites such as GSSPs. This relates to, *inter alia*, the IUGS Geosites Programme.

3. ORGANIZATION

Officers for 2004-2008:

Chair:	Dr. James Gehling, Australia
Vice-Chair:	Dr. Shuhai Xiao, USA
Secretary:	Dr. Graham Shields, Australia

The Subcommittee is organized by an Executive consisting of Chairman, Vice-Chairman and Secretary, who are all Voting Members of the Subcommittee. These officers were nominated and elected by voting members of the now terminated Terminal Proterozoic Subcommittee during late 2003. There are currently 37 other Voting Members, making 40 voting members in total (see appendix); there are currently 15 additional corresponding members. The Voting Members have been specifically selected for their international reputations and recognised expertise in an area of geoscience relevant to the subcommittee. Four voting members are required to be officers of the Cambrian and Precambrian Subcommittees. All responded promptly to their nominations by email; ease of contact and promptness of response are prerequisites of being voting members on this subcommittee.

Two thematic working groups have been established to assess candidates for 1) subdivision of the Ediacaran Period and 2) definition and subdivision of the Cryogenian Period, respectively. These two groups fit neatly within the auspices of existing IGCP project groups (IGCP 493, 512)

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Members of the Ediacaran Subcommittee are lead investigators and officers in a number of international projects, normally in an individual capacity but sometimes facilitated by contacts through activities related to the Subcommittee:

IGCP 478 (*Neoproterozoic-early Paleozoic events in SW Gondwana*) led by voting members **Claudio Gaucher, Hartwig Frimmel and Paulo Boggiani**;

IGCP 493 (*The Rise and Fall of the Vendian biota*) led by voting member **Mikhail Fedonkin** (Paleontological Institute, Moscow), Pat Vickers-Rich (Monash Uni.) and Ediacaran Subcommission chairman **James Gehling**;

IGCP 497 (*The Rheic Ocean: its origin, evolution and correlatives*) led by voting member **Ulf Linnemann**.

IGCP 512 (*Neoproterozoic Ice ages*) led by subcommission secretary **Graham Shields** and voting member **Emmanuelle Arnaud** and boasts most subcommission voting members on its mailing list.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2005 and 2006

An IGCP 493 meeting entitled: *The elusive Ediacarans — where did they come from and where did they go?* was organized by Prof. Terufumi Ohno and Prof. Patricia Vickers-Rich, in Japan at Kyoto University Museum from 30-31 January, 2006.

In conjunction with the 2nd International Palaeontological Congress held in China from June 17-24, 2006, Chinese voting members Zhu Maoyan, Yin Chongyu and Shuhai Xiao and a team of colleagues and their students organized a *Neoproterozoic field workshop* from June 6-16, to study the Cryogenian and Ediacaran successions of south China of the Neoproterozoic Subcommission. The 32 participants in the pre-Congress field trip, included nine voting members from six countries as well as 11 PhD candidates working on Neoproterozoic-Cambrian projects. In transit between field sites, participants gave in-bus presentations on the principal Neoproterozoic stratigraphy of the countries they represented and their research projects.

At the 2nd International Palaeontological Congress held on the Beijing University campus, (June 17-21), the Neoproterozoic Subcommission organized a very-well attended symposium and poster session on *Neoproterozoic Palaeontology and Geobiology*, that extended over two days. Papers and posters at the symposium included nine by voting members from seven countries. The strength of this meeting was the active participation by the best known palaeontologists, sedimentology geochemists and geochronologists active on Neoproterozoic projects. The symposium was followed by a working meeting of the subcommission to plan trips for 2007 and 2008 to investigate candidate sections for a Cryogenian GSSP and subdivision of the Ediacaran (*see Appendix 2*). The meeting asked for expressions of interest in organizing field workshops to investigate candidate sections for a Cryogenian GSSP and Ediacaran subdivision. Vibuti Rai has offered to organize an Indian field workshop in 2007. Paul Hofmann and Charlie Hoffmann have offered to organize a Namibian field workshop in 2008.

The *Australian Centre for Astrobiology* (Macquarie University, Sydney, New South Wales) headed by Malcolm Walter (former Vice-Chair of the Terminal Proterozoic Subcomm.) organized an *Acraman Workshop* in South Australia from August 4-9. The 20 participants gave papers and participated in field study of the Acraman eject layer. The Acraman horizon lies in the middle of the Ediacaran succession in the Flinders Ranges of South Australia, 1.5 km stratigraphically above the Ediacaran GSSP. The group is planning a project to drill the melt rock in the Acraman impact crater preserved in Mesoproterozoic volcanic to the west on Eyre Peninsula. The aim is to obtain an absolute age for the event which is loosely timed at 580 Ma and forms a lower limit to the first large organic walled microfossils in the Ediacaran.

A meeting entitled “*Snowball Earth 2006 appraisal conference*” was held at the Centro Stefano Franscini, Ascona, Switzerland, July 16-21, 2006. This conference was organised by Dr James Etienne and Dr Andrea Cozzi (Switzerland) and was cosponsored by IGCP 512. The conference brought together many of the world’s experts in Neoproterozoic Earth System Science

and represented the 2nd meeting of the thematic working group on Neoproterozoic ice ages. Discussions related to the subcommission are given in *Appendix 3*.

The Australian Broadcasting Commission (ABC) weekly science program, *Catalyst*, broadcast a feature on the Ediacaran GSSP and Ediacara fossils of the Flinders Ranges, South Australia, on 9 November 2006.

Seventeen papers have been published in 2006 on paleontology, sedimentology, chemo- and litho-stratigraphy of the late Neoproterozoic (*see Appendix 6*).

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

- The problem of the apparent diachroneity of Neoproterozoic diamictites judging from recent U-Pb dates.
- Determining criteria for a Cyogenian GSSP, which might utilize a chemostratigraphic anomaly in conjunction with microflora and event stratigraphy.
- Mismatch of timing of the onset and extinction of large ornate, organic walled microfossils in the Ediacaran that suggests problems for determining series boundaries.
- Previously proposed Ediacara biota fossil associations, representing a potential time sequence, are showing evidence of being more a product of environmental differences between and within fossil assemblages. However, a series boundary may well be determined using the end of the Gaskiers glaciation as a series boundary, since it appears to represent the base of the oldest known fossils of the Ediacara biota. There is now geochemical evidence for a rise in marine oxygen levels to a level that could sustain metazoans.
- Polarization of researchers on the potential of stable isotope patterns as a means for intercontinental correlation.

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007): INCOME

Carried forward from 2005_	US\$200
ICS	<u>US\$1950</u>
TOTAL	US\$2195

EXPENDITURE FROM 2006 BUDGET

Travel support for Indian voting member to 2 nd IPC and Field Workshop	US\$700
Field expenses for J. Gehling on Acraman Workshop, Aug 4-10, 2006	US\$430
Field expenses for two Chinese voting members visiting Ediacaran GSSP and succession in Flinders Ranges South Australia Aug 19-21. 2006	<u>US\$580</u>
TOTAL	US\$1710

To be carried forward to 2007 US\$485

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

(a) Newsletter:

A circular is currently being prepared for end 2006 to inform all corresponding members of:

- subcommission meeting in India during November 2007 to focus on the Neoproterozoic as a whole (V. Rai).
- related meeting in Australia (IGCP 512) during June 2007 to focus on Ediacaran subdivision (M. Corkeron).
- call for preliminary proposals for stratigraphic subdivision of the Neoproterozoic
- vote on possible criteria to subdivide the Neoproterozoic.

(b) Preparation of GSSP proposals:

Working groups will explore the potential of preliminary proposals and subdivision criteria and discuss them within wider spheres: IGCP 493 (and IGCP 478) in the case of Ediacaran Subdivision and IGCP 512 in the case of the Cryogenian subdivision and definition.

(c) Voting:

Towards the end of 2007, voting members will be asked to vote on preliminary proposals for criteria used to subdivide the Ediacaran and define the base of the Cryogenian.

10. BUDGET AND ICS COMPONENT FOR 2006

We anticipate that **\$5000** will be needed to support voting members who wish to participate in the planned field excursion to the Meoproterozoic and Neoproterozoic of India (*see Appendix 4*)

Potential funding sources outside IUGS

National IGCP committees and project groups for IGCP projects 478, 493 and 512.

The Neoproterozoic Subcommission does not receive financial support from outside IUGS-ICS, except for office support (computer, access to internet services, telephone, etc.) from the host institutions of the Executive. Most members are supported by national research grants, normally won competitively. Specific activities, such as meetings and some Working Groups, sometimes receive small grants to Convenors and Organizers from various sources, such as host institutions and national and regional authorities of the country where the meeting is being held.

11. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (1999-2003)

2003: In September 2003, a 3rd ballot of the Terminal Proterozoic Subcommission resulted in 85% of the votes in favor of a **GSSP for the Terminal Proterozoic Period** at the base of the Nuccaleena Formation *cap dolostone*, immediately above the Elatina glaciogenic diamictite in the Enorama Creek Section, Flinders Ranges, South Australia. The name “**Ediacaran**” received 79% of the votes cast. As a result the Subcommission submitted a proposal to the full International Commission on Stratigraphy (ICS) in December 2003.

2004: On February 16th, 2004, the ICS voted 14:1 in favor (with one abstention) on the GSSP and name for the “Ediacaran System”. The results were submitted to IUGS, which ratified the GSSP and name for the Ediacaran System and Period on March 19th (IUGS E-Bulletin, March 2004).

IGCP 493 “Rise and Fall of the Vendian Biota” ran a post IGC workshop on Neoproterozoic Paleobiology in Prato Italy on August 30-31. The resulting papers will be published in a special edition of the Journal of the Geological Society, London in 2007.

2005: Interpretive signs and a marker or “golden spike” were dedicated by the South Australian Premier at the Ediacaran GSSP on April 16 at the Ediacaran GSSP site in the Flinders ranges National Park.

Australia Post released an Ediacaran Postage Stamp series in conjunction with the dedication of the Ediacaran GSSP site in South Australia in April 2005.

The Neoproterozoic Subcommittee and IGCP 493 sponsored and ran a symposium (Ediacaran paleobiology: paleontological, molecular, embryological, and ecological constraints) at the NAPC meeting in Halifax Nova Scotia (June 19-26, 2005) and a 5-day pre-conference excursion to the Ediacaran succession of SE Newfoundland.

The first meeting of IGCP 512 (Cryogenian) ran a “Conference on Sedimentary Processes and Products” in Aberystwyth, Wales from 23-27 August, 2005.

Members of the Neoproterozoic Subcommittee participated in a *Time Scale Workshop* be held by the Precambrian Subcommittee in conjunction with a final "Supercontinents and Earth Evolution Symposium" organized by the Tectonics Special Research Centre at University of Western Australia/Curtin University, September 26-30, 2005.

See review of 2006 activities.

12. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2006-2009)

The Ediacaran Subcommittee aims to encourage research that will facilitate correlation and subdivision of the late Neoproterozoic (circa 800 – 542 Ma) by the time of the next IGC in 2008. In particular, field excursions and symposia will be designed to encourage international cooperation and collaboration that will lead to GSSP’s for the base of the “Cryogenian”, and subdivision of the Ediacaran. Suggestions for appropriate successions that would facilitate placement of GSSP’s will determine the precise location of future meetings and excursions but some preliminary ideas are outlined below for the years 2006-2008.

2007

- Call for submission of full proposals for Ediacaran subdivision.
- Vote on preliminary proposals for Cryogenian Period GSSP.
- Call for submission of full proposals for Cryogenian Period GSSP.
- A field workshop in India, organized by Vibuti Rai, to visit both the Himalayan and Vindhyan basins for Ediacaran, Neo, Meso and Palaeoproterozoic parts of the sequence (see Appendix 4)
- A field workshop is planned to review the Sturtian and Marinoan diamictites and claims for younger diamictites in the Neoproterozoic successions of the northern Flinders Ranges and Kimberley Ranges for June 2007) (*see Appendix 5*).

2008

- Vote on Cryogenian GSSP.
- Vote on Ediacaran Period subdivision into two or more epochs.
- Paul Hoffman and Charlie Hoffmann to lead a field workshop to study the Cryogenian successions of northern Namibia (June-July, 2008).

APPENDIX 1

EDIACARAN SUBCOMMISSION

Voting Members 2004-2008

Subcommission officers

- Chairman:** **James Gehling**, South Australian Museum, North Terrace, Adelaide, 5000 Australia.
Tel. +61-8-8207-7441, email jgehling@ozemail.com
- Vice-Chairman:** **Shuhai Xiao**, Department of Geological Sciences, Virginia Polytechnical Institute and University, 4044 Derring Hall, Blacksburg, VA 24061-0420, USA.
Tel. +1-540-231-1336, email xiao@vt.edu
- Secretary:** **Graham Shields**, Geologisch-Paläontologisches Institut, Westfälische Wilhelms-Universität, 48149 Münster, Germany
Tel. +49 (0)251 83-33937, email gshields@uni-muenster.de

Voting Members

- Jose-Javier Alvaro**, Lille, France; Jose-Javier.Alvaro@univ-lille1.fr
Emmanuelle Arnaud, Guelph, Canada; earnaud@uoguelph.ca
Wouter Bleeker, Ottawa, Canada; wbleeker@nrcan.gc.ca
Paulo César Boggiani, São Paulo, Brazil; boggiani@usp.br
Martin D. Brasier, Oxford, UK; martin.brasier@earth.ox.ac.uk
Nicholas Butterfield, Cambridge, UK; njb1005@esc.cam.ac.uk
Nicholas Christie-Blick, New York, USA; ncb@ldeo.columbia.edu
Nikolay Chumakov, Moscow, Russia; chumakov@ginras.ru
David A.D. Evans, New Haven, USA; dai.evans@yale.edu
Mikhail Fedonkin, Moscow, Russia; mfedon@paleo.ru
Hartwig Frimmel, Wuerzburg, Germany; hartwig.frimmel@mail.uni-wuerzburg.de
Claudio Gaucher, Montevideo, Uruguay; gaucher@chasque.apc.org
Gerard Germs, Johannesburg, South Africa; gagerms@global.co.za
Dmitri V. Grazhdankin, Moscow, Russia; dgra99@esc.cam.ac.uk
Kathleen Grey, Perth, Australia; kath.grey@doir.wa.gov.au
John P. Grotzinger, Cambridge, USA; grotz@mit.edu
Karl-Heinz Hoffmann, Windhoek, Namibia; khhoffmann@mme.gov.na
Hans Hofmann, Montreal, Canada; hofmann@eps.mcgill.ca
Mohieddin Jafari, Tehran, Iran; mohieddin300@yahoo.com
Richard Jenkins, Adelaide, Australia; jenkins.richard@saugov.sa.gov.au
Soren Jensen, Spain; soren@guadiana.unex.e
Alan Jay Kaufman, Maryland, USA; kaufman@geol.umd.edu
Vsevolod Khomentovsky, Novosibirsk, Russia; vkhom@uiggm.nsc.ru
Andrew H. Knoll, Cambridge, USA; aknoll@oeb.harvard.edu
Ulf Linnemann, Dresden, Germany; ulf.linnemann@snsd.smwk.sachsen.de
Victor Melezhik, Norway; Victor.Melezhik@ngu.no
Malgorzata Moczydlowska-Vidal, Uppsala, Sweden; malgo.vidal@pal.uu.se
Guy M. Narbonne, Kingston, Canada; narbonne@geol.queensu.ca
Peng Shanchi, Beijing, China; scpeng@nigpas.ac.cn, speng@pub.jlonline.com

Vibhuti Rai, Lucknow, India; vibhutihrai@rediffmail.com
Robert Rainbird, Ottawa, Canada; rrainbir@nrca.gc.ca
Mikhail A. Semikhatov, Moscow Russia; semikhatov@ginras.ru
Sun Weiguo, Nanjing, China; weiguo@jlonline.com
Malcolm Walter, Sydney, Australia; mwalter@els.mq.edu.au
Yin Chongyu, Beijing, China; chongyuyin@cags.net.cn
Yuan Xunlai, Nanjing, China; xlyuan@nigpas.ac.cn
Zhu Maoyan, Nanjing China; myzhu@nigpas.ac.cn

APPENDIX 2

Newsletter: Subcommittee meeting and call for submissions distributed September 19th 2006

Neoproterozoic Subcommittee meeting, June 25th, Beijing, China

A recent meeting of the ICS Neoproterozoic Subcommittee took place at 17:00 on June 25th, 2006 within the auspices of the International Palaeontological Congress (IPC) in Beijing, China. All officers (J. Gehling, S. Xiao and G. Shields) and a total of 12 voting members (M. Fedonkin, S. Jensen, V. Melezhik, S. Peng, V. Rai, W., Sun, C. Yin, L. Yin, M. Zhu) were present. About the same number of observers were also present (S. Bengtson, P. Hoffman, K.-H. Hoffmann, M.M. Mus, K. Peterson, C. Zhou and other unnamed observers).

Four items were discussed:

1. The suggestion was made and supported that a compilation of possible basal Cryogenian defining criteria be made and circulated to the subcommission. Experts need to be contacted by the officers of the subcommission for their input:
 - Geochronological data. Suggestion from Kevin Peterson that we contact EarthTime in order to facilitate new age dates from key sections. Presently a database is being compiled and updated by Breandan MacGhabhann.
 - Isotopic data. Currently being compiled by Galen Halverson with his and other data compiled on IGCP 512 website.
 - Vase-shaped microfossils. A compilation of global distribution needs to be made. S. Porter, A.H. Knoll and M.M. Mus are experienced in this field.
 - Glacial strata. This is being done as part of a book effort by IGCP 512 although it was agreed to be unlikely that glacial strata themselves will be used as part of the definition.
 - Molar-tooth structure. A global compilation is being compiled by Graham Shields and should be available online soon.
 - Calcified microbes. Global compilation unavailable.
 - Stromatolites. Global compilation unavailable.
 - Acritarchs. Global compilation unavailable.

It was suggested in this context that the subcommission propose a provisional GSSP by the IGC 2008 in Norway based on proposed criteria before banging in the Golden Spike at a later date.

2. Regarding possible subdivision of the Ediacaran Period, several possible criteria were discussed:
 - Potential of acritarchs through this interval needs to be examined as they hold great potential (M. Fedonkin).
 - Disappearance of Large Spiny Acritarchs may be globally correlative event.
 - FAD of Ediacaran-type soft-bodied fossils.
 - Shuram/Wonoka negative $\delta^{13}\text{C}$ excursion appears to be globally correlative.
 - Gaskiers glaciation is not known yet to be globally correlative phenomenon

Same approach as for Cryogenian definition could be attempted.

3. Concrete proposals for future fieldtrips are required:
 - Lesser Himalaya 2007 (details to be announced by V. Rai)
 - Namibia 2008 (P. Hoffman, K.-H. Hoffmann) – *see Appendix 4 below*
 - Australia (considered highly desirable by those present but so far no offers to organize such a trip – likely to be very popular) – *see Appendix 5 below*
4. Call for PDFs of hard-to-find literature to be put on the web (P. Hoffman):
 - This idea was also well received and two websites are currently available for this: www.IGCP512.com and www.SnowballEarth.org

APPENDIX 3

Discussion document from the Ascona conference circulated on September 19th, 2006

The Tonian-Cryogenian transition – an open discussion at Snowball Earth 2006, July 21st, Ascona, Switzerland

The **Cryogenian** Period (c.750-635 Ma), once it is formally defined in the rock record, will likely represent the most globally coherent time slice so far defined in the geological record. Its obvious metaphorical qualities have the potential to reach far beyond the normal sphere of academic research into the wider domain of schools and the general public. The name is already widely used and there seems to be no will within the geological community to challenge its status in the official geological time scale. The question of its definition and global correlation are stated goals of the International Subcommittee on Neoproterozoic Stratigraphy.

What defines the Cryogenian Period and what preceded it were the topics of discussion in the second of two open forum discussion sessions at the recent Snowball Earth 2006 conference in Ascona, Switzerland in July 2006, moderated by Graham Shields. It followed similar discussions at the IGCP 512 meeting in Aberystwyth, UK in August, 2005 and followed the Neoproterozoic Subcommittee meeting in Beijing, China in June, 2006 (see below). The discussion centred on the nature of the Earth System in the run-up to glaciation. The audience pointed out that the **end of the preceding Tonian Period** was characterized by:

1. Widespread continental rifting, possibly caused by a mantle plume event, between 850 Ma and 750 Ma, and leading to the break-up of the supercontinent 'Rodinia'. Some rifting events are marked by low-latitude flood basalts that would have been more susceptible to chemical weathering.

2. Start of a major rise in seawater $^{87}\text{Sr}/^{86}\text{Sr}$ from approximately 850 Ma. Values rose from 0.7055 to 0.7067 or higher by the onset of glaciation. After the c.635Ma deglaciation, ocean $^{87}\text{Sr}/^{86}\text{Sr}$ continues rising to 0.7092 by 500Ma.
3. Generally high seawater $\delta^{13}\text{C}$ values and first major negative $\delta^{13}\text{C}$ excursion of the Neoproterozoic: the “Bitter Springs” anomaly, which occurred when seawater $^{87}\text{Sr}/^{86}\text{Sr}$ had reached 0.7063.
4. Low continental relief, possibly due to the long existence of the supercontinent ‘Rodinia’; widespread development of shallow, stromatolite seas and massive deposition of evaporite minerals across Australia, in particular, c.850 Ma.
5. Widespread carbonate precipitation in shallow marine environments: high stromatolite diversity; global acme in molar-tooth structure (early calcite cements) worldwide; large ooids; first appearance of calcified cyanobacterial sheaths.
6. Biological diversification of eukaryotes, such as acanthomorphic acritarchs, organic walled megafossils (Chuar-Tawua assemblage) and enigmatic forms of apparently pelagic, single-celled eukaryotes, such as vase-shaped microfossils (VSM’s). These last fossils have been interpreted to be possible testate amoebae and may even have been lightly mineralised. Although the Tonian-Cryogenian transition marks a change from simple, long-ranging taxa to more complex taxa, it was acknowledged that Cryogenian assemblages are depauperate. The change to short-lived complex taxa is renewed after 635 Ma.

In essence the Tonian-Cryogenian transition is marked by the onset of phenomena that are set to become characteristic of later Neoproterozoic and early Cambrian time: continental rifting and volcanism; negative $\delta^{13}\text{C}$ excursions; high $\delta^{13}\text{C}$ values. Several aspects seem then to ‘take a back seat’ during the Cryogenian Period but are renewed after 635Ma, e.g. rising seawater $^{87}\text{Sr}/^{86}\text{Sr}$, diverse, short-lived acritarch assemblages and possibly biomineralisation. Some innovations do not reappear until the Precambrian-Cambrian boundary, e.g. calcimicrobes.

APPENDIX 4

Provisional arrangements for 2006 subcommission meeting proposed by V. Rai during Nov. 2006

Field excursion planned for the Lesser Himalayan Neoproterozoic successions and Central Indian Vindhyan Basin, India organized by Vibhuti Rai (University of Lucknow, India). Likely duration 14 days. Likely timing **November 15th to 28th, 2007**. Likely costs: US \$800-\$1400 per person depending on partial versus complete participation. The Himalayan trip can accommodate about 30 participants but the Vindhyan part only 20 due to logistics. A two-day conference will also be part of this trip during which there will be presentations and discussions on geological evidence for the relationship between biological evolution and climate during the Precambrian – this will be cosponsored by the Neoproterozoic Subcommission.

The participants would be assembling at **Dehradun**, the capital of Uttaranchal, a city well connected by Air and Train from **Delhi**. The first part of the trip ends at **Lucknow** from where participants can fly or travel by train to **Delhi, Kolkata, Agra** etc. The second part of the Field Meeting ends at **Khajuraho** which is rather ill connected. Participants can fly to **Delhi** or **Varanasi** from **Khajuraho** or travel by Bus/ Taxi/ Car to **Lucknow** from where they can travel to anywhere in India. The costs include expenses related to lodging, boarding, train/bus/taxi travel and field guide-book etc. Travel up to **Dehradun** and Travel from **Lucknow/ Khajuraho** would be at the participants cost). Itinerary below:

- DAY- 1 Arrival at **Dehradun** and Introductory Get-together
- DAY- 2 **Dehradun** to **Rishikesh** and Back – Evaluation of Varanger Glacials and Cap carbonates (the Blaini Formation)
- DAY – 3 **Dehradun** to **Kauriyala** and back – Evaluation of Varanger to Toyonian Succession (Blaini to Tal Formation)
- DAY – 4 **Dehradun** to **Mussoorie** and **Dhanaulti** and back – Complete succession of Ediacaran age (Krol and Tal Formations)

- DAY – 5 **Dehradun to Solan** (Himachal Pradesh)– On the way, exposures of Varanger and Ediacaran successions would be evaluated. Stay in **Solan**.
- DAY -6 **Solan to Simla** – Evaluation of different levels of Varanger glacials, type area of Blaini Formation and older Cryogenian deposits, Return to **Chandigarh**. Departing from Chandigarh to **Lucknow** by TRAIN in late evening.
- DAY – 7 Arrival early morning at **Lucknow**. Inauguration and Technical Sessions of Conference on Precambrian Life, Events & Basins
- DAY – 8 Technical Sessions of the Conference till Afternoon. Departure by Evening TRAIN to **Chopan**.
- DAY -9 Halt at **Renukut**. Fieldwork in and around Son Valley in the Lower Vindhyan successions (Palaeoproterozoic).
- DAY -10 Departure for **Rewa** by BUS/ CAR, Fieldwork on the way in Lower and Upper Vindhyan successions (Palaeoproterozoic and Mesoproterozoic Successions).
- DAY – 11 Halt at **Rewa**. Visit to **Chorhat** (Dolf Seilacher’s Locality) in Lower Vindhyan successions, Travel to **Maihar**.
- DAY -12 Halt at **Maihar**. Visit to Lower Vindhyan Successions.
- DAY – 13 Travel to **Khajuraho**. On the way, evaluation of lower part of Upper Vindhyan successions, Diamondiferous Kimberlite pipes and Rewa, Bhandar Formations. Halt at **Khajuraho**.
- DAY -14 Valedictory Function at **Khajuraho**. Departure by Air/ BUS/ Taxi/ Car to **Delhi/ Varanasi/ Lucknow**.

APPENDIX 5

Provisional arrangements for 2006 IGCP 512 meeting proposed by M. Corkeron during 2007

Field excursion planned for the Kimberley Ranges, NW Australia organized by Maree Corkeron (James Cook University, Australia). Likely duration 9-12 days. Likely timing 23 June to July 8th. Likely costs: AUS \$1600 per person. Itinerary below:

- Fly into Broome.
- Day 1 and 2: Broome to Mount House Station to view striated pavements beneath Walsh Tillite and either Mount House type section, or cap carb overlying diamictite in anticline used for palaeomag analysis..
- Day 3; Travels from Mount House to Louisa Downs via Windjana Gorge - Devonian reef.
- Day 4-5; Possibly 2 days at Louisa Downs; view Landrigan Tillite cap, possibly diamictite; Striated pavements beneath Egan Formation, stromatolite reef of Tungusia julia; complete sections of Egan Formation; spectacular scenery.
- Day 6; Louisa Downs to Bungle Bungle (Purnululu National Park). On way see Egan Fm type section.
- Day 7 Day at Bungles; west of Bungles is Neoproterozoic succession (Fargoo Tillite, Frank River Sandstone, Moonlight Valley Tillite and cap carb). Can either walk through succession, or take shorter visit to cap carbonate and spend half day looking at the Bungle Bungles.
- Day 8 Bungles to Kununurra or Keep River National Park via Texas Downs. Several hours stop at Texas Downs/Moonlight Valley; view Moonlight Valley type section; drive through Texas Downs across the Ord River and then through Spring Creek Station. This takes you up through the Antrim Plateau Volcanics. We could o/night at Keep River National Park instead of Kununurra.
- 9) Kununurra to Darwin (no geological stops required - though of course there is lots to see!!)

Fly out from either Kununurra or Darwin

Opportunity for a guided visit the Ediacaran GSSP will be provided either before or after the excursion.

APPENDIX 6

Neoproterozoic Publications for 2006 in Paleontology, Sedimentology, Isotope Geochemistry and Stratigraphy

1. Alene, M., Jenkin, G., Leng, M., and Darbyshire, F., 2006. The Tambien Group, Ethiopia: An early Cryogenian (ca. 800-735 Ma) Neoproterozoic sequence in the Arabian-Nubian Shield, Precambrian Research, 149, 79–89.

2. Allen, P. and Leather, J., 2006. Post-marinoan marine siliciclastic sedimentation: The Masirah Bay Formation, Neoproterozoic Huqf Supergroup of Oman, *Precambrian Research*, 144, 167–198.
3. Arnaud, E. and Eyles, C., 2006. Neoproterozoic environmental change recorded in the Port Askaig Formation, Scotland: climatic and tectonic controls on sedimentation, *Sedimentary Geology*, 283, 99–124.
4. Azmy, K., Kaufman, A., Misi, A., and deOliveira, T. F., 2006. Isotope stratigraphy of the Lapa Formation, Sao Francisco Basin, Brazil: Implications for Late Neoproterozoic glacial events in South America, *Precambrian Research*, 149, 231–248.
5. Bottjer, D.J. and Clapham, M.E. 2006. Evolutionary paleoecology of Ediacaran benthic marine animals. In *Neoproterozoic Geobiology and Paleobiology*. Edited by S. Xiao and A.J. Kaufman, Springer, pp. 91-114.
6. Canfield, D.E., Poulton, S.W. and Narbonne, G.M., 2006. Late Neoproterozoic deep-ocean oxygenation and the rise of animal life. *Science*, 10.1126/science.1135013.
7. Corsetti, F. and Lorentz, N., 2006. On Neoproterozoic cap carbonates as chronostratigraphic markers, in S. Xiao and A. Kaufman (Eds.), *Neoproterozoic Geobiology and Paleobiology*, Springer, New York, vol. 27, 273–294.
8. De, C. 2006. Ediacara fossil assemblage in the upper Vindhya of Central India and its significance. *Journal of Asian Earth Sciences* 27, 660-683.
9. Deynoux, M., Affaton, P., Trompette, R., and Villeneuve, M., 2006. Pan-African tectonic evolution and glacial events registered in Neoproterozoic to Cambrian cratonic and foreland basins of West Africa, *Journal of African Earth Sciences*, 46, 397–426.
10. Droser, M. L., Gehling, J.G. and Jensen, S.R. 2006. Assemblage palaeoecology of the Ediacara biota: The unabridged edition? *Palaeogeography, Palaeoclimatology, Palaeoecology* 232, 131-147.
11. Evans, D., 2006. Proterozoic low orbital obliquity and axial-dipolar geomagnetic field from evaporite paleolatitudes, *Nature*, 444, 51–55.
12. Fike, D.A., Grotzinger, J.P., Pratt, L.M. and Summons, R.E., 2006. Oxidation of the Ediacaran ocean. *Nature* 444, 744-747.
13. Font, E., Nédélec, A., Trindade, R., Macouin, M., and Charrière, A., 2006. Chemostratigraphy of the Neoproterozoic Mirassol d'Oeste cap dolostones (Mato Grosso, Brazil): An alternative model for Marinoan cap dolostone formation, *Earth and Planetary Science Letters*, 250, 89–103.
14. Frimmel, H., Tack, L., Basei, M., Nutman, A., and Bowen, A., 2006. Provenance and chemostratigraphy of the Neoproterozoic West Congolian Group in the Democratic Republic of Congo, *Journal of African Earth Sciences*, 46, 221–239.
15. Hagadorn, J.W., Xiao, S., Donoghue, P.C.J., Bengtson, S., Gostling, N.J., Pawlowska, M., Raff, E.C., Raff, R.A., Turner, F.R., Yin, C., Zhou, C., Yuan, X., McFeely, M.B., Stampanoni, M., and Neilson, K.H., 2006. Cellular and subcellular structure of Neoproterozoic embryos: *Science*, v. 314, p. 291–294.
16. Halverson, G., 2006. A Neoproterozoic Chronology, in S. Xiao and A. Kaufman (Eds.), *Neoproterozoic Geobiology and Paleobiology*, Springer, New York, vol. 27 of *Topics in Geobiology*, 231–271.
17. Hough, M., Shields, G., Evins, L., Strauss, H., Henderson, R., and Mackenzie, S., 2006. A major sulphur isotope event at c. 510 ma: a possible anoxia-extinction-volcanism connection during the Early-Middle Cambrian transition? , *Terra Nova*, 18, 257–263.
18. Huntley, J.W., Xiao, S., and Kowalewski, M., 2006, 1.3 billion years of acritarch history: An empirical morphospace approach: *Precambrian Research*, v. 144, p. 52-68.
19. Huntley, J.W., Xiao, S., and Kowalewski, M., 2006, On the morphological history of Proterozoic and Cambrian acritarchs, in Xiao, S., and Kaufman, A.J., eds., *Neoproterozoic Geobiology and Paleobiology*: Dordrecht, the Netherlands, Springer, p. 23-56.
20. Hurtgen, M., Halverson, G., Arthur, M., and Hoffman, P., 2006. Sulfur cycling in the aftermath of a Neoproterozoic (Marinoan) snowball glaciation: Evidence for a syn-glacial sulfidic deep ocean, *Earth and Planetary Science Letters*, 245, 251-270.
21. Jiang, G., Kennedy, M., Christie-Blick, N., Wu, H., and Zhang, S., 2006. Stratigraphy, sedimentary structures, and textures of the Late Neoproterozoic Doushantuo cap carbonate in South China, *Journal of Sedimentary Research*, 76, 978–995.
22. Jiang, G., Shi, X., and Zhang, S., 2006. Methane seeps, methane hydrate destabilization and the late Neoproterozoic postglacial cap carbonates, *Chinese Science Bulletin*, 51, 1152–1173.

23. Kasting, J., Howard, M., Wallmann, K., Veizer, J., Shields, G., and Jaffrés, J., 2006. Paleoclimates, ocean depth, and the oxygen isotopic composition of seawater, *Earth and Planetary Science Letters*, 252, 82–93.
24. Kaufman, A., Jiang, G., Christie-Blick, N., Banerjee, D., and Rai, V., 2006. Stable isotope record of the terminal Neoproterozoic Kroll platform in the Lesser Himalaya of northern India, *Precambrian Research*, 149, 156–185.
25. Kendall, B., Creaser, R., and Selby, D., 2006. Re-Os geochronology of postglacial black shales in Australia: Consequences for timing of the Sturtian glaciation, *Geology*, 729–732.
26. Kennedy, M., Droser, M., Mayer, L., Peaver, D., and Mrofka, D., 2006. Late Precambrian Oxygenation; inception of the clay mineral factory, *Science*, 311, 1446–1449.
27. Knoll, A., Walter, M., Narbonne, G., and Christie-Blick, N., 2006. The Ediacaran Period: a new addition to the geologic time scale, *Lethaia*, 39, 13–30, 10.1080/00241160500409223.
28. Le Guerroué, E., Allen, P., and Cozzi, A., 2006. Chemostratigraphic and sedimentological framework of the largest negative carbon isotopic excursion in Earth history: The Neoproterozoic Shuram Formation (Nafun Group, Oman), *Precambrian Research*, 146, 68–92.
29. Le Guerroué, E., Allen, P., Cozzi, A., Etienne, J., and Fanning, C., 2006. 50 Myr recovery from the largest negative c excursion in the Ediacaran ocean, *Terra Nova*, 18, 147–153.
30. Mapstone, N.B., and McIlroy, D. 2006. Ediacaran fossil preservation: Taphonomy and diagenesis of a discoid biota from the Amadeus Basin, central Australia. *Precambrian Research* 149, 126-148.
31. McKay, G., Prave, A., Alsop, G., and Fallick, A., 2006. Glacial trinity: Neoproterozoic Earth history within the British-Irish Caledonides, *Geology*, 34, 909–912.
32. McKirdy, D., Webster, L., Arouri, K., Grey, K., and Gostin, V., 2006. Contrasting sterane signatures in Neoproterozoic marine rocks of Australia before and after the Acraman asteroid impact, *Organic Geochemistry*, 37, 189–207.
33. Pyle, L.J., Narbonne, G.M., Nowlan, G.S., Xiao, S., and James, N.P., 2006, Early Cambrian metazoan eggs, embryos, and phosphatic microfossils from northwestern Canada: *Journal of Paleontology*, v. 80, p. 811-825.
34. Rieu, R., Allen, P.A., Etienne, J.L., Cozzi, A., and Wiechert, U., 2006. A Neoproterozoic glacially influenced basin margin succession and 'atypical' cap carbonate associated with bedrock palaeovalley, Mirbat area, southern Oman. *Basin Research* 18, 471-496.
35. Santos, R., de Alvarenga, C., Babinski, M., Ramos, M., Cukrov, N., Fonseca, M., Sial, A., Dardenne, M., and Noce, C., in press. Carbon isotopes of Mesoproterozoic-Neoproterozoic sequences from southern São Francisco craton and Aracuaí belt, Brazil: Paleogeographic implications, *Journal of South American Earth Sciences*, 18, 27–39.
36. Stern, R., Avigad, D., Miller, N., and Beyth, M., in press. Geological Society of Africa Presidential Review: Evidence for snowball Earth hypothesis in the Arabian-Nubian Shield and East African Orogen, *Journal of African Earth Sciences*.
37. Xiao, S. and Dong, L., 2006. On the morphological and ecological history of Proterozoic macroalgae, in S. Xiao and A. Kaufman (Eds.), *Neoproterozoic Geobiology and Paleobiology*, Springer, vol. 27 of Topics in Geobiology, 57–90.
38. Xiao, S. and Kaufman, A. (Eds.), 2006. *Neoproterozoic Geobiology and Paleobiology*, vol. 27 of Topics in Geobiology, Springer, New York.
39. Zhang, S., Li, Z. X., and Wu, H., 2006. New precambrian palaeomagnetic constraints on the position of the North China Block in Rodinia, *Precambrian Research*, 144, 213–238.



International Commission on Stratigraphy Subcommission on Precambrian Stratigraphy

ANNUAL REPORT 2006

1. TITLE OF CONSTITUENT BODY

Subcommission on Precambrian Stratigraphy

Submitted by:

Wouter Bleeker, *Chairman*

Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario, Canada, K1A 0E8

Email address: wbleeker@nrcan.gc.ca

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

An international subcommission under ICS that has set as its main goal to construct a 'natural' stratigraphy-based time scale for all of the Precambrian, and pin key stratigraphic boundaries with GSSPs like in the Phanerozoic (not GSSAs).

3. ORGANIZATION

Officers for 2004-2008:

Chair: Dr. Wouter Bleeker, Geological Survey of Canada

Vice-Chair: Dr. Martin Van Kranendonk, Geological Survey of Western Australia

Secretary: Dr. Robert Rainbird, Geological Survey of Canada

Website: www.stratigraphy.org/precambrian -- lists all relevant information, including downloadable pdf files of key papers and reports. The page was constructed and is maintained by Dr. Wouter Bleeker and Prof. Sorin Filipescu (Dept. of Geology, Babes-Bolyai University, in Cluj-Napoca, Romania), the ICS webmaster.

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

Work of the new Precambrian Subcommission interfaces closely with:

- The subcommission on the Neoproterozoic, currently chaired by Dr. Jim Gehling.
- The main body of ICS (International Commission on Stratigraphy)
- A new IGCP Project (509) led by Drs. Steven Reddy (Curtin University, Western Australia) and David Evans (Yale University, USA), et al.: Paleoproterozoic Tectonics and Global Evolution.

- A new IGCP Proposal by Dr. Graham Shields et al.: Neoproterozoic Ice Ages.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

- A comprehensive questionnaire has been drafted on questions pertaining to the Precambrian time scale. This will be sent out shortly to the Subcommittee members and a wider target group of Precambrian geologists and stratigraphers. The aim of this questionnaire is to ensure that there is a broad buy-in into formalizing the current subdivision of the Archean and into pegging the boundaries according to the GSSP concept (albeit with somewhat relaxed constraints as we go into the earliest record). It was hoped that this questionnaire would have been sent out already but this has been delayed. Results will be compiled this winter and will form the basis for a paper in Precambrian Research (and a shorter version in Episodes) outlining the future direction of the Subcommittee. Only when this broad buy-in is assessed and demonstrated (in a formal publication), can we proceed with changing the boundary definitions to GSSPs. Inevitably, there will be criticism (see, for instance, the debate on the status of the Quaternary) and at that point we need to be able to demonstrate that the direction set by the Subcommittee is based on broad consultation and international majority consensus.
- Made preparations for a next workshop of the Subcommittee on Precambrian Stratigraphy, to be held in Beijing, China, in September of 2007, in conjunction with the “International Symposium on Precambrian Chronology and Tectonic Evolution”. Lead organizers are Dr. Lu Songnian of the Tianjin Institute of Geology and Mineral Resources and colleagues of the Chinese Academy of Geological Sciences. At the meeting in Beijing, there will also be a workshop of IGCP 509 project on the Paleoproterozoic, with which there are significant synergies. The Beijing organizers have planned four field trips for Chinese and international participants, several of which will have a focus on well-preserved stratigraphic sections through Precambrian sequences with GSSP potential.
- In conjunction with ICS Chair Felix Gradstein, and potential co-authors, planning of the new chapters on the Precambrian and planetary time scales for the new time scale book “GTS2008”.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006

None. Not enough time in the day!

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2007):

Support received for Subcommittee from ICS treasurer: \$500 (US\$).

No expenses in 2006. Significant travel coming up in 2007 for several Subcommittee and ICS workshops.

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

- Distribution of a comprehensive questionnaire to Subcommittee members and a larger target group of Precambrian geologists and stratigraphers.
- Compilation of results from this questionnaire on strategic directions for the Precambrian time scale. Results will form the basis for a paper in Precambrian Research and a shorter report in Episodes.
- Subcommittee workshop and field trips in Beijing, September 2007.

9. BUDGET AND ICS COMPONENT FOR 2007

Support is requested for travel to and from 2007 workshops: \$3000 (US\$).

10. REVIEW CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2001-2006)

- The new Subcommittee on Precambrian Stratigraphy is now fully activated.
- Chapter contributed to GTS2004, the highly successful new comprehensive book on the time scale, edited by Gradstein et al.
- Proposal for new approach published in Lethaia.
- New website up and running (<http://stratigraphy.org/precambrian/>).
- Operational links with allied subcommittees (e.g., on the Ediacaran Period) firmly established.
- First 'concept' workshop held in Perth Australia.
- Previous chairman (Dr. Ken Plumb) was invited to the Perth workshop to help achieve a smooth transition from previous Subcommittee activities to those of the new Subcommittee.
- Follow-up workshops being planned, one in conjunction with IGCP 509.
- First field workshops to define a GSSP-based Archean-Proterozoic boundary being planned.
- Concept papers on the Precambrian time scale in general, and a GSSP-based Archean-Proterozoic boundary in advanced state of preparation, to be submitted to the new journal "Stratigraphy".
- Active participation in the overall body of ICS.

11. OBJECTIVES AND WORK PLAN FOR NEXT 5 YEARS (2004-2008)

The main objectives towards 2008 are:

- A complete Precambrian time scale in place, with formalized Hadean and Archean eons.
- Formal GSSP for the base of the Archean.
- Formal GSSP for the base of the Proterozoic.
- Natural subdivision of the Archean Eon, with GSSPs for each era-rank subdivision (Eo-, Paleo-, Meso-, and Neoproterozoic).
- In cooperation with the Neoproterozoic Subcommittee, an advanced plan on how to naturalize the time scale for the Proterozoic.

- Full incorporation of latest insights from planetary science in the earliest part of the terrestrial Precambrian time scale.
- In cooperation with other experts, compare and contrast the time scales of Earth with those of other planetary bodies, specifically the Moon and Mars.
- Prepare appropriate chapters on these topics for the 2008 version of the Geological Time Scale.

In 2007, we hope to solidify the general consensus on a GSSP-based approach for the Precambrian time scale and to start making preparations for field workshops to tackle in detail the Archean-Proterozoic boundary. A first such workshop and associated field trips will be held in Beijing, China, in September 2007.

November 2006,
Ottawa

APPENDIX

Subcommission officers:

Chair: Dr. Wouter Bleeker, Geological Survey of Canada, 601 Booth Street, Ottawa, Canada, K1A0E8, e-mail: wbleeker@nrcan.gc.ca

Vice-Chair: Dr. Martin Van Kranendonk, Geological Survey of Western Australia, Mineral House, 100 Plain Street, East Perth, Western Australia 6004, Australia, e-mail: martin.vankranendonk@doir.wa.gov.au

Secretary: Dr. Robert Rainbird, Geological Survey of Canada, 601 Booth Street, Ottawa, Canada, K1A0E8, e-mail: rrainbir@nrcan.gc.ca

List of voting members (see website):

Australia:

David Nelson, Geological Survey of Western Australia, david.nelson@doir.wa.gov.au

Allen Nutman, the Australian National University, allen.nutman@anu.edu.au

Graham Shields, James Cook University, graham.shields@jcu.edu.au

Ian Tyler, Geological Survey of Western Australia, ian.tyler@doir.wa.gov.au

Brasil:

Reinhardt Fuck, Universidade de Brasília, rfuck@unb.br

Benjamim Bley Brito Neves, Institute of Geosciences, University of Sao Paulo, bbleybn@usp.br

Cameroon:

Sadrack Félix Toteu, Centre for Geological and Mining Research, sftoteu@yahoo.fr

Canada:

Donald W. Davis, University of Toronto, dond@geology.utoronto.ca

Mike Hamilton (c), University of Toronto, mahamilton@geology.utoronto.ca

Sandra Kamo (c), University of Toronto, skamo@geology.utoronto.ca

Guy Narbonne, Queen's University, narbonne@geol.queensu.ca

China:

Huaikun Li, Chinese Geological Survey, tjlhuaikun@cgs.gov.cn

Songnian Lu, Chinese Geological Survey, tjlsongnian@cgs.gov.cn

Yusheng Wan, Chinese Academy of Geological Sciences, wanyusheng@bjshrimp.cn

Huichu Wang, Chinese Geological Survey, tjwhuichu@cgs.gov.cn

Finland:

Petri Peltonen, Geological Survey of Finland, petri.peltonen@gtk.fi

Germany:

Alfred Kröner, University of Mainz, kroener@mail.uni-mainz.de

Russia:

Andrei Khudoley, St. Petersburg State University, khudoley@ah3549.spb.edu

Sweden:

Martin Whitehouse, Swedish Museum of Natural History, martin.whitehouse@nrm.se

United Kingdom:

Stephen Moorbath, Oxford University, United Kingdom, stephenm@earth.ox.ac.uk

Euan Nisbet, Royal Holloway University of London, nisbet@gl.rhul.ac.uk

United States of America:

Andrey Bekker, Carnegie Institution of Washington, a.bekker@gl.ciw.edu

David Evans, Yale University, dai.evans@yale.edu

Don Lowe (c), Stanford University, lowe@pangea.stanford.edu

Stephen J. Mojzsis, University of Colorado, Stephen.Mojzsis@colorado.edu



International Commission on Stratigraphy Subcommission on Stratigraphic Classification

ANNUAL REPORT 2005

1. TITLE OF CONSTITUENT BODY

Subcommission on Stratigraphic Classification (ISSC)

Submitted by:

Maria Bianca Cita

Chairman, ISSC

Maria Rose Petrizzo

Secretary, ISSC

University of Milano, Dept. Earth Sciences "Ardito Desio", via Mangiagalli 34, 20133 Milano, Italy
Tel +39-02-503 15529; Fax: +39-02-503 15494, E-mail: maria.cita@unimi.it

20th November 2006

2. OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

The Subcommission represents a core business for the International Commission on Stratigraphy the primary body for creating, discussing, publishing and disseminating an internationally agreed-upon guide on stratigraphic terminology and classification or-in other words standardization of the Stratigraphic Units. Its first priority is to advertise new developments in stratigraphic methods, check that the procedures are carefully followed, and monitor the application of the accepted rules. They fall in two categories: 1) the world-wide acceptance of the basic rules of stratigraphy, without which no time-scale is meaningful, because of the potential gap between knowledge and concepts; and 2) coordination of international application of stratigraphic principles and concepts, with special reference to the most important "users" of stratigraphy, as Geological Surveys, graduate and undergraduate teaching, oil companies, professionals.

The objectives of the Subcommission are relevant to IUGS policy because standardization of the stratigraphic terminology is essential to any attempt of global correlation, and requires a large and active international cooperation.

3. ORGANIZATION

3a. Officers for 2004-2008:

Chair: Maria Bianca Cita, Italy

Vice-Chair: Ashton Embry, Canada

Secretary: Maria Rose Petrizzo, Italy

4. INTERFACES WITH OTHER INTERNATIONAL PROJECTS

ISSC has always been directly or indirectly linked to big international Project as ODP and IGCP.

5. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2006

5a- Two Newsletters were distributed electronically and/or via traditional mail, one in June 2006 (Newsletter n. 9), and one in November 2006 (Newsletter n. 10).

5b- New Developments in Stratigraphic Classification

A presentation to the ISSC sponsored series with this title is in press on Newsletter on Stratigraphy by ISSC Chair M.B. Cita. Expected time of publication: January 2007.

5c- Cyclostratigraphy Task Group

The cyclostratigraphy task group consists of three members, André Strasser (chair), Frits Hilgen, and Philip Heckel.

Their product i.e. the paper entitled CYCLOSTRATIGRAPHY – CONCEPTS, DEFINITIONS AND APPLICATIONS, is in press on *Newsletters on Stratigraphy*. Expected time of publication: January 2007.

5d- Sequence Stratigraphy Task Group

The sequence stratigraphy task group consists of five members, Ashton Embry (chair), Benoit Beauchamp, Don Owen, Erik Johannessen and Piero Gianolla.

Outline distributed in *ISSC Newsletter 8* (October 2005). The full text is in progress.

5e- Chemostratigraphy Task Group

Prof. Helmut Weissert (ETH, Zurich) has been appointed as task group leader, Joachimski as member. The leader is looking for Neogene specialists.

Outline distributed in *ISSC Newsletter 9* (June 2006). Comments received and distributed in *ISSC Newsletter 10* (November 2006).

5f- Biostratigraphy Working Group

Working Group leader is Prof. Thierry, but members are unknown.

Outline distributed in *ISSC Newsletter 9* (June 2006). Comments received and distributed in *ISSC Newsletter 10* (November 2006). The full text is in progress.

5g- Magnetostratigraphy Working Group

Working Group leader is Prof. Cor Langereis, members appointed are Wout Krijgsman, Giovanni Muttoni, Manfred Menning, and M. Szurlies.

The outline is in progress.

5h- Lithostratigraphy Working Group

Working Group leader is Prof. Brian Pratt, members appointed are Stan Finney, Werner Piller, and Mike Easton.

The outline is in progress.

5i- Chronostratigraphy Working Group

Working Group leader is Prof. Maria Bianca Cita, members appointed are Finney, Pratt, Hilgen, Zalaciewicz, Embry, and Thierry.

No outline yet, but the work plan is starting.

5j- *Penrose Conference on Chronostratigraphy: Beyond the GSSP*, Schloss Seggau, Leibnitz Austria, 3-9 June 2006

Participation of eleven ISSC members. Three conveners (Berggren, Piller, Zalesiewicz) out of five are ISSC member. A contribution by M.B. Cita was presented by S. Finney.

5l- NACSN Annual Meeting. Participation of Dr. Ashton Embry, ISSC vice-chair, to report on ISSC activities.

6. CHIEF PROBLEMS ENCOUNTERED IN 2006.

The ICS subvention allocated to ISSC was very very low and disproportionate to the overall importance and significance attributed to this subcommission at the IUGS Ad-hoc Review Committee(ARC) meeting in Paris (Nov. 7-8 2005).

The commercial web-site of the International Subcommission on the Stratigraphic Classification (http://www.geocities.com/issc_arg) cannot be updated anymore because of space limits. We need to move it to a different web page. This will include assistance with setting up and upgrading the software, for a nominal payment.

7. SUMMARY OF EXPENDITURES IN 2006 (ANTICIPATED THROUGH MARCH 2006):

I. INCOME	US DOLLARS
2006 ICS subvention	325 USD
Contingency travel funds	700 USD
After the Exchange changes	765,01 EURO
II. EXPENDITURES	
US DOLLARS	
Mail	50.00
Office material	95.00
Secretarial help	50.00
Meeting in Dijon (June 2006)	300.00
Meeting in Zurigo and Winterthur (March 2006)	300.00
ISSC Newsletter 9, and 10	200.00
Total Expenses	995.00 USD
Excess expenditures over income	-295.00 USD
Carry-over from 2005	- 685.58 USD
Total	-980.00 USD

NOTE: The ICS subvention for 2006 was very low (325 USD) and after the exchange charges the total amount was even lower!

8. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2007):

Next year, besides the presentation of the new ISSC series “new developments in Stratigraphic Classification and the first paper on Cyclostratigraphy, which will be published at the beginning of 2007, we plan to distribute

- three outlines (Magnetostratigraphy, Lithostratigraphy and Chronostratigraphy), and
- three full texts (Sequence Stratigraphy, Biostratigraphy, and Chemostratigraphy).

9. BUDGET AND ICS COMPONENT FOR 2007

(a) General office expenses	50.00 US Dollars
(b) ISSC Newsletter n. 11, 12 and 13 Dollars	100.00 US Dollars
(c) Contribution towards cost of upgrading the web-site	600.00 US Dollars
(d) Contributions to help costs of Task and Working Groups for the preparation (i.e. meetings) of the various part of the New Developments in Stratigraphic Classification ISSC series	1500.00 US Dollars
(e) Secretarial help	50.00 US Dollars
<hr/>	
TOTAL BUDGET REQUEST	2300.00 US Dollars

NOTE: The requested budget will be used to support meetings and help costs of Task and Working Groups for the preparation of the **New Developments in Stratigraphic Classification ISSC series (future ISG)**

Potential funding sources outside IUGS

The Subcommittee does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources.

As in previous years, financial support will be sought by individual members from their grant-awarding bodies for specific projects such as research projects and meetings.

General support will be provided to the Secretary by University of Milano Department of Earth Sciences for equipment including computers, email access and telephones. The web-site of the International Subcommittee on the Stratigraphic Classification (http://www.geocities.com/issc_arg) needs to be updated. This will include assistance with setting up and upgrading the software, for a nominal payment.

10. SUMMARY OF CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2002-2006)

See Accomplishments in 2006 (above) for additional details.

Significant results of the International Subcommittee on Stratigraphic Classification activities are listed below.

Creation and world-wide distribution of ISSC Circulars:

- Circular 100 (January 25, 2002), Circular 101 (July 31, 2002)
- Newsletter n.1 = Circular 102 (February 2003), Newsletter n. 2 = Circular 103 (May 2003), Newsletter 3 = Circular 104 (December 2003).
- Newsletter n. 4 (March 2004), Newsletter n. 5 (October 2004), Newsletter n. 6 (December 2004)
- Newsletter n. 7 (June 2005), Newsletter n. 8 (October 2005)
- Newsletter n. 9 (June 2006), Newsletter n. 10 (November 2006)

Participation to the Urbino Meeting (June 13-16, 2002) by the ISSC vice-chairman M. B. Cita and presentation of a tentative work-plan or list of problems to be focused: “ISSC purpose is and has been to reach a consensus on stratigraphic terminology and classification by creating, discussing, publishing and disseminating an internationally agreed upon Guide (that means standardization of the stratigraphic units)...” The Guides are not conceived as treatises on Stratigraphy, but as practical instruments to explain the concepts and their formal applications. Applications of the principles and procedures, as applied in different countries by different entities and within different cultural environments have to be monitored and discussed from time to time”.

Election 12 new members.

Selection/categorization “old” plus “new” members to fulfill (a) the requirements of IUGS approved new statute of ICS, (b) the peculiar requirements of ISSC where there is no voting activities (only for elections once every four years!).

Organization of the first ISSC workshop “POST-HEDBERG DEVELOPMENTS IN STRATIGRAPHIC CLASSIFICATION” during the 32nd IGC in Florence (Italy) sponsored by the International Commission on Stratigraphy (ICS) of IUGS. After an introduction on Background and Motivation of the meeting, we had: (1) a few invited keynote presentations on hot topics; (2) a report on the outcome(s) of DWO 04 on Unconformity bounded stratigraphic units; (3) a series of position papers and/or presentation of documents dealing with stratigraphic classification by national or multinational Stratigraphic Commissions, Geological Surveys and alike; (4) free contributions.

Interaction with NACSN in the coordinated preparation of two workshops organised during the 32nd IGC in Florence.

Participation of vice-chair Ashton Embry to the 59th NACSN Annual Meeting in Denver (November 7, 2004), who gave a summary of ISSC activities. According to his report “everyone was very pleased with the renewed close cooperation between ISSC and NACSN”.

Participation to ICS workshop on “New directions in Stratigraphy”, held in Louvain (Sept. 1-5, 2005). ISSC chair took an active part in the workshop where she expressed the Subcommission position towards the Quaternary issue, co-chaired a working group on single versus dual terminology in chronostratigraphy, appointed a working group on chronostratigraphy, and presented a project by the new Italian Commission on Stratigraphy (CIS 3).

The Italian Commission on Stratigraphy is planning to formalize the accepted subdivision of the Mediterranean Pleistocene in three stages: Calabrian, Ionian and Tyrrherian. For this purpose Boundary Stratotypes and Points need to be selected and formalized for the Ionian and Tyrrhenian. The project is aimed at a stabilization of the Pleistocene with standard sections well exposed on land, and correlated by means of multiproxy data with continuously cored ODP drillsites in the same area (Tyrrhenian Sea Site 653, Ionian Sea Site 964, Sicily Channel Site 963).

Participation to the IUGS Ad-hoc Review Committee (ARC) meeting in Paris (Nov. 7-8 2005). ISSC chair was invited to the Ad-hoc Review Committee of IUGS. The committee was chaired by Prof. A. Riccardi (previous chair of ISSC) and composed by IUGS chair Prof. Zhang Hongren and by three external examiners, namely Prof. Callomon, Dr. L. Edwards and Prof. G. B. Vai. There, ISSC Chair realized that ISSC is considered the most important Subcommission of ICS both for historical reasons and for the paramount international significance of the Guide to Stratigraphic Classification that requires periodical revisions resulting from new scientific developments. The report presented and the plans for the future guide were highly appreciated, and she received congratulations for the activity carried on in the last few years.

Participation of vice-chair Ashton Embry to the 60th NACSN Annual Meeting.

11. OBJECTIVES AND WORK PLAN FOR NEXT 2 YEARS (2006-2008)

ISSC substantially differs from all the other Subcommissions because it is not focused on a definite time-slice, to be identified and correlated world-wide by means of various fossil groups or other chronologically identifiable criteria, which require a certain number of specialists of the various fossil groups (from different bio provinces) and/or of other techniques.

ISSC is concerned with concepts and principles, and with their application in the various continents. Generalists of sedimentary geology with knowledge of conceptual problems as well as field experience are required but also stratigraphers working in Geological Surveys and in oil companies, not only in Academia. Language barriers, cultural barriers, different work styles are expected. No joint activity in the field is foreseen with direct personal contacts. The work is essentially theoretical, and meetings are very seldom organized.

The FINAL GOAL of ISSC to the next IGC to be held is to arrive in Oslo with all the seven chapters foreseen, for the future international guide printed or in press as ISSC series. The presentation and the first chapter are in press. The others are in progress. They will represent the basis for a new guide, following the lines indicated by IUGS.

The target is represented by undergraduate and graduate students, field geologists, professionals. Each chapter will start with an incipit summarizing the historical development of that peculiar branch of stratigraphy. Basic concepts have to be clearly presented, followed by precise definitions. Then real examples (case – studies) will be briefly discussed, one for the Precambrian (if appropriate), one for the Paleozoic, one or two for the Mesozoic, one or two for the Cenozoic. It is a demanding task: we have to work well and try hard to meet the deadline.

A workshop ISSC Sponsored Series “New developments on Stratigraphic Classification” will be held in Oslo 2008 at the next IGC. Conveners are Cita (ISSC chair), Embry (ISSC vice-chair, Strasser (first author of the first contribution of the series), Finney (ICS vice-chair). During the workshop all the protagonist of the ISSC initiative will have an opportunity to present and discuss the results of their activity in an integrated stratigraphy scenario.

APPENDIX [Names and Full Addresses of Current Officers and Voting Members]

Subcommission officers

Chairman: Maria Bianca Cita, University of Milano, Dept. Earth Sciences “Ardito Desio”, via Mangiagalli 34, 20133, Milano, Italy, Tel +39-02-503 15529, e-mail: maria.cita@unimi.it

Vice Chairman: Ashton Embry, Institute of Sedimentary and Petroleum Geology Geological Survey of Canada, 3303 33rd St. N.W., Calgary, Alberta T2L 2A7, Canada, Tel +1-403-292 7125, e-mail: AEmbry@NRCCan.gc.ca

Secretary and Webmaster: Maria Rose Petrizzo, University of Milano, Dept. Earth Sciences “Ardito Desio”, via Mangiagalli 34, 20133, Milano, Italy, Tel +39-02-503 15531, Fax: +39-02-503 15494, e-mail: mrose.petrizzo@unimi.it

List of Task Groups and their officers

Chemostratigraphy:

Leader: Helmut Weissert, Switzerland, helmut.weissert@erdw.ethz.ch
M. Joachimski, Germany, joachimski@geol.uni-erlangen.de

Cyclostratigraphy:

Leader: Andreas Strasser, Switzerland, andreas.strasser@unifr.ch
Fritz Hilgen, The Netherlands, fhilgen@geo.uu.nl
Philip Heckel, USA philip-heckel@uiowa.edu

Sequence Stratigraphy:

Leader: Ashton Embry, Canada, AEmbry@NRCCan.gc.ca
Donald E. Owen, USA, owende@hal.lamar.edu
Piero Gianolla, Italy piero.gianolla@unife.it
Benoit Beauchamp Canada, bbeauchamp@ucalgary.ca
Erik Johannessen Norway, EPJ@statoil.com

List of Working Groups and their officers

Biostratigraphy

Leader: Jacques Thierry, France, jthierry@mail.u-bourgogne.fr

Chronostratigraphy

Leader: Maria Bianca Cita, Italy, maria.bianca@unimi.it
Ashton Embry, Canada, AEmbry@NRCan.gc.ca
Fritz Hilgen, The Netherlands, fhilgen@geo.uu.nl
Jacques Thierry, France, jthierry@mail.u-bourgogne.fr
Jan Zalasiewicz, U.K., jaz1@le.ac.uk
Stan Finney, USA, scfinney@csulb.edu
Brian Pratt, Canada, brian.pratt@usask.ca

Lithostratigraphy

Leader: Brian Pratt, Canada, brian.pratt@usask.ca
Stan Finney, USA, scfinney@csulb.edu
Werner Piller, Austria, werner.piller@uni-graz.at
Mike Easton, Canada, mike.easton@ndm.gov.on.ca

Magnetostratigraphy

Leader: Cor Langereis, The Netherlands, langereis@geo.uu.nl
Wout Krijgsman, The Netherlands, krijgsma@geo.uu.nl
Giovanni Muttoni, Italy, giovanni.muttoni1@unimi.it
Manfred Menning, Germany, menne@gfz-potsdam.de
Michael Szurlies, Germany, szur@gfz-potsdam.de

List of Members

All the Task Groups and Working Groups members who are not presently ISSC members will obtain this qualification in recognition of their highly appreciated voluntary work.

Anderson Timothy A., San Ramon, USA uandt@pacbell.net
Berggren William A., Woods Hole, USA wberggren@who.edu
Bleeker Wouter, CANADA Wbleeker@NRCan.gc.ca
Brakel Albert T., Canberra, AUSTRALIA abrakel@netspeed.com.au
Carter R.M., Townsville, AUSTRALIA bob.carter@jcu.edu.au
Chang Ki-Hong, Daegu, REPUBLIC OF KOREA khchang@knu.ac.kr
Choi Duck K., Seoul, KOREA dkchoi@snu.ac.kr
Cita M. B., Milano, ITALY, maria.cita@unimi.it
Cooper Roger A., Lower Hutt, NEW ZEALAND R.Cooper@gns.cri.nz
Csaszar Geza, ELTE University, HUNGARY, csaszar@mafi.hu
Dermitzakis Michael D., Athens, GREECE mdermi@geol.uoa.gr
Edwards Lucy E., Reston, USA leedward@usgs.gov
Embry A., Calgary, CANADA AEmbry@NRCan.gc.ca
Etayo Serna Fernando, Santafé de Bogotá, COLOMBIA hduque@elsitio.net.co
Finney Stanley, Long Beach, CA, USA scfinney@csulb.edu
Gianolla Piero, Ferrara, ITALY piero.gianolla@unife.it
Gladenkov Yuri B., Moscow, RUSSIA gladenkov@ginras.ru
Grigelis Algimantas, Vilnius, LITHUANIA grigelis@geo.lt
Hasegawa Shiro, Kumamoto, JAPAN, shiro@sci.kumamoto-u.ac.jp
Heckel Philip H., Iowa City, Iowa, USA philip-heckel@uiowa.edu
Hilgen Frederik J., Utrecht, THE NETHERLANDS, fhilgen@geo.uu.nl
Hoedemaeker J., Leiden, THE NETHERLANDS Hoedemaeker@naturalis.nnm.nl
Holland Charles H., Dublin, IRELAND hepwholl@tcd.ie
Hongzhen Wang, Beijing, CHINA wangcugb@public.bta.net.cn
Ivanov Marin, Sofia, BULGARIA Amivanov@gea.uni-sofia.bg

Johnson M.R., Pretoria, REPUBLIC OF SOUTH AFRICA mjohnson@geosciences.org.za
Karogodin Yuri N., Novosibirsk, RUSSIA karogod@uiggm.nsc.ru
Kazuo Amano, Ibaraki, JAPAN kam@mx.ibaraki.ac.jp
Lane H. Richard, Arlington, VA, USA hlane@nsf.gov
Lasca Norman P., Milwaukee, WI, USA nplasca@csd.uwm.edu
Luterbacher H.P., Barcelona, SPAIN, HPLUTER@telefonica.net
Menning Manfred, Potsdam, GERMANY menne@gfz-potsdam.de
Odin G.S., Paris, FRANCE gilodin@ccr.jussieu.fr
Orchard Mike J., Vancouver, British Columbia, CANADA morchard@nrcan.gc.ca
Owen Donald E., Beaumont, USA owende@hal.lamar.edu
Petrizzo Maria Rose, Milano, ITALY, mrose.petrizzo@unimi.it
Piller Werner E., Graz, AUSTRIA werner.piller@uni-graz.at
Pratt Brian, CANADA brian.pratt@usask.ca
Premoli Silva Isabella, Milano, ITALY isabella.premoli@unimi.it
Rawson P., London, GREAT BRITAIN p.rawson@ucl.ac.uk
Reguant Salvador, Barcelona, SPAIN reguant@geo.ub.es
Riccardi Alberto C., La Plata, ARGENTINA riccardi@museo.fcnym.unlp.edu.ar
Robb Laurence, Witwatersrand, SOUTH AFRICA 065LJR@cosmos.wits.ac.za
Salvador Amos, Austin, TX, USA amos.salvador@mail.utexas.edu
Schwarzacher W., Belfast, UK w.schwarzacher@Queens-Belfast.AC.UK
Shouxin Zhang, Beijing, PEOPLE'S REPUBLIC OF CHINA shouxinzh@yahoo.com.cn
Steininger Fritz F., Frankfurt am Main, GERMANY fritz.steininger@senckenberg.de
Strasser Andreas, Fribourg, SWITZERLAND andreas.strasser@unifr.ch
Takayanagi Yokichi, Sendai, JAPAN ytaka@cat-v.ne.jp
Tchoumatchenco P.V., Sofia, BULGARIA platon@lark.vmei.acad.bg
Thierry Jacques, Dijon, FRANCE jthierry@mail.u-bourgogne.fr
Wardlaw Bruce R., Reston, VA, USA bwardlaw@usgs.gov
Waterhouse J.B., Oamaru, NEW ZEALAND Loris@xtra.co.nz
Winter Henk de la R., Johannesburg, SOUTH AFRICA winterh@xconnect.co.za
Zachariasse W.J., Utrecht, THE NETHERLANDS, jwzach@geo.uu.nl
Zalasiewicz Jan, Leicester, U. K. jaz1@leicester.ac.uk
Zhamoida A.I., St. Petersburg, RUSSIA MSK@vsegei.ru

ICS Report APPENDIX:

ICS-Sponsored Stratigraphic Symposia, Workshops and Fieldtrips proposed for the 33th IGC in Oslo in 2008

Coordinator Felix M. Gradstein

NOTE: This is the initial list of proposals (September, 2006), and will probably have more entries when completed.

Symposia

1. *Geologic Time Scale 2008*

Conveners: Felix M. Gradstein, James G. Ogg and Mike Villeneuve

Duration: one day

During the 32nd IGC in Florence, ICS held a very well attended special symposium on Geologic Timescale 2004. With the major effort of 40+ specialists underway now in ICS to create a fully digital version of the GTS, with major updates in chronostratigraphy and geochronology, the Oslo IGC is the appropriate venue to present where we are now in the standard, international geologic timescale. Standard boreal chronostratigraphy will be explored and outlined also.

2. *Pliocene-Pleistocene Correlations and Global Change*

Maria Bianca Cita, Brad Pillans and

Duration: 3/4 day

Debate on stratigraphic subdivision, regional and global correlations and ranking of units for the geologic time scale of the last 10 million years has been going on for over a century. Although this often rather boring debate pales in comparison to the importance of better understanding global change during that time interval, it bears directly on accuracy in time correlations. This symposium will highlight the current understanding of Late Cenozoic chronostratigraphy and geochronology and investigate global changes in climate and provide an outlook on the future 'around the corner'.

3. *Milestones in Stratigraphy*

Conveners: Stan Finney et al.

Duration: 3/4 day

The modern revolution in chronostratigraphy with on one hand global boundary stratotype sections and points (GSSP's) for stages, and few if any stage stratotypes sections on the other hand, create a challenge to practical stratigraphy. Are we going to correlate stage units with defined boundaries, but no fixed content, or are we going to correlate with the physical data in a typified body of rock itself (or with both if available offcourse). Current emphasis on high-resolution events for correlation tends to obscure chronostratigraphic philosophy. In this symposium we will first re-emphasize traditional philosophical roots, then examine how stratigraphy has changed the last 25 years and finally where it is heading after GSSP completion.

4. *Oligocene Series : a time of change in earth and life history.*

Organizations supporting the symposium : ICS and ISPS

Conveners: Yuri Gladenkov , GERS, Moscow, Russia and Noël Vandenberghe, K.U. Leuven, Belgium

Format : papers , posters and synthesis papers prepared by invited scientists.

Objective: The Oligocene time is seeing the change towards a significant cooling of the planet. An increased number of studies documented several aspects of the changing Oligocene earth and life history in different parts of the world. The symposium attempts to integrate and synthesize these results into a coherent paleogeographic and stratigraphic evolutionary history of the Oligocene as it is known today.

Subjects:

1. Contributions to improved stratigraphic resolution and understanding of the Oligocene and its transitions to Eocene and Miocene.
2. Paleogeography of land masses, seas and oceans during the Oligocene including atmospheric and oceanic circulation models for the Oligocene situation.
3. Periodicity, cycles, sequences and events: comparing and understanding observations.
4. The contrast to the Eocene and Miocene: Significance of the Oligocene Series in the evolution of earth and life history.

5. *Correlation of Devonian terrestrial, neritic and pelagic strata*

Thomas Becker et al.

Duration: 3/4 day

6. *Magnetic stratigraphy: the template for the construction of geologic time scales*

Conveners: Fabio Speranza and Fabio Florindo

Organization: Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy

Description: The analysis of magnetic anomaly profiles over the oceans represents the first-order template for the late Jurassic to Quaternary geomagnetic polarity time scale (GPTS). Yet, there is no oceanic crust older

than mid-late Jurassic, implying that the oceanic magnetic anomalies cannot be used for the older time scale interval. As a consequence, the pre-mid-late Jurassic (i.e. pre-Callovian-Oxfordian)

GPTS may be solely defined by the bio-magnetostratigraphic integrated study of land sections or

borehole cores. Obviously, this older part of the GPTS (pre-polarity chron M38) should be built

through target sedimentary sections displaying: 1) a high sedimentation rate, 2) presence of

biostratigraphic markers, and 3) a stable remanent magnetization of primary origin. The hunt of

sections contemporaneously satisfying these conditions is progressively yielding a refinement of the pre-M38 GPTS.

In this session we welcome all bio- and magneto-stratigraphic contributions aiming at both detailing

the late Jurassic to Quaternary GPTS, as well as highlighting the Triassic, Jurassic (and older)

GPTS, which is poorly (or no) defined for some geologic stages. Contributions dealing with orbital

forced cyclicity as a tool to better constrain the duration and boundary ages of polarity chrons and

geologic stages are also encouraged.

7. Accuracy in Fossil zonation

Conveners: David L. Bruton & J. Fredrik Bockelie, Sagex AS, Oslo

Description: How far can we trust fossils assemblages in fine scale correlation and what role do facies play in fossil distribution and preservation?

8. Global Controls on Sequence Stratigraphy

Conveners: Peter Sharland and Ken Miller

Description: We suggest a review of global controls would be timely and interesting, and allow a wide discussion of the influence of plate motions, mid-ocean ridges, climate, gas hydrates, glacio-eustasy etc. A half day oral session would suffice for this linked to a session of posters providing some meaty data and interpretations.

Workshop:

New developments in Stratigraphic Classification

Conveners Maria Bianca Cita, Ashton Embry, Andreas Strasser and Stan Finney

Duration: 2 days

Stratigraphic Fieldtrip:

Neoproterozoic Succession in Finmark, N.Norway - IGCP Project 512

Leader Graham Shields

Duration: < 10 days